

R N SHETTY TRUST ®



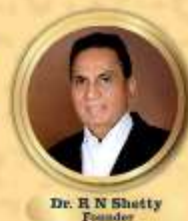
RNS INSTITUTE OF TECHNOLOGY

Autonomous Institution affiliated to Visvesvaraya Technological University, Belagavi

Approved By AICTE, New Delhi. Accredited by NAAC with 'A+' Grade

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Dr. R N Shetty
Founder

BACHELOR OF ENGINEERING

Scheme and Syllabus of I - II Semesters

(2025 Autonomous Scheme)

25
RNSIT



INSTITUTION'S
INNOVATION
COUNCIL
(Affiliated to VIT-VEL)



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BLOOM's TAXONOMY

Bloom's taxonomy is a framework for categorizing educational goals, developed by a committee of educators chaired by Benjamin Bloom in 1956. Bloom's Taxonomy was developed to guide educators in creating instruction that fosters higher-order thinking skills. Instead of focusing on memorization and repetition, it encourages critical and creative thinking that can be applied in various areas of life.



Revised Bloom's Taxonomy Action Verbs

Definitions	I.Remembering	II.Understanding	III.Applying	IV.Aanalyzing	V.Evaluating	VI.Creating
Bloom's Definition	Exhibit memory of previously learned material by recalling facts, terms, basic concepts and answers	Demonstrate understanding of facts and ideas by organizing, comparing, translating interpreting giving descriptions and stating main ideas	Solve problems to new situations by applying acquired knowledge, facts, techniques and rules in a different way	Examine & break information into parts by identifying motives or causes. Make inferences and find evidence to support generalizations	Present & defend opinions by making judgements about information, validity of ideas or quality of work based on a set of criteria	Compile information together in a different way by combining elements in a new pattern or proposing alternative solutions
Verb's	- Choose - Define - Find - How - Label - List - Match - Name - Omit - Recall - Relate - Select - Show - Spell - Tell - What - When - Where - Which - Who - Why	- Classify - Compare - Contrast - Demonstrate - Explain - Extend - Illustrate - Infer - Interpret - Outline - Relate - Rephrase - Show - Summarize - Translate	- Apply - Build - Choose - Construct - Develop - Experiment with - Identify - Interview - Make use of - Model - Organize - Plan - Select - Solve - Utilize	- Analyze - Assume - Categorize - Classify - Compare - Conclusion - Contrast - Discover - Dissect - Distinguish - Divide - Examine - Function - Inference - Inspect - List - Motive - Relationships - Simplify - Survey - Take part in - Test for - Theme	- Agree - Appraise - Asses - Award - Choose - Compare - Conclude - Criteria - Criticize - Decide - Deduct - Defend - Determine - Disprove - Estimate - Evaluate - Explain - Importance - Influence - Interpret - Judge - Justify - Mark - Measure - Opinion - Perceive - Prioritize - Prove - Rate - Recommend - Rule on - Select - Support - Value	- Adapt - Build - Change - Choose - Combine - Compile - Compose - Construct - Create - Delete - Design - Develop - Discuss - Elaborate - Estimate - Formulate - Happen - Imagine - Improve - Invent - Make up - Maximize - Minimize - Modify - Original - Originate - Plan - Predict - Propose - Solution - Solve - Suppose - Test - Theory

First Year B.E Autonomous Scheme and Syllabus

Batch 2026-2030

(As per NEP-2020)
(Effective from the academic year 2025 – 26)

About RNSIT

RNS Institute of Technology, familiar as RNSIT was established in the year 2001. It is the brainchild of Dr. R. N. Shetty, a well-known industrialist, and a great philanthropist. The institution was established with the sole purpose of imparting quality education in Engineering, Technology and Management. Being one of the premier engineering colleges in the country RNSIT is marching towards placing itself in the global map by excelling in academics and placements.

Lush green campus, state of the art infrastructure, well equipped laboratories, hundreds of activities, numerous new initiatives, consistent VTU ranks, path breaking placements, cultural extravaganza, Sports events, 4000 + students and 300 + faculty – with all these RNSIT has become dream destination for engineering aspirants across the country.

Vision

Building RNSIT into a World Class Institution

Mission

To impart high quality education in Engineering, Technology and Management with a difference, enabling students to excel in their career by

- Attracting quality Students and preparing them with a strong foundation in fundamentals so as to achieve distinctions in various walks of life leading to outstanding contributions
- Imparting value based, need based, choice based and skill based professional education to the aspiring youth and carving them into disciplined, World class Professionals with social responsibility
- Promoting excellence in Teaching, Research and Consultancy that galvanizes academic consciousness among Faculty and Students
- Exposing Students to emerging frontiers of knowledge in various domains and make them suitable for Industry, Entrepreneurship, Higher studies, and Research & Development
- Providing freedom of action and choice for all the Stakeholders with better visibility

Program Outcomes (Revised)

1. **PO1: Engineering Knowledge:** Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop to the solution of complex engineering problems.
2. **PO2: Problem Analysis:** Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)
3. **PO3: Design/Development of Solutions:** Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required. (WK5)
4. **PO4: Conduct Investigations of Complex Problems:** Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions. (WK8).
5. **PO5: Engineering Tool Usage:** Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems. (WK2 and WK6)
6. **PO6: The Engineer and The World:** Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment. (WK1, WK5, and WK7).
7. **PO7: Ethics:** Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9)
8. **PO8: Individual and Collaborative Teamwork:** Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.
9. **PO9: Communication:** Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences
10. **PO10: Project Management and Finance:** Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.
11. **PO11: Life-Long Learning:** Recognize the need for and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change. (WK8)

Knowledge and Attitude Profile (WK)

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

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

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

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

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

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

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

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

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

ABBREVIATIONS

Sl. No.	Abbreviation	Meaning
1.	CD	Computer Science & Engineering – Data Science
2.	AC	Applied Chemistry
3.	CI	Computer Science & Engineering – Artificial Intelligence & Machine Learning
4.	CS	Computer Science & Engineering
5.	CV	Civil Engineering
6.	CY	Computer Science & Engineering – Cyber Security
7.	EC	Electronics & Communication Engineering
8.	EE	Electrical & Electronics Engineering
9.	AM	Applied Mathematics
10.	ME	Mechanical Engineering
11.	AM/AP/AC	Applied Mathematics/ Applied Physics/ Applied Chemistry
12.	ASC (IC)	Applied Sciences Course (Integrated Course)
13.	AEC/SDC	Ability Enhancement Course/Skill Development Course
14.	PCC	Professional Core Course
15.	ESC	Engineering Science Course
16.	PLC	Programming Language Course
17.	ETC	Emerging Technology Course
18.	HSMS	Humanities and Social Sciences
19.	CIE	Continuous Internal Evaluation
20.	SEE	Semester End Examination
21.	VTU	Visvesvaraya Technological University
22.	TD/BoS/PSB	Teaching Department/Board of Studies/Paper Setting Board
23.	L:T:P	Lecture Hours: Tutorials: Practicals (per week)
24.	TW+SL	Term Work+ Self Learning
25.	NMC	Non Credit Mandatory Course

CATEGORY-WISE LIST OF COURSES

I / II Semester		
Sl. No.	Course Code	Course Title
APPLIED SCIENCE COURSES		
1.	BAMCV101	DIFFERENTIAL CALCULUS AND LINEAR ALGEBRA (CV STREAM)
2.	BAMEE101	DIFFERENTIAL CALCULUS AND LINEAR ALGEBRA (EEE STREAM)
3.	BAMME101	DIFFERENTIAL CALCULUS AND LINEAR ALGEBRA (ME STREAM)
4.	BAMCS101	CALCULUS AND LINEAR ALGEBRA (CSE STREAM)
5.	BAMCV201	DIFFERENTIAL CALCULUS AND NUMERICAL METHODS (CV STREAM)
6.	BAMEE201	CALCULUS, LAPLASE TRANSFORM AND NUMERICAL TECHNIQUES (EEE AND ECE)
7.	BAMME201	MULTIVARIABLE CALCULUS AND NUMERICAL METHODS (ME STREAM)
8.	BAMCS201	NUMERICAL METHODS (CSE STREAM)
9.	BACCV102/202	APPLIED CHEMISTRY FOR SUSTAINABLE STRUCTURE AND MATERIAL DESIGN (CV STREAM)
10.	BACEE102/202	APPLIED CHEMISTRY FOR EMERGING ELECTRONICS AND FUTURISTIC DEVICES (EEE & ECE)
11.	BACME102/202	APPLIED CHEMISTRY FOR ADVANCED METAL PROTECTION AND SUSTAINABLE ENERGY SYSTEMS (ME STREAM)
12.	BACCS102/202	APPLIED CHEMISTRY FOR SMART SYSTEMS (CSE STREAM)
13.	BAPCV102/202	PHYSICS FOR SUSTAINABLE STRUCTURAL SYSTEMS (CV STREAM)
14.	BAPEE102/202	PHYSICS OF ELECTRICAL AND ELECTRONIC MATERIALS (EEE)
15.	BAPEC102/202	QUANTUM PHYSICS AND ELECTRONIC SENSORS (ECE)
16.	BAPME102/202	PHYSICS OF MATERIALS (ME STREAM)

17.	BAPCS102/202	QUANTUM PHYSICS AND APPLICATIONS (CSE STREAM)
PROGRAM SPECIFIC COURSES		
18.	BCVEN103/203	ENGINEERING MECHANICS
19.	BEEEN103/203	BASICS OF ELECTRICAL ENGINEERING
20.	BECEN103/203	FUNDAMENTALS OF ELECTRONICS AND COMMUNICATION ENGINEERING
21.	BMEEN103/203	ELEMENTS OF MECHANICAL ENGINEERING
22.	BCSEN103/203	PROGRAMMING IN C
ENGINEERING SCIENCE COURSE FOR ALL BRANCHES		
23.	BCDCV103/203	COMPUTER AIDED ENGINEERING DRAWING (CV STREAM)
24.	BCDEE103/203	COMPUTER AIDED ENGINEERING DRAWING (EEE STREAM)
25.	BCDEC103/203	COMPUTER AIDED ENGINEERING DRAWING (ECE STREAM)
26.	BCDME103/203	COMPUTER AIDED ENGINEERING DRAWING (ME)
27.	BCDCS103/203	COMPUTER AIDED ENGINEERING DRAWING (CSE)
ENGINEERING SCIENCE COURSES (For Other Branch students)		
28.	BENSC104A /204A	BUILDING SCIENCES & MECHANICS
29.	BENSC104B/204B	INTRODUCTION TO ELECTRICAL ENGINEERING
30.	BENSC104C /204C	INTRODUCTION TO ELECTRONICS & COMMUNICATION ENGINEERING
31.	BENSC104D/204D	INTRODUCTION TO MECHANICAL ENGINEERING
32.	BENSC104E /204E	ESSENTIALS OF INFORMATION TECHNOLOGY
EMERGING TECHNOLOGY COURSE		
33.	BAIAP105/205	INTRODUCTION TO AI AND APPLICATIONS
PROGRAMMING LANGUAGE COURSES		

34.	BPRLC105A/205A	INTRODUCTION TO C PROGRAMMING (FOR NON IT STREAMS)
35.	BPRLC105B/205B	PYTHON PROGRAMMING (FOR CSE AND ALLIED STREAMS)
PROGRAM SPECIFIC LAB COURSES		
36.	BCVEL107/207	MECHANICS AND MATERIALS LAB
37.	BEEEL107/207	BASIC ELECTRICAL LAB
38.	BECEL107/207	FUNDAMENTALS OF ELECTRONICS AND COMMUNICATION ENGINEERING LAB
39.	BMEEL107/207	ELEMENTS OF MECHANICAL ENGINEERING LAB
40.	BCSEL107/207	C PROGRAMMING LAB
PROJECT BASED LEARNING COURSES		
41.	BIDTP158	INNOVATION AND DESIGN THINKING LAB (PROJECT BASED LEARNING)
42.	BIPRJ258	INTERDISCIPLINARY PROJECT BASED LEARNING
HUMANITIES AND SOCIAL SCIENCES COURSES		
43.	BEGHD106/206	COMMUNICATION SKILLS
44.	BSKHD109/209 /BBKHD109/209	SAMSKRUTIKA KANNADA/ BALAKE KANNADA
NON CREDIT MANDATORY COURSES		
45.	BICHHD107/207	INDIAN CONSTITUTION AND ENGINEERING ETHICS
46.	BSSHD106/206	SOFT SKILLS

I SEMESTER: PHYSICS GROUP: CSE Stream (CSE-AIML, CSE-DS, CSBS)													
SL NO	COURSE	COURSE CODE	COURSE TITLE	TD/ PSB	TEACHING HOURS PER WEEK			(TW + SL) Hours Per Sem	EXAMINATION				CREDITS
					THEORY LECTURE (L)	TUTORIAL (T)	PRACTICAL (P)		DURATION IN HOURS	CIE MARKS	SEE MARKS	TOTAL MARKS	
1	ASC	BAMCS101	CALCULUS AND LINEAR ALGEBRA(CSE STREAM)	MATHS	3	2	0	45	3	50	50	100	4
2	ASC (IC)	BAPCS102	QUANTUM PHYSICS AND APPLICATIONS (CSE STREAM)	PHYSICS	3	0	2	45	3	50	50	100	4
3	PSC	BCSEN103	PROGRAMMING IN C	CSE & ALLIED	3	0	0	45	3	50	50	100	3
4	ESC-1	BENSC104A	BUILDING SCIENCE AND MECHANICS	CIVIL	3	0	0	45	3	50	50	100	3
		BENSC104B	INTRODUCTION TO ELECTRICAL ENGINEERING	EEE									
		BENSC104C	INTRODUCTION TO ELECTRONICS & COMMUNICATION ENGINEERING	ECE									
		BENSC104D	INTRODUCTION TO MECHANICAL ENGINEERING	MECHANICAL									
5	ETC	BAIAP105	INTRODUCTION TO AI AND APPLICATIONS	ANY DEPT	3	0	0	45	3	50	50	100	3
6	AEC (NMC)	BSSHD106	SOFT SKILLS	HUMANITIES	1	0	0	15	-	100	-	100	PP
7	PSCL	BCSEL107	C PROGRAMMING LAB	CSE & ALLIED	0	0	2	0	3	50	50	100	1
8	AEC/SDC	BIDTP158	INNOVATION AND DESIGN THINKING LAB (PROJECT BASED LEARNING)	ANY DEPT	0	0	2	0	3	50	50	100	1
9	HSMS	BSKHD109/BBKHD109	SAMSKRUTI KA KANNADA/ BALAKE KANNADA	HUMANITIES	1	0	0	15	2	50	50	100	1
TOTAL										500	400	900	20

* TW – Term Work, SL – Self Learning *

II SEMESTER: CHEMISTRY GROUP: CSE Stream (CSE-AIML, CSE-DS, CSBS)													
SL NO	COURSE	COURSE CODE	COURSE TITLE	TD/ PSB	TEACHING HOURS PER WEEK			(TW + SL) Hours Per Sem	EXAMINATION				CREDITS
					THEORY LECTURE (L)	TUTORIAL (T)	PRACTICAL (P)		DURATION IN HOURS	CIE MARKS	SEE MARKS	TOTAL MARKS	
1	ASC	BAMCS201	NUMERICAL METHODS (CSE STREAM)	MATHS	3	2	0	45	3	50	50	100	4
2	ASC (IC)	BACCS202	APPLIED CHEMISTRY FOR SMART SYSTEMS (CSE STREAM)	CHEMISTRY	3	0	2	45	3	50	50	100	4
3	ESC	BCDCS203	COMPUTER AIDED ENGINEERING DRAWING (CSE STREAM)	MECHANICAL / CIVIL	2	0	2	30	3	50	50	100	3
4	ESC-II	BENSC204A	BUILDING SCIENCE AND MECHANICS	CIVIL	3	0	0	45	3	50	50	100	3
		BENSC204B	INTRODUCTION TO ELECTRICAL ENGINEERING	EEE									
		BENSC204C	INTRODUCTION TO ELECTRONICS & COMMUNICATION ENGINEERING	ECE									
		BENSC204D	INTRODUCTION TO MECHANICAL ENGINEERING	MECHANICAL									
5	PLC (IC)	BPRLC205B	PYTHON PROGRAMMING (FOR CSE AND ALLIED STREAM)	CSE & ALLIED	3	0	2	45	3	50	50	100	4
6	AEC	BEGHD206	COMMUNICATION SKILLS	HUMANITIES	1	0	0	15	2	50	50	100	1
7	NCMC	BICHD207	INDIAN CONSTITUTION & ENGINEERING ETHICS	HUMANITIES	1	0	0	15	-	100	-	100	PP
8	AEC/SDC	BIPRJ258	INTERDISCIPLINARY PROJECT BASED LEARNING	MULTI-DEPT	0	0	0	30	3	50	50	100	1
TOTAL										450	350	800	20

* TW – Term Work, SL – Self Learning

I SEMESTER: PHYSICS GROUP: ECE Stream (ECE, EE-VLSI)													
SL NO	COURSE	COURSE CODE	COURSE TITLE	TD/ PSB	TEACHING HOURS PER WEEK			(TW + SL) Hours Per Sem	EXAMINATION				CREDITS
					THEORY LECTURE (L)	TUTORIAL (T)	PRACTICAL (P)		DURATION IN HOURS	CIE MARKS	SEE MARKS	TOTAL MARKS	
1	ASC	BAMEE101	DIFFERENTIAL CALCULUS AND LINEAR ALGEBRA (EEE / ECE STREAM)	MATHS	3	2	0	45	3	50	50	100	4
2	ASC (IC)	BAPEC102	QUANTUM PHYSICS AND ELECTRONIC SENSORS (ECE STREAM)	PHYSICS	3	0	2	45	3	50	50	100	4
3	PSC	BECEN103	FUNDAMENTALS OF ELECTRONICS AND COMMUNICATION ENGINEERING	ECE	3	0	0	45	3	50	50	100	3
4	ESC-I	BENSC104A	BUILDING SCIENCE AND MECHANICS	CIVIL	3	0	0	45	3	50	50	100	3
		BENSC104B	INTRODUCTION TO ELECTRICAL ENGINEERING	EEE									
		BENSC104D	INTRODUCTION TO MECHANICAL ENGINEERING	MECHANICAL									
		BENSC104E	ESSENTIALS OF INFORMATION TECHNOLOGY	ANY DEPT									
5	ETC	BAIAP105	INTRODUCTION TO AI AND APPLICATIONS	ANY DEPT	3	0	0	45	3	50	50	100	3
6	AEC (NMC)	BSSHD106	SOFT SKILLS	HUMANITIES	1	0	0	15	-	100	-	100	PP
7	PSCL	BECEL107	FUNDAMENTALS OF ELECTRONICS AND COMMUNICATION ENGINEERING LAB	ELECTRONICS	0	0	2	0	3	50	50	100	1
8	AEC/SDC	BIDTP158	INNOVATION AND DESIGN THINKING LAB (PROJECT BASED LEARNING)	ANY DEPT	0	0	2	0	3	50	50	100	1
9	HSMS	BSKHD109/ BBKHD109	SAMSKRUTI KA KANNADA/ BALAKE KANNADA	HUMANITIES	1	0	0	15	2	50	50	100	1
TOTAL										500	400	900	20

* TW – Term Work, SL – Self Learning

II SEMESTER: CHEMISTRY GROUP: ECE Stream (ECE, EE-VLSI)													
SL NO	COURSE	COURSE CODE	COURSE TITLE	TD/ PSB	TEACHING HOURS PER WEEK			(TW + SL) Hours Per Sem	EXAMINATION				CREDITS
					THEORY LECTURE (L)	TUTORIAL (T)	PRACTI CAL (P)		DURAT- ION IN HOURS	CIE MARKS	SEE MARKS	TOTA L MARK S	
1	ASC	BAMEE201	CALCULUS, LAPLACE TRANSFORM AND NUMERICAL TECHNIQUES (EEE/ECE STREAM)	MATHS	3	2	0	45	3	50	50	100	4
2	ASC (JC)	BACEE202	APPLIED CHEMISTRY FOR EMERGING ELECTRONICS AND FUTURISTIC DEVICES (EEE / ECE STREAM)	CHEMISTRY	3	0	2	45	3	50	50	100	4
3	ESC	BCDEC203	COMPUTER AIDED ENGINEERING DRAWING (ECE STREAM)	MECHANICAL / CIVIL	2	0	2	30	3	50	50	100	3
4	ESC-II	BENSC204A	BUILDING SCIENCE AND MECHANICS	CIVIL	3	0	0	45	3	50	50	100	3
		BENSC204B	INTRODUCTION TO ELECTRICAL ENGINEERING	EEE									
		BENSC204D	INTRODUCTION TO MECHANICAL ENGINEERING	ECE									
		BENSC204E	ESSENTIALS OF INFORMATION TECHNOLOGY	ANY DEPT									
5	PLC (IC)	BPRLC205A	INTRODUCTION TO C PROGRAMMING (FOR NON IT STREAMS)	ANY DEPT	3	0	2	45	3	50	50	100	4
6	AEC	BEGHD206	COMMUNICATION SKILLS	HUMANITIES	1	0	0	15	2	50	50	100	1
7	NMC	BICHD207	INDIAN CONSTITUTION & ENGINEERING ETHICS	HUMANITIES	1	0	0	15	-	100	-	100	PP
8	AEC/SDC	BIPRJ258	INTERDISCIPLINARY PROJECT BASED LEARNING	MULTI-DEPT	0	0	0	30	3	50	50	100	1
TOTAL										450	350	800	20

* TW – Term Work, SL – Self Learning

I SEMESTER: PHYSICS GROUP: ME Stream (ME)													
SL NO	COURSE	COURSE CODE	COURSE TITLE	TD/ PSB	TEACHING HOURS PER WEEK			(TW + SL) Hours Per Sem	EXAMINATION				CREDITS
					THEORY LECTURE (L)	TUTORIAL (T)	PRACTICAL (P)		DURATION IN HOURS	CIE MARKS	SEE MARKS	TOTAL MARKS	
1	ASC	BAMME101	DIFFERENTIAL CALCULUS AND LINEAR ALGEBRA (ME STREAM)	MATHS	3	2	0	45	3	50	50	100	4
2	ASC (IC)	BAPME102	PHYSICS OF MATERIALS (ME STREAM)	PHYSICS	3	0	2	45	3	50	50	100	4
3	PSC	BMEEN103	ELEMENTS OF MECHANICAL ENGINEERING	MECHANICAL	3	0	0	45	3	50	50	100	3
4	ESC-I	BENSC104A	BUILDING SCIENCE AND MECHANICS	CIVIL	3	0	0	45	3	50	50	100	3
		BENSC104B	INTRODUCTION TO ELECTRICAL ENGINEERING	EEE									
		BENSC104C	INTRODUCTION TO ELECTRONICS & COMMUNICATION ENGINEERING	ECE									
		BENSC104E	ESSENTIALS OF INFORMATION TECHNOLOGY	ANY DEPT									
5	ETC	BAIAP105	INTRODUCTION TO AI AND APPLICATIONS	ANY DEPT	3	0	0	45	3	50	50	100	3
6	AEC(NCM C)	BSSHD106	SOFT SKILLS	HUMANITIES	1	0	0	15	-	100	-	100	PP
7	PSCL	BMEEL107	ELEMENTS OF MECHANICAL ENGINEERING LAB	MECHANICAL	0	0	2	0	3	50	50	100	1
8	AEC/SDC	BIDTP158	INNOVATION AND DESIGN THINKING LAB (PROJECT BASED LEARNING)	ANY DEPT	0	0	2	0	3	50	50	100	1
9	HSMS	BSKHD109/ BBKHD109	SAMSKRUTI KA KANNADA/ BALAKE KANNADA	HUMANITIES	1	0	0	15	2	50	50	100	1
TOTAL										500	400	900	20

* TW – Term Work, SL – Self Learning

II SEMESTER: CHEMISTRY GROUP: ME Stream (ME)													
SL NO	COURSE	COURSE CODE	COURSE TITLE	TD/ PSB	TEACHING HOURS PER WEEK			(TW + SL) Hours Per Sem	EXAMINATION				CREDITS
					THEORY LECTURE (L)	TUTORIAL (T)	PRACTICAL (P)		DURATION IN HOURS	CIE MARKS	SEE MARKS	TOTAL MARKS	
1	ASC	BAMME201	MULTIVARIABLE CALCULUS AND NUMERICAL METHODS (ME STREAM)	MATHS	3	2	0	45	3	50	50	100	4
2	ASC (IC)	BACME202	APPLIED CHEMISTRY FOR ADVANCED METAL PROTECTION AND SUSTAINABLE ENERGY SYSTEMS (ME STREAM)	CHEMISTRY	3	0	2	45	3	50	50	100	4
3	ESC	BCDME203	COMPUTER AIDED ENGINEERING DRAWING (ME STREAM)	MECHANICAL / CIVIL	2	0	2	30	3	50	50	100	3
4	ESC-II	BENSC204A	BUILDING SCIENCE AND MECHANICS	CIVIL	3	0	0	45	3	50	50	100	3
		BENSC204B	INTRODUCTION TO ELECTRICAL ENGINEERING	EEE									
		BENSC204C	INTRODUCTION TO ELECTRONICS & COMMUNICATION ENGINEERING	ECE									
		BENSC204E	ESSENTIALS OF INFORMATION TECHNOLOGY	ANY DEPT									
5	PLC (IC)	BPRLC205A	INTRODUCTION TO C PROGRAMMING (FOR NON IT STREAMS)	ANY DEPT	3	0	2	45	3	50	50	100	4
6	AEC	BEGHD206	COMMUNICATION SKILLS	HUMANITIES	1	0	0	15	2	50	50	100	1
7	NCMC	BICHD207	INDIAN CONSTITUTION & ENGINEERING ETHICS	HUMANITIES	1	0	0	15	-	100	-	100	PP
8	AEC/ SDC	BIPRJ258	INTERDISCIPLINARY PROJECT BASED LEARNING	MULTI-DEPT	0	0	0	30	3	50	50	100	1
TOTAL										450	350	800	20

* TW – Term Work, SL – Self Learning

I SEMESTER: CHEMISTRY GROUP: CV Stream (CV)													
SL NO	COURSE	COURSE CODE	COURSE TITLE	TD/ PSB	TEACHING HOURS PER WEEK			(TW + SL) Hours Per Sem	EXAMINATION				CREDITS
					THEORY LECTURE (L)	TUTORIAL (T)	PRACTICAL (P)		DURATION IN HOURS	CIE MARKS	SEE MARKS	TOTAL MARKS	
1	ASC	BAMCV101	DIFFERENTIAL CALCULUS AND LINEAR ALGEBRA (CV STREAM)	MATHS	3	2	0	45	3	50	50	100	4
2	ASC (IC)	BACCV102	APPLIED CHEMISTRY FOR SUSTAINABLE STRUCTURE AND MATERIAL DESIGN (CV STREAM)	CHEMISTRY	3	0	2	45	3	50	50	100	4
3	ESC	BCDCV103	COMPUTER AIDED ENGINEERING DRAWING (CV STREAM)	MECHANICAL/ CIVIL	2	0	2	30	3	50	50	100	3
4	ESC-I	BENSC104B	INTRODUCTION TO ELECTRICAL ENGINEERING	EEE	3	0	0	45	3	50	50	100	3
		BENSC104C	INTRODUCTION TO ELECTRONICS & COMMUNICATION ENGINEERING	ECE									
		BENSC104D	INTRODUCTION TO MECHANICAL ENGINEERING	MECHANICAL									
		BENSC104E	ESSENTIALS OF INFORMATION TECHNOLOGY	ANY DEPT									
5	PLC (IC)	BPRLC105A	INTRODUCTION TO C PROGRAMMING (FOR NON IT STREAMS)	ANY DEPT	3	0	2	45	3	50	50	100	4
6	AEC	BEGHD 106	COMMUNICATION SKILLS	HUMANITIES	1	0	0	15	2	50	50	100	1
7	NCMC	BICHD107	INDIAN CONSTITUTION & ENGINEERING ETHICS	HUMANITIES	1	0	0	15	-	100	-	100	PP
8	AEC/SDC	BIDTP158	INNOVATION AND DESIGN THINKING LAB (PROJECT BASED LEARNING)	ANY DEPT	0	0	2	0	3	50	50	100	1
TOTAL										450	350	800	20

* TW – Term Work, SL – Self Learning

II SEMESTER: PHYSICS GROUP: CV Stream (CV)

SL NO	COURSE	COURSE CODE	COURSE TITLE	TD/ PSB	TEACHING HOURS PER WEEK			(TW + SL) Per Sem (S)	EXAMINATION				CREDITS
					THEORY LECTURE (L)	TUTORIAL (T)	PRACTI CAL (P)		DURAT- ION IN HOURS	CIE MARKS	SEE MARKS	TOTAL MARKS	
1	ASC	BAMCV201	DIFFERENTIAL CALCULUS AND NUMERICAL METHODS (CV STREAM)	MATHS	3	2	0	45	3	50	50	100	4
2	ASC (IC)	BAPCV202	PHYSICS FOR SUSTAINABLE STRUCTURAL SYSTEMS (CV STREAM)	PHYSICS	3	0	2	45	3	50	50	100	4
3	PSC	BCVEN203	ENGINEERING MECHANICS	CIVIL	3	0	0	45	3	50	50	100	3
4	ESC-II	BENSC204B	INTRODUCTION TO ELECTRICAL ENGINEERING	EEE	3	0	0	45	3	50	50	100	3
		BENSC204C	INTRODUCTION TO ELECTRONICS & COMMUNICATION ENGINEERING	ECE									
		BENSC204D	INTRODUCTION TO MECHANICAL ENGINEERING	MECHANICAL									
		BENSC204E	ESSENTIALS OF INFORMATION TECHNOLOGY	ANY DEPT									
5	ETC	BAIAP205	INTRODUCTION TO AI AND APPLICATIONS	ANY DEPT	3	0	0	45	3	50	50	100	3
6	AEC (NCMC)	BSSHD206	SOFT SKILLS	HUMANITIES	1	0	0	15	-	100	-	100	PP
7	PSCL	BCVEL207	MECHANICS AND MATERIALS LAB	CIVIL	0	0	2	0	3	50	50	100	1
8	AEC/SDC	BIPRJ258	INTERDISCIPLINARY PROJECT BASED LEARNING	MULTI-DEPT	0	0	0	30	3	50	50	100	1
9	HSMS	BSKHD209/ BBKHD209	SAMSKRUTI KA KANNADA/ BALAKE KANNADA	HUMANITIES	1	0	0	15	2	50	50	100	1
TOTAL										500	400	900	20

* TW – Term Work, SL – Self Learning

I SEMESTER: CHEMISTRY GROUP: CSE Stream (CSE, CSE-CY)													
SL NO	COURSE	COURSE CODE	COURSE TITLE	TD/ PSB	TEACHING HOURS PER WEEK			(TW + SL) Hours Per Sem	EXAMINATION				CREDITS
					THEORY LECTURE (L)	TUTORIAL (T)	PRACTI CAL (P)		DURAT- ION IN HOURS	CIE MARKS	SEE MARKS	TOTAL MARKS	
1	A&C	BAMCS101	CALCULUS AND LINEAR ALGEBRA(CSE STREAM)	MATHS	3	2	0	45	3	50	50	100	4
2	ASC (IC)	BACCS102	APPLIED CHEMISTRY FOR SMART SYSTEMS (CSE STREAM)	CHEMISTRY	3	0	2	45	3	50	50	100	4
3	ESC	BCDCS103	COMPUTER AIDED ENGINEERING DRAWING (CSE STREAM)	MECHANICAL/ CIVIL	2	0	2	30	3	50	50	100	3
4	ESC-I	BENSC104A	BUILDING SCIENCE AND MECHANICS	CIVIL	3	0	0	45	3	50	50	100	3
		BENSC104B	INTRODUCTION TO ELECTRICAL ENGINEERING	EEE									
		BENSC104C	INTRODUCTION TO ELECTRONICS & COMMUNICATION ENGINEERING	ECE									
		BENSC104D	INTRODUCTION TO MECHANICAL ENGINEERING	MECHANICAL									
5	PLC (IC)	BPRLC105B	PYTHON PROGRAMMING (FOR CSE AND ALLIED STREAM)	CSE & ALLIED	3	0	2	45	3	50	50	100	4
6	AEC	BEGHD 106	COMMUNICATION SKILLS	HUMANITIES	1	0	0	15	2	50	50	100	1
7	NCMC	BICHD107	INDIAN CONSTITUTION & ENGINEERING ETHICS	HUMANITIES	1	0	0	15	-	100	-	100	PP
8	AEC/SDC	BIDTP158	INNOVATION AND DESIGN THINKING LAB (PROJECT BASED LEARNING)	ANY DEPT	0	0	2	0	3	50	50	100	1
TOTAL										450	350	800	20

* TW – Term Work, SL – Self Learning

II SEMESTER: PHYSICS GROUP: CSE Stream (CSE, CSE-CY)													
SL NO	COURSE	COURSE CODE	COURSE TITLE	TD/ PSB	TEACHING HOURS PER WEEK			(TW + SL) Per Sem (S)	EXAMINATION				CREDITS
					THEORY LECTURE (L)	TUTORIAL (T)	PRACTI CAL (P)		DURAT- ION IN HOURS	CIE MARKS	SEE MARKS	TOTAL MARKS	
1	ASC	BAMCS201	NUMERICAL METHODS (CSE STREAM)	MATHS	3	2	0	45	3	50	50	100	4
2	ASC (IC)	BAPCS202	QUANTUM PHYSICS AND APPLICATIONS (CSE STREAM)	PHYSICS	3	0	2	45	3	50	50	100	4
3	PSC	BCSEN203	PROGRAMMING IN C	CSE & ALLIED	3	0	0	45	3	50	50	100	3
4	ESC-II	BENSC204A	BUILDING SCIENCE AND MECHANICS	CIVIL	3	0	0	45	3	50	50	100	3
		BENSC204B	INTRODUCTION TO ELECTRICAL ENGINEERING	EEE									
		BENSC204C	INTRODUCTION TO ELECTRONICS & COMMUNICATION ENGINEERING	ECE									
		BENSC204D	INTRODUCTION TO MECHANICAL ENGINEERING	MECHANICAL									
5	ETC	BAIAP205	INTRODUCTION TO AI AND APPLICATIONS	ANY DEPT	3	0	0	45	3	50	50	100	3
6	AEC (NCMC)	BSSHD206	SOFT SKILLS	HUMANITIES	1	0	0	15	-	100	-	100	PP
7	PSCL	BCSEL207	C PROGRAMMING LAB	CSE & ALLIED	0	0	2	0	3	50	50	100	1
8	AEC/ SDC	BIPRJ258	INTERDISCIPLINARY PROJECT BASED LEARNING	MULTI-DEPT	0	0	0	30	3	50	50	100	1
9	HSMS	BSKHD209/ BBKHD209	SAMSKRUTI KA KANNADA/ BALAKE KANNADA	HUMANITIES	1	0	0	15	2	50	50	100	1
TOTAL										500	400	900	20

* TW – Term Work, SL – Self Learning

I SEMESTER: CHEMISTRY GROUP: EEE Stream (EEE)													
SL NO	COURSE	COURSE CODE	COURSE TITLE	TD/ PSB	TEACHING HOURS PER WEEK			(TW + SL) Hours Per Sem	EXAMINATION				CREDITS
					THEORY LECTURE (L)	TUTORIAL (T)	PRACTI CAL (P)		DURAT- ION IN HOURS	CIE MARKS	SEE MARKS	TOTAL MARKS	
1	ASC	BAMEE101	DIFFERENTIAL CALCULUS AND LINEAR ALGEBRA (EEE/ECE STREAM)	MATHS	3	2	0	45	3	50	50	100	4
2	ASC (IC)	BACEE102	APPLIED CHEMISTRY FOR EMERGING ELECTRONICS AND FUTURISTIC DEVICES (EEE / ECE STREAM)	CHEMISTRY	3	0	2	45	3	50	50	100	4
3	ESC	BCDEE103	COMPUTER AIDED ENGINEERING DRAWING (EEE)	MECHANICAL / CIVIL	2	0	2	30	3	50	50	100	3
4	ESC-I	BENSC104A	BUILDING SCIENCE AND MECHANICS	CIVIL	3	0	0	45	3	50	50	100	3
		BENSC104C	INTRODUCTION TO ELECTRONICS AND COMMUNICATION ENGINEERING	ECE									
		BENSC104D	INTRODUCTION TO MECHANICAL ENGINEERING	ME									
		BENSC104E	ESSENTIALS OF INFORMATION TECHNOLOGY	ANY DEPT									
5	PLC (IC)	BPRLC105A	INTRODUCTION TO C PROGRAMMING (FOR NON IT STREAMS)	ANY DEPT	3	0	2	45	3	50	50	100	4
6	AEC	BEGHD106	COMMUNICATION SKILLS	HUMANITIES	1	0	0	15	2	50	50	100	1
7	NCMC	BICHD107	INDIAN CONSTITUTION & ENGINEERING ETHICS	HUMANITIES	1	0	0	15	-	100	-	100	PP
8	AEC/SDC	BIDTP158	INNOVATION AND DESIGN THINKING LAB (PROJECT BASED LEARNING)	ANY DEPT	0	0	2	0	3	50	50	100	1
TOTAL										450	350	800	20

* TW – Term Work, SL – Self Learning

II SEMESTER: PHYSICS GROUP: EEE Stream (EEE)													
SL NO	COURSE	COURSE CODE	COURSE TITLE	TD/ PSB	TEACHING HOURS PER WEEK			(TW + SL) Per Sem (S)	EXAMINATION				CREDITS
					THEORY LECTURE (L)	TUTORIAL (T)	PRACTI CAL (P)		DURAT- ION IN HOURS	CIE MARKS	SEE MARKS	TOTAL MARKS	
1	ASC	BAMEE201	CALCULUS, LAPLACE TRANSFORM AND NUMERICAL TECHNIQUES (EEE AND ECE)	MATHS	3	2	0	45	3	50	50	100	4
2	ASC (IC)	BAPEE202	PHYSICS OF ELECTRICAL AND ELECTRONIC MATERIALS (EEE)	PHYSICS	3	0	2	45	3	50	50	100	4
3	PSC	BEEEN203	BASICS OF ELECTRICAL ENGINEERING	EEE	3	0	0	45	3	50	50	100	3
4	ESC-I	BENSC204A	BUILDING SCIENCE AND MECHANICS	CIVIL	3	0	0	45	3	50	50	100	3
		BENSC204C	INTRODUCTION TO ELECTRONICS & COMMUNICATION ENGINEERING	ECE									
		BENSC204D	INTRODUCTION TO MECHANICAL ENGINEERING	MECHANICAL									
		BENSC204E	ESSENTIALS OF INFORMATION TECHNOLOGY	ANY DEPT									
5	ETC	BAIAP205	INTRODUCTION TO AI AND APPLICATIONS	ANY DEPT	3	0	0	45	3	50	50	100	3
6	AEC (NMC)	BSSHD206	SOFT SKILLS	HUMANITIES	1	0	0	15	-	100	-	100	PP
7	PSCL	BEEEL207	BASIC ELECTRICAL LAB	EEE	0	0	2	0	3	50	50	100	1
8	AEC/ SDC	BIPRJ258	INTERDISCIPLINARY PROJECT BASED LEARNING	MULTI-DEPT	0	0	0	30	3	50	50	100	1
9	HSMS	BSKHD209/ BBKHD209	SAMSKRUTI KA KANNADA/ BALAKE KANNADA	HUMANITIES	1	0	0	15	2	50	50	100	1
TOTAL										500	400	900	20

* TW – Term Work, SL – Self Learning

GENERAL INSTRUCTIONS FOR ALL FOR ESC COURSES

ENGINEERING SCIENCE COURSES (ESC –I & II)		TEACHING DEPARTMENTS
BENSC104A	BUILDING SCIENCE AND MECHANICS	CIVIL
BENSC104B	INTRODUCTION TO ELECTRICAL ENGINEERING	EEE
BENSC104C	INTRODUCTION TO ELECTRONICS & COMMUNICATION ENGINEERING	ECE
BENSC104D	INTRODUCTION TO MECHANICAL ENGINEERING	MECHANICAL
BENSC104E	ESSENTIALS OF INFORMATION TECHNOLOGY	CSE & ALLIED

NOTE:

1. The student must select one course from the ESC-I/II group.
2. CSE/ISE and allied branches Students shall opt for any one of the courses from the ESC-I group except **BENSC104E- ESSENTIALS OF INFORMATION TECHNOLOGY**
3. The students must opt for the courses from ESC group without repeating the course studied in 1st semester in the 2nd semester

*TW – Term Work, SL – Self Learning

APPLIED SCIENCE COURSES

1	BAMCV101	DIFFERENTIAL CALCULUS AND LINEAR ALGEBRA (CV STREAM)
2	BAMEE101	DIFFERENTIAL CALCULUS AND LINEAR ALGEBRA (EEE STREAM)
3	BAMME101	DIFFERENTIAL CALCULUS AND LINEAR ALGEBRA (ME STREAM)
4	BAMCS101	CALCULUS AND LINEAR ALGEBRA (CSE STREAM)
5	BAMCV201	DIFFERENTIAL CALCULUS AND NUMERICAL METHODS (CV STREAM)
6	BAMEE201	CALCULUS, LAPLASE TRANSFORM AND NUMERICAL TECHNIQUES (EEE AND ECE)
7	BAMME201	MULTIVARIABLE CALCULUS AND NUMERICAL METHODS (ME STREAM)
8	BAMCS201	NUMERICAL METHODS (CSE STREAM)
9	BACCV102/202	APPLIED CHEMISTRY FOR SUSTAINABLE STRUCTURE AND MATERIAL DESIGN (CV STREAM)
10	BACEE102/202	APPLIED CHEMISTRY FOR EMERGING ELECTRONICS AND FUTURISTIC DEVICES (EEE & ECE)
11	BACME102/202	APPLIED CHEMISTRY FOR ADVANCED METAL PROTECTION AND SUSTAINABLE ENERGY SYSTEMS (ME STREAM)
12	BACCS102/202	APPLIED CHEMISTRY FOR SMART SYSTEMS (CSE STREAM)
13	BAPCV102/202	PHYSICS FOR SUSTAINABLE STRUCTURAL SYSTEMS (CV STREAM)
14	BAPEE102/202	PHYSICS OF ELECTRICAL AND ELECTRONIC MATERIALS (EEE)
15	BAPEC102/202	QUANTUM PHYSICS AND ELECTRONIC SENSORS (ECE)
16	BAPME102/202	PHYSICS OF MATERIALS (ME STREAM)
17	BAPCS102/202	QUANTUM PHYSICS AND APPLICATIONS (CSE STREAM)

B.E. (Civil Engineering) Outcome Based Education (OBE) and Choice Based Credit System (CBCS) SEMESTER – I			
Course Title:	Differential Calculus and Linear Algebra (Civil Stream)		
Course Code:	BAMCV101	CIE MARKS	50
(L: T: P) + SL	(3:2:0) + (45 hrs/semester)	SEE MARKS	50
Credits:	04	EXAM HOURS	03
COURSE LEARNING OBJECTIVES: <i>The purpose of the course is to facilitate the learner to:</i>			
Apply foundational concepts of calculus to analyse geometric properties of curves and model physical phenomena in science and engineering. Solve first-order and higher-order ordinary differential equations and apply them to engineering problem-solving. Apply principles of linear algebra to solve systems of linear equations, compute eigenvalues and eigenvectors, and analyse real-world scenarios such as traffic flow. Demonstrate the applications of civil engineering and allied sciences using modern ICT tools.			
Module-1: Polar Curves and Curvature (9 Hours Theory) + (6 Hours Tutorials)			
Polar coordinates: Polar curves, angle between the radius vector and the tangent, angle between two curves. Pedal equations.			
Curvature: Curvature and radius of curvature - Cartesian, parametric, polar and pedal forms.			
Module-2: Series Expansion and Multivariable Calculus (9 Hours Theory) + (6 Hours Tutorials)			
Power Series Expansion: Statement and problems on Taylor's and Maclaurin's series expansion for one variable.			
Partial Differentiation: Introduction to Partial differentiation, total derivative - differentiation of composite functions, Jacobian, Maxima and minima for the function of two variables. Lagrange's method of undetermined multipliers.			
Module-3: Ordinary Differential Equations of First Order (9 Hours Theory) + (6 Hours Tutorials)			
First order and First-degree ODE: Exact and reducible to exact differential equations- Integrating factors on $\frac{1}{N} \left(\frac{\partial M}{\partial y} - \frac{\partial N}{\partial x} \right)$ and $-\frac{1}{M} \left(\frac{\partial M}{\partial y} - \frac{\partial N}{\partial x} \right)$ only. Linear and Bernoulli's differential equations.			
Applications of ODE: Orthogonal trajectories, Newton's law of cooling.			
Module-4: Ordinary Differential Equations of Higher Order (9 Hours Theory) + (6 Hours Tutorials)			
Higher order ODE: Higher-order linear ordinary differential equations with constant coefficients, homogeneous and non- homogeneous equations (e^{ax} , $\sin(ax+b)$, $\cos(ax+b)$, x^n only), Method of variation of parameters, Cauchy's and Legendre's homogeneous differential equations.			
Applications: Solving governing differential equations of Mass Spring.			

Module-5: Linear Algebra	(9 Hours Theory) + (6 Hours Tutorials)
Solution of System of Equations: Elementary row transformation of a matrix, Rank of a matrix. Consistency and Solution of system of linear equations - Gauss-elimination method and approximate solution by Gauss-Seidel method. Eigenvalues and Eigenvectors, Rayleigh's power method to find the dominant Eigenvalue and Eigenvector. Applications: Traffic flow.	

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

CO1	Analyse polar curves and determine curvature and radius of curvature in various coordinate systems.
CO2	Apply Taylor's/Maclaurin's series and partial differentiation techniques to solve problems involving functions of single and multiple variables.
CO3	Solve first-order differential equations and apply them to model real-life problems such as Newton's law of cooling.
CO4	Solve higher-order linear differential equations using standard methods and apply them to physical systems like mass-spring models.
CO5	Apply matrix methods to solve systems of linear equations and compute eigenvalues/eigenvectors for practical applications like traffic flow analysis.

ASSESSMENT DETAILS (Both CIE and SEE)

Assessment Type	Maximum Marks	Minimum Passing Marks	Evaluation Details
CIE – IA Tests (A)	30	-	Two tests each of 50 marks shall be conducted. Average of Two Internal Assessment Tests shall be scaled down to 30 marks.
Continuous and Comprehensive Evaluation (B)	20	-	Any two Assessment methods as per 24RNBE4.2 (*if it is project based, one assignment shall be given), scaled to 20 marks.
Total CIE (A+B)	50	20	CIE Evaluation is done for a maximum of 50 marks
SEE (C)	50	18	SEE is a theory exam conducted for 100 marks and scaled down to 50 marks. Exam duration shall be for 3 hours.
CIE + SEE (A+B+C)	100	40	Final marks shall be the sum of marks scored in Components A, B and C.
The minimum marks to be secured in CIE is 20 (40%) out of allotted 50 marks to appear for SEE.			

Suggested Learning Resources:

Text Books:

1. **B.S. Grewal**, Higher Engineering Mathematics, Khanna Publishers, 44th Ed., 2021.
2. **E. Kreyszig**, Advanced Engineering Mathematics, John Wiley & Sons, 10th Ed., 2018.

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. **N. P. Bali and Manish Goyal**, A Textbook of Engineering Mathematics, Laxmi Publications, 10th Ed., 2022.

Web links and Video Lectures (e-Resources):

- <http://academicearth.org/>
- VTU e-Shikshana Program
- VTU EDUSAT Program
- <https://nptel.ac.in/courses/111106135>
- <https://nptel.ac.in/courses/111105160>
- <https://ocw.mit.edu/courses/18-06-linear-algebra-spring-2010/>
- <https://ocw.mit.edu/courses/18-02sc-multivariable-calculus-fall-2010/>

List of Lab-Programs using MATLAB (Part of CCA) – CV Stream

1	2D plots for cartesian and polar curves.
2	Finding angle between polar curves.
3	Finding radius of curvature.
4	Expansion of Maclaurin's series.
5	Finding partial derivatives and Jacobians.
6	Solution of first order and higher order ordinary differential equations.
7	Plotting solutions of ODE.
8	Finding Rank, reduced echelon form, solving system of linear equations using Gauss-elimination method.
9	Solving system of equations using Gauss-Seidel method.
10	Determination of Eigenvalues and Eigenvectors.

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

1. Programming Assignment
2. Tool/Software Exploration
3. Problem-Based Learning (PBL)
4. Quiz/surprise test/seminar

B.E. (Electrical Engineering and Electronics & Communication Engineering)			
Outcome Based Education (OBE) and Choice Based Credit System (CBCS)			
SEMESTER – I			
Course Title:	Differential Calculus and Linear Algebra (EEE Stream)		
Course Code:	BAMEE101	CIE MARKS	50
(L: T: P) + SL	(3:2:0) + (45 hrs/semester)	SEE MARKS	50
Credits:	04	EXAM HOURS	03
COURSE LEARNING OBJECTIVES:			
<i>The purpose of the course is to facilitate the learner to:</i>			
1. Familiarize the importance of calculus associated with one variable and multivariable for Electrical and Electronics engineering. 2. Analyze Electrical and Electronics engineering problems by applying ordinary differential equations of first order 3. Familiarize with second and higher order ordinary differential equations (ODEs) in the context of Electrical Engineering and Electronics engineering. 4. Develop the knowledge of Linear Algebra to solve system of equations.			
Module-1: Differential Calculus (9 Hours Theory + 6 Tutorials)			
Polar Coordinates: Polar curves, angle between the radius vector and the tangent, angle between the polar curves, pedal equations.			
Curvature: Curvature and radius of curvature in cartesian, polar, parametric and pedal forms -Problems.			
Module-2: Power Series Expansions, Indeterminate Forms and Multivariable Calculus (9 Hours Theory + 6 Tutorials)			
Power Series Expansion: Statement and problems on Taylor's and Maclaurin's series expansion for one variable. Problems.			
Indeterminate forms: L'Hôpital's rule, Problems.			
Partial Differentiation: Introduction to Partial differentiation, total derivative - differentiation of composite functions. Jacobian. Maxima and minima for a function of two variables.			
Module-3: Ordinary Differential Equations (ODE) of First Order and First Degree and Nonlinear ODE (9 Hours Theory + 6 Tutorials)			
First order and First-degree ODE: Exact and reducible to exact differential equations- Integrating factors on $\frac{1}{N}\left(\frac{\partial M}{\partial y} - \frac{\partial N}{\partial x}\right)$ and $-\frac{1}{M}\left(\frac{\partial M}{\partial y} - \frac{\partial N}{\partial x}\right)$ only. Linear and Bernoulli's differential equations.			
Non-linear ODE: Non-linear differential equations: Introduction to general and singular solutions, solvable for p only, Clairaut's equations, reducible to Clairaut's equations.			
Applications of ODE: Orthogonal trajectories, L-R and C-R circuits.			
Module-4: Ordinary Differential Equations of higher order (9 Hours Theory + 6 Tutorials)			
Higher order ODE: Higher-order linear ODEs with constant coefficients, homogeneous and non-homogeneous equations: e^{ax} , $\sin(ax+b)$, $\cos(ax+b)$, x^n only. Method of variation of parameters, Cauchy's and Legendre's homogeneous differential equations. L-C-R circuits.			

Module-5: Linear Algebra

(9 Hours Theory + 6 Tutorials)

Solution of System of Equations: Elementary transformations on a matrix, Echelon form, rank of a matrix, consistency of system of linear equations. Gauss elimination, Gauss-Jordan method, Gauss –Seidel method to solve system of linear equations.

Matrix Diagonalization: Eigen values and eigen vectors of a matrix (definitions only), Rayleigh power method to determine the dominant eigen value of a matrix. Diagonalization of a square matrix ($P^{-1}AP$ method)

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Apply the knowledge of Calculus to solve problems related to polar curves.
CO2	Learn the notion of partial differentiation to compute rate of change of multivariate functions.
CO3	Demonstrate various physical models through ordinary differential equations
CO4	Demonstrate various physical models through higher order differential equations and solve such linear ordinary differential equations
CO5	Make use of matrix theory for solving the system of equations and compute eigenvalues and eigenvectors.

ASSESSMENT DETAILS (Both CIE and SEE)

Assessment Type	Maximum Marks	Minimum Passing Marks	Evaluation Details
CIE – IA Tests (A)	30	-	Two tests each of 50 marks shall be conducted. Average of Two Internal Assessment Tests shall be scaled down to 30 marks.
Continuous and Comprehensive Evaluation (B)	20	-	Any two Assessment methods as per 24RNBE4.2 (*if it is project based, one assignment shall be given), scaled to 20 marks.
Total CIE (A+B)	50	20	CIE Evaluation is done for a maximum of 50 marks
SEE (C)	50	18	SEE is a theory exam conducted for 100 marks and scaled down to 50 marks. Exam duration shall be for 3 hours.
CIE + SEE (A+B+C)	100	40	Final marks shall be the sum of marks scored in Components A, B and C.
The minimum marks to be secured in CIE is 20 (40%) out of allotted 50 marks to appear for SEE.			

Textbooks:

1. **B.S. Grewal**, Higher Engineering Mathematics, Khanna Publishers, 44th Edition, 2021.
2. **Gilbert Strang**, Linear Algebra and its Applications, Cengage Publications, 4th Edition, 2022.

Reference Books:

1. **B.V. Ramana**, Higher Engineering Mathematics, McGraw-Hill Education, 11th Edition, 2017
2. **E. Kreyszig**, Advanced Engineering Mathematics, John Wiley & Sons, 10th Edition, 2018
3. **David C Lay**, Linear Algebra and its Applications, Pearson Publishers, 4th Edition, 2018.

Web links and Video Lectures (e-Resources):

- <http://academicearth.org/>
- [VTU e-Shikshana Program](#)
- [VTU EDUSAT Program](#)
- <https://nptel.ac.in/courses/111106135>
- <https://nptel.ac.in/courses/111105160>
- <https://ocw.mit.edu/courses/18-06-linear-algebra-spring-2010/>
- <https://ocw.mit.edu/courses/18-02sc-multivariable-calculus-fall-2010/>

List of Lab-Programs using MATLAB (Part of CCA) – EEE Stream

1	2D plots for cartesian and polar curves.
2	Finding angle between polar curves.
3	Finding radius of curvature.
4	Expansion of Maclaurin's series.
5	Finding partial derivatives and Jacobians.
6	Solution of first order and higher order ordinary differential equations.
7	Plotting solutions of ODE.
8	Finding Rank, reduced echelon form, solving system of linear equations using Gauss-elimination method.
9	Solving system of equations using Gauss-Seidel method.
10	Determination of Eigenvalues and Eigenvectors.

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

1. Programming Assignment
2. Tool/Software Exploration
3. Problem-Based Learning (PBL)
4. Quiz/surprise test/seminar

B.E. (Mechanical Engineering)			
Outcome Based Education (OBE) and Choice Based Credit System (CBCS)			
SEMESTER – I			
Course Title:	Differential Calculus and Linear Algebra (ME Stream)		
Course Code:	BAMME101	CIE MARKS	50
(L: T: P) + SL	(3:2:0) + (45 hrs/semester)	SEE MARKS	50
Credits:	04	EXAM HOURS	03
COURSE LEARNING OBJECTIVES:			
<i>The purpose of the course is to facilitate the learner to:</i>			
Familiarize the importance of calculus associated with one variable and multivariable for Mechanical engineering. Analyze mechanical engineering problems by applying Ordinary Differential Equations of first order and statistical methods. Familiarize with first order Ordinary Differential Equations (ODEs) in the context of Mechanical engineering. Develop the knowledge of Linear Algebra to solve system of equations referring to matrices.			
Module-1: Differential Calculus		(9 Hours Theory + 6 Tutorials)	
Polar Coordinates: Polar curves, angle between the radius vector and the tangent, angle between two polar curves, pedal equations. Curvature: Curvature and radius of curvature in cartesian, polar, parametric and pedal forms - Problems.			
Module-2: Power Series Expansions and Multivariable Calculus		(9 Hours Theory + 6 Tutorials)	
Power Series Expansion: Statement and problems on Taylor's and Maclaurin's series expansion for one variable. Problems. Partial Differentiation: Introduction to Partial differentiation, total derivative - differentiation of composite functions. Jacobian. Maxima and minima for a function of two variables, Lagrange's method of undetermined multipliers.			
Module-3: Ordinary Differential Equations (ODE)		(9 Hours Theory + 6 Tutorials)	
First order ODE: Linear and Bernoulli's differential equations. Exact and reducible to exact differential equations- Integrating factors on $\frac{1}{N} \left(\frac{\partial M}{\partial y} - \frac{\partial N}{\partial x} \right)$ and $-\frac{1}{M} \left(\frac{\partial M}{\partial y} - \frac{\partial N}{\partial x} \right)$ only. Applications of ODE: Orthogonal trajectories, Newton's Law of cooling, Natural growth and Radioactive decay.			
Module-4: Linear Algebra - 1		(9 Hours Theory + 6 Hours Tutorials)	
Solution of System of Equations: Elementary row transformations on a matrix, Row reduced echelon form, Rank of a matrix, Test of Consistency, Solution to system of linear equations by Gauss elimination method, Gauss-Jordan method and Gauss –Seidel method, Application: Traffic flow.			
Module-5: Linear Algebra		(9 Hours Theory + 6 Tutorials)	
Matrix Diagonalization: Eigenvalues and eigenvectors of a matrix (definitions only), Rayleigh power method to determine the dominant eigen value of a matrix. Diagonalization of a square matrix ($P^{-1}AP$ method)			

Cayley-Hamilton theorem – statement, finding inverse of a square matrix, Characteristic and minimal polynomials of block matrices, Moore-Penrose pseudo inverse.

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Apply the knowledge of Calculus to solve problems related to polar curves.
CO2	Learn the notion of partial differentiation to compute rate of change of multivariate functions.
CO3	Analyze the solution of linear ordinary differential equations.
CO4	Make use of matrix theory for solving the system of linear equations
CO5	Make use of matrix theory and compute eigenvalues and eigenvectors and find inverse of a square matrix.

ASSESSMENT DETAILS (Both CIE and SEE)

Assessment Type	Maximum Marks	Minimum Passing Marks	Evaluation Details
CIE- IA Tests (A)	30	-	Two tests each of 50 marks shall be conducted. Average of Two Internal Assessment Tests shall be scaled down to 30 marks.
Continuous and Comprehensive Evaluation (B)	20	-	Any two Assessment methods as per 24RNBE4.2 (*if it is project based, one assignment shall be given), scaled to 20 marks.
Total CIE (A+B)	50	20	CIE Evaluation is done for a maximum of 50 marks.
SEE (C)	50	18	SEE is a theory exam, conducted for 100 marks and scaled down to 50 marks. Exam duration shall be before 3 hours.
CIE+SEE (A+B+C)	100	40	Final marks shall be the sum of marks scored in Components A, B and C
The minimum marks to be secured in CIE is 20 (40%) out of allotted 50 marks to appear for SEE			

Textbooks:

1. **B.S. Grewal**, Higher Engineering Mathematics, Khanna Publishers, 44th Edition, 2021.
2. **Gilbert Strang**, Linear Algebra and its Applications, Cengage Publications, 4th Edition, 2022.

Reference Books:

1. **E. Kreyszig**, Advanced Engineering Mathematics, John Wiley & Sons, 10th Edition, 2018.

2. **N. P. Bali and Manish Goyal**, A Textbook of Engineering Mathematics, Laxmi Publications, 10th Edition., 2022.
3. **David C Lay**, Linear Algebra and its Applications, Pearson Publishers, 4th Edition, 2018.

Web links and Video Lectures (e-Resources):

- <http://academicearth.org/>
- [VTU e-Shikshana Program](#)
- [VTU EDUSAT Program](#)
- <https://nptel.ac.in/courses/111102011>
- <https://nptel.ac.in/courses/111105160>
- <https://ocw.mit.edu/courses/18-06sc-linear-algebra-fall-2011/>
- <https://ocw.mit.edu/courses/2-087-engineering-math-differential-equations-and-linear-algebra-fall-2014/>
- <https://ocw.mit.edu/courses/18-013a-calculus-with-applications-spring-2005/>

List of Lab Activities using MATLAB (Part of CCA) – ME Stream

1	2D plots for cartesian and polar curves.
2	Finding angle between polar curves.
3	Finding radius of curvature.
4	Expansion of Maclaurin's series.
5	Finding partial derivatives and Jacobians.
6	Solution of first order and higher order ordinary differential equations.
7	Plotting solutions of ODE.
8	Finding Rank, reduced echelon form, solving system of linear equations using Gauss-elimination method.
9	Solving system of equations using Gauss-Seidel method.
10	Determination of Eigenvalues and Eigenvectors.

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

1. Programming Assignment
2. Tool/Software Exploration
3. Problem-Based Learning (PBL)
4. Quiz/Surprise Test/Seminar

B.E. (Common for all CSE Streams) Outcome Based Education (OBE) and Choice Based Credit System (CBCS) SEMESTER – I			
Course Title:	CALCULUS AND LINEAR ALGEBRA (CSE Streams)		
Course Code:	BAMCS101	CIE MARKS	50
(L: T: P) + SL	(3:2:0) + (45 hrs/semester)	SEE MARKS	50
Credits:	04	EXAM HOURS	03
COURSE LEARNING OBJECTIVES: <i>The purpose of the course is to facilitate the learner to:</i> Familiarize with the concepts of polar curves, pedal equations, and curvature in different coordinate systems. Apply multivariable calculus and series expansion techniques to analyze and optimize functions of several variables. Develop an understanding of vector spaces and linear transformations for solving computational problems. Solve systems of linear equations and determine eigenvalues and eigenvectors with applications in engineering and computer science.			
Module-1: Polar Curves and Curvature (9 Hours Theory + 6 Tutorials) Polar coordinates: Polar curves, angle between radius vector and tangent, angle between two curves, Pedal equations. Curvature: Definition and radius of curvature – Cartesian, Polar, Pedal forms-Problems only.			
Module-2: Multivariable Calculus and Series Expansion (9 Hours Theory + 6 Tutorials) Partial Differentiation: Introduction to Partial differentiation, total derivative – differentiation of composite functions, Jacobian. Statement of Taylor's series and problems on Maclaurin's series expansion for two variables, Maxima and minima for the function of two variables.			
Module-3: Vector Space (9 Hours Theory + 6 Tutorials) Definition and examples, subspaces: definition and examples, linear Combinations, linear span, linearly independent and dependent sets, basis and dimension, Row/column spaces of a matrix, coordinates, inner products, orthogonality.			
Module-4: Linear Transformation (9 Hours Theory + 6 Tutorials) Definition and examples of linear transformations, algebra of linear transformations, matrix of a linear transformation. Singular, non- singular linear transformations and invertible linear transformations, Rank and nullity of linear transformations, rank-nullity theorem.			
Module-5: System of Linear Equations, Eigenvalues and Eigenvectors (9 Hours Theory + 6 Tutorials) Solution of System of Equations: Elementary row transformation of a matrix, Echelon form, rank of a matrix. Consistency and solution of systems of linear equations – Gauss elimination method, Gauss Jordan method,			

Matrix Diagonalization: Eigenvalues, Eigenvectors, modal matrix, diagonalization of the matrix, **Application:** Traffic flow.

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Apply the concepts of polar curves and curvature to analyze angles, pedal equations, and radius of curvature in Cartesian, Parametric, Polar, and Pedal forms
CO2	Apply the principles of multivariable calculus and series expansion to compute partial derivatives, optimize functions of several variables, and expand functions using Taylor's and Maclaurin's series.
CO3	Demonstrate understanding of vector spaces, subspaces, linear independence, basis, dimension, and orthogonality to solve computational problems
CO4	Apply the concepts of linear transformations, matrix representations, and rank-nullity theorem to problems in computer science and engineering.
CO5	Solve systems of linear equations and determine eigenvalues and eigenvectors using direct and iterative methods, with applications in computer science engineering.

ASSESSMENT DETAILS (Both CIE and SEE):

Assessment Type	Maximum Marks	Minimum Passing Marks	Evaluation Details
CIE – IA Tests (A)	30	-	Two tests each of 50 marks shall be conducted. Average of Two Internal Assessment Tests shall be scaled down to 30 marks.
Continuous and Comprehensive Evaluation (B)	20	-	Any two Assessment methods as per 24RNBE4.2 (*if it is project based, one assignment shall be given), scaled to 20 marks.
Total CIE (A+B)	50	20	CIE Evaluation is done for a maximum of 50 marks
SEE (C)	50	18	SEE is a theory exam conducted for 100 marks and scaled down to 50 marks. Exam duration shall be for 3 hours.
CIE + SEE (A+B+C)	100	40	Final marks shall be the sum of marks scored in Components A, B and C.
The minimum marks to be secured in CIE is 20 (40%) out of allotted 50 marks to appear for SEE.			

Textbooks:

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Reference Books:

1. **E. Kreyszig**, Advanced Engineering Mathematics, John Wiley & Sons, 10th Edition, 2018.
2. **N. P. Bali and Manish Goyal**, A Textbook of Engineering Mathematics, Laxmi Publications, 10th Ed., 2022.
3. **David C. Lay**, Linear Algebra and its Applications, Pearson Publishers, 4th Ed., 2018.

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2. [VTU e-Shikshana Program](#)
3. [VTU EDUSAT Program](#)
4. <https://nptel.ac.in/courses/111106135>
5. <https://nptel.ac.in/courses/111105160>
6. <https://ocw.mit.edu/courses/18-06-linear-algebra-spring-2010/>
7. <https://ocw.mit.edu/courses/18-02sc-multivariable-calculus-fall-2010/>

List of Lab-Programs using MATLAB (Part of CCA)- CSE Stream:

1	Finding Radius of curvature.
2	Expansion of Taylor's and Maclaurin's series.
3	Finding Partial derivatives and Jacobian
4	Finding rank, reduced echelon form, solving system of linear equations using Gauss elimination method.
5	Solving system of linear equations using Gauss Jordan method.
6	Determine Eigenvalues and Eigenvectors.
7	Linearly Independence and Dependence sets,
8	Basis and dimension
9	Linear transformation-range space and null space.
10	Verification of the rank nullity theorem.

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

1. Programming Assignment
2. Tool/Software Exploration
3. Problem-Based Learning (PBL)
4. Quiz/surprise test/seminar

B.E. (Civil Engineering)			
Outcome Based Education (OBE) and Choice Based Credit System (CBCS)			
SEMESTER – II			
Course Title:	Differential Calculus and Numerical Methods (CV Stream)		
Course Code:	BAMCV201	CIE MARKS	50
(L: T: P) + SL	(3:2:0) + (45 hrs/semester)	SEE MARKS	50
Credits:	04	EXAM HOURS	03
COURSE LEARNING OBJECTIVES:			
<i>The purpose of the course is to facilitate the learner to:</i>			
1. Familiarize the importance of Integral calculus essential for civil engineering. 2. Analyze Engineering problems by applying Partial Differential Equations. 3. Familiarize the importance of Vector calculus essential for civil engineering. 4. Develop the knowledge of solving engineering problems numerically.			
Module-1: Integral Calculus		(9 Hours Theory + 6	
Multiple Integrals: Definition, Evaluation of double and triple integrals, evaluation of double integrals by changing the order of integration, applications to find area and volume by the double integral. Beta and Gamma functions: Definitions, properties, relation between Beta and Gamma functions.			
Module-2: Partial Differential Equations (PDEs)		(9 Hours Theory + 6 Tutorials)	
Formation of PDE's by elimination of arbitrary constants and function, solution of non-homogeneous PDE by direct integration, homogeneous PDE involving derivatives with respect to one independent variable only, application of PDE: Derivation of one-dimensional heat equation and wave equation.			
Module-3: Vector Calculus		(9 Hours Theory + 6	
Tutorials)			
Vector Differentiation: Scalar and vector fields. Gradient, directional derivative, divergence and curl - physical interpretation, solenoidal vector fields, irrotational vector fields and scalar potential. Vector Integration: Line integrals, work done by the force and flux, Statements of Green's theorem and Stoke's theorem.			
Module-4: Numerical Methods - 1		(9 Hours Theory + 6 Tutorials)	
Solution of algebraic and transcendental equations: Regula-Falsi and Newton-Raphson methods. Finite Differences and Interpolation: Newton's forward and backward difference formulae, Newton's divided difference formula and Lagrange's interpolation formula. Numerical integration: Trapezoidal, Simpson's 1/3 rd and 3/8 th rules.			
Module-5: Numerical Methods – 2		(9 Hours Theory + 6 Tutorials)	
Numerical solution of ordinary differential equations of first order and first degree: Taylor's series method, Modified Euler's method, Runge-Kutta method of fourth order, Milne's predictor-corrector method and Adams-Bashforth predictor-corrector method.			

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Understand the applications of integral calculus and to evaluate line and surface integrals.
CO2	Demonstrate partial differential equations and their solutions for physical interpretations
CO3	Understand the applications of vector calculus refer to solenoidal and irrotational vectors.
CO4	Apply the knowledge of numerical methods in solving various physical and engineering phenomena.
CO5	Solve first order ordinary differential equations arising in engineering problems using single step and multi-step numerical methods.

ASSESSMENT DETAILS (Both CIE and SEE)

Assessment Type	Maximum Marks	Minimum Passing Marks	Evaluation Details
CIE – IA Tests (A)	30	-	Two tests each of 50 marks shall be conducted. Average of Two Internal Assessment Tests shall be scaled down to 30 marks.
Continuous and Comprehensive Evaluation (B)	20	-	Any two Assessment methods as per 24RNBE4.2 (*if it is project based, one assignment shall be given), scaled to 20 marks.
Total CIE (A+B)	50	20	CIE Evaluation is done for a maximum of 50 marks
SEE (C)	50	18	SEE is a theory exam conducted for 100 marks and scaled down to 50 marks. Exam duration shall be for 3 hours.
CIE + SEE (A+B+C)	100	40	Final marks shall be the sum of marks scored in Components A, B and C.
The minimum marks to be secured in CIE is 20 (40%) out of allotted 50 marks to appear for SEE.			

Text Books:

- B. S. Grewal:** "Higher Engineering Mathematics", Khanna Publishers, 44th Ed., 2021.
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Reference Books:

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- N.P Bali and Manish Goyal:** "A Textbook of Engineering Mathematics" Laxmi Publications, 10th Ed., 2022

3. **Srimanta Pal & Subodh C. Bhunia:** "Engineering Mathematics" Oxford University Press, 3rd Ed., 2016.

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- VTU EDUSAT Program
- <https://nptel.ac.in/courses/111105160>
- <https://nptel.ac.in/courses/127106019>
- <https://ocw.mit.edu/courses/18-335j-introduction-to-numerical-methods-spring-2019/>
- <https://ocw.mit.edu/courses/18-330-introduction-to-numerical-analysis-spring-2012/pages/syllabus/>

List of Lab Activities using MATLAB (Part of CCA)- CV Stream

1	Evaluate double integration and compute area and volume.
2	Evaluate triple integration and compute volume.
3	Finding gradient, divergence and curl.
4	Evaluation of line integrals.
5	Regula Falsi and Newton Raphson method.
6	Interpolation – forward and backward interpolation.
7	Numerical integration.
8	Modified Euler's method.
9	4 th order Runge-Kutta method.
10	Milne's method.

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

1. Programming Assignment
2. Tool/Software Exploration
3. Problem-Based Learning (PBL)
4. Quiz/surprise test/seminar



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**B.E. (Electrical Engineering and Electronics & Communication Engineering)
Outcome Based Education (OBE) and Choice Based Credit System (CBCS)
SEMESTER – II**

Course Title:	Calculus, Laplace Transforms and Numerical Techniques (EEE Stream)		
Course Code:	BAMEE201	CIE MARKS	50
(L: T: P) + SL	(3:2:0) + (45 hrs/semester)	SEE MARKS	50
Credits:	04	EXAM HOURS	03
COURSE LEARNING OBJECTIVES: <i>The purpose of the course is to facilitate the learner to:</i>			
Familiarize the importance of Vector Calculus for Electronics and Electrical engineering. Familiarize the important tools in Integral Calculus that are essential in Electrical and Electronics engineering. Have an insight into solving ordinary differential equations using Laplace Transforms. Develop the knowledge of solving Electronics and Electrical engineering problems numerically.			
Module-1: Integral Calculus and its Applications (9 Hours Theory + 6 Tutorials)			
Multiple Integrals: Evaluation of double and triple integrals, evaluation of double integrals by change of order of integration, changing cartesian to polar coordinates.			
Applications: Applications to find area and volume by double integrals. Problems.			
Special Functions: Beta and Gamma functions – Definitions, properties, relation between Beta and Gamma functions. Problems.			
Module-2: Vector Calculus and its Applications (9 Hours Theory + 6 Tutorials)			
Vector Differentiation: Scalar and vector fields, gradient of a scalar field, directional derivatives, divergence of a vector field, solenoidal vector, curl of a vector field, irrotational vector, physical interpretation of gradient, divergence, curl and scalar potential.			
Vector Integration: Line integrals, Statement of Green's and Stokes' theorem without verification problems.			
Module-3: Numerical Methods-1 (9 Hours Theory + 6 Tutorials)			
Solution of algebraic and transcendental equations: Regula-Falsi method and Newton-Raphson method.			
Finite Differences and Interpolation: Forward and backward differences, Interpolation, Newton forward and backward interpolation formulae, Newton's divided difference interpolation formula and Lagrange's interpolation formula.			
Numerical Integration: Trapezoidal rule, Simpson's 1/3rd rule and Simpson's 3/8th rule.			
Module-4: Numerical Methods-2 (9 Hours Theory + 6 Tutorials)			
Numerical solution of ordinary differential equations of first order and first degree: Taylor's series method, Modified Euler's method, Runge-Kutta method of fourth order, Milne's predictor corrector method and Adam-Bashforth predictor-corrector method.			
Module-5: Laplace Transform (9 Hours Theory + 6 Tutorials)			
Laplace transform (LT): Definition and Formulae of Laplace Transform, LT of elementary functions. Properties– linearity, scaling, shifting property, differentiation in the s domain,			

division by t . LT of periodic functions, square wave, saw-tooth wave, triangular wave, full and half wave rectifier, Heaviside Unit step function.

Inverse Laplace Transforms: Definition, properties, evaluation using different methods, and applications to solve ordinary differential equations.

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Understand the concept of double and triple integrals and their geometrical interpretations.
CO2	Understand the applications of vector calculus and to evaluate line and surface integrals.
CO3	Apply the knowledge of numerical methods in solving various physical and engineering phenomena.
CO4	Solve first order differential equations arising in engineering problems using single-step and multi-step methods.
CO5	Understand the concept of Laplace Transform to solve initial value problems.

ASSESSMENT DETAILS (Both CIE and SEE)

Assessment Type	Maximum Marks	Minimum Passing Marks	Evaluation Details
CIE – IA Tests (A)	30	-	Two tests each of 50 marks shall be conducted. Average of Two Internal Assessment Tests shall be scaled down to 30 marks.
Continuous and Comprehensive Evaluation (B)	20	-	Any two Assessment methods as per 24RNBE4.2 (*if it is project based, one assignment shall be given), scaled to 20 marks.
Total CIE (A+B)	50	20	CIE Evaluation is done for a maximum of 50 marks
SEE (C)	50	18	SEE is a theory exam conducted for 100 marks and scaled down to 50 marks. Exam duration shall be for 3 hours.
CIE + SEE (A+B+C)	100	40	Final marks shall be the sum of marks scored in Components A, B and C .
The minimum marks to be secured in CIE is 20 (40%) out of allotted 50 marks to appear for SEE.			

Textbooks:

1. **B.S. Grewal**, Higher Engineering Mathematics, Khanna Publishers, 44th Edition, 2021.
2. **M.K. Jain**, S.R.K. Iyengar and R.K. Jain, Numerical Methods for Scientific and Engineering Computation, New Age International Publishers, 8th Edition, 2022

Reference Books:

1. **B.V. Ramana**, Higher Engineering Mathematics, McGraw-Hill Education, 11th Edition, 2017
2. **E. Kreyszig**, Advanced Engineering Mathematics, John Wiley & Sons, 10th Edition, 2018.
3. **S.S. Sastry**, "Introductory Methods of Numerical Analysis", PHI Learning Private Limited, 5th Edition, 2012.

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- <https://nptel.ac.in/courses/127106019>
- <https://ocw.mit.edu/courses/18-335j-introduction-to-numerical-methods-spring-2019/>
- <https://ocw.mit.edu/courses/18-330-introduction-to-numerical-analysis-spring-2012/pages/syllabus/>

List of Lab-Programs using MATLAB (Part of CCA) – EEE Stream

1	Evaluation of double integrals, triple integrals, area and volume
2	Beta and Gamma functions.
3	Finding gradient, divergence and curl.
4	Evaluation of line integrals.
5	Regula Falsi and Newton Raphson method.
6	Interpolation – forward backward and backward interpolation and Numerical integration.
7	Taylor's series method, Modified Euler's method.
8	4 th order Runge-Kutta method and Milne's method.
9	Laplace Transforms.
10	Inverse Laplace Transforms.

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

1. Programming Assignment
2. Tool/Software Exploration
3. Problem-Based Learning (PBL)
4. Quiz/surprise test/seminar

B.E. (Mechanical Engineering)			
Outcome Based Education (OBE) and Choice Based Credit System (CBCS)			
SEMESTER – II			
Course Title:	Multivariable Calculus and Numerical Methods (ME Stream)		
Course Code:	BAMME201	CIE MARKS	50
(L: T: P) + SL:	(3:2:0) + (45 hrs/semester)	SEE MARKS	50
Credits:	04	EXAM HOURS	03
COURSE LEARNING OBJECTIVES:			
<i>The purpose of the course is to facilitate the learner to:</i>			
1. Familiarize the importance of Integral calculus essential for Mechanical engineering. 2. Analyze Engineering problems by applying Ordinary Differential Equations of Higher Order. 3. Familiarize the importance of Vector calculus essential for Mechanical engineering. 4. Develop the knowledge of solving Mechanical engineering problems numerically.			
Module-1: Integral Calculus		(9 Hours Theory + 6 Tutorials)	
Multiple Integrals: Definition, Evaluation of double and triple integrals, evaluation of double integrals by changing the order of integration, applications to find area and volume by double integral.			
Beta and Gamma functions: Definitions, properties, relation between Beta and Gamma functions.			
Module-2: Ordinary Differential Equations of Higher Order		(9 Hours Theory + 6 Tutorials)	
Higher-order ordinary differential equations with constant coefficients, homogeneous and non-homogeneous equations: e^{ax} , $\sin(ax+b)$, $\cos(ax+b)$, x^n only, Cauchy's and Legendre's homogeneous differential equations. Applications: mass spring model.			
Module-3: Vector Calculus		(9 Hours Theory + 6 Tutorials)	
Vector Differentiation: Scalar and vector fields. Gradient, directional derivative. Divergence and curl of a vector field- physical interpretations, solenoidal vector fields, irrotational vector fields and scalar potential.			
Vector Integration: Line integrals, work done by the force and flux, Statement of Green's theorem and Stoke's theorem.			
Module-4: Numerical Methods-1		(9 Hours Theory + 6 Tutorials)	
Solution of algebraic and transcendental equations using Regula-Falsi and Newton-Raphson methods.			
Finite differences and Interpolation: Newton's forward and backward difference formulae, Newton's divided difference formula and Lagrange's interpolation formula.			
Numerical integration: Trapezoidal, Simpson's $(1/3)^{rd}$ and $(3/8)^{th}$ rules.			
Module-5: Numerical Methods-2		(9 Hours Theory + 6 Tutorials)	
Numerical solution of ordinary differential equations of first order and first degree: Taylor's series method, Modified Euler's method, Runge-Kutta method of fourth order, Milne's predictor-corrector method and Adams-Bashforth predictor-corrector method.			

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Understand the applications of integral calculus and to evaluate line and surface integrals.
CO2	Analyse the solution of Higher Order Ordinary Differential Equations.
CO3	Understand the applications of vector calculus refer to solenoidal and irrotational vectors.
CO4	Apply the knowledge of numerical methods in solving various physical and engineering phenomena.
CO5	Solve first order ordinary differential equations arising in engineering problems using single step and multi-step numerical methods.

ASSESSMENT DETAILS (Both CIE and SEE)

Assessment Type	Maximum Marks	Minimum Passing Marks	Evaluation Details
CIE – IA Tests (A)	30	-	Two tests each of 50 marks shall be conducted. Average of Two Internal Assessment Tests shall be scaled down to 30 marks.
Continuous and Comprehensive Evaluation (B)	20	-	Any two Assessment methods as per 24RNBE4.2 (*if it is project based, one assignment shall be given), scaled to 20 marks.
Total CIE (A+B)	50	20	CIE Evaluation is done for a maximum of 50 marks
SEE (C)	50	18	SEE is a theory exam conducted for 100 marks and scaled down to 50 marks. Exam duration shall be for 3 hours.
CIE + SEE (A+B+C)	100	40	Final marks shall be the sum of marks scored in Components A, B and C.
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Textbooks:

1. **B. S. Grewal:** "Higher Engineering Mathematics", Khanna Publishers, 44th Ed., 2021
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2. **Srimanta Pal & Subodh C. Bhunia:** "Engineering Mathematics" Oxford University Press, 3rd Ed., 2016

3. **N.P Bali and Manish Goyal:** “A Textbook of Engineering Mathematics” Laxmi Publications, 10th Ed., 2022

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6. <https://ocw.mit.edu/courses/18-335j-introduction-to-numerical-methods-spring-2019/>
7. <https://ocw.mit.edu/courses/18-330-introduction-to-numerical-analysis-spring-2012/pages/syllabus/>

List of Lab Activities using MATLAB (Part of CCA)- For Mechanical Engineering

1	Evaluation of double integrals and computation of area and volume.
2	Evaluation of triple integrals and volume.
3	Finding gradient, divergence and curl.
4	Evaluation of line integrals.
5	Regula Falsi and Newton Raphson method.
6	Interpolation – forward and backward interpolation and Numerical integration.
7	Taylor’s series method.
8	Modified Euler’s method.
9	Fourth order Runge-Kutta method.
10	Milne’s method.

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

1. Programming Assignment
2. Tool/Software Exploration
3. Problem-Based Learning
4. Quiz/Surprise Test/Seminar

B.E. (Common to all CSE streams) Outcome Based Education (OBE) and Choice Based Credit System (CBCS) SEMESTER – II			
Course Title:	NUMERICAL METHODS (CS Stream)		
Course Code:	BAMCS201	CIE MARKS	50
(L: T : P) + SL	(3:2:0) + (45 hrs/semester)	SEE MARKS	50
Credits:	04	EXAM HOURS	03
COURSE LEARNING OBJECTIVES: <i>The purpose of the course is to facilitate the learner to:</i> Understand vector and matrix norms and analyse the conditioning of linear systems using the condition number. Apply Ordinary Differential Equations to model and analyse problems in Computer Science and Engineering. Acquire knowledge of numerical methods and utilize them to solve transcendental and ordinary differential equations. Formulate solutions for higher-order homogeneous and non-homogeneous differential equations with constant coefficients using inverse differential operators.			
Module-1: Introduction to Numerical Methods (9 Hours Theory + 6 Tutorials)			
Errors and their computation: Round off error, Truncation error, Absolute error, Relative error and Percentage error. Solution of algebraic and transcendental equations: Bisection, Regula-Falsi, Secant and Newton-Raphson methods.			
Module-2: Numerical solution for system of linear equations (9 Hours Theory + 6 Tutorials)			
Norms: Vector norms and Matrix norms-L1, L2 and L ∞ , Ill conditioned linear system, condition number. Solution of system of linear equations: Gauss Seidel method and LU-decomposition method. Eigenvalues and Eigen vectors: Rayleigh power method, Jacobi's method.			
Module-3: Interpolation (9 Hours Theory + 6 Tutorials)			
Finite differences and Interpolation: Newton Gregory forward and Newton Gregory backward difference formulae, Newton's divided difference. Lagrange interpolation formulae, piecewise interpolation-linear and quadratic.			
Module-4: Differential Equations of First and Higher Order (9 Hours Theory + 6 Tutorials)			
Linear and Bernoulli's differential equations. Exact and reducible to exact differential equations with integrating factors on $\frac{1}{N} \left(\frac{\partial M}{\partial y} - \frac{\partial N}{\partial x} \right)$ and $\frac{-1}{M} \left(\frac{\partial M}{\partial y} - \frac{\partial N}{\partial x} \right)$. Homogeneous and non-homogeneous Differential equations of higher order with constant coefficients. Inverse differential operators – e^{ax} , $\sin(ax + b)$, $\cos(ax + b)$ and x^n .			
Module-5: Numerical Integration and Numerical Solution of Differential Equations (9 Hours Theory + 6 Tutorials)			
Numerical integration: Trapezoidal, Simpson's 1/3 rd , Simpson's 3/8 th rule and Weddle's rule.			

Numerical solution of ordinary differential equations of first order and first degree: Taylor's series method, Modified Euler's method, Runge-Kutta method of fourth order and Milne's predictor-corrector method.

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Apply numerical techniques to approximate solutions of algebraic and transcendental equations with error estimation.
CO2	Analyse and solve systems of linear equations and eigenvalue problems using numerical approaches.
CO3	Construct interpolation polynomials to estimate unknown values of functions.
CO4	Formulate and solve first- and higher-order differential equations using analytical and numerical techniques.
CO5	Apply numerical integration and differential equation solvers to approximate solutions of engineering and scientific problems.

ASSESSMENT DETAILS (Both CIE and SEE)

Assessment Type	Maximum Marks	Minimum Passing Marks	Evaluation Details
CIE – IA Tests (A)	30	-	Two tests each of 50 marks shall be conducted. Average of Two Internal Assessment Tests shall be scaled down to 30 marks.
Continuous and Comprehensive Evaluation (B)	20	-	Any two Assessment methods as per 24RNBE4.2 (*if it is project based, one assignment shall be given), scaled to 20 marks.
Total CIE (A+B)	50	20	CIE Evaluation is done for a maximum of 50 marks
SEE (C)	50	18	SEE is a theory exam conducted for 100 marks and scaled down to 50 marks. Exam duration shall be for 3 hours.
CIE + SEE (A+B+C)	100	40	Final marks shall be the sum of marks scored in Components A, B and C.
The minimum marks to be secured in CIE is 20 (40%) out of allotted 50 marks to appear for SEE.			

Textbooks:

1. **B.S. Grewal**, Higher Engineering Mathematics, Khanna Publishers, 44th Ed., 2021.
2. **M.K. Jain, S.R.K. Iyengar and R.K. Jain**, Numerical Methods for Scientific and Engineering Computation, New Age International Publishers, 8thEd., 2022.

Reference Books:

1. **E. Kreyszig**, Advanced Engineering Mathematics, John Wiley & Sons, 10th Ed., 2018.
2. **B.V. Ramana**, Higher Engineering Mathematics, McGraw-Hill Education, 11th Ed., 2017.
3. **N. P. Bali and Manish Goyal**, A Textbook of Engineering Mathematics, Laxmi Publications, 10th Ed., 2022.

Web links and Video Lectures (e-Resources):

1. <http://academicearth.org/>
2. VTU e-Shikshana Program
3. VTU EDUSAT Program
4. <https://nptel.ac.in/courses/111105122>
5. <https://nptel.ac.in/courses/111105160>
6. <https://nptel.ac.in/courses/127106019>
7. <https://ocw.mit.edu/courses/18-335j-introduction-to-numerical-methods-spring-2019/>
8. <https://ocw.mit.edu/courses/18-330-introduction-to-numerical-analysis-spring-2012/pages/syllabus/>
9. <https://ocw.mit.edu/courses/18-01-calculus-i-single-variable-calculus-fall-2020/>

List of Lab-Programs using MATLAB (Part of CCA) - CSE stream

1	Gauss Seidel Method.
2	LU decomposition method.
3	Rayleigh's power method.
4	Interpolation – forward and backward interpolation.
5	Lagrange's Interpolation and Numerical integration.
6	Regula Falsi and Newton-Raphson method.
7	Taylor's series method.
8	Modified Euler's method.
9	Fourth order Runge-Kutta method.
10	Milne's method.

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

1. Programming Assignment
2. Tool/Software Exploration
3. Problem-Based Learning (PBL)
4. Quiz/surprise test/seminar

B.E. (Civil Engineering) Outcome Based Education (OBE) and Choice Based Credit System (CBCS) SEMESTER – I/II			
Course Title:	Applied Chemistry for Sustainable Structure & Material Design (CV Stream)		
Course Code:	BACCV102/202	CIE MARKS	50
(L :T : P) + SL	(3:0:2) + (45 hrs/semester)	SEE MARKS	50
Credits:	04	EXAM HOURS	03
COURSE LEARNING OBJECTIVES: <i>The purpose of the course is to facilitate the learner to:</i>			
1. To enable students to acquire knowledge on principles of electrochemistry for engineering applications. 2. To develop an insightful understanding of chemistry by emphasizing the related branches of engineering. 3. To provide students with a solid foundation in analytical reasoning required to solve societal problems.			
Module-1: Energy Systems and Green Fuels			9 Hrs
Electrochemistry: Introduction, electrode potential, overview of Nernst equation, concentration cell, numerical problems.			
Energy systems: Introduction, classification of batteries, characteristics of voltage, capacity, power density, shelf life & cycle life. Construction, working and application of Lithium-ion battery, redox flow battery. Fuel cell-definition, difference between battery and fuel cell. Construction and working of solid oxide fuel. Silicon solar cell- advantages, limitations and applications.			
Green Fuels: Introduction, green hydrogen production by TiO ₂ - Photocatalytical method and applications.			
Self-Learning: Construction and working of Na-ion battery, Direct recycling of Li-ion battery, Characteristic of battery: Cell balancing, Construction and working of PV cell.			
Module-2: Corrosion Science and Surface Protection			9 hrs
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.			
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.			
Coating technology: Introduction, technological importance of metal finishing. Electroplating of Chromium-decorative and hard coating.			
Self-Learning: Corrosion inhibitor, Corrosion control: Cathodic protection, Electroless plating of Cu, Difference between electroplating and electroless plating.			
Module-3: Materials for Structural Integrity			9 hrs
Polymer: Introduction, polymerization, types, synthesis, properties and engineering applications of CPVC, PMMA, Kevlar fiber and Epoxy resins. Molecular weight of polymers:			

number average and weight average molecular weight of polymers, numerical. Properties and industrial applications of (carbon-based) graphene/carbon nano-tubes as fillers reinforced composites.

Biopolymers: Polylactic Acid (PLA)-synthesis, properties and applications.

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 TiO₂ nanoparticles by sol-gel method for sensor applications.

Self-Learning: Synthesis and applications of Polyurethanes, Conducting polymer-PA, Top-down and bottom-up approach, Nanoscale Materials: Fullerenes, Carbon Nanotubes.

Module-4: Conventional and Sustainable Construction Materials	9 hrs
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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.

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

Piezoelectric Cement Composites: Introduction, piezoelectric materials in cement composites and its applications in civil engineering.

Glass: Introduction, Composition, Types, Preparation of Soda-lime glass, properties and applications of glass.

Self-Learning: Types of cement with its composition and properties, Estimation of CaO in cement, Additives for cement, Application and properties of geopolymer concrete.

Module-5: Water Chemistry and Analytical Techniques	9 hrs
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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, COD and numerical.

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 electroplating effluent.

Self-Learning: Desalination of water by RO, Ion exchange method for softening of water, Waste water treatment, Estimation of BOD of waste water sample.

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Apply the fundamentals of electrochemistry for energy storage and conversion devices.
CO2	Understand the properties of alloys and the strategies for corrosion control.
CO3	Explain the fundamentals of functional polymers and nanomaterials.
CO4	Identify the futuristic engineering materials for sustainable development.
CO5	Demonstrate the physical methods of analysis to monitor water quality parameters.

FIXED SET OF EXPERIMENTS

1. Estimation of acid mixture using conductometric sensor
2. Estimation of iron in rust sample using potentiometric sensor
3. Determination of pKa value of vinegar solution using pH sensor
4. Estimation of iron in TMT bar using optical sensor
5. Determination of viscosity coefficient of polycarboxylate ether (PCE) based admixture using Ostwald's viscometer.
6. Colorimetric determination of phenolic content in wastewater using smartphone.
7. Estimation of total hardness of given water sample by EDTA method
8. Determination of chemical oxygen demand (COD) of industrial effluents
9. Estimation of iron in TMT bar by diphenyl amine indicator method
10. Determination of alkalinity of water using standard NaOH solution
11. Estimation of percentage of CaO in cement by EDTA method
12. Determination of pka of a weak acid and its interpretation using origin software.

ASSESSMENT DETAILS (Both CIE and SEE)

Assessment Type	Maximum Marks	Minimum Passing Marks	Evaluation Details
CIE – IA Tests (A)	20	-	Two tests each of 50 marks shall be conducted. Average of Two Internal Assessment Tests shall be scaled down to 20 marks.
Continuous and Comprehensive Evaluation (B)	10	-	Anyone-assessment methods as pre 24RNBE4.2 scaled to 10 marks.
Total CIE Theory (A+B)	30	12	Marks of Tests and Assignments awarded for a maximum of 30.
CIE Practical	12	-	Marks awarded for Weekly Conduction of Experiments and Submission of Laboratory records, scales down to 12 marks.
CIE Practical Test	8	-	Average of marks of two tests, each conducted for 100 marks covering all

			experiments, scaled to 8.
Total CIE Practical	20	8	Marks of Experiments, record and Test awarded for a maximum of 20 marks.
CIE: Theory+ Practical (A+B+C)	50	20	CIE Evaluation is done for maximum of 50marks
SEE (D)	50	18	SEE is a theory exam, conducted for 100marks and scaled down to 50 marks. Exam duration shall be for 3 hours.
CIE + SEE (A+B+C+D)	100	40	Final marks shall be sum of marks scored in Components A, B, C and D

The minimum marks to be secured in CIE is 20 (40%) out of allotted 50 marks to appear for SEE. The laboratory component of the IPCC shall be for CIE only. However, the question from the laboratory component shall be included in their respective modules only.

Textbooks

1. **Engineering Chemistry:** Jain & Jain, 2018 **Publisher:** Dhanpat Rai Publishing Company, **ISBN:** 9789353161181.
2. Engineering Chemistry for 1 & 2 sem BE: VTU: Dr. T Jeevananda, 2019 **Publisher:** Sapna Book House, **ISBN:** 978-9388913966.
3. Chemistry for Engineering Students by Dr B S Jai Prakash, Prof R Venugopal, Dr Shivakumaraiah. 2018, **Publisher:** Subhas stores, **ISBN:** 5551234102668.

Reference Books:-

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. **Advances in corrosion science and technology**, M.G. Fontana, R.W. Staettle, Springer publications, 2012, ISBN: 9781461590620.
3. **Energy storage and conversion devices;** Supercapacitors, batteries and hydroelectric Cells Editor: Anurag Gaur, 2021, CRC Press, ISBN: 9781000470512.

Web links and Video Lectures (e-Resources):

1. <https://www.youtube.com/watch?v=VxMM4g2Sk8U&pp=ygUPbGl0aGl1bSBiYXR0ZXJ5>
2. <https://www.youtube.com/watch?v=TSsqCazP1V0&pp=ygUQdmFuYWRpdW0gYmF0dGVyeQ%3D%3D>
3. <https://youtu.be/9TW9xMho6Yw>
4. <https://youtu.be/CiDrOPS04j8>
5. <https://www.youtube.com/watch?v=QYd9ENn1nP0&pp=ygUlaW1wcmVzc2VklGN1cnJlbnQgY2F0aG9kaWMgcHJvdGVjdGlvdGVjbG%3D%3D>

6. <https://youtu.be/YjTl4Jp1TB0>
7. <https://youtu.be/QjRp62KDaxM>
8. <https://youtu.be/LIOd6rjaDJk>



B.E. (Electrical and Electronics/ Electronics and Communication Engineering) Outcome Based Education (OBE) and Choice Based Credit System (CBCS) SEMESTER – I/II			
Course Title:	APPLIED CHEMISTRY FOR EMERGING ELECTRONICS AND FUTURISTIC DEVICES (EEE/ECE STREAM)		
Course Code:	BACEE102/202	CIE MARKS	50
(L: T: P) + SL	(3:0:2) + (45 hrs/semester)	SEE MARKS	50
Credits:	04	EXAM HOURS	03
COURSE LEARNING OBJECTIVES: <i>The purpose of the course is to facilitate the learner to:</i> 1. To enable students to acquire knowledge on principles of electrochemistry for engineering applications. 2. To develop an insightful understanding of materials for semiconductor and futuristic devices by emphasizing the related branches of engineering. 3. To provide students with a solid foundation in analytical reasoning required to solve societal problems.			
Module-1: Materials For Energy Devices			9 Hrs
Electrode System: Introduction, types of electrodes, Nernst equation (Preview), reference electrode: construction, working and applications of calomel electrode, Ion selective electrode- definition, construction, working of glass electrode, determination of pH using glass electrode, construction and working of concentration cell and numerical. Energy Storage Devices: Introduction, classification of batteries-primary, secondary and reserve battery, its characteristics (voltage, capacity, power density, shelf life & cycle life). Construction and working of lithium-ion battery and their advantages in EV applications. Construction and working of ultra-small asymmetric super capacitor- Energy Conversion Devices: Introduction, construction, working principle, advantages and applications of photovoltaic cell (PV cell). Self-Learning: Cell balancing of batteries, its applications of IoT/ Wearable devices			
Module-2: Corrosion Science And Energy Conversions			9 Hrs
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. Coating Technologies: Introduction, difference between electroplating & electroless plating. Electroplating of chromium for hard and decorative coatings, electroless plating of copper on PCBs. GREEN FUELS: Green hydrogen, properties and production of hydrogen by alkaline electrolysis, Construction, working and applications of Methanol–Oxygen fuel cell. Self-Learning: Corrosion Inhibitors, Factors affecting Corrosion, Sacrificial Anode method, Stress Corrosion in steel boilers.			

Module-3: Polymers And Hybrid Composites In Flexible Electronics	9 Hrs
Stretchable and wearable Microelectronics: Introduction, basic principle and working of Lithography for micro-patterned copper deposition, synthesis, properties and applications of PDMS (Polydimethylsiloxane) in RFID (Radio Frequency Identification) Polymers: Introduction, Synthesis, conduction mechanism of polyaniline and its applications in electronic devices, Number average and weight average molecular weight and numerical. Synthesis, properties and applications of Nylon-12, PMMA and CPVC. 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. Self-Learning: Applications of PDMS in E-nose, Conducting mechanism of Polyacetylene, Significance of Glass transition temperature (T_g), Viscosity Average Molecular Weight of Polymers.	
Module-4: Advanced Electronic Devices And E-Waste	9 Hrs
Organic Semiconductors: Introduction, n-type and p-type semiconductor materials, difference between organic and inorganic semiconductors. Organic photovoltaics - Poly (3-hexylthiophene) (P3HT) as a donor and PhenylC61-butyric acid methyl ester (PCBM) as a acceptor, construction, working and applications. Sensing Methods: Introduction, principle and instrumentation of colorimetric sensors; its application in the estimation of copper in PCBs. Principle and instrumentation of potentiometric sensors; applications in the estimation of iron in steel. Conductometric sensors; its application in the estimation of acid mixture in the given 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, recovery of copper from PCBs. Self-Learning: Working principle of electrochemical sensors, conductometric estimation of Strong acid vs Strong Base, Role of Consumers and Recyclers in e waste management, how recycling plants work.	
Module-5: Nano And Quantum Dot Materials	9 hrs
Nanomaterials: Introduction, size dependent properties of nanomaterials - Surface area, optical and electrical. Synthesis of TiO_2 nanoparticles by sol-gel method for sensor applications. Quantum Dot Materials: Introduction, types, optical and electronic properties of quantum dots (QDs). Construction and working principle of QDSSC's. 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 applications in optoelectronic devices, Quantum Dot-based copper conductive ink by wet chemical reduction method, properties and applications. Organic Quantum Dot Materials (OQDMs): Introduction, synthesis and properties of chitosan-carbon quantum dot hydrogels and its applications in next-generation flexible and wearable electronics. Self-Learning: Synthesis of graphene quantum Dot using Citric acid method, its applications, synthesis of nanomaterials by Chemical Vapour Deposition and Combustion method.	

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Apply the fundamentals of electrochemistry for energy storage and conversion devices.
CO2	Understand corrosion control, coating techniques and green fuels for sustainable strategies.
CO3	Explain the role of functional polymers and composites in flexible electronic applications.
CO4	Outline the properties, classification and applications of semiconductor materials and e-waste management techniques.
CO5	Demonstrate the fundamentals of nanomaterials and quantum dots.

FIXED SET OF EXPERIMENTS

1. Estimation of total hardness of water by EDTA method.
2. Determination of chemical oxygen demand (COD) of industrial effluent sample.
3. Estimation of iron in TMT bar by diphenyl amine indicator method.
4. Determination of alkalinity of given boiler water sample.
5. Green synthesis of copper nanoparticles for conductive ink applications.
6. Estimation of acid mixture by conductometric sensor (Conductometry)
7. Estimation of iron in rust sample by Potentiometric sensor (Potentiometry)
8. Determination of pKa of vinegar using pH sensor (Glass electrode)
9. Estimation of copper present in e-waste by optical sensor (Colorimetry).
10. Smartphone-Based colorimetric estimation of total phenolic content in coffee products.
11. Data analysis of pKa of a weak acid and its interpretation using origin software.
12. Chemical structure drawing using software: Chem Draw/ Chem Sketch.

ASSESSMENT DETAILS (Both CIE and SEE)

Assessment Type	Maximum Marks	Minimum Passing Marks	Evaluation Details
CIE – IA Tests (A)	20	-	Two tests each of 50 marks shall be conducted. Average of Two Internal Assessment Tests shall be scaled down to 20 marks.
Continuous and Comprehensive Evaluation (B)	10	-	Anyone-assessment methods as pre 24RNBE4.2 scaled to 10 marks.
Total CIE Theory (A+B)	30	12	Marks of Tests and Assignments awarded for a maximum of 30.
CIE Practical	12	-	Marks awarded for Weekly Conduction of Experiments and Submission of Laboratory records, scales down to 12 marks.
CIE Practical Test	8	-	Average of marks of two tests, each conducted for 100 marks covering all experiments, scaled to 8.
Total CIE Practical	20	8	Marks of Experiments, record and Test awarded for a maximum of 20 marks.
CIE: Theory+ Practical (A+B+C)	50	20	CIE Evaluation is done for maximum of 50marks
SEE (D)	50	18	SEE is a theory exam, conducted for 100marks and scaled down to 50 marks. Exam duration shall be for 3 hours.
CIE + SEE (A+B+C+D)	100	40	Final marks shall be sum of marks scored in Components A, B, C and D

The minimum marks to be secured in CIE is 20 (40%) out of allotted 50 marks to appear for SEE. The laboratory component of the IPCC shall be for CIE only. However, the question from the laboratory component shall be included in their respective modules only.

Textbooks

- Engineering Chemistry:** Jain & Jain, 2018 **Publisher:** Dhanpat Rai Publishing Company, **ISBN:** 9789353161181.
- Engineering Chemistry for 1 & 2 sem BE:** VTU: Dr. T Jeevananda, 2019 **Publisher:** Sapna Book House, **ISBN:** 978-9388913966.
- Chemistry for Engineering Students** by Dr B S Jai Prakash, Prof R Venugopal, Dr Shivakumaraiah. 2018, **Publisher:** Subhas stores, **ISBN:** 5551234102668.

Reference Books: -

- Electrochemical Energy System:** Dr. K. K. Rajeshwar (IIT Madras), Publisher: IIT Madras Open Courseware (Free PDF & videos), ISBN: N/A (Open Educational Resource).
- Advances in corrosion science and technology**, M.G. Fontana, R.W. Staettle, Springer publications, 2012, ISBN: 9781461590620.

3. Energy storage and conversion devices; Supercapacitors, batteries and hydroelectric Cells
Editor: Anurag Gaur, 2021, CRC Press, ISBN: 9781000470512.

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>



B.E. (Mechanical Engineering) Outcome Based Education (OBE) and Choice Based Credit System (CBCS) SEMESTER – I/II			
Course Title:	Applied Chemistry for Advanced Metal Protection and Sustainable Energy Systems (ME Stream)		
Course Code:	BACME102/202	CIE MARKS	50
(L :T : P) + SL	(3:0:2) + (45 hrs/semester)	SEE MARKS	50
Credits:	04	EXAM HOURS	03
COURSE LEARNING OBJECTIVES: <i>The purpose of the course is to facilitate the learner:</i> 1. To enable students to acquire knowledge on principles of chemistry for engineering applications. 2. To develop an intuitive understanding of chemistry by emphasizing the related branches of engineering. 3. To provide students with a solid foundation in analytical reasoning required to solve societal problems.			
Module-1: Corrosion Science and Coating Technologies			9 hrs
Corrosion: Introduction, electrochemical theory of corrosion, Factors affecting the rate of corrosion: ratio of anodic to cathodic areas, nature of metal, nature of corrosion product, nature of medium– pH, conductivity and temperature. Types of corrosion differential metal and differential aeration corrosion, Corrosion control-metal coating: galvanization, surface conversion coating: anodization 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 electroless plating. Self learning: Stress corrosion, Phosphate coating, Impressed current, Corrosion Inhibitor.			
Module-2: Sustainable Green Fuels			9 hrs
Fuels: Introduction, calorific value, determination of calorific value using bomb calorimeter, numerical problems on GCV and NCV. 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. Self-learning: Properties of green hydrogen, physical and chemical storage method. Alkaline electrolysis of water.			

Module-3: Materials for Energy System	9 hrs
Energy Systems: Batteries - Introduction, classification of batteries, characteristics-Voltage, 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. Nanomaterials: Introduction, size-dependent properties of nanomaterial-surface area, optical, electrical and thermal conductivity, Synthesis of TiO₂ nanoparticles by sol-gel method for catalytic converter applications, Graphene - Synthesis by chemical vapor deposition method, properties and engineering applications, Role of carbon nanotubes (CNTs) in energy devices. Self learning: QDSSC, Sodium ion battery, Classification of nanomaterial based on dimensions.	
Module-4: Materials for Engineering Applications	9 hrs
Engineering Polymers: Introduction, molecular weight of polymers – number average and weight average molecular weight numerical problems, Synthesis, properties and engineering applications of chlorinated polyvinyl chloride (CPVC), and polymethyl methacrylate (PMMA), Structure and property relationship of polymers. Glass transition temperature (T_g), factor affecting T_g (Flexibility, inter molecular forces, molecular mass,) and its significance. Polymer Composites: Introduction, fiber-reinforced polymers (FRPs); Kevlar – Synthesis, properties and industrial applications. Carbon fiber - Preparation from Polyacrylonitrile (PAN), properties and industrial applications. Biopolymer for 3D Printing materials: Introduction, synthesis, properties and applications of polylactic acid (PLA) resin. Self learning: Synthesis, properties and applications of Poly carbonate (PC) and Epoxy resin.	
Module-5: Fluid Technology and Smart Sensors	9 hrs
Lubricants: Introduction, classification, ideal properties and applications. Lubricant testing: Viscosity index-experimental determination of viscosity, numerical. Industrial Coolants: Introduction, types-water and oil-based coolants, properties and industrial applications. Sensors: Introduction, potentiometric sensor principle and its application in the estimation of iron in steel industry effluent, Conductometric sensor principle and its application in the estimation of acids in electrochemical bath effluent. Optical Sensors: Colorimetry principle and its Application in the Estimation of the Copper. pH sensor - principle and its application in the estimation of pK_a of beverages. Self learning: Electrochemical sensor for measurement gases (SO_x, NO_x, DO).	

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Evaluate corrosion process and the methods to control corrosion using coating techniques.
CO2	Understand the significance of fuels and their production for sustainable energy applications.
CO3	Outline the importance of nanomaterials and their application in energy storage systems.
CO4	Utilize polymeric materials for multidisciplinary engineering applications.
CO5	Apply the fundamentals of analytical chemistry in fluid technology and sensors.

FIXED SET OF EXPERIMENTS

1. Estimation of total hardness of water by EDTA method
2. Determination of chemical oxygen demand (COD) of industrial wastewater
3. Estimation of iron in steel industry effluent by diphenyl amine indicator method
4. Determination of alkalinity of water using standard NaOH solution
5. Estimation of acid mixture in electrochemical bath effluent using conductometric sensor (Conductometry)
6. Estimation of iron in rust sample by Potentiometric sensor (Potentiometry)
7. Determination of pKa of acid electrolyte using pH sensor (Glass electrode)
8. Estimation of copper present in e-waste by optical sensor (Colorimetry)
9. Determination of viscosity coefficient of lubricant using Ostwald's viscometer
10. Determination of acid value of biofuel
11. Green synthesis of copper nanoparticles for conductive inks
12. Synthesis of polylactic acid (PLA).

ASSESSMENT DETAILS (Both CIE and SEE)

Assessment Type	Maximum Marks	Minimum Passing Marks	Evaluation Details
CIE – IA Tests (A)	20	-	Two tests each of 50 marks shall be conducted. Average of Two Internal Assessment Tests shall be scaled down to 20 marks.
Continuous and Comprehensive Evaluation (B)	10	-	Anyone-assessment methods as pre 24RNBE4.2 scaled to 10 marks.
Total CIE Theory (A+B)	30	12	Marks of Tests and Assignments awarded for a maximum of 30.
CIE Practical	12	-	Marks awarded for Weekly Conduction of Experiments and Submission of Laboratory records, scales down to 12 marks.
CIE Practical Test	8	-	Average of marks of two tests, each conducted for 100 marks covering all experiments, scaled to

			8.
Total CIE Practical	20	8	Marks of Experiments, record and Test awarded for a maximum of 20 marks.
CIE: Theory+ Practical (A+B+C)	50	20	CIE Evaluation is done for maximum of 50marks
SEE (D)	50	18	SEE is a theory exam, conducted for 100marks and scaled down to 50 marks. Exam duration shall be for 3 hours.
CIE + SEE (A+B+C+D)	100	40	Final marks shall be sum of marks scored in Components A, B, C and D
The minimum marks to be secured in CIE is 20 (40%) out of allotted 50 marks to appear for SEE. The laboratory component of the IPCC shall be for CIE only. However, the question from the laboratory component shall be included in their respective modules only.			

Textbooks

- Engineering Chemistry:** Jain & Jain, 2018 **Publisher:** Dhanpat Rai Publishing Company, **ISBN:** 9789353161181.
- Engineering Chemistry for 1 & 2 sem BE: VTU: Dr. T Jeevananda, 2019 **Publisher:** Sapna Book House, **ISBN:** 978-9388913966.
- Chemistry for Engineering Students by Dr B S Jai Prakash, Prof R Venugopal, Dr Shivakumaraiah. 2018, **Publisher:** Subhas stores, **ISBN:** 5551234102668.

Reference Books:

- Electrochemical Energy System:** Dr. K. K. Rajeshwar (IIT Madras), Publisher: IIT Madras Open Courseware (Free PDF & videos), ISBN: N/A (Open Educational Resource).
- Advances in corrosion science and technology**, M.G. Fontana, R.W. Staettle, Springer publications, 2012, ISBN: 9781461590620.
- Energy storage and conversion devices;** Supercapacitors, batteries and hydroelectric Cells Editor: Anurag Gaur, 2021, CRC Press, ISBN: 9781000470512.
- Polymer Science**, V R Gowariker, N V Viswanathan, Jayadev, Sreedhar, Newage Int. Publishers, 4th Edition, 2021
- Nanotechnology A Chemical Approach to Nanomaterials**, G.A. Ozin & A.C. Arsenault, RSC Publishing, 2005.

Web links and Video Lectures (e-Resources):

- [1.https://www.vturesource.com/post/1570/News/Bomb-calorimeter-construction-working-vtu-chemistry.html?utm_source](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](https://pubs.acs.org/doi/10.1021/acsomega.3c00963?utm_source)
- [3. https://youtu.be/qTw_p9dkiVU](https://youtu.be/qTw_p9dkiVU)
- [4. https://youtu.be/wdCYXj-bI-U](https://youtu.be/wdCYXj-bI-U)
- [5. https://youtu.be/Y0EkLYK5i-c](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_rNjiliBKE
11. <https://youtu.be/GpbcjWstzEE>
12. <https://youtu.be/ygtbo5KDXeI>



B.E. (Common for all CSE Streams) Outcome Based Education (OBE) and Choice Based Credit System (CBCS) SEMESTER – I/II			
Course Title:	Applied Chemistry for Smart Systems (CSE stream)		
Course Code:	BACCS102/202	CIE MARKS	50
(L: T: P) + SL	(3:0:2) + (45 hrs/semester)	SEE MARKS	50
Credits:	04	EXAM HOURS	03
COURSE LEARNING OBJECTIVES: <i>The purpose of the course is to facilitate the learner to:</i> 1. Enable students to acquire principles of electrochemistry and adapt for low-carbon energy systems. 2. Provide students with a solid foundation in analytical reasoning for quantitative approach. 3. Resolve the society problems and initiate green development for sustainable future. 4. Develop an insightful understanding of functional and quantum materials in smart devices.			
Module-1: Sustainable Chemistry for Energy Devices			09 hrs
Batteries: Introduction, Nernst equation (Preview), concentration cell and numerical problems. Classification of batteries, characteristics of battery (voltage, capacity, power density, shelf life and cycle life). Construction, working and applications of Li-Ion battery. Next-Generation Energy Systems: Introduction, construction and working of sodium ion battery and redox flow battery for EV applications. Construction and working of ultra-small asymmetric supercapacitor and its applications. Clean Energy Chemistry: Introduction to fuel cell, difference between fuel cell and battery. Construction, working principle, applications and limitations of solid-oxide fuel cell (SOFCs). Construction, working, applications and limitations of solar photovoltaic cell (PV cell). Self-Learning: Supercapacitors and its applications in IoT/wearable devices. Production of green hydrogen by photocatalytic water splitting using TiO ₂ method and its advantages. Supercapacitors.			
Module-2: Corrosion Science and Chemical Sensors			09 hrs
Corrosion: Introduction, electrochemical theory of corrosion. Its types-differential metal and differential aeration corrosion. Corrosion control- Galvanization and Anodization, vapor corrosion inhibitors for protecting computer circuit boards. Corrosion penetration rate (CPR)-definition, importance and numerical problems. Sensors: Introduction, terminologies- transducers, actuators and sensors. Electrochemical sensor working principle and applications. Electrochemical gas sensor for the detection of NO _x and SO _x in air sample. Working principle and applications of conductometric and colorimetric sensors. Self-Learning: Cathodic protection for corrosion control, Biosensor-principle and working mechanism for detection of glucose in biofluids. Disposable sensors.			
Module-3: Green Materials and E-waste Management			09 hrs

Green Chemistry: Introduction, Basic Principles of green chemistry, properties and applications of green solvents for server heat management, biosynthesis and properties of glycerol trioleate ester and its applications. Green synthesis of ZnO nanoparticles, properties and its applications.

Biomaterials: Introduction, synthesis and properties of polylactic Acid (PLA) and polyethylene glycol (PEG) and its applications.

E-waste: Introduction, sources, composition of e-waste, effects of e-waste on environment and human health, extraction of gold from e-waste by aqua regia method. Extraction of Cu by hydrometallurgical method from e-waste.

Self-Learning: Synthesis and properties of Alginate Hydrogel for Brain-Computer Interfaces (BCIs) applications. Artificial intelligence in e-waste management and its applications.

Module-4: Quantum Materials and Polymers

09 hrs

Quantum Dots: Introduction, size dependent properties -quantum confinement effect, surface-to-volume ratio & band gap. Synthesis and applications of Cd-Se Quantum dots by wet chemical method. Quantum dot sensitized solar cells (QDSSCs)-construction, working principle and applications.

Polymer: Introduction, molecular weight of polymers – number average and weight average molecular weight of polymers, numerical problems, structure-property relationship of polymers, synthesis and properties of nylon-12 advantages and its applications, synthesis and properties of CPVC and PMMA for device applications.

Conducting polymers- Introduction, synthesis of polyaniline, conduction mechanism and its engineering applications.

Self-Learning: Definition and significance of glass transition temperature. Synthesis and conduction mechanism of polyacetylene, applications of Carbon fibre Reinforced composites and epoxy-resins

Module-5: Functional Materials for Memory and Display systems

09 hrs

Memory Devices: Introduction, types of organic semiconductors used in memory devices- p-type (pentacene) and n-type (perfluoropentacene), difference between organic and inorganic memory devices. Construction and working of pentacene semiconductor chips.

Resistive RAM (ReRAM) Materials: Introduction, synthesis of TiO₂- RAM nanomaterial by sol-gel method, properties and its applications.

Display Systems: Introduction, Liquid crystals (LCs)- classification, properties and applications. Construction, working principle and applications of LEDs, OLEDs, QLEDs and Active-Matrix Organic Light Emitting Diodes (AMOLEDs).

Self-Learning: Construction and working of LC Displays, polymeric memory devices, organic-inorganic memory devices.

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Evaluate next-generation energy systems by applying electrochemical concepts.
CO2	Apply the concepts of corrosion control and development of sensors for real time analysis.
CO3	Understand the need of next-generation green materials for sustainable development and e-waste management.
CO4	Demonstrate the role of quantum materials and polymers in smart devices.
CO5	Identify the functional materials used for memory and display systems.

FIXED SET OF EXPERIMENTS

1. Estimation of total hardness of water by EDTA method.
2. Determination of chemical oxygen demand (COD) of industrial effluent sample.
3. Estimation of iron in TMT bar by diphenyl amine indicator method.
4. Determination of alkalinity of given boiler water sample.
5. Estimation of acid mixture by conductometric sensor (Conductometry)
6. Estimation of iron in rust sample by Potentiometric sensor (Potentiometry)
7. Determination of pKa of vinegar using pH sensor (Glass electrode)
8. Estimation of copper present in e-waste by optical sensor (Colorimetry).
9. Green synthesis of copper nanoparticles for conductive ink applications.
10. Smartphone-Based colorimetric estimation of total phenolic content in coffee products.
11. Data analysis of pKa of a weak acid and its interpretation using origin software.
12. Chemical structure drawing using software: Chem Draw/ Chem Sketch.

ASSESSMENT DETAILS (Both CIE and SEE)

Assessment Type	Maximum Marks	Minimum Passing Marks	Evaluation Details
CIE – IA Tests (A)	20	-	Two tests each of 50 marks shall be conducted. Average of two Internal Assessments Tests shall be scaled down to 20 marks.
Alternate Assessment (B)	10	-	Anyone-assessment methods as per 24RNBE4.2 scaled to 10 marks.
Total Theory CIE (A+B)	30	12	Marks of Tests and Assignment awarded for a maximum of 30.
CIE Practical	12	-	Marks awarded for Weekly Conduction of Experiments and Submission of Laboratory records, scales down to 12 marks.
CIE Practical Tests	08	-	Average of marks of two tests, each conducted for 100 marks covering all experiments, scaled to 8 marks.

Total Practical CIE (C)	20	8	Marks of Experiments, record and Test awarded for a maximum of 20 marks.
Total CIE: Theory + Practical (A+B+C)	50	20	CIE evaluation is done for a maximum of 50 marks.
SEE (D)	50	18	SEE is a theory exam, conducted for 100 marks and scaled down to 50 marks.
CIE + SEE (A + B + C + D)	100	40	Final marks shall be the sum of marks scored in components A, B, C and D.
The minimum marks to be secured in CIE are 20 (40%) out of allotted 50 marks to appear for SEE. The laboratory component for IPCC shall be for CIE only. However, in SEE, the questions from the laboratory components shall be included in their respective modules only.			

Textbooks

1. **Engineering Chemistry:** Jain & Jain, 2018, **Publisher:** Dhanpat Rai Publishing Company, **ISBN:** 9789353161181.
2. Engineering Chemistry for 1 & 2 sem BE: VTU: Dr. T Jeevananda, 2019, **Publisher:** Sapna Book House, **ISBN:** 978-9388913966.
3. Chemistry for Engineering Students by Dr B S Jai Prakash, Prof R Venugopal, Dr Shivakumaraiah, 2018, **Publisher:** Subhas stores; **ISBN:** 5551234102668.

Reference Books-

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. **Advances in corrosion science and technology**, M.G. Fontana, R.W. Staettle, Springer publications, 2012, **ISBN:** 9781461590620.
3. **Energy storage and conversion devices;** Supercapacitors, batteries and hydroelectric Cells Editor: Anurag Gaur, 2021, CRC Press, **ISBN:** 9781000470512.

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>

B.E. (Civil Engineering) Outcome Based Education (OBE) and Choice Based Credit System (CBCS) SEMESTER – I/II			
Course Title:	Physics for Sustainable Structural Systems (CV stream)		
Course Code:	BAPCV102/202	CIE MARKS	50
(L: T: P) + SL	(3:0:2) + (45 Hours/Sem)	SEE MARKS	50
Credits:	04	EXAM HOURS	3
COURSE LEARNING OBJECTIVES: <i>The purpose of the course is to facilitate the learner to:</i> 1. Learn the principles of oscillations to apply it for mechanical and electrical systems 2. Study the role of wave's structures and natural hazards. 3. Acquire the fundamentals of acoustics, radiometry, and photometry to design and evaluate systems for sound and light. 4. Analyse the essentials of photonics for engineering applications. 5. Gain the fundamentals of smart materials to enhance the sustainability of engineering systems.			
Module-1: Mechanics of Oscillations			9 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 (Qualitative), Types of damping (Graphical Approach). Engineering applications of Damped oscillations, Theory of forced oscillations (Qualitative), Resonance and Sharpness of resonance. Resonance in LCR Circuits (Qualitative). Numerical Problems.			
Module-2: Waves and their role in Structural Behavior			9 hrs
Earthquake Waves: 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 Waves: causes for tsunami, characteristics, adverse effects, risk reduction measures, engineering structures to withstand tsunami, Seismometer and Seismograph, Accelerometer. Shock waves: Mach number and Mach Angle, Mach Regimes, definition and characteristics of Shock waves, Construction and working of Reddy shock tube, Applications of Shock Waves. Numerical problems.			
Module-3: Acoustics, Radiometry and Photometry			9 hrs
Acoustics: Introduction to Acoustics, Types of Acoustics, Reverberation and reverberation time, Absorption power and Absorption coefficient, Requisites for acoustics in auditorium, Sabine's formula (derivation), 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). Numerical Problems.			

Module-4: Photonics	9 hrs
Photon: Origin of Photon from Blackbody Spectrum, Block body laws, Planck's equation and its success, Boltzmann's population ratio. Lasers: Basic properties of a LASER beam, Interaction of Radiation with Matter, Einstein's Coefficients, derivation of energy density expression, Metastable State and Population Inversion, Requisites of a laser system, Semiconductor Laser, Power of a laser beam, List of Application of LASERS in Range Finder, LIDAR, Road Profiling, Bridge Deflection, Speed Checker (qualitative). OPTICAL FIBERS: Principle and working, Acceptance angle and Numerical Aperture (NA), derivation of an expression for the NA, Modes of Propagation, Classification of Optical Fibers, Attenuation and derivation of fiber Loss. Various Applications of Optical fibers (only mention), Point to point communication. Numerical Problems.	
Module-5: Smart Materials for Sustainable Structures	9 hrs
Types of smart materials, Piezo, Magnetostrictive, Electrostrictive, 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. Numerical Problems.	

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Analyse the behaviour of simple harmonic, damped, and forced oscillatory systems in mechanical and electrical contexts.
CO2	Evaluate wave propagation and structural response to dynamic loads such as earthquakes and blasts, incorporating modern mitigation strategies and smart materials.
CO3	Apply the principles of acoustics, radiometry, and photometry to design and evaluate systems for sound, light, and radiation measurements.
CO4	Study the essentials of photonics for engineering applications.
CO5	Assess the properties and applications of smart materials to enhance the performance and sustainability of engineering systems.

FIXED SET OF EXPERIMENTS

1. Determination of effective spring constant of the given springs in series and parallel combinations.
2. Study of the frequency response of Series LCR circuit.
3. Determination of Young's Modulus of the material of the given bar using Single cantilever.
4. Determination of wavelength of LASER using Diffraction Grating.
5. Determination of acceptance angle and numerical aperture of the given Optical Fibre.
6. Verification of Stefan's law.
7. Torsional Pendulum
8. Moment of Inertia
9. Uniform bending
10. Study of Forced Mechanical Oscillations and Resonance.
11. Determination of wavelength of Ultrasonic using Ultrasonic Interferometer.
12. Verification of Inverse Square Law of Intensity of Light Study on types of damping (Pendulum and Damper / PHET)
13. Simulations using V-labs.

ASSESSMENT DETAILS (Both CIE and SEE)

Assessment Type	Maximum Marks	Minimum Passing Marks	Evaluation Details
CIE – IA Tests (A)	20	-	Two tests each of 50 marks shall be conducted. Average of Two Internal Assessment Tests shall be scaled down to 20 marks.
Continuous and Comprehensive Evaluation (B)	10	-	Any one-assessment methods as per 24RNBE4.2 scaled to 10 marks.
Total CIE Theory (A+B)	30	12	Marks of Tests and Assignments awarded for a maximum of 30.
CIE Practical	12	-	Marks awarded for Weekly Conduction of Experiments and Submission of Laboratory records, scales down to 12 marks.
CIE Practical Test	8	-	Average of marks of two tests, each conducted for 100 marks covering all experiments, scaled to 8.
Total CIE Practical (C)	20	8	Marks of Experiments, record and Test awarded for a maximum of 20 marks.
CIE: Theory+ Practical (A+B+C)	50	20	CIE Evaluation is done for maximum of 50marks
SEE (D)	50	18	SEE is a theory exam, conducted for 100 marks and scaled down to 50 marks. Exam duration shall be for 3 hours.
CIE + SEE (A+B+C+D)	100	40	Final marks shall be sum of marks scored in Components A, B, C and D

The minimum marks to be secured in CIE is 20 (40%) out of allotted 50 marks to appear for SEE. The laboratory component of the IPCC shall be for CIE only. However, the question from the laboratory component shall be included in their respective modules only.

Textbooks

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. Solid State Physics - S O Pillai, 8th Ed- New Age International Publishers-2018.
5. Smart Materials in Structural Health Monitoring, Control and Biomechanics, Suresh Bhalla (IIT Delhi), C. K. Soh, Yaowen Yang, Springer.

Reference books

1. Engineering Physics by R. K. Gaur and S. L. Gupta, 2010 edition, Dhanpat Rai Publications Ltd., New Delhi-110002.
2. Introduction to Seismology, Earthquakes, and Earth Structure, Stein, Seth, and Michael Wyssession. Blackwell Publishing, 2003.
3. Photometry Radiometry and Measurements of Optical Losses, Micheal Bukshtab, Springer, 2nd edition.
4. Engineering Physics, S Mani Naidu, Pearson, 2025.
5. Building Science: Lighting and Acoustics, B. P. Singh and Devaraj Singh, Dhanpat Rai Publications (P) Ltc.
6. Lagoudas, D. C. Shape Memory Alloys: Modelling and Engineering Applications. Springer, 2008. ISBN: 978-0-387-47684-1.
7. 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.

Web links and Video Lectures (e-Resources)

1. Waves and Oscillations Playlist (SHM, damping, resonance etc) – NPTEL https://www.youtube.com/playlist?list=PLyqSpQzTE6M9X7oRXliYM8t0aaR_N0Csd.
2. Stress- strain curves: <https://web.mit.edu/course/3/3.11/www/modules/ss.pdf>
3. Stress curves: <https://www.youtube.com/watch?v=f08Y39UiC-o>.
4. Acoustics: <https://www.youtube.com/watch?v=fHBPvMDFyO8>.
5. INTRO – Fundamentals of Acoustics” (Lecture 1, NPTEL-NOC, IIT Madras).
6. Structural Health Monitoring of Composites (IIT Kanpur) – Full NPTEL Course: <https://nptel.ac.in/courses/112104160>.
7. Course Introduction-Structural Health Monitoring (IITM-NPTEL): <https://www.youtube.com/watch?v=It4aogUfQis>.
8. Smart Structures (IIT Kharagpur)-Covers smart materials, actuators, SHM: https://onlinecourses.nptel.ac.in/noc23_ae19/preview.

B.E. (Electrical and Electronics Engineering) Outcome Based Education (OBE) and Choice Based Credit System (CBCS) SEMESTER – I/II			
Course Title:	Physics of Electrical and Electronic Materials (EEE stream)		
Course Code:	BAPEE102/202	CIE MARKS	50
(L :T : P) + SL	(3:0:2) + (45 hrs/semester)	SEE MARKS	50
Credits:	4	EXAM HOURS	3
COURSE LEARNING OBJECTIVES: <i>The purpose of the course is to facilitate the learner to:</i> 1. Learn the principles of dielectric and magnetic properties of materials and apply them in electrical components like transformers, capacitors, and magnetic switches. 2. Study the thermoelectric phenomena, device construction, and identify suitable materials and applications for energy conversion. 3. Acquire the fundamentals of Physics of electronic materials 4. Gain the fundamentals of superconducting materials and applications. 5. Analyse the essentials of photonics for engineering applications.			
Module-1: Dielectric and Magnetic Materials			9 hrs
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), SF ₆ in High Voltage application.			
Magnetic materials: 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, Transformer Cores, Armature, Inductors and chokes, Permanent Magnets. Numerical Problems.			
Module-2: Thermoelectric Materials and Characterization Techniques			9 hrs
Thermoelectrics: 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 T ₁ and T ₂ , Thermocouples, thermopile, Construction and Working of Thermoelectric generators (TEG) and Thermoelectric coolers (TEC), low, mid and high temperature thermoelectric materials, Applications (mention).			
Characterization techniques: Crystal planes and inter-planar distance, Bragg's law (derivation), Basic Principles, Morphological characterization- SEM, TEM and AFM. Numerical Problems.			
Module-3: Electrical Properties of Metals and Semiconductors			9 hrs
Failures of classical free electron theory, Mechanisms of electron scattering in solids, Matheissen's rule, Assumptions of Quantum Free Electron Theory, Density of States, Fermi Dirac statistics, derivation of Fermi Energy and average fermi energy, Variation of Fermi Factor With Temperature and Energy, Expression for carrier concentration- Expression for electron and hole concentration in extrinsic semiconductor, Fermi level for intrinsic (with			

derivation) and extrinsic semiconductor (no derivation), Hall effect (with derivation). Numerical Problems.	
Module-4: Superconductivity	9 hrs
Zero resistance state, Persistent current, Meissner effect, Critical temperature, Critical current (Silsbee Effect) – Derivation for a cylindrical wire using ampere's law, Critical field, Formation of Cooper pairs - Mediation of phonons, Two-fluid model, BCS Theory - Phase coherent state, Limitations of BCS theory, Type-I and Type-II superconductors, High T _c superconductors, London's equations (derivation), Josephson junction, Flux quantization, DC SQUID, Superconducting Magnet, MAGLEV. Numerical Problems.	
Module-5: Photonics	9 hrs
Photon: Origin of Photon from Blackbody Spectrum, Black body laws, Planck's equation and its success, Boltzmann's population ratio. Lasers: Basic properties of a LASER beam, Interaction of Radiation with Matter, Einstein's Coefficients, derivation of energy density expression, Metastable State and Population Inversion, Requisites of a laser system, Semiconductor Laser, Power of a laser beam, List of Various Applications of Lasers: Numerical problems. Optical Fibers: Principle and working, Acceptance angle and Numerical Aperture (NA) and derivation of Expression for NA, Modes of Propagation, Classification of Optical Fibres, Attenuation and derivation of fibre Loss. Various Applications of Optical fibres (only mention), Point to point communication. Numerical Problems.	

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Explain dielectric and magnetic properties of materials and apply them in electrical components like transformers, capacitors, and magnetic switches.
CO2	Analyse thermoelectric phenomena, device construction, and identify suitable materials and applications for energy conversion.
CO3	Evaluate electrical transport mechanisms in metals and semiconductors using classical and quantum models and perform relevant calculations.
CO4	Describe superconducting principles, distinguish between types of superconductors, and explain their physical properties and technological uses.
CO5	Interpret the interaction of radiation with matter and the operational principles of photonic devices such as lasers, optical fibres, modulators, and photodetectors.

FIXED SET OF EXPERIMENTS

1. Determination of dielectric constant by Charging and discharging capacitor.
2. Determination of Magnetic Flux Density at any point along the axis of a circular coil.
3. Light Emitting Diode to find Planck's constant
4. Study the Characteristics of a Photo-Diode and to determine the power responsivity
5. Study the frequency response of Series LCR circuit.

6. Determination of Fermi Energy of Copper.
7. Energy Gap of a Semiconductor
8. Laser Diffraction
9. Optical Fibre
10. Identification of Electrical Components in Black box
11. Determination of resistivity of a semiconductor by Four Probe Method
12. Maxwell's/Wheatstone Bridge Circuits
13. Simulations using V-labs.

ASSESSMENT DETAILS (Both CIE and SEE):

Assessment Type	Maximum Marks	Minimum Passing Marks	Evaluation Details
CIE – IA Tests (A)	20	-	Two tests each of 50 marks shall be conducted. Average of Two Internal Assessment Tests shall be scaled down to 20 marks.
Continuous and Comprehensive Evaluation (B)	10	-	Any one-assessment methods as per 24RNBE4.2 scaled to 10 marks.
Total CIE Theory (A+B)	30	12	Marks of Tests and Assignments awarded for a maximum of 30.
CIE Practical	12	-	Marks awarded for Weekly Conduction of Experiments and Submission of Laboratory records, scales down to 12 marks.
CIE Practical Test	8	-	Average of marks of two tests, each conducted for 100 marks covering all experiments, scaled to 8.
Total CIE Practical (C)	20	8	Marks of Experiments, record and Test awarded for a maximum of 20 marks.
CIE: Theory+ Practical (A+B+C)	50	20	CIE Evaluation is done for maximum of 50marks
SEE (D)	50	18	SEE is a theory exam, conducted for 100 marks and scaled down to 50 marks. Exam duration shall be for 3 hours.
CIE + SEE (A+B+C+D)	100	40	Final marks shall be sum of marks scored in Components A, B, C and D

The minimum marks to be secured in CIE is 20 (40%) out of allotted 50 marks to appear for SEE. The laboratory component of the IPCC shall be for CIE only. However, the question from the laboratory component shall be included in their respective modules only.

Textbooks

1. Solid State Physics-S O Pillai, 8th Ed- New Age International Publishers-2018.
2. Engineering Physics, Satyendra Sharma and Jyotsna Sharma, Pearson, 2018.
3. A Textbook of Engineering Physics by M.N. Avadhanulu, P G. Kshirsagar, S Chand, 2014, Revised Edition.

Reference books

1. Engineering Physics, S L Kakani, Shubra Kakani, 3rd Edition, 2020, CBS Publishers and Dis- tributers Pvt Ltd., 2018
2. Tinkham, M. (2004). Introduction to Superconductivity (2nd ed.). Dover Publications.
3. Engineering Physics, Wiley, 2014
4. Engineering Physics-Gaur and Gupta-Dhanpat Rai Publications-2017.
5. Electrical Engineering Materials, R. K. Shukla, Tata McGraw-Hill Education, India, 2017 reprint edition.

Web links and Video Lectures (e-Resources)

1. Mod-02 Lec-20: Dielectrics – Prof. D. K. Ghosh, IIT Bombay
<https://www.youtube.com/watch?v=P9VyW2wq9E>.
2. Mod-01 Lec-16: Dielectric (Insulating) Solids– Prof. G. Rangarajan, IIT Madras
<https://www.youtube.com/watch?v=etjZmdmrjSU>.
3. Lecture 41: Thermoelectric Generators – Functioning and Applications
<https://www.youtube.com/watch?v=G9NgoxHMPwk>.
4. NPTEL course: Solid State Physics – Prof. A.K. Raychaudhuri, IIT Kharagpur Course link:
<https://archive.nptel.ac.in/courses/115/105/115105099>.
5. Mod-01 Lec-27: Superconductivity – Perfect Conductivity & Diamagnetism – Prof. G. Rangarajan, IIT Madras <https://www.youtube.com/watch?v=GglT1RoBPzg>.
6. Lecture 01: PMMC Instrument – <https://www.youtube.com/watch?v=n1MinLtnvPY>.
7. Lecture 02: Electrodynamic/Moving Iron Instruments–
<https://www.youtube.com/watch?v=n1MinLtnvPY&list=PLbRMhDVUMngcoKrA4sH-zvbNVSE6IpEio&index=2>.
8. Lecture 03: Measurement Systems Characteristics–
<https://www.youtube.com/watch?v=Hlvbr5DCEfM>.
9. Lecture 05: Moving Iron Instruments– <https://www.youtube.com/watch?v=TgGMqVPsaK0>.
10. Electrical Measurement course Prof Avishek Chatterjee IIT Kharagpur:
<https://www.youtube.com/playlist?list=PLbRMhDVUMngcoKrA4sH-zvbNVSE6IpEio>.



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FIRST YEAR AUTONOMOUS SCHEME AND SYLLABUS

Effective from Academic Year 2025 – 26

B.E. (Electronics and Communication Engineering) Outcome Based Education (OBE) and Choice Based Credit System (CBCS) SEMESTER – I/II			
Course Title:	Quantum Physics and Electronic Sensors (ECE stream)		
Course Code:	BAPEC102/202	CIE MARKS	50
(L: T: P) + SL	(3:0:2) + (45 hrs/semester)	SEE MARKS	50
Credits:	4	EXAM HOURS	3
COURSE LEARNING OBJECTIVES: <i>The purpose of the course is to facilitate the learner to:</i> 1. Learn the principles of quantum mechanics and its applications in quantum computing. 2. Study the electrical properties of materials. 3. Acquire the fundamentals of Physics of electronic materials 4. Analyse the essentials of photonics for engineering applications. 5. Gain the fundamentals of semiconductor devices and sensors			
Module-1: Quantum Physics			9 hrs
de-Broglie hypothesis, Phase and group velocities, Heisenberg's Uncertainty Principle, spectral width, Gamma ray experiment and application of Uncertainty Principle to prove non-existence of electron inside the nucleus. Wave Function, Schrodinger time independent wave equation in 1D and extension to 3D, Physical Significance of a wave function and Born's Interpretation, Operators. Particle in 1D infinite potential well, Eigen functions and Eigen Values, extension to 3D case and degeneracy. Quantization of energy, wave function, wavelength and velocity, Waveforms and Probabilities for $n=1, 2$ states of 1D box. Numerical problems.			
Module-2: Electrical Properties of Solids			9 hrs
Quantum Free Electron theory: Assumptions, Density of states, Fermi energy, Fermi level. Fermi factor, Variation of Fermi Factor with Temperature and energy, Fermi-Dirac statistics, Fermi Energy (derivation), Average energy (derivation), Fermi velocity and Fermi temperature. Semiconductor nanostructures: Properties of nanomaterials, Types of nanomaterials, Variation of density of states from 3D to 0D, Quantum well, Quantum wire and Quantum dot (qualitative). Superconductivity: Temperature dependence of resistivity (Matheissen's rule), BCS theory (Qualitative), Meissner Effect, Proof of diamagnetism, Temperature dependence of Critical field, Types of Super Conductors, London's equations (derivation), High Temperature superconductivity, Persistent currents and Lossless power transmission. Numerical problems.			
Module-3: Physics of Electronic Materials			9 hrs
Conductivity of semiconductors (derivation), Expression for electron and hole concentrations (no derivation), Law of mass action, Fermi level and proof of position of Fermi level in intrinsic ($E_f = E_g/2$) and extrinsic (both for N-type and P-type) semiconductors, Hall effect, derivation of Hall voltage, Hall field and Hall coefficient. Direct and indirect band gap engineering, Fluorescence and Phosphorescence. Luminescence and types in it. Mechanism of photoluminescence and thermoluminescence and applications of luminescence. Numerical problems.			

Module-4: Photonics	9 hrs
Photon: Origin of Photon from Blackbody Spectrum, Block body laws, Planck's equation and its success, Boltzmann's population ratio. Lasers: Basic properties of a LASER beam, Interaction of Radiation with Matter, Einstein's Coefficients, derivation of energy density expression, Metastable State and Population Inversion, Requisites of a laser system, Semiconductor Laser, Power of a laser beam, List of Various Applications of Lasers. Optical Fibres: Construction and working principle, Acceptance angle and Numerical Aperture (NA) and derivation of Expression for NA, Modes of Propagation, Classification of Optical Fibres, Attenuation and derivation of expression for fibre Loss. Various Applications of Optical fibres (only mention), Point to point communication. Numerical Problems.	
Module-5: Semiconductor Devices and Sensors	9 hrs
LED, Quantum efficiency, Luminous efficacy, Photodiode, Photoconductivity, Expression for Photo current (derivation), quantum efficiency (derivation) and responsivity (derivation), Photo Transistor, its V-I characteristics and gain factors, Light dependent resistor. Sensing mechanisms, Piezo electric Sensors, Metal Oxide Semiconductor (MOS) sensors, Hall sensor, Optical fibre sensors. Numerical Problems.	

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Apply fundamental principles of quantum mechanics to analyse microscopic physical systems.
CO2	Analyse electrical conduction mechanisms in metals and superconductors using quantum models.
CO3	Describe light-matter interaction, laser operations and photonic devices to illustrate principles of photonics for advanced studies.
CO4	Evaluate principles of band gap engineering and interpret carrier concentration for advanced material applications.
CO5	Demonstrate the principles, characteristics and applications of semiconductor and optical devices, sensors, used in electronic and photonic systems.

FIXED SET OF EXPERIMENTS

1. Determination of wavelength of LASER using Diffraction Grating.
2. Study of the Characteristics of a Photo-Diode and to determine the power responsivity
3. Study the I-V Characteristics of the Given Bipolar Junction Transistor.
4. Verification of Stefan's law
5. Determination of Fermi Energy of Copper.
6. Determination of acceptance angle and numerical aperture of the given Optical Fibre.
7. Determination of Magnetic Flux Density at any point along the axis of a circular coil.
8. Study the frequency response of Series LCR circuit.
9. Determination of Energy gap of the given Thermistor.
10. Determination of Planck's constant using LEDs.
11. Determination of dielectric constant of the material of capacitor by Charging and discharging method.
12. Black-Box Experiment
13. Simulations using V-labs.

ASSESSMENT DETAILS (Both CIE and SEE):

Assessment Type	Maximum Marks	Minimum Passing Marks	Evaluation Details
CIE – IA Tests (A)	20	-	Two tests each of 50 marks shall be conducted. Average of Two Internal Assessment Tests shall be scaled down to 20 marks.
Continuous and Comprehensive Evaluation (B)	10	-	Any one-assessment methods as per 24RNBE4.2 scaled to 10 marks.
Total CIE Theory (A+B)	30	12	Marks of Tests and Assignments awarded for a maximum of 30.
CIE Practical	12	-	Marks awarded for Weekly Conduction of Experiments and Submission of Laboratory records, scales down to 12 marks.
CIE Practical Test	8	-	Average of marks of two tests, each conducted for 100 marks covering all experiments, scaled to 8.
Total CIE Practical (C)	20	8	Marks of Experiments, record and Test awarded for a maximum of 20 marks.
CIE: Theory+ Practical (A+B+C)	50	20	CIE Evaluation is done for maximum of 50marks
SEE (D)	50	18	SEE is a theory exam, conducted for 100 marks and scaled down to 50 marks. Exam duration shall be for 3 hours.
CIE + SEE (A+B+C+D)	100	40	Final marks shall be sum of marks scored in Components A, B, C and D

The minimum marks to be secured in CIE is 20 (40%) out of allotted 50 marks to appear for SEE. The laboratory component of the IPCC shall be for CIE only. However, the question from the laboratory component shall be included in their respective modules only.

Textbooks

1. Engineering Physics, Satyendra Sharma and Jyotsna Sharma, Pearson, 2018.
2. A textbook of Engineering Physics by M.N. Avadhanulu, P G. Kshirsagar and T V S Arun
3. Murthy, Eleventh edition, S Chand and Company Ltd. New Delhi-110055.
4. Engineering Physics, S L Kakani, Shubra Kakani, 3rd Edition, 2020, CBS Publishers and
5. Distributers Pvt Ltd.
6. Lasers and Non-Linear Optics, B B Loud, New age international, 2011 edition.
7. Solid State Physics, S. O. Pillai, New Age International.
8. Engineering Physics by Gupta and Gour, Dhanpat Rai Publications, 2016 (Reprint).
9. Basic Electronics, B L Theraja, Multi-colour Edition, S Chand, 2006.

Reference books

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.

Web links and Video Lectures (e-Resources)

1. NPTEL – Quantum Mechanics I (IIT Madras): <https://nptel.ac.in/courses/115106066>.
2. NPTEL–Physics: Introductory Quantum Mechanics (NOC):
<https://archive.nptel.ac.in/courses/115/104/115104096>.
3. Solid State Physics – NPTEL (IIT Madras) <https://nptel.ac.in/courses/115106127>.
4. A Brief Course on Superconductivity – NPTEL IIT Guwahati (Prof. Saurabh Basu).
5. Playlist Introduction Video: <https://www.youtube.com/watch?v=SHoGV-sezNL>.
6. Full playlist available via the YouTube channel description or archive link.
7. Concepts in Magnetism and Superconductivity – NOC (IIT Kharagpur) Series start (Lecture 1): <https://digimat.in/nptel/courses/video/115105131/L01.html>.
8. Introduction to Photonics – NPTEL (IIT Madras, Prof. Balaji Srinivasan) Lecture 03 to Lecture 12 cover: Direct video link (start Lecture 03): <https://nptel.ac.in/courses/108106135/03>.
9. Semiconductor Optoelectronics – NPTEL (IIT Delhi, Prof. M. R. Shenoy) Direct video link (start relevant lecture): <https://nptel.ac.in/courses/108108174/05>.
10. Sensors and Actuators – NPTEL (IISc Bangalore, Prof. Hardik J. Pandya) Lecture 1 – Introduction to Sensors, Transducers & Actuators, incl. Hall, RTDs, Thermistors <https://digimat.in/nptel/courses/video/108108147/L01.html>.
11. Smart Sensors – NPTEL Lecture 34–Covers various sensors including gas, pressure, MOS sensors, photodetectors like SNSPD <https://www.youtube.com/watch?v=oRydUfgMdgA>.
12. Lecture 32–Superconducting Qubits (includes Charge Qubit/Cooper-Pair Box) <https://www.youtube.com/watch?v=iYo8ALJ-Mls>.

B.E. (Mechanical Engineering) Outcome Based Education (OBE) and Choice Based Credit System (CBCS) SEMESTER – I/II			
Course Title:	Physics of materials (Mechanical stream)		
Course Code:	BAPME102/202	CIE MARKS	50
(L: T: P) + SL	(3: 0: 2) + 45 hrs/semester	SEE MARKS	50
Credits:	04	EXAM HOURS	3
COURSE LEARNING OBJECTIVES: <i>The purpose of the course is to facilitate the learner to:</i> 1. Learn the principles of oscillations and waves to apply them in mechanical systems and shockwave applications. 2. Study the fundamentals of elasticity to analyse stress-strain relations, elastic moduli, and mechanical behaviour of beams and torsion systems. 3. Acquire the concepts of thermoelectric and lasers to evaluate energy conversion devices and industrial applications. 4. Analyse the fundamentals of cryogenics and superconductivity to explore low-temperature systems and advanced engineering applications such as Maglev. 5. Learn the principles of radioactivity and material characterization techniques to analyse nuclear phenomena and investigate material properties.			
Module-1: Mechanics of Oscillations and Waves			9 hrs
Oscillations: Simple Harmonic motion (SHM), differential equation for SHM (derivation), Springs: Stiffness Factor and its Physical Significance, series and parallel combination of springs (derivation). Types of oscillations: Free oscillations, Damped oscillations and Forced oscillations, Theory of each type of oscillation (qualitative), Resonance, Quality factor, Sharpness of resonance. Shock waves: Mach number and Mach Angle, Mach Regimes, definition and characteristics of Shock waves, Construction and working of Reddy shock tube, Applications of Shock Waves. Numerical problems.			
Module-2: Elasticity			9 hrs
Types of stress and strain, relation between compression, elongation and shear strains. Hooke's law, Stress-Strain Curve, Elastic Moduli, Poisson's ratio and its limiting values. Relation between Y , n and k (with derivation), relation between Y , k and σ (no derivation). Beams, types of beams, Applications of beams, bending moment for circular disc and derivation of its expression. Cantilever, formula for depression of a loaded beam (no derivation) and arrival of Young's modulus of cantilever beam. Torsional pendulum and its applications (qualitative). Numerical problems.			
Module-3: Thermoelectrics and Lasers			9 hrs
Thermoelectrics: Thermoemf 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 T_1 and T_2 , Thermocouples, thermopile, Construction and Working of Thermoelectric generators (TEG) and Thermoelectric coolers (TEC Applications (mention):			

Laser materials: Laser fundamentals, Energy density (derivation), Population inversion, Requisites of a laser, Ruby Laser, laser cutting and welding. Numerical Problems.
Module-4: Cryogenics and Superconductivity 9 hrs
Cryogenics: Review of laws of Thermodynamics, Carnot's principle, Efficiency, Production of low temperature, Joule Thomson effect (Derivation), Porous plug experiment, Thermodynamical analysis of Joule Thomson effect, Liquefaction of Oxygen by cascade process, Lindey's air liquefier. Superconductors: Transition temperature, Meissner effect, Critical field, Type I & Type II Superconductors, Applications in Maglev. Numerical Problems.
Module-5: Radioactivity and Material Characterization Techniques 9 hrs
Radioactive materials: α , β and γ -decay, derivation of energy of emitted α -particle, β -particles, and recoil energy of γ -decay: Activity, Decay law, Radioactive decay rate, Radioactive decay law, $N=N_0e^{-\lambda t}$, Half-life, Mean Life and their expressions (derivation), applications of radioactivity. Numerical Problems. Characterization techniques: Crystal planes and inter-planar distance, Bragg's law (derivation), Basic Principles, Morphological characterization- SEM, TEM and AFM, Numerical Problems.

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Analyse the principles of simple harmonic, damped, and forced oscillations, and apply them to solve problems involving mechanical and electrical oscillatory
CO2	Apply the concepts of stress, strain, and elastic moduli to evaluate the elastic behaviour of solids under various loading conditions.
CO3	Evaluate the principles of thermoelectric effects and laser fundamentals, and assess the performance of thermoelectric materials, devices, and laser systems for energy conversion, thermal management, and industrial applications.
CO4	Demonstrate an understanding of low-temperature physics and superconductivity, including methods of cryogen production, superconducting phenomena, and analyse their scientific principles and engineering applications such as cryogenic systems and Maglev technology.
CO5	Explain the principles of radioactivity and apply material characterization techniques and instrumentation to analyse the macroscopic and microscopic properties of engineering materials.

FIXED SET OF EXPERIMENTS

1. Study the frequency response of Series LCR circuit.
2. Torsional Pendulum
3. Determination of effective spring constant of the given springs in series and parallel combinations.
4. Determination of Young's Modulus of the material of the given bar using Single cantilever
5. Verification of Stefan's law
6. Uniform Bending
7. Moment of Inertia
8. Determination of wavelength of LASER using Diffraction Grating.

9. Determination of acceptance angle and numerical aperture of the given Optical Fibre.
10. Black box
11. Study of forced mechanical oscillations and resonance
12. V-labs Simulation Experiments

ASSESSMENT DETAILS (Both CIE and SEE):

Assessment Type	Maximum Marks	Minimum Passing Marks	Evaluation Details
CIE – IA Tests (A)	20	-	Two tests each of 50 marks shall be conducted. Average of Two Internal Assessment Tests shall be scaled down to 20 marks.
Continuous and Comprehensive Evaluation (B)	10	-	Any one-assessment methods as per 24RNBE4.2 scaled to 10 marks.
Total CIE Theory (A+B)	30	12	Marks of Tests and Assignments awarded for a maximum of 30.
CIE Practical	12	-	Marks awarded for Weekly Conduction of Experiments and Submission of Laboratory records, scales down to 12 marks.
CIE Practical Test	8	-	Average of marks of two tests, each conducted for 100 marks covering all experiments, scaled to 8.
Total CIE Practical (C)	20	8	Marks of Experiments, record and Test awarded for a maximum of 20 marks.
CIE: Theory+ Practical (A+B+C)	50	20	CIE Evaluation is done for maximum of 50marks
SEE (D)	50	18	SEE is a theory exam, conducted for 100 marks and scaled down to 50 marks. Exam duration shall be for 3 hours.
CIE + SEE (A+B+C+D)	100	40	Final marks shall be sum of marks scored in Components A, B, C and D

The minimum marks to be secured in CIE is 20 (40%) out of allotted 50 marks to appear for SEE. The laboratory component of the IPCC shall be for CIE only. However, the question from the laboratory component shall be included in their respective modules only.

Textbooks

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 Textbook of Engineering Physics by M.N. Avadhanulu, P G. Kshirsagar, S Chand, 2014, Revised Edition.

4. Fundamentals of Cryogenic Engineering, Mamata Mukhopadhyay, PHI Learning (India).
5. Characterization of Materials- Mitra P.K. Prentice Hall India Learning Private Limited.

Reference books

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 Distributors Pvt Ltd.
4. Cryogenics: A Textbook, S.S. Thipse, Alpha Science International, Limited, 2013.
5. Materials Characterization Techniques-Sam Zhang, Lin Li, Ashok Kumar, CRC Press, First Edition, 2008.

Web links and Video Lectures (e-Resources)

1. Lecture Series on Physics - I: Oscillations and Waves by Prof. S. Bharadwaj, Department of Physics and Meteorology, IIT Kharagpur: <https://www.youtube.com/watch?v=gnD8Se92hfk>.
2. Stress- strain curves: <https://web.mit.edu/course/3/3.11/www/modules/ss.pdf>.
3. Stress curves: <https://www.youtube.com/watch?v=f08Y39UiC-o>.
4. Cryogenic Engineering by Prof. M.D. Atrey, Department of Mechanical Engineering, IIT Bombay.: <https://www.youtube.com/watch?v=4gGMBNEzeuc>.
5. Liquefaction of gases: <https://www.youtube.com/watch?v=aMelwOsGpIs>. Non-destructive testing: <https://youtu.be/JGQnbwxPiFA>.
6. Non-destructive testing: <https://youtu.be/uzogGRDSmMA>.
7. Materials Characterisation: <https://youtu.be/SXIYzrFGmkU>.

B.E. (Common for all CSE Streams) Outcome Based Education (OBE) and Choice Based Credit System (CBCS) SEMESTER – I/II			
Course Title:	Quantum Physics and Applications (CSE Stream)		
Course Code:	BAPCS102/202	CIE MARKS	50
(L: T: P) + SL	(3:0:2) + 45 hrs/semester	SEE MARKS	50
Credits:	04	EXAM HOURS	03
COURSE LEARNING OBJECTIVES: <i>The purpose of the course is to facilitate the learner to:</i> 1. Study the essentials of photonics for engineering applications. 2. Learn the principles of quantum mechanics and its applications in quantum computing. 3. Acquire the fundamentals of Physics of electronic materials. 4. Study the electrical properties of materials. 5. Learn the essentials of physics for communication.			
Module-1: Photonics			9 hrs
Photon: Origin of Photon from Blackbody Spectrum, Black body laws, Planck's equation and its success, Boltzmann's population ratio. Lasers: Basic properties of a LASER beam, Interaction of Radiation with Matter, Einstein's Coefficients, derivation of energy density expression, Metastable State and Population Inversion, Requisites of a laser system, Semiconductor Laser, Power of a laser beam, List of Various Applications of Lasers. Optical Fibres: Construction and working principle, Acceptance angle and Numerical Aperture (NA) and derivation of Expression for NA, Modes of Propagation, Classification of Optical Fibres, Attenuation and derivation of expression for fibre Loss. Various Applications of Optical fibres (only mention), Point to point communication. Numerical Problems.			
Module-2: Quantum Mechanics			9 hrs
Introduction to quantum mechanics, Wave particle duality and Matter Waves, de-Broglie wavelength, Phase Velocity and Group Velocity and their relation, Heisenberg's Uncertainty Principle, spectral width, Heisenberg's Gamma ray microscope and its application to non-existence of electron inside the nucleus and beta decay mechanism. Wave Function, Schrodinger time independent wave equation in 1D and extension to 3D, Physical Significance of a wave function and Born Interpretation, Operators, Eigen functions and Eigen Values of Particle in 1D infinite potential box, extension to 3D case and degeneracy. Quantization of energy, Wave function, wavelength and velocity, Waveforms and Probabilities for n=1, 2 states of 1D box. Numerical problems.			
Module-3: Quantum Computing			9 hrs
Moore's law - limitation of VLSI, Classical vs Quantum Computation, bit, Qubit and its properties, Bloch Sphere, Dirac notation, Brief discussion on types of qubits, Superconducting qubits, Charge qubit, Matrix representation of qubits, Pauli matrices, Inner product, Quantum Gates – Pauli Gates, Phase gate (S, T), Hadamard Gate, two qubit gates – CNOT gate, C-Z gate, Toffoli Gate, Predicting the outputs of various combinations of single and multiple qubit gates. Numerical Problems.			
Module-4: Quantum Science and Technology			9 hrs
Electrical conductivity in metals: Quantum free electron theory, Assumptions, Density of states, Fermi Energy, Fermi level, Variation of fermi factor with temperature and energy, Fermi energy at 0K (derivation), Average energy (derivation), fermi velocity, fermi temperature. Expression for electron and hole concentration in extrinsic semiconductor, Fermi level for intrinsic (derivation) and extrinsic semiconductor (no derivation), Hall effect (no derivation)			

Superconductivity: Temperature dependence of resistivity (Matthiessen's rule), BCS theory (Qualitative), Meissner's Effect, Proof of diamagnetism, Critical field and its temperature dependence, Types of Superconductors, London's equations (derivation), High-Tc superconductivity, Josephson effect, SQUID. Numerical problems.

Module-5: Communication Physics

9 hrs

Elements of communication and types of radio wave propagation. Ionospheric effects on radio waves, Key factors, Frequency Selection, Skip distance (SK) and maximum usable frequency (MUF), and relation between SK and MUF for flat surface (derivation) and secant law. Remote sensing, types, advantages and limitations. Principle of RADAR, Radar range equation (derivation), Receiver noise, Figure of merit (derivation), Doppler effect and Doppler frequency (derivation). Numerical problems.

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Interpret the interaction of radiation with matter and the operational principles of photonic devices such as lasers, optical fibres, modulators, and photodetectors.
CO2	Explain the core concepts of quantum mechanics such as matter waves, uncertainty principle, wave functions, and quantization of energy, with relevance to computational applications.
CO3	Summarize the essential properties of conductors, superconductors and nanomaterials for their application in Quantum Computing.
CO4	Evaluate the principles and characteristics of superconductivity, including Meissner's effect, critical parameters, and Cooper pair formation, and their relevance in quantum systems.
CO5	Illustrate the application of physics in Communication.

FIXED SET OF EXPERIMENTS

1. Determination of wavelength of LASER using Diffraction Grating.
2. Study of the Characteristics of a Photo-Diode and to determine the power responsivity
3. Study the I-V Characteristics of the Given Bipolar Junction Transistor.
4. Verification of Stefan's law
5. Determination of Fermi Energy of Copper.
6. Determination of acceptance angle and numerical aperture of the given Optical Fibre.
7. Determination of Magnetic Flux Density at any point along the axis of a circular coil.
8. Study the frequency response of Series LCR circuit.
9. Determination of Energy gap of the given Thermistor.
10. Determination of Planck's constant using LEDs.
11. Determination of dielectric constant of the material of capacitor by Charging and Discharging method.
12. Diffraction Grating to find wavelength of Mercury lamp
13. Simulations using V-labs.

ASSESSMENT DETAILS (Both CIE and SEE):

Assessment Type	Maximum Marks	Minimum Passing Marks	Evaluation Details
CIE – IA Tests (A)	20	-	Two tests each of 50 marks shall be conducted. Average of Two Internal Assessment Tests shall be scaled down to 20 marks.
Continuous and Comprehensive Evaluation (B)	10	-	Anyone-assessment methods as per 24RNBE4.2 scaled to 10 marks.
Total CIE Theory (A+B)	30	12	Marks of Tests and Assignments awarded for a maximum of 30.
CIE Practical	12	-	Marks awarded for Weekly Conduction of Experiments and Submission of Laboratory records, scales down to 12 marks.
CIE Practical Test	8	-	Average of marks of two tests, each conducted for 100 marks covering all experiments, scaled to 8.
Total CIE Practical (C)	20	8	Marks of Experiments, record and Test awarded for a maximum of 20 marks.
CIE: Theory+ Practical (A+B+C)	50	20	CIE Evaluation is done for maximum of 50 marks
SEE (D)	50	18	SEE is a theory exam, conducted for 100 marks and scaled down to 50 marks. Exam duration shall be for 3 hours.
CIE + SEE (A+B+C+D)	100	40	Final marks shall be sum of marks scored in Components A, B, C and D
The minimum marks to be secured in CIE is 20 (40%) out of allotted 50 marks to appear for SEE. The laboratory component of the IPCC shall be for CIE only. However, the question from the laboratory component shall be included in their respective modules only.			

Textbooks

1. Engineering Physics, Satyendra Sharma and Jyotsna Sharma, Pearson, 2018.
2. Engineering Physics, S L Kakani, Shubra Kakani, 3rd Edition, 2020, CBS Publishers and Dis-tributors Pvt. Ltd., 2018
3. Quantum Computing, Parag K Lala, McGraw Hill, 2020.
4. A textbook of Engineering Physics by M.N. Avadhanulu, P G. Kshirsagar and T V S Arun Murthy, Eleventh edition, S Chand and Company Ltd. New Delhi-110055.
5. Engineering Physics by Gupta and Gour, Dhanpat Rai Publications, 2016 (Reprint).
6. Solid State Physics, S O Pillai, New Age International Private Limited, 8th Edition, 2018.
7. Lasers and Non-Linear Optics, B B Loud, New age international, 2011 edition.
8. Quantum Computation and Quantum Information, Michael A. Nielsen & Isaac L. Chuang, Cambridge Universities Press, 2010 Edition.
9. Quantum Computing, Vishal Sahani, McGraw Hill Education, 2007 Edition.
10. Communication physics, Gullybaba publishing house pvt. ltd 2017.
11. Communication Systems by H. Taub and D. Schilling McGraw Hill Education; 4th edition 2017.

Reference books

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. Communication Systems by H. Taub and D. Schilling McGraw Hill Education; 4th edition 2017.

Web links and Video Lectures (e-Resources)

1. NPTEL–Quantum Mechanics I (IIT Madras): <https://nptel.ac.in/courses/115106066>.
2. NPTEL–Physics: Introductory Quantum Mechanics (NOC): <https://archive.nptel.ac.in/courses/115/104/115104096>.
3. Solid State Physics–NPTEL (IIT Madras) <https://nptel.ac.in/courses/115106127>.
4. A Brief Course on Superconductivity – NPTEL IIT Guwahati (Prof. Saurabh Basu).
5. Concepts in Magnetism and Superconductivity – NOC (IIT Kharagpur) Series start (Lecture 1): <https://digimat.in/nptel/courses/video/115105131/L01.html>.
6. Introduction to Photonics – NPTEL (IIT Madras, Prof. Balaji Srinivasan) Lecture 03 to Lecture 12 cover: Direct video link (start Lecture 03): <https://nptel.ac.in/courses/108106135/03>.
7. Lecture 04 – Quantum Computing Basics: <https://www.youtube.com/watch?v=-fttE1SzpD8>.
8. Lecture 08–Quantum Gates and Circuits Part 1: https://www.youtube.com/watch?v=nGPr1QM_XrY.

PROGRAM SPECIFIC COURSES		
1	BCVEN103/203	ENGINEERING MECHANICS
2	BEEEN103/203	BASICS OF ELECTRICAL ENGINEERING
3	BECEN103/203	FUNDAMENTALS OF ELECTRONICS AND COMMUNICATION ENGINEERING
4	BMEEN103/203	ELEMENTS OF MECHANICAL ENGINEERING
5	BCSEN103/203	PROGRAMMING IN C

B.E. (Civil Engineering) Outcome Based Education(OBE) and Choice Based Credit System(CBCS) SEMESTER – I/II			
Course Title:	Engineering Mechanics		
Course Code:	BCVEN103/203	CIE Marks	50
(L :T : P) + SL	(3:0:0) + (45 Hours/Sem)	SEE Marks	50
Credits:	3	Exam Hours	3
COURSE LEARNING OBJECTIVES: <i>The purpose of the course is to facilitate the learner to:</i> 1. Explain the fundamentals of force systems, moments, couples, friction, centroid, and moment of inertia. 2. Apply the principles of equilibrium in analyzing force systems with and without friction. 3. Analyze beams under various loadings and determine support reactions. 4. Evaluate centroids and second moments of area for simple and composite sections.			
Module-1: Coplanar Force System			9 hrs
Basic dimensions and units, Idealizations, Force- Characteristic and Classification of force system, Principle of transmissibility of a force, Principle of superposition and Principle of physical independence of forces, Resolution and Composition of forces, Resultant of coplanar concurrent force system- Parallelogram law of forces, Moment and Couple, Resultant of coplanar non-concurrent force system- Varignon's theorem. Numerical examples on moment, couple, resultant of coplanar concurrent and non-concurrent force system.			
Module-2: Equilibrium and Support Reactions			9 hrs
Conditions of equilibrium, Free body diagrams, Equilibrium of coplanar concurrent force system, Lami's theorem, Numerical examples on equilibrium of force and Lami's theorem. Introduction to Coplanar Non-Concurrent Force System, Types of supports in beams, types of beams, types of loadings, Difference between statically determinate and indeterminate beams, Numerical examples on support reactions of statically determinate beams subjected to various types of loads (point loads, uniformly distributed loads, uniformly varying loads).			
Module-3: Friction			9 hrs
Introduction, Types of friction, Concept of static and dynamic friction, laws of dry friction, Limiting friction, coefficient of friction, angle of friction, angle of repose, cone of friction, equilibrium of blocks resting on horizontal and inclined planes with connected bodies, ladder friction, Applications to engineering problems, Numerical examples.			
Module-4: Centroid			9 hrs
Introduction, Differences between centre of gravity and centroid, symmetrical and asymmetrical axis, Locating the centroid of rectangle, triangle, circle, semicircle, and quadrant of a circle using method of integration, Numerical examples on the centroid of composite and simple built-up sections.			
Module-5: Moment of Inertia			9 hrs
Introduction-Moment of inertia, Polar moment of inertia, product of inertia, radius of gyration, Parallel axes theorem, Perpendicular axis theorem, Moment of inertia of rectangular, triangular, semi-circular and quarter-circular areas using the method of integration, Numerical examples on moment of inertia of L, T, I, C and simple built up sections.			

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Explain the fundamental concepts of force systems, free body diagrams, moments, couples, friction, centroid, and second moment of area.
CO2	Apply the conditions of equilibrium to force systems, including the effects of friction.
CO3	Analyze different types of loading and support reactions in beams, incorporating friction principles in problem-solving.
CO4	Evaluate the centroid and the second moment of area for plane laminas.

ASSESSMENT DETAILS (Both CIE and SEE)

Assessment Type	Maximum Marks	Minimum Passing Marks	Evaluation Details
CIE – IA Tests (A)	30	-	Two tests each of 50 marks shall be conducted. Average of two Internal Assessment Tests shall be scaled down to 30 marks.
Continuous and Comprehensive Evaluation (B)	20	-	Any two assessment methods as per 24RNBE4.2 (if it is project based, one assignment shall be given), scaled to 20 marks.
Total CIE (A + B)	50	20	CIE Evaluation is done for a maximum of 50 marks.
SEE (C)	50	18	SEE is a theory exam conducted for 100 marks and scaled down to 50 marks. Exam duration shall be 3 hours.
CIE + SEE (A+B+C)	100	40	Final marks shall be the sum of marks scored in Components A, B, and C.
- The minimum marks to be secured in CIE is 20 (40%) out of allotted 50 marks to appear for SEE. - If any course of 3 credits is of Integrated Course type, the method suggested for 4 credits IPCC shall be followed.			

Textbooks:

1. Rangwala, "Building Construction", 33rd ed., Charotar Publishing House Pvt. Ltd., 2016.
2. R. K. Bansal, Rakesh Ranjan Beohar and Ahmad Ali Khan, "Basic Civil Engineering and Engineering Mechanics", 3rd ed., Laxmi Publications, 2015.
3. S. S. Bhavikatti, "Engineering Mechanics", 9th ed., New Age International Publishers, 2023.
4. K. Vijay Kumar Reddy and J. Suresh Kumar, "Singer's Engineering Mechanics Statics and Dynamics", BS Publications, 2011.

Reference Books

1. F.P. Beer, E. R. Johnston, Cornwell and Sanghi, “Vector Mechanics for Engineers: Statics and Dynamics, 10th ed., McGraw Hill Education, 2017.
2. R. C. Hibbeler, “Engineering Mechanics: Statics and Dynamics”, 14th ed., Pearson Education, 2017.



B.E. (EEE branch)			
Outcome Based Education(OBE) and Choice Based Credit System(CBCS)			
SEMESTER – I/II			
Course Title:	Basics of Electrical Engineering		
Course Code:	BEEEN103/203	CIE MARKS	50
(L:T:P) + (SL)	(3:0:0) + (45 Hours / Semester)	SEE MARKS	50
Credits:	3	EXAM HOURS	3 Hours
COURSE LEARNING OBJECTIVES:			
<i>The purpose of the course is to facilitate the learner to:</i>			
1. Learn fundamental concepts of Electromagnetism and Electromagnetic Induction.			
2. Know the application of fundamental laws in DC circuits			
3. Understand fundamentals of single phase and three phase AC circuits.			
4. Know the constructional features, working and performance of machines.			
5. Know methodology of electricity billing, personal safety and equipment safety measures			
Module 1:		9 hrs	
DC circuits: Ohm’s law and Kirchhoff’s laws, analysis of series, parallel and series-parallel circuits. Power and energy. Problems.			
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.			
Module 2:		9 hrs	
AC Fundamentals: Generation of sinusoidal voltage, frequency of generated voltage, Expression of average value, RMS value (including derivation), form factor and peak factor of sinusoidal voltage and current. Phasor representation of alternating quantities.			
Single-phase AC Circuits: Analysis of R, L and C circuits. Series R-L, R-C and R-L-C circuits with phasor diagrams, calculation of real power, reactive power, apparent power, and power factor, Problems.			
Module 3:		9 hrs	
Three- phase Circuits: Advantages of three-phase system over single-phase system, generation of three-phase system, definition of phase sequence, star and delta connections, relation between phase and line values of voltages and of currents of star and delta connections (Including derivation). Measurement of 3-phase power by 2-wattmeter method. Expression of power factor in terms wattmeter readings, Problems.			

Module 4:	9 hrs
Transformers: Necessity of transformer, principle of operation, constructional features of single-phase transformers (core and shell type). EMF equation, losses, variation of losses with respect to load. Calculation of efficiency and condition of maximum efficiency, Problems. Three-phase induction Motors: Concept of rotating magnetic field, Constructional features of squirrel cage type and wound rotor type, working principle of three phase induction motor. Slip and its significance, Problems. Applications.	
Module 5:	9 hrs
Domestic Wiring: Types of wiring: casing and capping, conduit wiring. 2-way and 3-way control of lamp. Domestic Electricity Bill: Power-rating of household connected loads, sanctioned load. Two-part tariff with illustration of an electricity bill. Equipment Safety Measures: Working principles of fuse and miniature circuit breaker (MCB). Personal safety measures: Electric shock, effects of shock. Safety precautions to avoid shock. Earthing : Necessity of earthing, Types of earthing: Pipe and plate.	

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Apply the basic laws used in the analysis of DC circuits.
CO2	Understand the fundamentals of Electromagnetism.
CO3	Understand the fundamentals of AC and analyze the working of single-phase and three phase AC circuits.
CO4	Understand the features, working mechanism and performance of electrical machines.
CO5	Understand the concepts of electricity billing, domestic wiring and safety measures

ASSESSMENT (CIE & SEE)

Assessment Type	Maximum Marks	Minimum Passing Marks	Evaluation Details
CIE – IA Tests (A)	30	-	Two tests each of 50 marks shall be conducted. Average of Two Internal Assessment Tests shall be scaled down to 30 marks.
Continuous and Comprehensive Evaluation (B)	20	-	Any two Assessment methods as per 24RNBE4.2 (*if it is project based, one assignment shall be given), scaled to 20 marks.
Total CIE (A+B)	50	20	CIE Evaluation is done for a maximum of 50 marks

SEE (C)	50	18	SEE is a theory exam conducted for 100 marks and scaled down to 50 marks. Exam duration shall be for 3 hours.
CIE + SEE (A+B+C)	100	40	Final marks shall be the sum of marks scored in Components A, B and C.
- The minimum marks to be secured in CIE is 20 (40%) out of allotted 50 marks to appear for SEE. - If any courses of 3 credits are of Integrated Course type, for such courses the method suggested for 4 credits IPCC shall be followed.			

Textbooks:

- 1) Basic Electrical Engineering by D C Kulshreshtha, Tata McGraw Hill, First Edition 2019.
- 2) A text book of Electrical Technology by B.L. Theraja, Volume 1, S Chand and Company, reprint edition 2014.
- 3) A text book of Electrical Technology by B.L. Theraja, Volume 3, S Chand and Company, reprint edition 2014.
- 4) Basic Electrical Engineering, D. P. Kothari and I. J. Nagrath, Tata McGraw Hill 4th edition, 2019.
- 5) Principles of Electrical Engineering & Electronics by V. K. Mehta, Rohit Mehta, S. Chand and Company Publications, 2nd edition, 2015.
- 6) Fundamentals of Electrical Engineering by Rajendra Prasad, PHI, 3rd edition, 2014.

Web links and Video Lectures (e-Resources):

1. <https://nptel.ac.in/courses/108108076>
2. <https://archive.nptel.ac.in/courses/108/105/108105112/>
3. <https://nptel.ac.in/courses/108105053>

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

- Visit to campus switch yard
- Visit to Electrical machines lab to explain DC, single phase AC, Three phase AC supply systems

B.E. (Electronics and Communication Engineering) Outcome Based Education(OBE) and Choice Based Credit System(CBCS) SEMESTER – I			
Course Title:	Fundamentals of Electronics and Communication Engineering		
Course Code:	BECEN103/203	CIE MARKS	50
(L : T : P) + SL	(3 : 0 : 0) +(45 hrs/semester)	SEE MARKS	50
Credits:	03	EXAM HOURS	03
COURSE LEARNING OBJECTIVES: <i>The purpose of the course is to facilitate the learner to:</i> 1. To introduce the fundamental concepts of semiconductor devices, their characteristics, and applications in basic electronic circuits. 2. To provide knowledge of transistor operation, characteristics, and biasing techniques for amplification and switching applications. 3. To develop an understanding of operational amplifiers, their parameters, configurations, and applications in linear circuit design. 4. To familiarize students with the principles of communication systems, transmission channels, and analog modulation techniques. 5. To impart knowledge of number systems, Boolean algebra, and digital logic circuits for the design of basic combinational circuits. 6. To build a strong foundation in both analog and digital electronics as a prerequisite for advanced courses in electronics and communication engineering.			
Module-1: Diodes			9 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.			
Module-2: Transistors			9 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.			
Module-3: Operational Amplifiers			9 hrs
Operational Amplifiers: Introduction, The Operational Amplifier, Block Diagram Representation of Typical Op-Amp, 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.

Module-4: Communication Systems **9 hrs**

Fundamentals of Communication: Elements of a Communication System, Digital Communication system, Communication Channels and their characteristics: Wireline, Wireless Electromagnetic Channels.

Analog Modulation Types: Amplitude Modulation, AM Detection, Frequency and Phase Modulation definition and waveforms. (Excluding Derivation and Spectral Diagrams), Differences between AM and FM.

Applications: AM Radio Broadcasting, Superheterodyne FM Receiver.

GSM: Principle of operations of Mobile phone.

Module-5: Digital Systems **9 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)

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Analyze the characteristics and applications of semiconductor diodes, rectifiers, filters, Zener diodes, and diode-based logic circuits.
CO2	Explain the operation of BJTs and FETs, their characteristics, biasing methods, and demonstrate their applications in amplification and switching.
CO3	Apply the concepts of operational amplifiers to design and analyze inverting, non-inverting, differential amplifiers, voltage follower, integrator, and differentiator circuits.
CO4	Describe the fundamentals of communication systems, transmission channels, and various analog modulation techniques along with their practical applications.
CO5	Apply Boolean algebra and number systems to analyze and design digital logic circuits including logic gates, adders, and arithmetic operations.

ASSESSMENT DETAILS (Both CIE and SEE)

Assessment Type	Maximum Marks	Minimum Passing Marks	Evaluation Details
CIE – IA Tests (A)	30	-	Average of Two Internal Assessment Tests each of 50 marks, scaled down

			to 30 marks.
Continuous and Comprehensive Evaluation (B)	20	-	Any two Assessment methods as per 24RNBE4.2(*if it is project based, one assignment shall be given), scaled to 20 marks.
Total CIE (A+B)	50	20	CIE Evaluation is done for a maximum of 50 marks.
SEE (C)	50	18	SEE is a theory exam conducted for 100 marks and scaled down to 50 marks. Exam duration shall be for 3 hours.
CIE + SEE (A+B+C)	100	40	Final marks shall be the sum of marks scored in Components A, B and C.
The minimum marks to be secured in CIE is 20 out of allotted 50 marks to appear for SEE, with minimum 40% scored in every component of CIE.			

Textbooks:

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, 2nd Edition, Pearson Educations, Inc., 2014.
4. D.P Kothari and I J Nagrath, Basic electronics, 2nd 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 and Video Lectures (e-Resources)

1. Introduction to Basic Electronics: <https://nptel.ac.in/courses/122106025>
2. Digital Electronic Circuits: <https://nptel.ac.in/courses/108105132>

B.E. (ME Stream) Outcome Based Education (OBE) and Choice Based Credit System (CBCS) SEMESTER – I / II			
Course Title:	ELEMENTS OF MECHANICAL ENGINEERING (ME Stream)		
Course Code:	BMEEN103/203	CIE MARKS	50
(L : T : P) + SL	(3:0:0) + (45Hrs/Semester)	SEE MARKS	50
Credits:	3	EXAM HOURS	3
COURSE LEARNING OBJECTIVES: <i>The purpose of the course is to facilitate the learner:</i>			
1. Understand various Engineering Materials, their classifications, and the working principles of Power Plants. 2. Gain knowledge of Thermodynamics, Internal Combustion (IC) engines, and Future Mobility vehicles. 3. Understand the concepts of different Machine tool operations and Joining processes. 4. Comprehend the principles of Gear and Belt drives. 5. Gain exposure to Manufacturing processes, Technologies, and their applications, including additive manufacturing and robotics.			
MODULE – 1			9 hrs
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.			
Power plants: Working principles of Hydro, Thermal, Solar and Wind Power Plants			
MODULE – 2			9 hrs
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 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.			
MODULE – 3			9 hrs
Machine Tools:			
Lathe: Working principle, Specifications, Operations performed – Turning, Facing, Taper turning by swiveling the compound rest, Thread cutting and Knurling. Drilling Machine: Working principle, Specifications, Operations performed – Drilling, Reaming, Boring, Counter boring, 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

MODULE – 4

9 hrs

Belt drives: Introduction, Open and Cross belt drives, Flat belts and V belts. Derivation on Tension ratio with simple Numericals.

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

MODULE – 5

9 Hrs

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

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

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Explain the classification, properties, advantages, disadvantages, and applications of engineering Materials and introduction to Power plants.
CO2	Apply the fundamental concepts of thermodynamics, steam properties, and IC engine working principles to understand conventional and modern energy systems, including electric and hybrid vehicles.
CO3	Demonstrate the working principles and applications of lathe, drilling, milling machines, and joining processes in basic manufacturing operations.
CO4	Analyse different power transmission systems such as belt and gear drives.
CO5	Describe additive manufacturing processes with applications in automotive and aerospace industries and Introduction to Robotics

ASSESSMENT DETAILS (BOTH CIE AND SEE)

Assessment Type	Maximum Marks	Minimum Passing Marks	Evaluation Details
CIE – IA Tests (A)	30	--	Average of Two Internal Assessment Tests each of 50 marks, scaled down to 30 marks.
Alternate Assessment (B)	20	--	Any two Assessment methods as per 24RNBE4.2 (*if it is project based, one assignment shall be given), scaled to 20 marks.
Total CIE (A+B)	50	20	CIE Evaluation is done for a maximum of 50 marks

SEE (C)	50	18	SEE is a theory exam conducted for 100 marks and scaled down to 50 marks. Exam duration shall be for 3 hours.
CIE + SEE (A+B+C)	100	40	Final marks shall be the sum of marks scored in Components A, B and C.
- The minimum marks to be secured in CIE is 20 out of allotted 50 marks to appear for SEE, with minimum 40 % scored in every component of CIE. - If any courses of 3 credits are of Integrated Course type, for such courses the method suggested for 4 credits IPCC shall be followed.			

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
3. Electric and Hybrid Vehicles, A K Babu, Second Edition 2022

REFERENCE BOOKS:

1. Elements of Workshop Technology (Vol. 1 and 2), Hazra Choudhry and Nirzar Roy, Media Promoters and Publishers Pvt. Ltd., 2010.
2. Manufacturing Technology- Foundry, Forming and Welding, P.N.Rao Tata McGraw Hill 3rd Ed. 2003.
3. Internal Combustion Engines, V. Ganesan, Tata McGraw Hill Education; 4th edition, 2017
4. Robotics, Appu Kuttan KK K. International Pvt Ltd, volume 1
5. Dr SRN Reddy, Rachit Thukral and Manasi Mishra, "Introduction to Internet of Things: A Practical Approach", ETI Labs
6. Raj Kamal, "Internet of Things: Architecture and Design", McGraw hill.

WEB LINKS AND VIDEO LECTURES (E-RESOURCES):

1. Videos | Makino (For Machine Tool Operation)

ACTIVITY BASED LEARNING (SUGGESTED ACTIVITIES IN CLASS)/ PRACTICAL BASED LEARNING

1. Demonstration of lathe/milling/drilling operations
2. Demonstration of working of IC Engine.
3. Study arc welding.
4. Video demonstration of latest trends in mobility robotics and Automation

B.E. (Common to CSE Allied Branches)			
Outcome Based Education(OBE) and Choice Based Credit System(CBCS)			
SEMESTER – I/II			
Course Title:	Programming in C		
Course Code:	BCSEN103/203	CIE MARKS	50
(L :T : P) + SL	(3:0:0) + 45 Hrs/Sem	SEE MARKS	50
Credits:	3	EXAM HOURS	3
COURSE LEARNING OBJECTIVES:			
<i>The purpose of the course is to facilitate the learner to:</i>			
1. Demonstrate fundamental concepts and language constructs of C programming.			
2. Make use of control structures and arrays to solve basic computational problems.			
3. Develop modular programs using user-defined functions for complex computational problems.			
4. Construct user defined datatypes using structures, unions and enumerations to model simple real- world scenarios.			
5. Choose suitable datatypes and language constructs to solve a given computational or real-world problem			
Module 1		9 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, Variable Initializations, Constants, Operators, Expressions.			
Module 2		9 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.			
Arrays: Single-Dimension Arrays, generating a Pointer to an Array, Passing Single-Dimension Arrays to Functions			
Module 3		9 hrs	
Arrays and Strings: Strings, Two-Dimensional Arrays, Multidimensional Arrays, Array Initialization, Variable Length Arrays			
Sorting and Searching: Sorting, The Bubble Sort, Searching Methods, The Sequential Search, The Binary Search			
Pointers: What Are Pointers? Pointer Variables, The Pointer Operators, Pointer Expressions, Pointers and Arrays, Multiple Indirection, Initializing Pointers.			
Self-learning: sorting by Selection, Sorting by Insertion			
Module 4		9 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, **Pointers (Contd...):** Pointers to Functions, C's Dynamic Allocation Functions, Storage Class Specifiers

Module 5

9 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.

Preprocessor: The preprocessor, Defining Function-like Macros, Conditional Compilation Directives

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Explain fundamental concepts of C programming including variables, data types, and operators.
CO2	Apply conditional and iterative statements along with arrays for solving problems.
CO3	Design and implement modular programs using functions and recursion
CO4	Construct and manipulate user-defined data types such as structures and unions.
CO5	Apply appropriate language constructs to solve real-world or computational problems.

ASSESSMENT DETAILS (Both CIE and SEE)

Assessment Type	Maximum Marks	Minimum Passing Marks	Evaluation Details
CIE – IA Tests (A)	30	-	Two tests each of 50 marks shall be conducted. Average of Two Internal Assessment Tests shall be scaled down to 30 marks.
Alternate Assessment (B)	20	-	Any two Assessment methods as per 24RNBE4.2 (*if it is project based, one assignment shall be given), scaled to 20 marks.
Total CIE (A+B)	50	20	CIE Evaluation is done for a maximum of 50 marks
SEE (C)	50	18	SEE is a theory exam conducted for 100 marks and scaled down to 50 marks. Exam duration shall be for 3 hours.
CIE + SEE (A+B+C)	100	40	Final marks shall be the sum of marks scored in Components A, B and C.

The minimum marks to be secured in CIE is 20 (40%) out of allotted 50 marks to appear for SEE. If any courses of 3 credits are of Integrated Course type, for such courses the method suggested for 4 credits IPCC shall be followed.

Textbooks

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.



ENGINEERING SCIENCE COURSE FOR ALL BRANCHES		
1	BCDCV103/203	COMPUTER AIDED ENGINEERING DRAWING (CV STREAM)
2	BCDEE103/203	COMPUTER AIDED ENGINEERING DRAWING (EEE STREAM)
3	BCDEC103/203	COMPUTER AIDED ENGINEERING DRAWING (ECE STREAM)
4	BCDME103/203	COMPUTER AIDED ENGINEERING DRAWING (ME STREAM)
5	BCDCS103/203	COMPUTER AIDED ENGINEERING DRAWING (CSE STREAM)

B.E. (Civil Engineering)			
Outcome Based Education(OBE) and Choice Based Credit System(CBCS)			
SEMESTER – I/II			
Course Title:	Computer Aided Engineering Drawing for CV Stream		
Course Code:	BCDCV103/203	CIE Marks	50
L :T : P	2:0:2	SEE Marks	50
Credits:	3	Exam Hours	3
COURSE LEARNING OBJECTIVES:			
<i>The purpose of the course is to facilitate the learner to:</i>			
1. Understand the basic principles and conventions of Civil engineering drawing.			
2. Use drawing as a communication mode.			
3. Understand the development of lateral surfaces of solids and Isometric Projections.			
4. Develop basic 2-Drafting skills for simple floor plan, elevation and site plan with all building components.			
5. Build skills in 3D modelling of building components and interpretation of building drawings			
Module-1		9 hrs	
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 1 st and 3 rd quadrants.			
Orthographic projections of lines (Placed in First quadrant only).			
Orthographic projections of planes: triangle, square, rectangle, pentagon, hexagon, and circular lamina (Placed in First quadrant only using change of position method).			
Application on projections of Lines & Planes			
Problems on projection of points, lines and planes. (L2, L3)			
Module-2		9 hrs	
Orthographic Projection of Solids:			
Orthographic projection of right regular solids (Solids Resting on HP only): Prisms & Pyramids (triangle, square, rectangle, pentagon, hexagon), Cones, Cubes & Tetrahedron.			
Problems on projection of solids. (L2, L3)			
Module-3		9 hrs	

Isometric Projections:

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

Conversion of simple isometric drawings into orthographic views:

Problems on conversion of Isometric projections of simple objects / engineering components into orthographic projections. Problems on Isometric Projections. (L2, L3)

Development of Lateral Surfaces of Solids:

Development of lateral surfaces of right regular prisms, cylinders, pyramids and cones resting with base on HP only. Development of lateral surfaces of their frustums and truncations. (Section Planes inclined to HP only).

Module-4

9 hrs

Drafting of building plan

Drafting of 2D floor plan for a simple single storey residential building. Concept of building drawing plan, elevation and site plan.

Module-5:

9 hrs

Building components drafting and conversion of floor plan to 3D model.

Modelling Basic Building components: Foundations, columns, beams, slabs, walls, door, windows, staircase, assigning materials and rendering building components.

Demonstration of converting the floor plan into 3D model with walls, openings and roof

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Create accurate orthographic projections of points, lines, and planes in the first quadrant, and solve related projection problems.
CO2	Create orthographic projections of prisms, pyramids, cones, cubes and tetrahedrons resting on the horizontal plane.
CO3	Create isometric projections of simple and combine solids & develop the lateral surfaces of the solids.
CO4	Draft 2D floor plans, elevations, and site plans for a simple single-storey residential building and its components.
CO5	Create 3D modeling of simple Residential building and its components.

ASSESSMENT DETAILS (Both CIE and SEE)

The weight age 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) and that for SEE minimum passing marks is 35% of the maximum marks (18 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination (SEE), and a minimum of 40% (40 marks out of 100) in the sum of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation (CIE)

- CIE shall be evaluated for max. marks of 100 and later the same shall be scaled-down to 50 marks as detailed below:
- CIE component should comprise of Continuous evaluation of drawing work of students as and when the Modules are covered based on below detailed weight age.

Module	Max. Marks Weightage	Evaluation Weightage in marks	
		Computer display and printout (a)	Sketching (b)
Module 1	20	15	05
Module 2	20	15	05
Module 3	20	15	05
Module 4	20	15	05
Module 5	20	15	05
Total	100	75	25
Consideration of Classwork		Total of [(a)+(b)=100] scaled down to 30	

- Two tests are to be conducted for 50 marks each and evaluation to be based on SEE pattern, scaled to 20 marks.
- The final CIE = Class work marks + Test marks

Continuous Internal Evaluation (CIE)

Assessment Type	Maximum Marks	Minimum Passing Marks	Evaluation Details
Continuous Evaluation of Drawing Work (A)	30	-	Continuous evaluation of drawing work evaluated module wise for 80 Marks, scaled down to 30 marks.
CIE-IA Tests (B)	20	-	Two are to be conducted for 50 marks each and evaluation to be based on SEE pattern, scaled to 20 marks.
Total CIE(A+B)	50	20	CIE Evaluation is done for a maximum of 50marks

SEE(C)	50	18	SEE is a theory exam conducted for 100 marks and scaled down to 50marks. Exam duration shall be
CIE+SEE (A+B+C)	100	40	Final marks shall be the sum of marks Scored in Components A, B and C.

- The minimum marks to be secured in CIE is 20 out of allotted 50 marks to appear for SEE.
- If any courses of 3 credits are of Integrated Course type, for such courses the method Suggested for 4 credits IPCC shall be followed.

Semester End Examination (SEE)

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours**)

- SEE shall be conducted and evaluated for maximum marks 100. Marks obtained shall be accounted for SEE final marks, reducing it by 50%
- Question paper shall be set jointly by both Internal and External Examiner and made available for each batch as per schedule. *Questions are to be set preferably from Text Books.*
- Related to Module-1:** One full question shall be set from “*points & lines*” and “*planes*” where students will be given an option to answer any one.
- Evaluation shall be carried jointly by both the examiners.
- One full question shall be set from each of the Module from Modules 1, 2, 3 and 4 as per the below tabled weightage details. **However, the student may be awarded full marks, if he/she completes solution on computer display without sketch.**

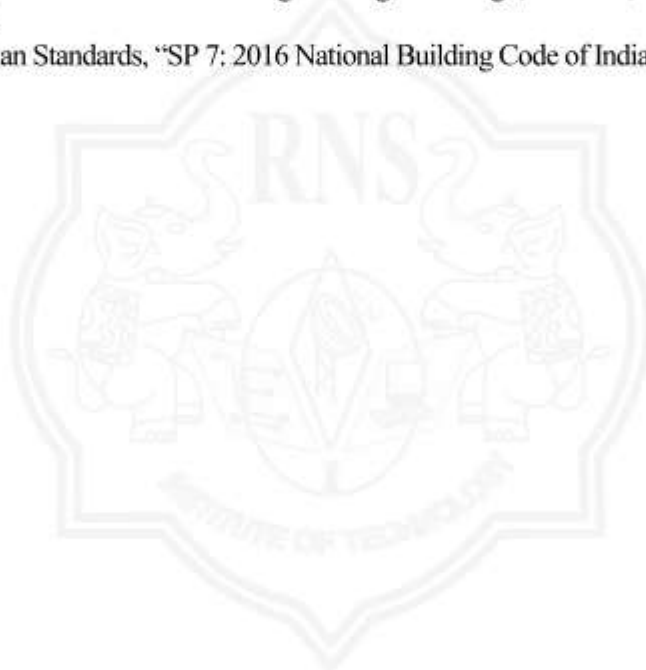
Module	Max. Marks Weightage	Evaluation Weightage in marks	
		Computer display and print out	Preparatory sketching
		(a)	(b)
Module 1	20	15	05
Module 2	30	25	05
Module 3	25	20	05
Module 4	25	20	05
Total	100	80	20
Consideration of SEE Marks		Total of (a) + (b) ÷ 2 = Final SEE marks	

Textbooks

1. K. R. Gopalakrishna, & Sudhir Gopalakrishna “A Textbook of Computer Aided Engineering Drawing”, 39th ed., Subash Stores, Bangalore, 2017.
2. N. D. Bhatt, “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. 1st ed., 2022.
2. P.J. Shah, “Computer Aided Engineering Drawing”, S. Chand Publishing, 2021.
3. M. B. Shah & B.C. Rana, “Engineering Drawing”, Revised ed., Pearson Education, 2009.
4. V. B. Sikka, “A Course in Civil Engineering Drawing”, 11th ed., S. K. Kataria & Sons, reprint 2024.
5. Bureau of Indian Standards, “SP 7: 2016 National Building Code of India”, New Delhi, India,





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RNS INSTITUTE OF TECHNOLOGY

An Autonomous Institution under VTU

Accredited with NAAC A+ Grade

**FIRST YEAR AUTONOMOUS
SCHEME AND SYLLABUS**
Effective from Academic Year 2025 – 26

B.E. (Electrical and Electronics Engineering) Outcome Based Education (OBE) and Choice Based Credit System (CBCS) SEMESTER – I/II			
Course Title:	Computer Aided Engineering Drawing for EEE Stream		
Course Code:	BCDEE103/203	CIE MARKS	50
L: T: P	2:0:2	SEE MARKS	50
Credits:	3	EXAM HOURS	3
COURSE LEARNING OBJECTIVES: <i>The purpose of the course is to facilitate the learner to:</i> 1. Understand the basic principles and conventions of engineering drawing. 2. Use drawing as a communication mode. 3. Understand the development of lateral surfaces of solids and Isometric Projections. 4. Develop basic 2-D drafting skills for electrical layout in building. 5. Build skills in modelling of electrical systems			
Module-1:			9 hrs
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). Orthographic projections of planes: triangle, square, rectangle, pentagon, hexagon, and circular lamina (Placed in First quadrant only using change of position method). Application on projections of Lines & Planes Problems on projection of points, lines and planes. (L2, L3)			
Module-2:			9 hrs
Orthographic Projection of Solids: Orthographic projection of right regular solids (Solids Resting on HP only): Prisms & Pyramids (triangle, square, rectangle, pentagon, hexagon), Cones, Cubes & Tetrahedron. Problems on projection of solids. (L2, L3)			
Module-3:			9 hrs
Isometric Projections: Introduction to Isometric views, Isometric scale, Isometric projection of hexahedron (cube), right regular prisms, pyramids, cylinders, cones and spheres. Isometric projection of combination of two simple solids. Conversion of simple isometric drawings into orthographic views: Problems on conversion of Isometric projections of simple objects / engineering components into orthographic projections. Problems on Isometric Projections. (L2, L3) Development of Lateral Surfaces of Solids: Development of lateral surfaces of right regular prisms, cylinders, pyramids and cones resting with base on HP only. Development of lateral surfaces of their frustums and truncations. (Section Planes inclined to HP only)			

Module-4:	9 hrs
Electrical layout for a building Drafting a 2D plan for a simple single-storey residential or commercial building, and generating an electrical layout that shows the placement and connections of electrical components such as switches, sockets, lighting fixtures, and distribution boards within the building. (L2, L3)	
Module-5	9 hrs
Electrical Drawing: 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. (L2, L3, L4)	

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Create accurate orthographic projections of points, lines, and planes in the first quadrant, and solve related projection problems.
CO2	Create orthographic projections of prisms, pyramids, cones, cubes, and tetrahedrons resting on the horizontal plane.
CO3	Create isometric projections of simple and combined solids & develop the lateral surfaces of the solids.
CO4	Draft electrical layout of a building
CO5	Create schematic diagrams of Electrical Systems.

ASSESSMENT DETAILS (Both CIE and SEE)

The weight age 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) and that for SEE minimum passing marks is 35% of the maximum marks (18 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination (SEE), and a minimum of 40% (40 marks out of 100) in the sum of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation (CIE)

- CIE shall be evaluated for max. marks of 100 and later the same shall be scaled-down to 50 marks as detailed below:
- CIE component should comprise of Continuous evaluation of drawing work of students as and when the Modules are covered based on below detailed weight age.

Module	Max. Marks Weightage	Evaluation Weightage in marks	
		Computer display and printout (a)	Sketching (b)
Module 1	20	15	05
Module 2	20	15	05
Module 3	20	15	05
Module 4	20	15	05
Module 5	20	15	05
Total	100	75	25
Consideration of Class work		Total of [(a)+(b) =100] scaled down to 30	

- Two tests covering all the modules are to be conducted for 50 marks each and evaluation to be based SEE pattern, scaled to 20 marks.
- The final CIE = Class work marks + Test marks

Continuous Internal Evaluation (CIE)

Assessment Type	Maximum Marks	Minimum Passing Marks	Evaluation Details
Continuous Evaluation of Drawing Work (A)	30	-	Continuous evaluation of drawing work evaluated module wise for 80 Marks, scaled down to 30 marks.
CIE – IA Tests (B)	20	-	Two tests covering all the modules are to be conducted for 50 marks each and evaluation to be based SEE pattern, scaled to 20 marks.
Total CIE (A+B)	50	20	CIE Evaluation is done for a maximum of 50 marks
SEE (C)	50	18	SEE is a theory exam conducted for 100 marks and scaled down to 50 marks. Exam duration shall be for 3 hours.
CIE + SEE (A+B+C)	100	40	Final marks shall be the sum of marks scored in Components A, B and C.
- The minimum marks to be secured in CIE is 20 out of allotted 50 marks to appear for SEE. - If any courses of 3 credits are of Integrated Course type, for such courses the method suggested for 4 credits IPCC shall be followed.			

Semester End Examination (SEE)

- Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours**)
- SEE shall be conducted and evaluated for maximum marks of 100. Marks obtained shall be accounted for SEE final marks, reducing it by 50%
- Question paper shall be set jointly by both Internal and External Examiner and made available for each batch as per schedule. *Questions are to be set preferably from Text Books.*
- Related to Module-I:** One full question shall be set from “*points & lines*” and “*planes*” where students will be given an option to answer any one.
- Evaluation shall be carried jointly by both the examiners.
- One full question shall be set from each of the Module from Modules 1, 2, 3 and 4 as per the below table weightage details. *However, the student may be awarded full marks, if he/she completes solution on computer display without sketch.*

Module	Max. Marks Weightage	Evaluation Weightage in marks	
		Computer display and print out (a)	Preparatory sketching (b)
Module 1	20	15	05
Module 2	30	25	05
Module 3	25	20	05
Module 4	25	20	05
Total	100	80	20
Consideration of SEE Marks		Total of (a) + (b) ÷ 2 = Final SEE marks	

Textbooks

- K. R. Gopalakrishna, & Sudhir Gopalakrishna: A Textbook of Computer Aided Engineering Drawing, 39th Edition, Subash Stores, Bangalore, 2017
- Bhatt, N.D., Engineering Drawing: Plane and Solid Geometry, 53rd Edition, Charotar Publishing House Pvt. Limited, 2023.
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**FIRST YEAR AUTONOMOUS
SCHEME AND SYLLABUS**
Effective from Academic Year 2025 – 26

B.E. (Electronics and Communication Engineering) Outcome Based Education (OBE) and Choice Based Credit System (CBCS) SEMESTER – I/II			
Course Title:	Computer Aided Engineering Drawing for ECE Stream		
Course Code:	BCDEC103/203	CIE MARKS	50
L: T: P	2:0:2	SEE MARKS	50
Credits:	3	EXAM HOURS	3
COURSE LEARNING OBJECTIVES: <i>The purpose of the course is to facilitate the learner to:</i> 1. Understand the basic principles and conventions of engineering drawing. 2. Use drawing as a communication mode. 3. Understand the development of lateral surfaces of solids and Isometric Projections. 4. Develop basic 2-D drafting skills for electrical layout in building. 5. Build skills in modelling of electrical systems			
Module-1:			9 hrs
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). Orthographic projections of planes: triangle, square, rectangle, pentagon, hexagon, and circular lamina (Placed in First quadrant only using change of position method). Application on projections of Lines & Planes Problems on projection of points, lines and planes. (L2, L3)			
Module-2:			9 hrs
Orthographic Projection of Solids: Orthographic projection of right regular solids (Solids Resting on HP only): Prisms & Pyramids (triangle, square, rectangle, pentagon, hexagon), Cones, Cubes & Tetrahedron. Problems on projection of solids. (L2, L3)			
Module-3:			9 hrs
Isometric Projections: Introduction to Isometric views, Isometric scale, Isometric projection of hexahedron (cube), right regular prisms, pyramids, cylinders, cones and spheres. Isometric projection of combination of two simple solids. Conversion of simple isometric drawings into orthographic views: Problems on conversion of Isometric projections of simple objects / engineering components into orthographic projections. Problems on Isometric Projections. (L2, L3) Development of Lateral Surfaces of Solids: Development of lateral surfaces of right regular prisms, cylinders, pyramids and cones resting with base on HP only. Development of lateral surfaces of their frustums and truncations. (Section Planes inclined to HP only).			

Module-4:	9 hrs
Electrical layout for a building Drafting a 2D plan for a simple single-storey residential or commercial building, and generating an electrical layout that shows the placement and connections of electrical components such as switches, sockets, lighting fixtures, and distribution boards within the building. (L2, L3)	
Module-5	9 hrs
Electrical Drawing: 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. (L2, L3, L4)	

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Create accurate orthographic projections of points, lines, and planes in the first quadrant, and solve related projection problems.
CO2	Create orthographic projections of prisms, pyramids, cones, cubes, and tetrahedrons resting on the horizontal plane.
CO3	Create isometric projections of simple and combined solids & develop the lateral surfaces of the solids.
CO4	Draft electrical layout of a building
CO5	Create schematic diagrams of Electrical Systems.

ASSESSMENT DETAILS (Both CIE and SEE)

The weight age 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) and that for SEE minimum passing marks is 35% of the maximum marks (18 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination (SEE), and a minimum of 40% (40 marks out of 100) in the sum of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation (CIE)

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- CIE component should comprise of Continuous evaluation of drawing work of students as and when the Modules are covered based on below detailed weight age.

Module	Max. Marks Weightage	Evaluation Weightage in marks	
		Computer display and printout (a)	Sketching (b)
Module 1	20	15	05
Module 2	20	15	05
Module 3	20	15	05
Module 4	20	15	05
Module 5	20	15	05
Total	100	75	25
Consideration of Class work		Total of [(a)+(b) =100] scaled down to 30	

- Two tests covering all the modules are to be conducted for 50 marks each and evaluation to be based SEE pattern, scaled to 20 marks.
- The final CIE = Class work marks + Test marks

Continuous Internal Evaluation (CIE)

Assessment Type	Maximum Marks	Minimum Passing Marks	Evaluation Details
Continuous Evaluation of Drawing Work (A)	30	-	Continuous evaluation of drawing work evaluated module wise for 80 Marks, scaled down to 30 marks.
CIE – IA Tests (B)	20	-	Two tests covering all the modules are to be conducted for 50 marks each and evaluation to be based SEE pattern, scaled to 20 marks.
Total CIE (A+B)	50	20	CIE Evaluation is done for a maximum of 50 marks
SEE (C)	50	18	SEE is a theory exam conducted for 100 marks and scaled down to 50 marks. Exam duration shall be for 3 hours.
CIE + SEE (A+B+C)	100	40	Final marks shall be the sum of marks scored in Components A, B and C.
- The minimum marks to be secured in CIE is 20 out of allotted 50 marks to appear for SEE. - If any courses of 3 credits are of Integrated Course type, for such courses the method suggested for 4 credits IPCC shall be followed.			

Module	Max. Marks Weightage	Evaluation Weightage in marks	
		Computer display and print out (a)	Preparatory sketching (b)
Module 1	20	15	05
Module 2	30	25	05
Module 3	25	20	05
Module 4	25	20	05
Total	100	80	20
Consideration of SEE Marks		Total of (a) + (b) ÷ 2 = Final SEE marks	

Semester End Examination (SEE)

- Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours**)
- SEE shall be conducted and evaluated for maximum marks of 100. Marks obtained shall be accounted for SEE final marks, reducing it by 50%
- Question paper shall be set jointly by both Internal and External Examiner and made available for each batch as per schedule. *Questions are to be set preferably from Text Books.*
- **Related to Module-1:** One full question shall be set from “points & lines” and “planes” where students will be given an option to answer any one.
- Evaluation shall be carried jointly by both the examiners.
- One full question shall be set from each of the Module from Modules 1, 2, 3 and 4 as per the below table weightage details. **However, the student may be awarded full marks, if he/she completes solution on computer display without sketch.**

Textbooks

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2. Bhatt, N.D., Engineering Drawing: Plane and Solid Geometry, 53rd Edition, Charotar Publishing House Pvt. Limited, 2023.
3. Bhattacharya S. K., Electrical Engineering Drawing, New Age International Publishers, Second edition 1998, reprint 2005.

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.

B.E. (ME stream) Outcome Based Education (OBE) and Choice Based Credit System (CBCS) SEMESTER – I / II			
Course Title:	Computer Aided Engineering Drawing (ME stream)		
Course Code:	BCDME103/203	CIE MARKS	50
(L : T : P) + SL	(2:0:2) + (45hrs/Semester)	SEE MARKS	50
Credits:	3	EXAM HOURS	3 Hrs
COURSE LEARNING OBJECTIVES:			
The purpose of the course is to facilitate the learner:			
1. To understand the basic principles and conventions of engineering drawing 2. To use drawing as a communication mode 3. To understand the development of lateral surfaces of solids and Isometric Projections. 4. To develop basic 2-D drafting skills for simple machine components and mechanisms 5. To build skills in 3D modeling, sheet metal and surface design, and interpretation of industrial drawings.			
MODULE – 1		=	9 hrs
Introduction: (for CIE only)			
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).			
Orthographic projections of planes: triangle, square, rectangle, pentagon, hexagon, and circular lamina (Placed in First quadrant only using change of position method).			
Application on projections of Lines & Planes (For CIE only)			
Problems on projection of points, lines and planes. (L2, L3).			
MODULE – 2			9 hrs
Orthographic Projection of Solids:			
Orthographic projection of right regular solids (Solids Resting on HP only): Prisms & Pyramids (triangle, square, rectangle, pentagon, hexagon), Cones, Cubes & Tetrahedron.			
Problems on projection of solids. (L2, L3)			
MODULE – 3			9 hrs
Isometric Projections:			
Introduction to Isometric views, Isometric scale, Isometric projection of hexahedron (cube), right regular prisms, pyramids, cylinders, cones and spheres. Isometric projection of combination of two simple solids.			
Conversion of simple isometric drawings into orthographic views:			
Problems on conversion of Isometric projections of simple objects / engineering components into orthographic projections.			

Problems on Isometric Projections. (L2, L3)

Development of Lateral Surfaces of Solids:

Development of lateral surfaces of right regular prisms, cylinders, pyramids and cones resting with base on HP only. Development of lateral surfaces of their frustums and truncations. (Section Planes inclined to HP only).

MODULE – 4

9 hrs

2-D Drafting of Simple Machine Components/ Devices:

Simple gear Train, Compound gear Train, Ratchet and Pawl, Trolley, Mobile, Fan, Disc Break, Bicycle Problems on Simple Machine Components/ Devices. (L2, L3)

MODULE – 5

9 hrs

Concept of Part Design (For CIE Only):

3D Modelling: Simple machine parts / engineering components, (Applying material properties and rendering for realistic visualization)

Sheet Metal and Surface Design: Automotive panels, HVAC ducting.

Concept of Industrial drawings (L2, L3, L4)

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Create accurate orthographic projections of points, lines, and planes in the first quadrant, and solve related projection problems.
CO2	Create orthographic projections of prisms, pyramids, cones, cubes, and tetrahedrons resting on the horizontal plane.
CO3	Create isometric projections of simple and combined solids & Develop the lateral surfaces of the solids.
CO4	Able to draft 2-D views of simple machine components and mechanisms.
CO5	Create 3D Modelling of Simple Machine Components, Sheet Metal and Surface Design

ASSESSMENT DETAILS (Both CIE and SEE)

The weight age 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) and that for SEE minimum passing marks is 35% of the maximum marks (18 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination (SEE), and a minimum of 40% (40 marks out of 100) in the sum of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation (CIE)

- CIE shall be evaluated for max. marks of 100 and later the same shall be scaled-down to 50 marks as detailed below:
- CIE component should comprise of Continuous evaluation of drawing work of students as and when the Modules are covered based on below detailed weight age.

Module	Max. Marks Weightage	Evaluation Weightage in marks	
		Computer display and print out (a)	Sketching (b)
Module 1	20	15	05
Module 2	20	15	05
Module 3	20	15	05
Module 4	20	15	05
Module 5	20	15	05
Total	100	75	25
Consideration of Class work		Total of [(a)+(b)=100] scaled down to 30	

- Two tests covering all the modules are to be conducted for 50 marks each and evaluation to be based SEE pattern, scaled to 20 marks.
- The final CIE = Class work marks + Test marks

Continuous Internal Evaluation (CIE)

Assessment Type	Maximum Marks	Minimum Passing Marks	Evaluation Details
Continuous Evaluation of Drawing Work (A)	30	–	Continuous evaluation of drawing work evaluated module wise for 80 Marks, scaled down to 30 marks.
CIE – IA Tests (B)	20	–	Two tests covering all the modules are to be conducted for 50 marks each and evaluation to be based SEE pattern, scaled to 20 marks.
Total CIE (A+B)	50	20	CIE Evaluation is done for a maximum of 50 marks
SEE (C)	50	18	SEE is a theory exam conducted for 100 marks and scaled down to 50 marks. Exam duration shall be for 3 hours.
CIE + SEE (A+B+C)	100	40	Final marks shall be the sum of marks scored in Components A, B and C.
- The minimum marks to be secured in CIE is 20 out of allotted 50 marks to appear for SEE. - If any courses of 3 credits are of Integrated Course type, for such courses the method suggested for 4 credits IPCC shall be followed.			

Semester End Examination (SEE)

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours**)

- SEE shall be conducted and evaluated for maximum marks 100. Marks obtained shall be accounted for SEE final marks, reducing it by 50%
- Question paper shall be set jointly by both Internal and External Examiner and made available for each batch as per schedule. *Questions are to be set preferably from Text*

Books,

- **Related to Module-1:** One full question shall be set from “*points & lines*” and “*planes*” where students will be given an option to answer any one.
- Evaluation shall be carried jointly by both the examiners.
- One full question shall be set from each of the Module from Modules 1,2,3 and 4 as per the below tabled weightage details. **However, the student may be awarded full marks, if he/she completes solution on computer display without sketch.**

Module	Max. Marks Weightage	Evaluation Weightage in marks	
		Computer display and print out (a)	Preparatory sketching (b)
Module 1	20	15	05
Module 2	30	25	05
Module 3	25	20	05
Module 4	25	20	05
Total	100	80	20
Consideration of SEE Marks		Total of (a) + (b) ÷ 2 = Final SEE marks	

Textbooks

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

Reference Books

- 1) Bhattacharya S. K., Electrical Engineering Drawing, New Age International publishers, second edition 1998, reprint 2005.
- 2) Chris Schroder, Printed Circuit Board Design using AutoCAD, Newnes, 1997.
- 3) K S Sai Ram Design of steel structures, Third Edition by Pearson
- 4) Nainan P Kurian Design of foundation systems, Narosapublications
- 5) A S Pabla, Electrical power distribution, 6th edition, Tata Mcgrawhill
- 6) S.N. Lal, & T Madhusudhan: Engineering Visualisation, 1st Edition, Cengage, Publication
- 7) Parthasarathy N. S., Vela Murali, Engineering Drawing, Oxford University Press, 2015.

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

- Hands on experience in workshop using sheet metal.

B.E. (CSE stream) Outcome Based Education (OBE) and Choice Based Credit System (CBCS) SEMESTER – I / II			
Course Title:	Computer Aided Engineering Drawing (CSE stream)		
Course Code:	BCDCS103/203	CIE MARKS	50
(L : T : P) + SL	(2:0:2) + (45hrs/Semester)	SEE MARKS	50
Credits:	3	EXAM HOURS	3 Hrs
COURSE LEARNING OBJECTIVES: The purpose of the course is to facilitate the learner: 1. To understand the basic principles and conventions of engineering drawing 2. To use drawing as a communication mode 3. To understand the development of lateral surfaces of solids and Isometric Projections. 4. To familiarize students with 2D network topology drawings and 3D modelling of computing and IoT hardware components. 5. To introduce students to 2D graphics in OpenGL through coordinate systems, primitives, and attribute functions.			
MODULE – 1			9 hrs
Introduction: (for CIE only) 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). Orthographic projections of planes: triangle, square, rectangle, pentagon, hexagon, and circular lamina (Placed in First quadrant only using change of position method). Application on projections of Lines & Planes (For CIE only) Problems on projection of points, lines and planes. (L2, L3)			
MODULE – 2			9 hrs
Orthographic Projection of Solids: Orthographic projection of right regular solids (Solids Resting on HP only): Prisms & Pyramids (triangle, square, rectangle, pentagon, hexagon), Cones, Cubes & Tetrahedron. Problems on projection of solids. (L2, L3)			
MODULE – 3			9 hrs
Isometric Projections: Introduction to Isometric views, Isometric scale, Isometric projection of hexahedron (cube), right regular prisms, pyramids, cylinders, cones and spheres. Isometric projection of combination of two simple solids. Conversion of simple isometric drawings into orthographic views: Problems on conversion of Isometric projections of simple objects / engineering components into orthographic projections. Problems on Isometric Projections. (L2, L3)			

Development of Lateral Surfaces of Solids:

Development of lateral surfaces of right regular prisms, cylinders, pyramids and cones resting with base on HP only. Development of lateral surfaces of their frustums and truncations. (Section Planes inclined to HP only).

MODULE – 4

9 hrs

2-D Drafting of Computer Network Drawing

2D Network drawing with wired and wireless, Network topology - wired and wireless. 3D Modelling: Raspberry Pi / Arduino boards, Router & switches, IoT devices

MODULE – 5

9 hrs

Open GL (For CIE Only)

Introduction to OpenGL, coordinate reference frames, specifying two-dimensional world coordinate reference frames in OpenGL, OpenGL point functions, OpenGL line functions, point attributes, line attributes, curve attributes, OpenGL point attribute functions, OpenGL line attribute functions.

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Create accurate orthographic projections of points, lines, and planes in the first quadrant, and solve related projection problems.
CO2	Create orthographic projections of prisms, pyramids, cones, cubes, and tetrahedrons resting on the horizontal plane.
CO3	Create isometric projections of simple and combined solids & Develop the lateral surfaces of the solids.
CO4	Create 2D network topology drawings and develop 3D models of computing, networking, and IoT devices.
CO5	Implement 2D graphics in OpenGL using coordinate systems, primitives, and attribute functions

ASSESSMENT DETAILS (Both CIE and SEE)

The weight age 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) and that for SEE minimum passing marks is 35% of the maximum marks (18 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination (SEE), and a minimum of 40% (40 marks out of 100) in the sum of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation (CIE)

- CIE shall be evaluated for max. marks of 100 and later the same shall be scaled-down to 50 marks as detailed below:
- CIE component should comprise of Continuous evaluation of drawing work of students as and when the Modules are covered based on below detailed weight age.

Module	Max. Marks Weightage	Evaluation Weightage in marks	
		Computer display and print out (a)	Sketching (b)
Module 1	20	15	05
Module 2	20	15	05
Module 3	20	15	05
Module 4	20	15	05
Module 5	20	15	05
Total	100	75	25
Consideration of Class work		Total of [(a)+(b)=100] scaled down to 30	

- Two tests covering all the modules are to be conducted for 50 marks each and evaluation to be based SEE pattern, scaled to 20 marks.
- The final CIE = Class work marks + Test marks

Continuous Internal Evaluation (CIE)

Assessment Type	Maximum Marks	Minimum Passing Marks	Evaluation Details
Continuous Evaluation of Drawing Work (A)	30	–	Continuous evaluation of drawing work evaluated module wise for 80 Marks, scaled down to 30 marks.
CIE – IA Tests (B)	20	–	Two tests covering all the modules are to be conducted for 50 marks each and evaluation to be based SEE pattern, scaled to 20 marks.
Total CIE (A+B)	50	20	CIE Evaluation is done for a maximum of 50 marks
SEE (C)	50	18	SEE is a theory exam conducted for 100 marks and scaled down to 50 marks. Exam duration shall be for 3 hours.
CIE + SEE (A+B+C)	100	40	Final marks shall be the sum of marks scored in Components A, B and C.
The minimum marks to be secured in CIE is 20 out of allotted 50 marks to appear for SEE. If any courses of 3 credits are of Integrated Course type, for such courses the method suggested for 4 credits IPCC shall be followed.			

Semester End Examination (SEE)

- Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours**)
- SEE shall be conducted and evaluated for maximum marks 100. Marks obtained shall be accounted for SEE final marks, reducing it by 50%

- Question paper shall be set jointly by both Internal and External Examiner and made available for each batch as per schedule. ***Questions are to be set preferably from Text Books.***
- **Related to Module-1:** One full question shall be set from “*points & lines*” and “*planes*” where students will be given an option to answer any one.
- Evaluation shall be carried jointly by both the examiners.
- One full question shall be set from each of the Module from Modules 1,2,3 and 4 as per the below table weightage details. **However, the student may be awarded full marks, if he/she completes solution on computer display without sketch.**

Module	Max. Marks Weightage	Evaluation Weightage in marks	
		Computer display and print out (a)	Preparatory sketching (b)
Module 1	20	15	05
Module 2	30	25	05
Module 3	25	20	05
Module 4	25	20	05
Total	100	80	20
Consideration of SEE Marks		Total of (a) + (b) ÷ 2 = Final SEE marks	

Textbooks

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

Reference Books

1. Bhattacharya S. K., Electrical Engineering Drawing, New Age International publishers, second edition 1998, reprint 2005.
2. Chris Schroder, Printed Circuit Board Design using AutoCAD, Newnes, 1997.
3. K S Sai Ram Design of steel structures, Third Edition by Pearson
4. Nainan P Kurian Design of foundation systems, Narosa publications
5. A S Pabla, Electrical power distribution, 6th edition, Tata Mcgrawhill
6. S.N. Lal, & T Madhusudhan: Engineering Visualisation, 1st Edition, Cengage, Publication
7. Parthasarathy N. S., Vela Murali, Engineering Drawing, Oxford University Press, 2015.

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

- Hands on experience in workshop using sheet metal.

ENGINEERING SCIENCE COURSE (For other Branch students)		
1	BENSC104A /204A	BUILDING SCIENCES & MECHANICS
2	BENSC104B /204B	INTRODUCTION TO ELECTRICAL ENGINEERING
3	BENSC104C /204C	INTRODUCTION TO ELECTRONICS & COMMUNICATION ENGINEERING
4	BENSC104D /204D	INTRODUCTION TO MECHANICAL ENGINEERING
5	BENSC104E /204E	ESSENTIALS OF INFORMATION TECHNOLOGY



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SCHEME AND SYLLABUS**
Effective from Academic Year 2025 – 26

B.E. (Common to all except Civil Engineering) Outcome Based Education(OBE) and Choice Based Credit System(CBCS) SEMESTER – I/II			
Course Title:	Building Sciences and Mechanics		
Course Code:	BENSC104A/204A	CIE Marks	50
(L :T : P) + SL	(3:0:0) + (45 Hours/Sem)	SEE Marks	50
Credits:	3	Exam Hours	3
COURSE LEARNING OBJECTIVES: <i>The purpose of the course is to facilitate the learner to:</i> 1. Provide an overview of Civil Engineering, construction materials, and structural elements of buildings. 2. Introduce sustainable materials, green building concepts, and rating systems for creating a sustainable built environment. 3. Impart knowledge of fundamental engineering principles governing coplanar force systems, equilibrium, and support reactions. 4. Develop an understanding of centroid calculation for simple and composite sections and its applications in engineering design.			
Module-1: Introduction to Building Science			9 hrs
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: Definition and function of Foundation & its types, Plinth, Lintel, Chejja, Masonry wall, Column, Beam, Slab, Flooring and Staircase.			
Module-2: Sustainable Built Environment			9 hrs
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.			
Module-3: Coplanar Force System			9 hrs
Basic dimensions and units, Idealizations, Force- Characteristic and Classification of force system, Principle of transmissibility of a force, Principle of superposition and Principle of physical independence of forces, Resolution and Composition of forces, Resultant of coplanar concurrent force system- Parallelogram law of forces, Moment and Couple, Resultant of coplanar non-concurrent force system- Varignon's theorem. Numerical examples on moment, couple, resultant of coplanar concurrent and non-concurrent force system.			
Module-4: Equilibrium and Support Reactions			9 hrs
Conditions of equilibrium, Free body diagrams, Equilibrium of coplanar concurrent force system, Lami's theorem, Numerical examples on equilibrium of force and Lami's theorem. Introduction to Coplanar Non-Concurrent Force System, Types of supports in beams, types of beams, types of loadings, Difference between statically determinate and indeterminate beams, Numerical examples on support reactions of statically determinate beams subjected to various types of loads (point loads, uniformly distributed loads, uniformly varying loads)			

Module-5: Centroid	9 hrs
Introduction, Differences between centre of gravity and centroid, symmetrical and asymmetrical axis, Locating the centroid of rectangle, triangle, circle, semicircle, and quadrant of a circle using method of integration, Numerical examples on the centroid of composite and simple built-up sections.	

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Understand the scope of Civil Engineering, fundamentals of construction materials, and structural elements of buildings.
CO2	Acquire knowledge of sustainable materials, green building concepts, and rating systems for a sustainable built environment.
CO3	Apply engineering principles in analysing coplanar force systems, equilibrium, and support reactions in beams.
CO4	Determine the centroid of simple and composite sections.

ASSESSMENT DETAILS (Both CIE and SEE)

Assessment Type	Maximum Marks	Minimum Passing Marks	Evaluation Details
CIE – IA Tests (A)	30	-	Two tests each of 50 marks shall be conducted. Average of two Internal Assessment Tests shall be scaled down to 30 marks.
Continuous and Comprehensive Evaluation (B)	20	-	Any two assessment methods as per 24RNBE4.2 (if it is project based, one assignment shall be given), scaled to 20 marks.
Total CIE (A + B)	50	20	CIE Evaluation is done for a maximum of 50 marks.
SEE (C)	50	18	SEE is a theory exam conducted for 100 marks and scaled down to 50 marks. Exam duration shall be 3 hours.
CIE + SEE (A+B+C)	100	40	Final marks shall be the sum of marks scored in Components A, B, and C.
- The minimum marks to be secured in CIE is 20 (40%) out of allotted 50 marks to appear for SEE. - If any course of 3 credits is of Integrated Course type, the method suggested for 4 credits IPCC shall be followed.			

Textbooks

1. Rangwala, "Building Construction", 33rd ed., Charotar Publishing House Pvt. Ltd., 2016.
2. R. K. Bansal, Rakesh Ranjan Beohar and Ahmad Ali Khan, "Basic Civil Engineering and Engineering Mechanics", 3rd ed., Laxmi Publications, 2015.
3. S. S. Bhavikatti, "Engineering Mechanics", 9th ed., New Age International Publishers, 2023.
4. K. Vijay Kumar Reddy and J. Suresh Kumar, "Singer's Engineering Mechanics Statics and Dynamics, BS Publications, 2011.

Reference Books

1. F.P. Beer, E. R. Johnston, Cornwell and Sanghi, "Vector Mechanics for Engineers: Statics and Dynamics, 10th ed., McGraw Hill Education, 2017.
2. R. C. Hibbeler, "Engineering Mechanics: Statics and Dynamics", 14th ed., Pearson Education, 2017.



B.E. (Common to all branches except EEE)			
Outcome Based Education (OBE) and Choice Based Credit System(CBCS)			
SEMESTER – I/II			
Course Title:	Introduction to Electrical Engineering		
Course Code:	BENSC104B/204B	CIE MARKS	50
(L:T:P) + (SL)	(3:0:0) + (45 Hours / Semester)	SEE MARKS	50
Credits:	3	EXAM HOURS	3 Hours
COURSE LEARNING OBJECTIVES:			
<i>The purpose of the course is to facilitate the learner to:</i>			
1. To explain the laws used in the analysis of DC and AC circuits.			
2. To explain the concept of three phase AC circuits.			
3. To explain the construction and operation of transformers, rotating machines.			
4. To introduce concepts of circuit protecting devices and earthing.			
5. To explain methods of power generation, transmission and distribution, billing, safety measures.			
Module 1:		9 hrs	
Basics of power generation, Transmission and Distribution: Power generation using Thermal, Hydel, Nuclear, Solar and Wind (Block diagram approach), general structure of electrical power transmission and distribution scheme (single line diagram approach).			
DC circuits: Ohm's law and Kirchhoff's laws, analysis of series, parallel and series-parallel circuits, Power and energy, Problems.			
Module 2:		9 hrs	
AC Fundamentals: Generation of single-phase sinusoidal voltage, Equation of AC voltage and current, Derivation average value, RMS value, form factor, peak factor and their relation, Problems.			
Single Phase AC circuits: 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, Problems.			
Module 3:		9 hrs	
Three-Phase Circuits: Generation of three-phase sinusoidal voltage, star and delta connections, relation between phase and line values of voltages and of currents in star and delta connections with phasor diagram. Definition of balanced and unbalanced source and load, three phase active power, reactive power and power factor. Problems with balanced loads.			
Three-phase induction Motors: Concept of rotating magnetic field, Principle of operation, Constructional features of squirrel cage type and wound rotor type induction motor. Slip and its significance, Applications and Problems			
Module 4:		9 hrs	
Transformers: Necessity of transformer, principle of operation, constructional features of single-phase transformers (core and shell type). EMF equation, losses, variation of losses with respect to load. Calculation of efficiency and condition of maximum efficiency, Problems.			
Three Phase Synchronous Machines: Working Principle, Constructional features of stator, Salient pole and Non-salient pole type of synchronous machine, concept of synchronous speed, EMF equation (excluding derivation of winding factors), Problem			

Module 5:	9 hrs
Domestic Wiring: Types of wiring: casing and capping, conduit wiring. 2 way and 3 way control of lamp. Domestic Electricity Bill: Power-rating of household connected loads, sanctioned load. Two-part tariff with illustration of an electricity bill. Equipment Safety Measures: Working principles of fuse and miniature circuit breaker (MCB). Personal safety measures: Electric shock, Effects of shock. Safety precautions to avoid shock. Earthing: Necessity of earthing, Types of earthing: Pipe and plate earthing.	

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Understand the methods of power generation, transmission and distribution
CO2	Apply the basic laws used in the analysis of DC circuits.
CO3	Understand the fundamentals of AC and analyze the working of single-phase and three phase AC circuits.
CO4	Understand the features, working mechanism and performance of electrical machines.
CO5	Understand the concepts of electricity billing, domestic wiring and safety measures

ASSESSMENT (CIE & SEE)

Assessment Type	Maximum Marks	Minimum Passing Marks	Evaluation Details
CIE – IA Tests (A)	30	-	Two tests each of 50 marks shall be conducted. Average of Two Internal Assessment Tests shall be scaled down to 30 marks.
Continuous and Comprehensive Evaluation (B)	20	-	Any two Assessment methods as per 24RNBE4.2 (*if it is project based, one assignment shall be given), scaled to 20 marks.
Total CIE (A+B)	50	20	CIE Evaluation is done for a maximum of 50 marks
SEE (C)	50	18	SEE is a theory exam conducted for 100 marks and scaled down to 50 marks. Exam duration shall be for 3 hours.
CIE + SEE (A+B+C)	100	40	Final marks shall be the sum of marks scored in Components A, B and C.

- The minimum marks to be secured in CIE is 20 (40%) out of allotted 50 marks to appear for SEE.
- **If any courses of 3 credits are of Integrated Course type, for such courses the method suggested for 4 credits IPCC shall be followed.**

Resources: Books:

1. Basic Electrical Engineering by D C Kulshreshtha, Tata McGraw Hill, First Edition 2019.
2. A text book of Electrical Technology by B.L. Theraja, Volume 1, S Chand and Company, reprint edition 2014.
3. A text book of Electrical Technology by B.L. Theraja, Volume 3, S Chand and Company, reprint edition 2014.
4. Basic Electrical Engineering, D. P. Kothari and I. J. Nagrath, Tata McGraw Hill 4th edition, 2019.
5. Principles of Electrical Engineering & Electronics by V. K. Mehta, Rohit Mehta, S. Chand and Company Publications, 2nd edition, 2015.
6. Fundamentals of Electrical Engineering by Rajendra Prasad, PHI, 3rd edition, 2014.

Web links and Video Lectures (e-Resources):

1. <https://nptel.ac.in/courses/108108076>
2. <https://archive.nptel.ac.in/courses/108/105/108105112/>
3. <https://nptel.ac.in/courses/108105053>

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

- Visit to campus switch yard
- Visit to Electrical machines lab to explain DC, single phase AC, Three phase AC supply systems

B.E. (Common to All Branches except ECE)			
Outcome Based Education (OBE) and Choice Based Credit System (CBCS)			
SEMESTER – I / II			
Course Title:	Introduction to Electronics & Communication Engineering		
Course Code:	BENSC104C/204C	CIE MARKS	50
(L :T : P) + SL	(3:0:0) + (45 hrs/semester)	SEE MARKS	50
Credits:	3	EXAM HOURS	3
COURSE LEARNING OBJECTIVES:			
The purpose of the course is to facilitate the learner to:			
1. Operation of semiconductor diode and Rectifiers, fundamental knowledge of Amplifiers.			
2. Transistor operation, study of Oscillators and Operational amplifier and its applications.			
3. Logic circuits and their optimization.			
4. Acquire basic knowledge of Embedded systems and sensors.			
5. Gain knowledge in Communication system and different modulation techniques.			
Module-1		9 hrs	
Semiconductor Diodes & Power Supplies: Semiconductor diode Working and Characteristics. Block diagram of Power supply, Half Wave Rectifiers, Full Wave Rectifiers- Bi Phase and Bridge Rectifiers and filters (only operation and Problems, no derivation), Zener Diode and its characteristics, Voltage regulators, Output resistance and voltage regulation, Voltage Multipliers.			
Amplifiers: Types of amplifiers, Gain, Input and output resistance, Frequency response, Bandwidth, Phase shift, Negative feedback, multi-stage amplifiers,			
Module-2		9 hrs	
Bipolar junction transistor: Introduction, Symbols of NPN and PNP, BJT operation.			
Oscillator: Barkhausen criterion, sinusoidal and non-sinusoidal oscillator, Ladder network oscillator, Wein bridge oscillator, Multivibrators, Single stage astable oscillator, Crystal controlled oscillator, Multivibrators, single stage astable oscillator.			
Operational amplifiers: Operational Amplifier Parameters, Operational Amplifier characteristics, Operational Amplifier Configurations, Operational Amplifier circuits (only Qualitative analysis): Inverting and non-inverting amplifiers, voltage follower, summer, integrator, differentiator.			
Module-3		9 hrs	
Boolean Algebra and Logic Circuits: Binary numbers, Number Base Conversion, octal & Hexa Decimal Numbers, Complements (1's and 2's), Basic definitions, Axiomatic Definition of Boolean Algebra, Basic Theorems and Properties of Boolean Algebra, Boolean Functions, Canonical and Standard Forms, Other Logic Operations, Digital Logic Gates.			
Combinational logic: Introduction, Design procedure, Adders- Half adder, Full adder.			

Module-4	9 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.	
Introduction to Internet of Things: Introduction, Physical Design of IoT, Logical Design of IoT, IoT Enabling Technologies.	
What is an IoT Device: Basic building blocks of an IoT Device.	
Module-5	9 hrs
Analog Communication Schemes – Modern communication system scheme, Information source, input transducer, Transmitter, Channel or Medium – Hardwired and Soft wired, Noise, Receiver, Multiplexing, Types of communication systems. Types of modulation (only concepts) - AM, FM, PM, Concept of Radio wave Propagation (Ground, space, Sky).	
Digital Modulation Schemes: ASK, PSK, FSK, Advantages of Digital communication over Analog communication	

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Develop the basic knowledge on semiconductor diode and construct Rectifiers, and gain fundamental knowledge on Amplifiers.
CO2	Apply the acquired knowledge of Transistors in the design of oscillators and Opamp with its applications.
CO3	Develop competence knowledge to construct basic digital circuitry making use of basic gates and use of Boolean theorems for reduction of Expression.
CO4	Apply the basic knowledge acquired in the construction of the design of Embedded systems.
CO5	Construct the conceptual blocks for basic communication systems.

ASSESSMENT DETAILS (Both CIE and SEE)

Assessment Type	Maximum Marks	Minimum Passing Marks	Evaluation Details
CIE – IA Tests (A)	30	-	Average of Two Internal Assessment Tests each of 50 marks, scaled down to 30 marks.
Alternate Assessment (B)	20	-	Any two Assessment methods (*if it is project based, one assignment shall be given), scaled to 20 marks.

Total CIE (A+B)	50	20	CIE Evaluation is done for a maximum of 50 marks
SEE (C)	50	18	SEE is a theory exam conducted for 100 marks and scaled down to 50 marks. Exam duration shall be 3 hours.
CIE + SEE (A+B+C)	100	40	Final marks shall be the sum of marks scored in Components A, B and C.
The minimum marks to be secured in CIE are 20 out of allotted 50 marks to appear for SEE, with minimum 40 % scored in every component of CIE.			

Textbooks:

1. M. Tooley, *Electronic Circuits: Fundamentals & Applications*, 4th ed. Elsevier, 2015. doi: [10.4324/9781315737980](https://doi.org/10.4324/9781315737980).
2. M. M. Mano, *Digital Logic and Computer Design*. PHI Learning, 2008. ISBN: 978-81-203-0417-84.
3. K. V. Shibu, *Introduction to Embedded Systems*, 2nd ed. New Delhi, India: McGraw Hill Education (India) Pvt. Ltd., 2016.
4. S. L. Kakani and P. Punglia, *Communication Systems*. New Delhi, India: New Age International Publishers, 2017.
5. A. Bahga and V. Madiseti, *Internet of Things: A Hands-on Approach*. Hyderabad, India: Universities Press, 2014. ISBN: 978-81-7371-954-7.



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**FIRST YEAR AUTONOMOUS
SCHEME AND SYLLABUS**
Effective from Academic Year 2025 – 26

B.E. (Common to All Branches except ME) Outcome Based Education (OBE) and Choice Based Credit System (CBCS) SEMESTER – I / II			
Course Title:	INTRODUCTION TO MECHANICAL ENGINEERING		
Course Code:	BENSC104D/204D	CIE MARKS	50
(L : T : P) + SL	(3:0:0) + (45Hrs/Semester)	SEE MARKS	50
Credits:	3	EXAM HOURS	3
COURSE LEARNING OBJECTIVES: <i>The purpose of the course is to facilitate the learner:</i> 1. To develop the basic knowledge on Mechanical Engineering, Fundamentals and Energy Sources. 2. Understand the concept of different types of Machine tool operations and Modern Manufacturing Processes like CNC, 3D printing. 3. To know the concept of IC engines and Future Mobility vehicles. 4. To give exposure in the field of Engineering Materials, Manufacturing Processes, Technology and its applications 5. To acquire a basic understanding of the role of Mechanical Engineering in the Robotics, IIoT and Automation industry.			
MODULE – 1			9 hrs
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 ENERGY: Harnessing of energy sources like Hydel, Solar photovoltaic cell, Flat plate collector, wind, 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. Refrigeration and air conditioning principles.			
MODULE – 2			9 hrs
MACHINE TOOL OPERATIONS: Working Principle of lathe, Lathe operations: Turning, facing, knurling. Working principles of radial Drilling Machine, drilling operations: drilling, boring, reaming. Working of Horizontal Milling Machine, Milling operations: plane milling and slot milling. (No sketches of machine tools, sketches to be used only for explaining the operations). INTRODUCTION TO ADVANCED MANUFACTURING SYSTEMS: Introduction, components of CNC, advantages and applications of CNC, Introduction to 3D printing, FDM method.			
MODULE – 3			9 hrs
INTRODUCTION TO IC ENGINES: Components and Working Principles, 4 Stroke Petrol and Diesel Engines, Application of IC Engines. (No Numerical) 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	
MODULE – 4	9 hrs
ENGINEERING MATERIALS: Types and applications of Ferrous & Nonferrous Metals (no composition tables), Composite materials: Introduction, Constituents of a composite, Classification, Types of Matrix and Reinforcement materials, Advantages, Disadvantages and Applications of composite materials. JOINING PROCESSES: Soldering, Brazing and Welding, Definitions, classification of welding process, Arc welding, Gas welding and types of flames in Oxyacetylene gas welding.	
MODULE – 5	9 hrs
INTRODUCTION TO MECHATRONICS AND ROBOTICS: Mechatronics systems: Definition of Mechatronics, elements of Mechatronics systems, examples. Classification based on robot configuration: polar, cylindrical, Cartesian coordinate and Jointed Arm. Robot application, Advantages and disadvantages. Elementary sensors: Working principle and applications of Potentiometer, capacitive sensor and optical encoders. AUTOMATION IN INDUSTRY AND INTRODUCTION TO IIOT: Definition, types – Fixed, programmable and flexible automation, Basic elements with block diagrams, advantages. Definition and characteristics of IIoT, Industry 4.0	

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Describe the role of mechanical engineering in industry and society and various energy sources.
CO2	Explain the Machine Tool Operations and Advanced Manufacturing Process.
CO3	Classify the IC engines and working principle of IC engines, EV vehicles and Hybrid Vehicles
CO4	Differentiate the Properties of Common Engineering Materials and various Metal Joining Processes.
CO5	Appraise the Concepts of Mechatronics, Robotics, Automation, Characteristics of IIoT, Industry 4.0

ASSESSMENT DETAILS (BOTH CIE AND SEE)

Assessment Type	Maximum Marks	Minimum Passing Marks	Evaluation Details
CIE – IA Tests (A)	30	-	Average of Two Internal Assessment Tests each of 50 marks, scaled down to 30 marks.
Alternate Assessment (B)	20	-	Any two Assessment methods as per 24RNBE4.2 (*if it is project based, one assignment shall be given), scaled to 20 marks.
Total CIE (A+B)	50	20	CIE Evaluation is done for a maximum of 50 marks

SEE (C)	50	18	SEE is a theory exam conducted for 100 marks and scaled down to 50 marks. Exam duration shall be for 3 hours.
CIE + SEE (A+B+C)	100	40	Final marks shall be the sum of marks scored in Components A, B and C.
The minimum marks to be secured in CIE is 20 out of allotted 50 marks to appear for SEE, with minimum 40 % scored in every component of CIE. If any courses of 3 credits are of Integrated Course type, for such courses the method suggested for 4 credits IPCC shall be followed.			

SUGGESTED LEARNING RESOURCES:

Text Books:

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
3. Electric and Hybrid Vehicles, A K Babu, Second Edition 2022

REFERENCE BOOKS:

1. Elements of Workshop Technology (Vol. 1 and 2), Hazra Choudhry and Nirzar Roy, Media Promoters and Publishers Pvt. Ltd., 2010.
2. Manufacturing Technology- Foundry, Forming and Welding, P.N.Rao Tata McGraw Hill 3rd Ed. 2003.
3. Internal Combustion Engines, V. Ganesan, Tata McGraw Hill Education; 4th edition, 2017
4. Robotics, Appu Kuttan KK K. International Pvt Ltd, volume 1
5. Dr SRN Reddy, Rachit Thukral and Manasi Mishra, "Introduction to Internet of Things: A Practical Approach", ETI Labs
6. Raj Kamal, "Internet of Things: Architecture and Design", McGraw hill.

WEB LINKS AND VIDEO LECTURES (E-RESOURCES):

1. Videos | Makino (For Machine Tool Operation)

ACTIVITY BASED LEARNING (SUGGESTED ACTIVITIES IN CLASS)/ PRACTICAL BASED LEARNING

1. Demonstration of lathe/milling/drilling operations
2. Demonstration of working of IC Engine.
3. Study arc welding.
4. Video demonstration of latest trends in mobility robotics and Automation

B.E. (Common to all branches except CSE & allied)			
Outcome Based Education (OBE) and Choice Based Credit System (CBCS)			
SEMESTER – I/II			
Course Title:	Essentials of Information Technology		
Course Code:	BENSC104E/204E	CIE MARKS	50
(L:T:P) + SL	(3:0:0) + (45 hrs/Sem)	SEE MARKS	50
Credits:	3	EXAM HOURS	3
COURSE LEARNING OBJECTIVES:			
<i>The purpose of the course is to facilitate the learner to:</i>			
1. Understand the basics of computers, operating systems, and the Internet. a. Use common IT tools like Word, Excel, and PowerPoint for everyday tasks.			
2. Create simple web pages and databases.			
3. Understand the importance of cybersecurity and ethics in IT.			
4. Apply IT skills to solve problems and share information effectively.			
Module 1		9 hrs	
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.			
Module 2		9 hrs	
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.			
Module 3		9 hrs	
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.			
Module 4		9 hrs	
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.			
Module 5		9 hrs	
Introduction to HTML and Website Development: What is HTML?, Cascading Style Sheets (CSS), Website Design and Storyboarding, Structure of a Website.			
Computer Graphics: The Scope of Computer Graphics, Overview of 3D Graphics, Modelling, Rendering.			

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Illustrate different information representation and manipulation schemes.
CO2	Practice Information Technology (IT) infrastructure for information exchange.
CO3	Apply basic software engineering principles to design simple websites and applications.
CO4	Develop queries for quick insert, access and updating of structured information.
CO5	Identify security issues in cybersecurity and importance of ethics in Information Technology (IT).

ASSESSMENT DETAILS (Both CIE and SEE)

Assessment Type	Maximum Marks	Minimum Passing Marks	Evaluation Details
CIE – IA Tests (A)	30	-	Two tests each of 50 marks shall be conducted. Average of Two Internal Assessment Tests shall be scaled down to 30 marks.
Continuous and Comprehensive Evaluation (B)	20	-	Any two Assessment methods as per 24RNBE4.2 (*if it is project based, one assignment shall be given), scaled to 20 marks.
Total CIE (A+B)	50	20	CIE Evaluation is done for a maximum of 50 marks
SEE (C)	50	18	SEE is a theory exam conducted for 100 marks and scaled down to 50 marks. Exam duration shall be for 3 hours.
CIE + SEE (A+B+C)	100	40	Final marks shall be the sum of marks scored in Components A, B and C.
The minimum marks to be secured in CIE is 20 (40%) out of allotted 50 marks to appear for SEE.			

Textbooks:

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 / Manuals:

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

Web links and Video Lectures (e-Resources):

1. Information Technology: https://onlinecourses.swayam2.ac.in/cec20_cs05/preview
2. Computer Organization and Architecture: <https://nptel.ac.in/courses/106103068>
3. Introduction To Internet: <https://nptel.ac.in/courses/106105084>



EMERGING TECHNOLOGY COURSE		
1	BAIAP105/205	INTRODUCTION TO AI AND APPLICATIONS

B.E. (Common to All Engineering Branch) Outcome Based Education(OBE) and Choice Based Credit System(CBCS) SEMESTER – I/II			
Course Title:	Introduction to AI and Applications		
Course Code:	BAIAP105/205	CIE MARKS	50
(L :T : P) + SL	(3:0:0) + (45 hrs/Sem)	SEE MARKS	50
Credits:	3	EXAM HOURS	3
COURSE LEARNING OBJECTIVES: <i>The purpose of the course is to facilitate the learner to:</i> 1. Understand AI concepts and knowledge representation. 2. Develop skills in prompt engineering for creative and problem-solving tasks using AI tools. 3. Apply machine learning techniques for classification and clustering using AI tools. 4. Identify real-world AI applications, trends like AlaaS, AIoT, expert systems, and ethics. 5. Introduce robotics and AI applications in various industries using AI tools.			
Module 1			9 hrs
Introduction: Artificial Intelligence, How Does AI Work?, Advantages and Disadvantages of Artificial Intelligence, History of Artificial Intelligence, Types of Artificial Intelligence, Weak AI, Strong AI, Reactive Machines, Limited Memory, Theory of Mind, Self-Awareness, Is Artificial Intelligence Same as Augmented Intelligence and Cognitive Computing, Machine Learning and Deep Learning. Machine Intelligence: Defining Intelligence, Components of Intelligence, Differences Between Human and Machine Intelligence, Agent and Environment, Search, Uninformed Search Algorithms, Informed Search Algorithms: Pure Heuristic Search, Best-First Search Algorithm (Greedy Search). Knowledge Representation: Introduction, Knowledge Representation, Knowledge-Based Agent, Types of Knowledge.			
Module 2			9 hrs
Introduction to Prompt Engineering: Introduction to Prompt Engineering, The Evolution of Prompt Engineering, Types of Prompts, How Does Prompt Engineering Work?, Comprehending Prompt Engineering's Function in Communication, The Advantages of Prompt Engineering, The Future of LLM Communication. Prompt Engineering Techniques for ChatGPT: Introduction to Prompt Engineering Techniques, Instructions Prompt Technique, Zero, One, and Few Shot Prompting, Self-Consistency Prompt. Prompts for Creative Thinking: Introduction, Unlocking Imagination and Innovation. Prompts for Effective Writing: Introduction, Igniting the Writing Process with Prompts.			
Module 3			9 hrs
Machine Learning: Techniques in AI, Machine Learning Model, Regression Analysis in Machine Learning, Classification Techniques, Clustering Techniques, Naïve Bayes Classification, Neural Network, Support Vector Machine (SVM).			

Module 4		9 hrs
Trends in AI: AI and Ethical Concerns, AI as a Service (AlaaS), Recent trends in AI, Expert System, Internet of Things, Artificial Intelligence of Things (AIoT).		
Module 5		9 hrs
Robotics: Robotics, Robotics-an Application of AI, Drones Using AI, No Code AI, Low Code AI		
Industrial Applications of AI: Application of AI in Healthcare, Application of AI in Finance, Application of AI in Retail, Application of AI in Agriculture, Application of AI in Education, Application of AI in Transportation, AI in Experimentation and Multi-disciplinary research.		
Sl. No.	Designing an Effective Learning Activity	
	Note: To conduct the activity students can use any of the AI tools. INSTRUCTIONS: Students must demonstrate their solutions to the course instructor and submit a record containing the AI project workflow, including problem analysis, tool selection, procedure, execution, and results with observations. AI tools may include but are not limited to Orange Data Mining, Google Teachable Machine, Node-RED, Lobe.ai, IBM Watson Assistant, Microsoft Power Platform AI Builder, or any other AI simulation/platform relevant to the activity.	
1	Analyze how a logistics company can plan efficient delivery routes across multiple cities, compare uninformed (BFS, DFS) and informed (Heuristic, Greedy) search algorithms, discuss their advantages and limitations, and explore a route-planning simulation using a tool (e.g., Orange Data Mining or AI simulation platform).	
2	Create two prompts to ask an AI about a selected topic such as Photosynthesis the first being vague and the second clear and specific(Basic prompt), and then compare the responses to identify which one provides a better explanation and why. Next, ask the AI to explain the same topic without giving any background or example (Zero-Shot) and evaluate the clarity and correctness of the response. After this, provide the AI with one example related to the topic and then ask it to solve a similar problem (One-Shot). Finally, extend the prompt by adding two more examples (Few-Shot) and observe how the quality, detail, and accuracy of the AI's response change across the different prompting methods. (e.g., using ChatGPT)	
3	i. Prompt Refinement: Start with an ambiguous prompt related to the "Water Cycle." Test the AI's response, note the confusion or errors, and then refine your prompt to make it clearer and more specific. Repeat this process twice and record how the AI's responses improve with each refinement. ii. Role-Based Prompting: Create three prompts asking the AI to explain "Newton's Laws of Motion," each with a different role instruction: (a) as an expert engineer, (b) as a high school teacher, (c) as a beginner. Compare the tone, detail, and style of the responses. (e.g., using ChatGPT)	
4	Choose a real engineering challenge or societal problem relevant to your field (e.g., "Reducing plastic waste in campus cafeterias" or "Optimizing solar panel placement on campus rooftops"). Draft an initial prompt that asks an AI to propose practical solutions. Share the AI's (or peer's) answer in small groups and identify aspects that	



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	are missing, vague, or not actionable. Refine your prompt based on feedback (e.g., specify constraints, ask for step-by-step solutions, or require a list of pros and cons). Repeat the process one more time, refining again for further clarity or specificity. Document the entire prompt-refinement process and share the best solution generated, along with a brief analysis of how prompt improvements led to better responses. (e.g., using ChatGPT)
5	Analyze how a weather forecasting agency can predict the daily temperature based on features such as humidity, wind speed, and atmospheric pressure, identify how regression techniques work in machine learning, compare how models like Linear Regression handle training and predictions, and explore this activity using a machine-learning tool (e.g., Orange Data Mining).
6	Analyze how a banking system can classify incoming customer queries into categories such as “loan inquiry,” “account issue,” or “transaction dispute” based on features like keywords, sentence patterns, and query length, identify how Naïve Bayes classification works in machine learning, compare how it handles training and predictions, and explore this activity using a machine learning tool (e.g., Orange Data Mining).
7	Image Classification Using Machine Learning: A healthcare startup wants to build a system that can automatically classify medical images, such as distinguishing between normal and pneumonia X-rays. The task is to study how image classification works using machine learning, compare how Neural Networks and SVMs handle training and classification, and explore this activity using a tool (e.g., Google Teachable Machine).
8	Analyze how an AI-based facial recognition system can raise ethical issues such as bias, privacy violations, or wrongful identification, identify possible mitigation strategies, and explore these concerns using an AI tool (e.g., ChatGPT or IBM Watson Assistant) to simulate decision-making scenarios.
9	Investigate how AI can enhance IoT devices in smart cities to monitor air quality and predict pollution levels based on data from sensors, traffic patterns, and weather conditions, analyze the decision-making process for timely interventions, and explore an AIoT simulation using a tool (e.g., Orange Data Mining or Node-RED with AI widgets).
10	Investigate how AI algorithms enable robots to make decisions, such as sorting objects in warehouses or assisting in surgery, analyze the role of machine learning in robotic decision-making, and explore AI-powered robotic workflows using a tool (e.g., Orange Data Mining or Teachable Machine).
11	Examine how drones can leverage AI for applications like disaster surveillance, agriculture monitoring, or delivery services, analyze the decision-making and path-planning process, and explore a drone simulation using AI tools (e.g., AirSim, Node-RED, or Orange Data Mining).
12	Investigate how No-Code and Low-Code AI platforms can be used to build a chatbot for customer support, analyze the workflow, decision-making process, and limitations of such platforms, and explore creating a functional AI-powered chatbot using a tool (e.g., Google Teachable Machine, Lobe.ai, or Microsoft Power Platform AI Builder).

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Explain the concepts of artificial intelligence and knowledge representation.
CO2	Apply prompt engineering techniques to interact with generative AI tools.
CO3	Illustrate basic machine learning methods for regression, classification and clustering.
CO4	Analyse recent trends in artificial intelligence and machine learning.
CO5	Identify real-world applications across different disciplines.

ASSESSMENT DETAILS (Both CIE and SEE)

Assessment Type	Maximum Marks	Minimum Passing Marks	Evaluation Details
CIE – IA Tests (A)	30	-	Average of Two Internal Assessment Tests each of 50 marks, scaled down to 30 marks.
Alternate Assessment (B)	20	-	Any two learning activities in the given list scaled to 20 marks.
Total CIE (A+B)	50	20	CIE Evaluation is done for a maximum of 50 marks
SEE (C)	50	18	SEE is a theory exam conducted for 100 marks and scaled down to 50 marks. Exam duration shall be for 3 hours.
CIE + SEE (A+B+C)	100	40	Final marks shall be the sum of marks scored in Components A, B and C.
The minimum marks to be secured in CIE are 20 out of allotted 50 marks to appear for SEE, with minimum 40 % scored in every component of CIE.			

Text books:

1. Reema Thareja, Artificial Intelligence: Beyond Classical AI, Pearson Education, 2023.
2. Ajantha Devi Vairamani and Anand Nayyar, Prompt Engineering: Empowering Communication, 1st Edition, CRC Press, Taylor & Francis Group, 2024. (DOI: <https://doi.org/10.1201/9781032692319>).
3. Saptarsi Goswami, Amit Kumar Das and Amlan Chakrabarti, "AI for Everyone – A Beginner's Handbook for Artificial Intelligence", Pearson, 2024.

Reference Books:

1. Stuart Russell and Peter Norvig, Artificial Intelligence: A Modern Approach (4th Edition), Pearson Education, 2023.
2. Elaine Rich, Kevin Knight, and Shivashankar B. Nair, Artificial Intelligence, McGraw Hill Education.

3. Tom Taulli, Prompt Engineering for Generative AI: ChatGPT, LLMs, and Beyond, Apress, Springer Nature.
4. Nilakshi Jain, Artificial Intelligence: Making A System Intelligent, First Edition, Wiley.

Web links and Video Lectures (e-Resources):

1. Elements of AI – <https://www.elementsofai.com>
2. CS50's Introduction to Artificial Intelligence with Python – Harvard: <https://cs50.harvard.edu/ai/>
3. Google Machine Learning Crash Course – <https://developers.google.com/machine-learning/crash-course>
4. Learn Prompting (Open-Source Guide) – <https://learnprompting.org>
5. Google AI – Learn with Google AI <https://ai.google/education/>
6. Coursera – Machine Learning by Andrew Ng (Stanford University):
<https://www.coursera.org/learn/machine-learning>
7. OpenAI Prompt Engineering Guide (for ChatGPT): <https://platform.openai.com/docs/guides/gpt-best-practices>
8. Prompt Engineering for Developers – DeepLearning.AI + OpenAI:
<https://www.deeplearning.ai/short-courses/chatgpt-prompt-engineering-for-developers/>
9. Ethics in AI – Google Responsible AI Practices: <https://ai.google/responsibilities/responsible-ai-practices/>
10. Google Teachable Machine (Train AI models visually without code):
<https://teachablemachine.withgoogle.com>

PROGRAMMING LANGUAGE COURSES		
1	BPRLC105A /205A	INTRODUCTION TO C PROGRAMMING (FOR NON-IT STREAMS)
2	BPRLC105B /205B	PYTHON PROGRAMMING (FOR CSE AND ALLIED STREAMS)

B.E. (Common to non IT Engineering Branches)			
Outcome Based Education(OBE) and Choice Based Credit System(CBCS)			
SEMESTER – I/II			
Course Title:	INTRODUCTION TO C PROGRAMMING		
Course Code:	BPRLC105A/205A	CIE MARKS	50
(L : T : P) + SL	(3:0:2) + (45 Hrs/Sem)	SEE MARKS	50
Credits:	4	EXAM HOURS	3
COURSE LEARNING OBJECTIVES:			
<i>The purpose of the course is to facilitate the learner to:</i>			
1. Explain the fundamental structure of a C program and primitive constructs. 2. Apply decision-making and iterative control structures to solve simple computational problems. 3. Develop programs using arrays and string operations to solve real-world problems. 4. Construct user-defined functions to modularize the solution to the given problems. 5. Build programs using structures and pointers for complex data representation and access data.			
Module 1		9 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.			
Module 2		9 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.			
Module 3		9 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.			
Module 4		9 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.			

Module 5	9 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.	

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Describe the basic structure of C programming, data types, operators, and control statements.
CO2	Apply the concepts of arrays, strings, pointers, and functions to solve simple computational problems.
CO3	Develop modular programs using structures, unions, and user-defined functions.
CO4	Implement file handling and dynamic memory management concepts in C to manage data effectively.
CO5	Design and evaluate solutions for real-life problems using appropriate C programming constructs.

Assessment Type	Maximum Marks	Minimum Passing Marks	Evaluation Details
CIE- IA Tests (A)	20	-	Two tests each of 50 marks shall be conducted. Average of Two Internal Assessment Tests shall be scaled down to 20 marks.
Continuous and Comprehensive Evaluation (B)	10	-	Any one Assessment methods as per 24RNBE4.2 scaled to 10 marks.
Total CIE Theory (A+B)	30	12	Marks of Tests and Assignments awarded for a maximum of 30.
CIE Practical	12	-	Marks awarded for Weekly Conduction of Experiments and Submission of Laboratory records, scaled to 12 marks.
CIE Practical Test	8	-	Average of marks of Two tests, each conducted for 100 marks covering all experiments, scaled to 8.
Total CIE Practical (C)	20	8	Marks of Experiments, Record and Test awarded for a maximum of 20 marks.
CIE: Theory + Practical (A + B + C)	50	20	CIE Evaluation is done for a maximum of 50 marks.

SEE (D)	50	18	SEE is a theory exam, conducted for 100 marks and scaled down to 50 marks. Exam duration shall be for 3 hours.
CIE+SEE (A+B+C+D)	100	40	Final marks shall be the sum of marks scored in Components A, B, C and D

The minimum marks to be secured in CIE is 20 (40%) out of allotted 50 marks to appear for SEE. The laboratory component of the IPCC shall be for CIE only. However, in SEE, the questions from the laboratory component shall be included in their respective modules only.

Laboratory Component:

Sl. No.	Experiments
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	Develop a program to find the transpose of a matrix.
7	Develop a program to concatenate two strings, find length of a string and copy one string to other using string operations
8	Develop a program to declare the structure of employees and display the employee records with higher salary among two employees
9	Develop a program to add two numbers using the pointers to the variables.
10	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

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

Web links and Video Lectures (e-Resources):

1. [elearning.vtu.ac.in/ e-content /courses/video/BS/15PCD23.html](http://elearning.vtu.ac.in/e-content/courses/video/BS/15PCD23.html)
2. <https://nptel.ac.in/courses/106/105/106105171/> MOOC

B.E. (Computer Science and Engineering) Outcome Based Education(OBE) and Choice Based Credit System(CBCS) SEMESTER – I/II			
Course Title:	PYTHON PROGRAMMING		
Course Code:	BPRLC105B/205B	CIE MARKS	50
(L :T : P) + SL	(3:0:2) + (45 Hrs/Sem)	SEE MARKS	50
Credits:	4	EXAM HOURS	3
COURSE LEARNING OBJECTIVES: <i>The purpose of the course is to facilitate the learner to:</i> 1. Understand the Syntax and Semantics and create Functions in python. 2. Handle Strings, Tuples and Lists 3. Understand Dictionaries, Files and Regular Expression 4. Have exposure to the concepts of Object-Oriented Programming as used in Python			
Module 1			9 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. 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. Conditionals: Boolean values and expressions, logical operators, conditional executions, omitting the else clause, chained conditions, nested conditions, logical opposites 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.			
Module 2			9 hrs
Strings: Working with strings as single strings, 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, Looping, Nested lists, Matrices.			

Module 3	9 hrs
Dictionaries: Dictionary operations, dictionary methods, aliasing and copying. 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. Regular Expressions: Finding Patterns of Text Without Regular Expressions, Finding Patterns of Text with Regular Expressions, More Pattern Matching with Regular Expressions, Greedy and Non greedy Matching, The findall() Method.	
Module 4	9 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.	
Module 5	9 hrs
Object oriented programming: Objects are mutable, Sameness, Copying. Inheritance: Pure functions, Modifiers, Generalization, Operator Overloading, Polymorphism. Exceptions: Catching Exceptions, Raising your own exceptions.	

Lab Component:

SL. No.	Questions
1	a. Write 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 no. c. Write a python program to add 10 numbers by inputting each from the keyboard using for loop.
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



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Effective from Academic Year 2025 – 26**

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-Dimensional 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	a. 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. b. Write a python program to create a class called time with members hours, minutes, and seconds. Store user entered time and print the total number of seconds.
8	a. 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 ($N \geq 2$) complex numbers and to compute the addition of N complex numbers. b. Write a python program to implement inheritance: <pre> graph TD Employee --> Clerk Employee --> SoftwareEngineer[Software Engineer] SoftwareEngineer --> TeamLeader[Team Leader] </pre>
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).

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Demonstrate proficiency in handling loops and creation of functions
CO2	Identify the methods to create and manipulate lists, tuple, dictionaries and use of regular expressions
CO3	Develop programs using modules and files.
CO4	Interpret the concepts of Object-Oriented Programming as used in Python.
CO5	Demonstrate the use of built-in functions for string processing and exception

ASSESSMENT DETAILS (Both CIE and SEE)

Assessment Type	Maximum Marks	Minimum Passing Marks	Evaluation Details
CIE - IA Tests (A)	20	-	Two tests each of 50 marks shall be conducted. Average of Two Internal Assessment Tests shall be scaled down to 20 marks.
Continuous and Comprehensive Evaluation (B)	10	-	Any one Assessment methods as per 24RNBE4.2 scaled to 10 marks.
Total CIE Theory (A+B)	30	12	Marks of Tests and Assignments awarded for a maximum of 30.
CIE Practical	12	-	Marks awarded for Weekly Conduction of Experiments and Submission of Laboratory records, scaled to 12 marks.
CIE Practical Test	8	-	Average of marks of Two tests, each conducted for 100 marks covering all experiments, scaled to 8.
Total CIE Practical (C)	20	8	Marks of Experiments, Record and Test awarded for a maximum of 20 marks.
CIE: Theory + Practical (A + B + C)	50	20	CIE Evaluation is done for a maximum of 50 marks.
SEE (D)	50	18	SEE is a theory exam, conducted for 100 marks and scaled down to 50 marks. Exam duration shall be for 3 hours.
CIE+SEE (A+B+C+D)	100	40	Final marks shall be the sum of marks scored in Components A, B, C and D

The minimum marks to be secured in CIE is 20 (40%) out of allotted 50 marks to appear for SEE. The laboratory component of the IPCC shall be for CIE only. However, in SEE, the questions from the laboratory component shall be included in their respective modules only.

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>
2. Al Sweigart - Automate the Boring Stuff with Python, No Starch Press, 2015. (Available under CC-BY-NC-SA license at <https://automatetheboringstuff.com/>) (Chapters 1 to 18, except 12) for lambda functions use this link: [https:// www.learnbyexample.org/python-lambda-function/](https://www.learnbyexample.org/python-lambda-function/), 1st edition.

Reference Books :

1. Downey, A., Elkner, J., & Meyers C - How to think like a computer scientist: learning with python. Green Tea Press, Wellesley, Massachusetts, 2012.
2. Allen B. Downey - Think Python: How to Think Like a Computer Scientist, Green Tea Press, <http://greenteapress.com/thinkpython2/thinkpython2.pdf>, 2nd edition, 2015

Links:

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

PROGRAM SPECIFIC LAB COURSES		
1.	BCVEL107/207	MECHANICS AND MATERIALS LAB
2.	BEEEL107/207	BASIC ELECTRICAL LAB
3.	BECEL107/207	FUNDAMENTALS OF ELECTRONICS AND COMMUNICATION ENGINEERING LAB
4.	BMEEL107/207	ELEMENTS OF MECHANICAL ENGINEERING LAB
5.	BCSEL107/207	C PROGRAMMING LAB



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FIRST YEAR AUTONOMOUS SCHEME AND SYLLABUS

Effective from Academic Year 2025 – 26

B.E. (Civil Engineering) Outcome Based Education(OBE) and Choice Based Credit System(CBCS) SEMESTER – I/II			
Course Title:	Mechanics of Material Lab		
Course Code:	BCVEL107/207	CIE Marks	50
L :T : P	0:0:2	SEE Marks	50
Credits:	1	Exam Hours	3
COURSE LEARNING OBJECTIVES: <i>The purpose of the course is to facilitate the learner to:</i> 1. Understand building materials and their basic properties. 2. Develop competency in performing standard laboratory tests on civil engineering materials. 3. Impart understanding of fundamental engineering principles through verification experiments. 4. Promote creativity and problem-solving skills through open-ended laboratory activities.			
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 Conventional Experiments			
1. Visual identification of building materials: Bricks and Concrete blocks, Stones, Tiles, Natural sand and M-Sand, Bitumen, Fly-Ash, GGBS, Steel bars of Various Sizes. 2. Specific Gravity of a) Fine aggregates. b) Coarse aggregates. c) Cement. d) Soil. 3. Sieve analysis of soil-Graphical representation of the gradation curve 4. Verification of Lami's Theorem. 5. Equilibrium of concurrent forces. 6. Parallel force system- Simply supported beam. 7. Verification of Varignon's theorem.			

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. Reactions.
2. Field tests on cement and brick
3. Particle size distribution.
a. Gap graded.
b. Uniformly graded.
c. Well graded.

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Classify common building materials based on their properties.
CO2	Determine physical properties of aggregates, cement, and soil through standard tests.
CO3	Verify engineering principles such as Lami's theorem, Varignon's theorem, and equilibrium conditions.
CO4	Develop open-ended laboratory experiments and interpret results.

ASSESSMENT DETAILS (Both CIE and SEE)

Assessment Type	Maximum Marks	Minimum Passing Marks	Evaluation Details
CIE – IA Tests (A)	30	-	Marks awarded for weekly conduction of experiments and submission of laboratory records, scaled to 30 marks.
CIE Practical Test (B)	20	-	Average of marks of two tests, each conducted for 100 marks covering all experiments, scaled to 20.
Total CIE Practical (A + B)	50	20	Sum of marks of experiments, record, and test shall be CIE marks awarded for a maximum of 50.
SEE (C)	50	20	SEE is a lab exam, conducted for 100 marks and scaled down to 50 marks. Exam duration shall be 3 hours.
CIE + SEE (A+B+C)	100	40	Final marks shall be the sum of marks scored in Components A, B, and C.
The minimum marks to be secured in CIE is 20 (40%) out of allotted 50 marks to appear for SEE.			

Textbooks

1. M. L. Gambhir, “Concrete manual”, New Delhi: Dhanpat Rai & Sons, 1965.
2. R. K. Bansal, R. R. Beohar, & A. A. Khan, “Basic civil engineering and engineering mechanics”, 3rd ed., New Delhi: Laxmi Publications, 2015.
3. S. Ramamrutham, “Engineering mechanics”, New Delhi: Dhanpat Rai Books, 2013.
4. B. C. Punmia, A. K. Jain, & A. K. Jain, “Soil mechanics and foundation engineering”, 18th ed., New Delhi: Laxmi Publications, 2023.

Reference Books

1. J. L. Meriam and L. G. Kraige, “Engineering mechanics – Statics”, Vol. I, 6th ed., Wiley Publication, 2008.
2. S. S. Rattan, “Strength of materials”, 3rd ed., New Delhi: McGraw Hill Education, 2017.
3. R. K. Bansal, “Strength of materials”, 4th ed., New Delhi: Laxmi Publications, 2023.
4. Bureau of Indian Standards, “IS 4031 (Part 11):1988 – Methods of physical tests for hydraulic cement: Determination of specific gravity”, New Delhi: BIS, 1988.
5. Bureau of Indian Standards, “IS 383:1970 – Specification for coarse and fine aggregates from natural sources for concrete”, New Delhi: BIS, 1970.
6. Bureau of Indian Standards, “IS 2386 (Part 3):1963 – Methods of test for aggregates for concrete: Part 3 Specific gravity, density, voids, absorption and bulking”, New Delhi: BIS, 1963.
7. Bureau of Indian Standards, “IS 2720 (Part 3/Sec 1):1980 – Methods of test for soils: Part 3 Determination of specific gravity of soil, Section 1 Fine grained soils”, New Delhi: BIS, 1980.

B.E. (EEE Students)			
Outcome Based Education (OBE) and Choice Based Credit System (CBCS)			
SEMESTER – I/II			
Course Title:	Basic Electrical Lab		
Course Code:	BEEEL107/207	CIE MARKS	50
L:T:P	0:0:2	SEE MARKS	50
Credits:	1	EXAM HOURS	03
COURSE OBJECTIVES:			
At the end of the course, the student will be able to:			
1. Conduct standard electrical experiments to verify theoretical principles.			
2. Measure key electrical parameters such as resistance, inductance, impedance, power, and power factor with standard methods.			
3. Design and perform experiments to solve practical open-ended electrical problems.			
4. Analyse experimental data from non-routine method to arrive at a solution.			
PART – A			
CONVENTIONAL EXPERIMENTS			
Sl. No.	Title of the Experiment		
1	Verification of Kirchoff's Laws (KCL & KVL) in DC circuits.		
2	Measurement of low range resistance using voltmeter-ammeter method. Verification of resistance value using multimeter/LCR meter.		
3	Measurement of three-phase power by 2-wattmeter method, when the load is balanced (a) star connected and (b) delta connected.		
4	Study the effect of open circuit and short circuit in a simple DC circuit.		
5	2 -way and 3- way control of lamp		
6	Power factor measurement of (a) Incandescent lamp (b) LED Lamp (c) Fluorescent lamp connected across single phase AC supply.		
PART – B			
OPEN ENDED EXPERIMENTS			
7	Creation of short circuit to determine the time taken by a fuse of different length. Documenting the test data and the conclusions		
8	Setup a simple power distribution scheme of a domestic consumer with Energy meter, fuse, MCB and loads forming subcircuits. Analyse the variation in current and energy intake by changing the loads.		
9	Only three ammeters and standard resistance are available in the laboratory. Using the same measure the single-phase power consumed by an inductive load.		
10	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:

After successfully completing the course, the student will be able to:

CO1	Conduct standard electrical experiments to verify theoretical principles of KCL & KVL.
CO2	Measure key electrical parameters such as resistance, inductance, impedance, power, and power factor with standard methods
CO3	Verify the working mechanism in 2-way & 3-way control of lamp.
CO4	Measure active power and reactive power consumed by balanced three phase AC load and infer their values when they are connected in star and delta.
CO5	Design and perform experiments to solve practical open-ended electrical problems.

ASSESSMENT (CIE & SEE)

Assessment Type	Maximum Marks	Minimum Passing Marks	Evaluation Details
CIE Practical (A)	30	-	Marks awarded for Weekly Conduction of Experiments and Submission of Laboratory records, scaled to 30 marks.
CIE Practical Test (B)	20	-	Average of marks of Two tests, each conducted for 100 marks covering all experiments, scaled to 20.
Total CIE Practical (A+B)	50	20	Sum of Marks of Experiments, Record and Test shall be CIE marks awarded for a maximum of 50.
SEE (C)	50	20	SEE is a lab exam, conducted for 100 marks and scaled down to 50 marks. Exam duration shall be for 3 hours.
CIE + SEE (A+B+C)	100	40	Final marks shall be the sum of marks scored in Components A, B and C.
The minimum marks to be secured in CIE is 20 (40%) out of allotted 50 marks to appear for SEE.			

B.E. (Electronics and Communication Engineering) Outcome Based Education(OBE) and Choice Based Credit System(CBCS) SEMESTER – I			
Course Title:	Fundamentals of Electronics and Communication Engineering Lab		
Course Code:	BECEL107/207	CIE MARKS	50
L : T : P	0 : 0 : 2	SEE MARKS	50
Credits:	01	EXAM HOURS	03
COURSE LEARNING OBJECTIVES: <i>The purpose of the course is to facilitate the learner to:</i> 1. To provide hands-on experience with basic electronic devices (diodes, BJTs, MOSFETs) and circuits. 2. To enable students to design and test rectifiers, amplifiers, filters, and op-amp applications. 3. To familiarize students with digital logic circuits and basic combinational systems. 4. To develop practical skills in testing, measurement, and waveform analysis using lab instruments. 5. To bridge theory with practice through design, testing, and verification of analog and digital circuits.			
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			
1	Design and Testing of Half-Wave and Bridge Rectifier Rectifiers With and Without Filter for Determining Ripple Factor, Voltage Regulation, and Efficiency.		
2	Design and Testing of Clipping and Clamping Circuits to obtain desired Transfer Characteristics.		
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 experiments)	
1	Design and test a single stage bipolar junction transistor amplifier to obtain desired gain and bandwidth requirements.
2	Testing of Op-Amp as voltage follower and a weighted summer with waveform analysis.
3	Design and Testing of Integrator and Differentiator Circuits using Op-Amp with Waveform Analysis
4	Amplitude Modulation using Discrete Components for Given Specifications.
5	Realization of Half/ Full Adder and Subtractor using Logic Gates.

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Demonstrate the working of semiconductor devices (diodes, BJTs, MOSFETs) through input-output characteristic analysis.
CO2	Design and test rectifier circuits with and without filters, evaluating ripple factor, regulation, and efficiency.
CO3	Implement and analyze operational amplifier configurations (inverting, non-inverting, summer, integrator, differentiator, voltage follower).
CO4	Realize and verify truth tables of basic and universal logic gates, adders, and subtractors.
CO5	Design and analyze analog communication circuits (Amplitude Modulation) using discrete components.

ASSESSMENT DETAILS (Both CIE and SEE)

Assessment Type	Maximum Marks	Minimum Passing Marks	Evaluation Details
CIE Practical (A)	30	-	Marks awarded for Weekly Conduction of Experiments and Submission of Laboratory records, scaled to 25 marks.
CIE Practical Test (B)	20	-	Average of marks of Two tests, each conducted for 100 marks covering all experiments, scaled to 25.
Total CIE Practical (A+B)	50	20	Sum of Marks of Experiments, Record and Test shall be CIE marks awarded for a maximum of 50.
SEE (C)	50	20	SEE is a lab exam, conducted for 100 marks and scaled down to 50 marks. Exam duration shall be for 3 hours.
CIE + SEE (A+B+C)	100	40	Final marks shall be the sum of marks scored in Components A, B and C.
The minimum marks to be secured in CIE is 20 out of allotted 50 marks to appear for SEE, with minimum 40 % scored in every component of CIE.			

Textbooks

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.
6. Robert L. Boylestad, Louis Nashelsky, "Electronic Devices and Circuit Theory", 11th Edition, PHI, 2016.

Web links and Video Lectures (e-Resources)

1. Introduction to Basic Electronics: <https://nptel.ac.in/courses/122106025>
2. Digital Electronic Circuits: <https://nptel.ac.in/courses/108105132>

B.E. (ME Stream) Outcome Based Education (OBE) and Choice Based Credit System (CBCS) SEMESTER – I / II			
Course Title:	Elements of Mechanical Engineering Lab (ME Stream)		
Course Code:	BMEEL107/207	CIE MARKS	50
L : T : P	0:0:2	SEE MARKS	50
Credits:	1	EXAM HOURS	3
COURSE LEARNING OBJECTIVES: <i>The purpose of the course is to facilitate the learner:</i>			
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.			
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.			

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Perform basic machining and welding operations using lathe and welding machines.
CO2	Calibrate and use measuring instruments for accurate linear and angular measurements.

CO3	Apply suitable techniques to determine properties of fuels and oils.
CO4	Evaluate the hardness of engineering materials using standard testing methods.
CO5	Demonstrate problem-solving and critical thinking skills through open-ended mechanical experiments.

ASSESSMENT DETAILS (BOTH CIE AND SEE)

Assessment Type	Maximum Marks	Minimum Passing Marks	Evaluation Details
CIE Practical (A)	30	--	Marks awarded for Weekly Conduction of Experiments and Submission of Laboratory records, scaled to 30 marks.
CIE Practical Test (B)	20	--	Average of marks of Two tests, each conducted for 100 marks covering all experiments, scaled to 20.
Total CIE Practical (A+B)	50	20	Sum of Marks of Experiments, Record and Test shall be CIE marks awarded for a maximum of 50.
SEE (C)	50	20	SEE is a lab exam, conducted for 100 marks and scaled down to 50 marks. Exam duration shall be for 3 hours.
CIE + SEE (A+B+C)	100	40	Final marks shall be the sum of marks scored in Components A, B and C.
The minimum marks to be secured in CIE is 20 (40%) out of allotted 50 marks to appear for SEE.			

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:

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):

1. <https://openoregon.pressbooks.pub/manufacturingprocesses45/chapter/chapter-unit-1-the-engine-lathe/>
2. <https://www.millerwelds.com/resources/article-library/the-fundamentals-of-welding-process-equipment-and-applications>
3. <https://www.youtube.com/watch?v=sbbwJ5p6irc>
4. <https://www.youtube.com/watch?v=TlhGTSDfQxc>



B.E. (Common to CSE Allied Branches)			
Outcome Based Education (OBE) and Choice Based Credit System (CBCS)			
SEMESTER – I/II			
Course Title:	C PROGRAMMING LAB		
Course Code:	BCSEL107/207	CIE MARKS	50
L :T : P	0:0:2	SEE MARKS	50
Credits:	1	EXAM HOURS	3

COURSE LEARNING OBJECTIVES:

The purpose of the course is to facilitate the learner to:

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

PART - A	PRACTICAL COMPONENT
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 76 50 to 59: Grade D 77 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.	



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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

OPEN-ENDED EXPERIMENTS

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.

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Explain fundamental concepts of C programming including variables, data types, and operators.
CO2	Apply conditional and iterative statements along with arrays for solving problems.
CO3	Design and implement modular programs using functions and recursion
CO4	Construct and manipulate user-defined data types such as structures and unions.
CO5	Apply appropriate language constructs to solve real-world or computational problems.

ASSESSMENT DETAILS (Both CIE and SEE)

Assessment Type	Maximum Marks	Minimum Passing Marks	Evaluation Details
CIE Practical (A)	30	-	Marks awarded for Weekly Conduction of Experiments and Submission of Laboratory records, scaled to 30 marks.
CIE Practical Test (B)	20	-	Average of marks of Two tests, each conducted for 100 marks covering all experiments, scaled to 20.
Total CIE Practical (A+B)	50	20	Sum of Marks of Experiments, Record and Test shall be CIE marks awarded for a maximum of 50.
SEE (C)	50	20	SEE is a lab exam, conducted for 100 marks and scaled down to 50 marks. Exam duration shall be for 3 hours.
CIE + SEE (A+B+C)	100	40	Final marks shall be the sum of marks scored in Components A, B and C.
The minimum marks to be secured in CIE is 20 (40%) out of allotted 50 marks to appear for SEE.			

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 :

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



PROJECT BASED LEARNING COURSES		
1	BIDTP158	INNOVATION AND DESIGN THINKING LAB (PROJECT BASED LEARNING)
2	BIPRJ258	INTERDISCIPLINARY PROJECT BASED LEARNING

B.E. (All Engineering) Outcome Based Education(OBE) and Choice Based Credit System(CBCS) SEMESTER – I			
Course Title:	Innovation and Design Thinking Lab		
Course Code:	BIDTP158	CIE MARKS	50
L :T : P	0:0:2	SEE MARKS	50
Credits:	01	EXAM HOURS	3hr
COURSE LEARNING OBJECTIVES:			
<i>The purpose of the course is to facilitate the learner to:</i>			
1. Understand the principles of innovation, social entrepreneurship, and design thinking, and apply them to real-world problem-solving. 2. Develop the ability to empathize with stakeholders, explore field problems, and define meaningful challenge statements. 3. Cultivate creative ideation, rapid prototyping, and testing skills using interdisciplinary approaches and maker space tools. 4. Enhance teamwork, communication, and presentation skills by pitching socially relevant, user-centric, and scalable solutions.			
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's activities			
Week 4–5: Empathy and Field Exploration			
Weeks - 4 & 5: Field visits to public places of interest to students (e.g., village, Government Office, Industry, R&D institute, NGO), stakeholder interviews, and interactions. Recording all interactions through handwritten in the 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.			

How to generate ideas: Roles for a good Brainstorming session, Creativity Techniques.
Week-11: 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:

After successfully completing the course, the student will 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.

ASSESSMENT DETAILS (Both CIE and SEE)

Assessment Type	Maximum Marks	Minimum Passing Marks	Evaluation Details
CIE – Evaluation (A)	30	-	Communication and teamwork skill-building exercises, field visit reflections, stakeholder interviews, and an activity book.
CIE – Presentation (B)	20	-	Project pitching, poster presentation, storytelling, and scalability model.

Total CIE (A+B)	50	20	The sum of the marks of the Activity Book and Project Pitching shall constitute the CIE marks, awarded for a maximum of 50.
SEE (C)	50	20	Project Presentation (Innovation showcase, Poster display, Prototype)
CIE + SEE (A+B+C)	100	40	Final marks shall be the sum of marks scored in Components A, B, and C.
The minimum marks to be secured in CIE are 20 out of allotted 50 marks to appear for SEE, with minimum 40 % scored in every component of CIE.			

Reference Books:

1. Michael Lewrick, Patrick Link and Larry Leifer, "Design Thinking Playbook", John Wiley and Sons, 2018.
2. John.R.Karsnitz, Stephen O'Brien and John P. Hutchinson, "Engineering Design", Cengage learning (International edition) Second Edition, 2013.
3. Roger Martin, "The Design of Business: Why Design Thinking is the Next Competitive Advantage", Harvard Business Press , 2009.

B.E. (Common to All Branches of Engineering)			
Outcome Based Education (OBE) and Choice Based Credit System (CBCS)			
SEMESTER – I/II			
Course Title:	Interdisciplinary Project Based Learning		
Course Code:	1BPRJ258	CIE MARKS	50
(L: T: P) + SL	(0:0:2) + 0	SEE MARKS	50
Credits:	01	EXAM HOURS	3
Examination type (SEE)		Project Viva-Voce	
Course Objectives			
By the end of this course, students will be able to:			
1. Explore interdisciplinary thinking by discovering and integrating concepts from multiple domains to address real-world problems. 2. Develop problem identification and analysis skills through observation, research, and critical thinking in diverse application areas. 3. Enhance design and innovation capabilities by applying fundamental principles of science and engineering to create feasible solutions or prototypes. 4. Foster teamwork and collaboration by engaging students in group-based projects with clearly defined roles and responsibilities. 5. Build project management skills including planning, scheduling, documentation, and systematic execution of project tasks. 6. Strengthen communication and presentation skills through regular reviews, reports, and demonstrations. 7. Encourage socially responsible and sustainable thinking while designing solutions that address real-life societal and environmental challenges.			

SL. NO.	WEEK NUMBER	ACTIVITY TO BE COMPLETED	DELIVERABLES
1.	1 & 2	Introduction, Orientation, Team Formation, Problem Selection and Literature Survey	Team list + chosen problem/theme area and Synopsis with Literature survey report.
2.	3 & 4	Refining the Problem Statement, Multiple Solution Ideas and Selection of Best IDEA , Methodology/Prototype	Finalized Problem definition with objectives, List of solution concepts (sketches/flowcharts) and Design document (diagrams, flow), Prototype development plan and timeline, Phase I

		development plan	presentation
3.	5,6,7,8	Development of Subsystem/Modules & Prototyping	Demo of few subsystems in the prototype and mid-term presentation
4.	9,10, 11,12 & 13	Prototyping stage 2 Report and Paper writing/ Filing for IPR	Final Prototype/working model, Testing Results, Limitations/challenges, Final Review(Phase-II presentation), Draft and final report and paper submission/ IPR document submission
5.	14 &15	Final Demo and Project Open House	Presentation of the project with prototype and SDG alignment

General Instructions

1. Each group shall contain minimum of 4 and maximum of 6 students.
2. Nature of the group shall be multidisciplinary. (Group shall be formed by selecting students from different branches)
3. One faculty member shall be assigned to guide 2 to 4 teams.

Teaching-Learning Process (Innovative Delivery Methods)

1. Project Based Experiential Learning
2. Group discussion, Presentations.

Course Outcomes (Course Skill Set) –

On successful completion, students will be able to:

1. Identify and define problems requiring interdisciplinary knowledge.
2. Apply basic concepts of science, engineering, and technology to design simple solutions.
3. Work effectively in teams with defined roles and responsibilities.
4. Use project management, documentation, and presentation skills.
5. Develop socially relevant, sustainable, and innovative prototypes/solutions.

Assessment Structure:

The assessment 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., 20 marks, in the CIE.
- 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.

Submission Requirements:

- Submission of weekly progress reports.
- Final project report (Typed using LaTeX/ MS-Word).
- Final presentation ppt/pdf .
- Prototype or working model.
- Peer/team feedback and reflection entries (if applicable).

Internal Evaluation (CIE):

CIE Marks allocation Parameters for Interdisciplinary Project Work CIE Parameters (50 Marks)

Stage/Activity	Weightage (%)	Marks (out of 50)
Phase-I		
A. Problem Selection/Identification & Literature Survey, Concept Development & Design		03 marks
B. Timely submission of Synopsis	20%	02 marks
C. PHASE-I PRESENTATION		05 marks
MID TERM - PRESENTATION	Presentation to the Guide	
PHASE-II:		
A. Prototype Development Testing & Validation	40%	15 marks
Open House Demo		5 marks
B. PHASE-II PRESENTATION		
Paper writing/IPR documentation		
To submit completed paper in a conference journal and show proof of presentation/acceptance.	20%	10 marks
Proof of publishing IPR		
PHASE-III:		
Report writing	10%	10 marks

***Minimum CIE to Qualify for SEE: 20 out of 50**

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 (External Examiner can be from other branches of the same Institution)

Component	Marks (out of 100)	Description
Final Demonstration and report	60	i) Working model evaluation: Prototype satisfying all objectives, its Quality & Functionality is evaluated. ii) Social Impact & Sustainability: Relevance to society, cost-effectiveness, ethical considerations, environmental impact, and scalability. iii) Innovation & Originality: Creativity, uniqueness, feasibility, and application of interdisciplinary concepts. iv) Completeness, structure, accuracy, clarity in diagrams, data analysis, testing results and conclusions in the report are evaluated.
Final Presentation	20	Delivery, engagement and presentation are evaluated: Clear articulation of the problem, solution approach, discussion of results, and team contribution.
Viva-Voce	20	Response to questions is evaluated.

HUMANITIES AND SOCIAL SCIENCES COURSES		
1	BEGHD106/206	COMMUNICATION SKILLS
2	BSKHD109/209/ BBKHD109/209	SAMSKRUTIKA KANNADA / BALAKE KANNADA

B.E. (Common to All Branches of Engineering) Outcome Based Education (OBE) and Choice Based Credit System (CBCS) SEMESTER – I/II			
Course Title:	COMMUNICATION SKILLS		
Course Code:	BEGHD106/206	CIE MARKS	50
(L: T: P) + SL	1:0:0 + (15 hours)	SEE MARKS	50
Credits:	1	EXAM HOURS	2
COURSE LEARNING OBJECTIVES: <i>The purpose of the course is to facilitate the learner to:</i> 1. Use English as a communication tool through the four skills of listening, speaking, reading and writing to meet basic and practical communication needs on familiar topics related to college, recreational activities, career, etc. 2. Formulate and develop basic knowledge of English, including pronunciation, vocabulary and grammar. 3. Use English to improve the quality of learning other subjects in the general education curriculum. 4. Use English for further education or immediate employment. 5. Enable students to communicate effectively on digital media and navigate the digital landscape.			
Module-1: COMMUNICATION SKILLS			3 hrs
Communication Skills: Communication Process, Verbal and Non verbal, Proxemics, Chronemics and Barriers of Communication. Listening: English Pronunciation, Phonemes, Intelligible Accent, Speech Organs, Syllable Structure, Intonation and Practice. Speaking: Making enquiries about weather and places, Discussions on routine and giving directions. Grammar: Subject- Verb agreement, Sentence Structures. Extended Reading: <i>The Chimney Sweeper</i> by William Blake, <i>All the World is stage</i> by William Shakespeare, Martin Luther King Jr's <i>I have a dream</i> , Speech.			
Module-2: INTERPERSONAL SKILLS			3 hrs
Listening: Panel Discussions, Team Meetings, Negotiations, TED talks. Speaking: Introducing Oneself, Technical Presentation, Debate, Roleplay in Workplace Context, Group Discussion. Reading: Skimming, Scanning, Case Studies (Articles with opinions, Technology, Art and Space), Interview of an Achiever. Writing: Writing Introductions, Reflections based on the biography/ interview of an achiever, Express personal opinions. Grammar: Tenses with relative clauses. Vocabulary: Political and Technical jargon. Extended Reading: Interview of Dr. APJ Abdul Kalam and Mrs. Sudha Murthy.			
Module-3: ENGLISH FOR EMPLOYABILITY			3 hrs
Speaking: Making requests, asking permission, Gratitude and apology, Agreeing and disagreeing, guidelines and instructions. Listening: Colloquialism. Writing: Letter Writing (Letters on enquiry, order and complaint), Email Writing (Etiquette, Structure, Writing and Responding), Paragraph Writing (Expository, Descriptive, Argumentative, Short story, and Narrative). Reading: Proof reading (spelling, punctuation, grammar), Error identification exercises. Grammar: Reported Speech and Direct speech, Active and Passive Voice.			

Module-4: ENGLISH IN DIGITAL WORLD	3 hrs
Writing: Framing of search terms / keywords in search engines/ Commands for search on open AIs, citing information from source material, Write an opinion/post, Blog Writing, Plagiarism. Speaking: Online Communication- Types, Pro's and Con's, Acceptable online roles and Behaviours (Netiquette), and Etiquettes of social media. Listening: Online Engagement (discussions on social media). Reading: Reading a blog. Extended activity: Using AI tools to check grammar.	
Module-5: APPLYING FOR JOBS	3 hrs
Speaking: Mock Interview, Telephone interview, Formal and informal tone, Non-verbal information cues. Writing: Job application, Resume, CV, profile building. Listening and reading: Understand Basic conversations (Job discussions, self-description and introduction). Grammar: Modal Verbs. Vocabulary: Workplace Jargon. Extended activity: Using AI for mock interview.	

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Build essential verbal, non-verbal, and phonetic communication skills for clarity and effectiveness.
CO2	Use interpersonal skills in group discussions, presentations, and professional
CO3	Apply formal writing, email etiquette, and creative content development for employability.
CO4	Communicate effectively in digital platforms, following netiquette and academic integrity.
CO5	Prepare job applications, resume, and perform confidently in interviews.

ASSESSMENT DETAILS (Both CIE and SEE)

Assessment Type	Maximum Marks	Minimum Passing Marks	Evaluation Details
CIE – IA Tests (A)	30	-	Two Tests for 30 marks each (Average of the two will be computed)
Alternate Assessment (B)	20	-	Assignment 1: Quiz/ Projects/ Presentation Assignment 2: Case study/ Question & Answers
Total CIE (A+B)	50	20	CIE Evaluation is done for a maximum of 50 marks.
SEE (C)	50	18	Answer Multiple Choice Questions
CIE + SEE (A+B+C)	100	40	Final marks shall be the sum of marks scored in Components A, B and C

The minimum marks to be secured in CIE are 20 out of allotted 50 marks to appear for SEE, with minimum 40 % scored in every component of CIE.

Textbooks

1. Kumar, A. R. (2008). *English for engineers and technologists*. Orient BlackSwan.
2. Raman, M., & Sharma, S. (2015). *Technical communication: Principles and practice* (3rd ed.). Oxford University Press.
3. Floyd, K., & Cardon, P. W. (2019). *Business and professional communication* (3rd ed.). Principles of Scientific and Technical Writing, 1e, By Pratap K. J. Mohapatra, Sanjib Moulick, © 2025 | Published: December 23, 2024
4. *Effective Technical Communication*, 3e, By Ashraf M. Rizvi, Priyadarshi Patnaik, © 2024 | Published: September 12, 2024
5. Yadav, D. P. (2022). *A course in English pronunciation*. Notion Publications.

Learning Resources:

1. Oxford Advance Learners Dictionary
2. Cambridge English Skills Real Listening and Speaking by Miles Craven
3. Communicative English for Professionals by Nitin Bhatnagar and Mamta Bhatnagar

Other Digital Resources:

1. **Google Docs + Voice Typing** - <https://docs.google.com>
2. **LearnEnglish** – <https://learnenglish.britishcouncil.org/>
3. **Take IELTS** - <https://www.britishcouncil.in/exam/ielts>
4. **British Council Apps** – BBC Learn English online Grammar
Learn English Podcasts
IELTS Word Power
Sounds Right (Phonemic Chart)

B.E. (Common to All Branches of Engineering) Outcome Based Education (OBE) and Choice Based Credit System(CBCS) SEMESTER – I/II			
Course Title:	ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ		
Course Code:	BSKHD109/209	CIE MARKS	50
(L :T : P) + SL	(1:0:0) + (15 hrs)	SEE MARKS	50
Credits:	01	EXAM HOURS	02
ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ ಪಠ್ಯ ಕಲಿಕೆಯ ಉದ್ದೇಶಗಳು: 1. ವೃತ್ತಿಪರ ಪದವಿ ವಿದ್ಯಾರ್ಥಿಗಳಾಗಿರುವುದರಿಂದ ಕನ್ನಡ ಭಾಷೆ ಸಾಹಿತ್ಯ ಮತ್ತು ಕನ್ನಡದ ಸಂಸ್ಕೃತಿಯ ಪರಿಚಯ ಮಾಡಿಕೊಡುವುದು 2. ಕನ್ನಡ ಸಾಹಿತ್ಯದ ಪ್ರಧಾನ ಭಾಗವಾದ ಆಧುನಿಕ ಪೂರ್ವ ಮತ್ತು ಆಧುನಿಕ ಕಾವ್ಯಗಳನ್ನು ಸಾಂಸ್ಕೃತಿಕವಾಗಿ ಪರಿಚಯಿಸುವುದು 3. ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ಸಾಹಿತ್ಯ ಮತ್ತು ಕನ್ನಡದ ಸಂಸ್ಕೃತಿಯ ಬಗ್ಗೆ ಅರಿವು ಹಾಗೂ ಆಸಕ್ತಿಯನ್ನು ಮೂಡಿಸುವುದು. 4. ತಾಂತ್ರಿಕ ವ್ಯಕ್ತಿಗಳ ಪರಿಚಯವನ್ನು ಹಾಗೂ ಅವರುಗಳು ಸಾಧಿಸಿದ ವಿಷಯಗಳನ್ನು ಪರಿಚಯಿಸುವುದು. 5. ಸಾಂಸ್ಕೃತಿಕ, ಜನಪದ ಹಾಗೂ ಪ್ರವಾಸ ಕಥನಗಳ ಪರಿಚಯ ಮಾಡಿಕೆ			
ಘಟಕ - 1 ಕನ್ನಡ ಸಂಸ್ಕೃತಿ ಮತ್ತು ಭಾಷೆ ಕುರಿತಾದ ಲೇಖನಗಳು (3 ಘಂಟೆ)			
1. ಕರ್ನಾಟಕ ಸಂಸ್ಕೃತಿ - ಹಂಪ ನಾಗರಾಜಯ್ಯ 2. ಕರ್ನಾಟಕ ಏಕೀಕರಣ: ಒಂದು ಅಪೂರ್ವ ಚರಿತ್ರೆ ಜಿ.ವೆಂಕಟಸುಬ್ಬಯ್ಯ 3. ಆಡಳಿತ ಭಾಷೆಯಾಗಿ ಕನ್ನಡ - ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ್ ಮತ್ತು ಪ್ರೊ. ವಿ. ಕೇಶವಮೂರ್ತಿ			
ಘಟಕ - 2 ಆಧುನಿಕ ಪೂರ್ವದ ಕಾವ್ಯ ಭಾಗ (3 ಘಂಟೆ)			
1. ವಚನಗಳು : ಬಸವಣ್ಣ, ಅಕ್ಕಮಹಾದೇವಿ, ಅಲ್ಲಮಪ್ರಭು, ಆಯ್ಯಕ್ಕಿ ಮಾರಯ್ಯ, ಜೇಡರ ದಾಸಿಮಯ್ಯ, ಆಯ್ಯಕ್ಕಿ ಲಕ್ಕಮ್ಮ 2. ಕೀರ್ತನೆಗಳು ಅದರಿಂದೇನು ಫಲ ಇದರಿಂದೇನು ಫಲ ಪುರಂದರದಾಸರು ತಲ್ಲಣಿಸಿದಿರು ಕಂಡ್ಯ ತಾಳು ಮನವೇ ಕನಕದಾಸರು 3. ತತ್ವಪದಗಳು : ಸಾವಿರ ಕೊಡಗಳ ಸುಟ್ಟು - ಸಂತ ಶಿಶುನಾಳ ಶರೀಫ			
ಘಟಕ - 3 ಆಧುನಿಕ ಕಾವ್ಯ ಭಾಗ (3 ಘಂಟೆ)			
1. ಡಿ ವಿ ಜಿ ರವರ ಮಂಕುತಿಮ್ಮನ ಕಗ್ಗದಿಂದ ಆಯ್ದ ಕೆಲವು ಭಾಗಗಳು 2. ಕುರುಡು ಕಾಂಚಾಣ : ದ. ರಾ. ಬೇಂದ್ರೆ 3. ಹೊಸಬಾಳಿನ ಗೀತೆ : ಕುವೆಂಪು			
ಘಟಕ - 4 ತಾಂತ್ರಿಕ ವ್ಯಕ್ತಿಗಳ ಪರಿಚಯ (3 ಘಂಟೆ)			
1. ಡಾ.ಸರ್. ಎಂ.ವಿಶ್ವೇಶ್ವರಯ್ಯ ವ್ಯಕ್ತಿ ಮತ್ತು ಐತಿಹ್ಯ - ಎ ಎನ್ ಮೂರ್ತಿರಾವ್ 2. ಕರಕುಶಲ ಕಲೆಗಳು ಮತ್ತು ಪರಂಪರೆಯ ವಿಜ್ಞಾನ - ಕರಿಗೌಡ ಬೀಚನಹಳ್ಳಿ			
ಘಟಕ - 5 ಸಾಂಸ್ಕೃತಿಕ ಜನಪದ ಕಥೆ ಮತ್ತು ಪತ್ರ ವ್ಯವಹಾರ (3 ಘಂಟೆ)			
1. ಯುಗಾದಿ - ವಸುದೇಂದ್ರ 2. ಪತ್ರ ವ್ಯವಹಾರ / ಪತ್ರ ಅರ್ಜಿಯ ವಿವಿಧ ಬಗೆಗಳು			

COURSE OUTCOMES

After successfully completing the course, the student will be able to

CO1	ಕನ್ನಡ ಭಾಷೆ ಸಾಹಿತ್ಯ ಮತ್ತು ಕನ್ನಡದ ಸಂಸ್ಕೃತಿಯ ಅರಿವು ಮೂಡಿರುತ್ತದೆ.
CO2	ಕನ್ನಡದ ಸಾಹಿತ್ಯದ ಪ್ರಧಾನ ಭಾಗವಾದ ಆಧುನಿಕ ಪೂರ್ವ ಮತ್ತು ಆಧುನಿಕ ಕಾವ್ಯಗಳನ್ನು ಸಾಂಕೇತಿಕವಾಗಿ ಕಲಿತು ಹೆಚ್ಚಿನ ಓದಿಗೆ ಮತ್ತು ಜ್ಞಾನಕ್ಕೆ ಸ್ಪೂರ್ತಿ ಮೂಡುತ್ತದೆ.
CO3	ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ಸಾಹಿತ್ಯ ಮತ್ತು ಕನ್ನಡದ ಸಂಸ್ಕೃತಿಯ ಬಗ್ಗೆ ಅರಿವು ಹಾಗೂ ಆಸಕ್ತಿ ಹೆಚ್ಚಾಗುತ್ತದೆ.
CO4	ತಾಂತ್ರಿಕ ವ್ಯಕ್ತಿಗಳ ಪರಿಚಯ ಹಾಗೂ ಅವರುಗಳು ಸಾಧಿಸಿದ ವಿಷಯಗಳನ್ನು ತಿಳಿದುಕೊಂಡು ನಾಡಿನ ಇನ್ನಿತರ ವ್ಯಕ್ತಿಗಳ ಬಗ್ಗೆ ತಿಳಿದುಕೊಳ್ಳಲು ಕೌತುಕ ಹೆಚ್ಚಾಗುತ್ತದೆ.
CO5	ಕಥೆಗಳ ಬಗ್ಗೆ ಕುತೂಹಲ ಹೆಚ್ಚಾಗುತ್ತದೆ ಮತ್ತು ವಿವಿಧ ಪ್ರಕಾರದ ಅರ್ಜಿ ಮತ್ತು ಪತ್ರಗಳನ್ನು ಬರೆಯುವ ವಿಧಾನಗಳನ್ನು ತಿಳಿದುಕೊಳ್ಳುತ್ತಾರೆ.

ASSESSMENT DETAILS (Both CIE and SEE)

Insert suitable assessment table as per credits.

Assessment Type	Maximum Marks	Minimum Passing Marks	Evaluation Details
CIE - IA Tests (A)	30	-	Two tests each of 50marks shall be conducted average of two internal assessment tests shall be scaled down to 30 marks.
Alternate Assessment (B)	20	-	Any two-learning activity in the given list scaled to 20 marks
Total CIE (A+B)	50	20	CIE Evaluation is done for a maximum of 50 marks.
SEE (C)	50	18	SEE is a theory exam conducted for 100 marks and scaled down to 50 marks exam duration shall be for 3 hours
CIE + SEE (A+B+C)	100	40	Final marks shall be the sum of marks scored in Components A, B and C.

The minimum marks to be secured in CIE is 20 (40%) out of allotted 50 marks to appear for SEE.



ಪಠ್ಯಪುಸ್ತಕ:

1. ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ - ಡಾ.ಹೀ ಚಿ ಬೋರ ಲಿಂಗಯ್ಯ, ಡಾ. ಎಲ್ ತಿಮ್ಮೇಶ

ಪರಾಮರ್ಶನ ಪುಸ್ತಕಗಳು:

1. ಡಿವಿಜಿ- ಜ್ಞಾಪಕ ಚಿತ್ರ ಶಾಲೆ
2. ಫ. ಗು ಹಳಕಟ್ಟಿ - ವಚನ ಸಾಹಿತ್ಯ ಸಾರ
3. ಕುವೆಂಪು- ವಿಚಾರಕ್ರಾಂತಿಗೆ ಆಹ್ವಾನ



B.E. (Common to All Branches of Engineering) Outcome Based Education(OBE) and Choice Based Credit System(CBCS) SEMESTER – I / II			
Course Title:	Balake Kannada (ಬಳಕೆ ಕನ್ನಡ)		
Course Code:	BBKHD109/209	CIE MARKS	50
(L : T : P) +SL	1:0:0 + (15 hrs)	SEE MARKS	50
Credits:	01	EXAM HOURS	02
Course objectives: ಬಳಕೆ ಕನ್ನಡ ಪಠ್ಯ ಕಲಿಕೆಯ ಉದ್ದೇಶಗಳು The Course will enable the students 1. To create the awareness regarding the necessity of learning local language for comfortable and healthy life. 2. To enable learners to listen and understand the Kannada language properly. 3. To speak, read and write Kannada language as per requirement. 4. To train the learners for correct and polite Conservation. 5. To know about Karnataka state and its language and general information about this state.			
ಬೋಧನೆ ಮತ್ತು ಕಲಿಕಾ ವ್ಯವಸ್ಥೆ (Teacher Learning Process – General Instructions): These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes. 1. ಬಳಕೆ ಕನ್ನಡವನ್ನು ತರಗತಿಯಲ್ಲಿ ಶಿಕ್ಷಕರು ಬೋಧಿಸಲು ವಿಟಿಯು ಸೂಚಿಸಿರುವ ಪಠ್ಯ ಪುಸ್ತಕವನ್ನು ಉಪಯೋಗಿಸಬೇಕು. 2. ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್‌ಗಳನ್ನು ತಯಾರಿಸಲು ವಿದ್ಯಾರ್ಥಿಗಳನ್ನು ಉತ್ತೇಜಿಸುವುದು ಮತ್ತು ತರಗತಿಯಲ್ಲಿ ಅವುಗಳನ್ನು ಚರ್ಚಿಸಲು ಅವಕಾಶ ಮಾಡಿಕೊಡುವುದು. 3. ಪ್ರತಿ ವಿದ್ಯಾರ್ಥಿ ಪುಸ್ತಕವನ್ನು ತರಗತಿಯಲ್ಲಿ ಬಳಸುವಂತೆ ನೋಡಿಕೊಳ್ಳುವುದು ಮತ್ತು ಪ್ರತಿ ಪಾಠ ಮತ್ತು ಪ್ರವಚನಗಳ ಮೂಲ ಅಂಶಗಳಿಗೆ ಸಂಬಂಧಪಟ್ಟಂತೆ ಪೂರಕ ಚಟುವಟಿಕೆಗಳಿಗೆ ತೊಡಗಿಸಿಕೊಳ್ಳುವುದು. 4. ಡಿಜಿಟಲ್ ತಂತ್ರಜ್ಞಾನದ ಮುಖಾಂತರ ಇತ್ತೀಚೆಗೆ ಡಿಜಿಟಲೈಸೇಷನ್ ಗೊಂಡಿರುವ ಭಾಷೆ ಕಲಿಕೆಯ ವಿಧಾನಗಳನ್ನು ಪಿಪಿಟಿ ಮತ್ತು ದೃಶ್ಯ ಮಾಧ್ಯಮದ ಮುಖಾಂತರ ಚರ್ಚಿಸಲು ಕ್ರಮ ಕೈಗೊಳ್ಳುವುದು. ಇದರಿಂದ ವಿದ್ಯಾರ್ಥಿಗಳನ್ನು ತರಗತಿಯಲ್ಲಿ ಹೆಚ್ಚು ಏಕಾಗ್ರತೆಯಿಂದ ಪಾಠ ಕೇಳಲು ಮತ್ತು ಅಧ್ಯಯನದಲ್ಲಿ ತೊಡಗಲು ಅನುಕೂಲವಾಗುತ್ತದೆ. 5. ಭಾಷಾಕಲಿಕೆಯ ಪ್ರಯೋಗಾಲಯದ ಮುಖಾಂತರ ಬಹುಬೇಗ ಕನ್ನಡ ಭಾಷೆಯನ್ನು ಕಲಿಯಲು			
MODULE – 1			(03 hrs)
1. Introduction Necessity of learning a local language. Methods to learn the Kannada language. 2. Easy learning of a Kannada language. A few tips . hints for correct and polite conservation , Listening and Speaking Activities, Key to Transcription. 3. ವೈಯಕ್ತಿಕ, ಸ್ವಾಮ್ಯಸೂಚಕ/ಸಂಬಂಧಿತ ಸರ್ವನಾಮಗಳ ಮತ್ತು ಪ್ರಶ್ನಾರ್ಥಕ ಪದಗಳು – personal Pronouns Possessive Forms, Interrogative words.			

MODULE – 2	(03 hrs)
1. ನಾಮಪದಗಳ ಸಂಬಂಧಾರ್ಥಕ ರೂಪಗಳು, ಸಂದೇಹಾಸ್ಪದ ಪ್ರಶ್ನೆಗಳು ಮತ್ತು ಸಂಬಂಧವಾಚಕ ನಾಮಪದಗಳು – Possessive forms of nouns, dubitive question and relative nouns. 2. ಗುಣ ಪರಿಮಾಣ ಮತ್ತು ವರ್ಣಬಣ್ಣ ವಿಶೇಷಣಗಳು, ಸಂಖ್ಯಾವಾಚಕಗಳು Qualitative, Quantitative and Colour Adjectives, Numerals. 3. ಕಾರಕ ರೂಪಗಳು ಮತ್ತು ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯಗಳು - ಸಪ್ರಮಿ ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯ -(ಅ, ಅದು, ಅವು, ಅಲ್ಲಿ) – Predictive Forms, locative Case.	
MODULE – 3	(03 hrs)
1. ಚತುರ್ಥಿ ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯದ ಬಳಕೆ ಮತ್ತು ಸಂಖ್ಯಾವಾಚಕಗಳು – Dative Cases, and Numerals. 2. ಸಂಖ್ಯಾಗುಣವಾಚಕಗಳು ಮತ್ತು ಬಹುವಚನ ನಾಮರೂಪಗಳು – Ordinal numerals and Plural markers. 3. ನ್ಯೂನ / ನಿಷೇಧಾರ್ಥಕ ಕ್ರಿಯಾಪದಗಳು ಮತ್ತು ವರ್ಣ ಗುಣವಾಚಕಗಳು – Defective/ Negative Verbs & Colour Adjectives	
MODULE – 4	(03 hrs)
1. ಅಪ್ರಣೆ / ಒಪ್ಪಿಗೆ, ನಿರ್ದೇಶನ, ಪ್ರೋತ್ಸಾಹ ಮತ್ತು ಒತ್ತಾಯ ಅರ್ಥರೂಪ ಪದಗಳು ಮತ್ತು ವಾಕ್ಯಗಳು permission, commands, encouraging and urging words. (imperative words and sentences) 2. ಸಾಮಾನ್ಯ ಸಂಭಾಷಣೆಗಳಲ್ಲಿ ದ್ವಿತೀಯ ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯಗಳು ಮತ್ತು ಸಂಭವನೀಯ ಪ್ರಕಾರಗಳು Accusative Cases and Potential Forms used in General Communication.	
MODULE – 5	(03 hrs)
1. ಕಾಲ ಮತ್ತು ಸಮಯದ ಹಾಗೂ ಕ್ರಿಯಾಪದಗಳ ವಿವಿಧ ಪ್ರಕಾರಗಳು – Different types of Tense, Time and Verbs. 2. ದ್ವಿ, - ತ್ವ, - ತು, - ಇತ್ಯು, - ಆಗಿ, - ಅಲ್ಲ, - ಗೆ, - ಕ್, - ಇದೆ ಕ್ರಿಯಾ ಪ್ರತ್ಯಯಗಳೊಂದಿಗೆ ಭೂತ, ಭವಿಷ್ಯತ್ ಮತ್ತು ವರ್ತಮಾನ ಕಾಲ ವಾಕ್ಯ ರಚನೆ – Formation of Past, Future and Present Tense sentences with verbs forms. 3. Kannada Vocabulary List - ಸಂಭಾಷಣೆಯಲ್ಲಿ ದಿನೋಪಯೋಗಿ ಕನ್ನಡ ಪದಗಳು	

Course outcomes:

ಬಳಕೆ ಕನ್ನಡ ಪಠ್ಯ ಕಲಿಕೆಯಿಂದ ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ ಆಗುವ ಅನುಕೂಲಗಳು ಮತ್ತು ಫಲಿತಾಂಶಗಳು

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

CO1	To understand the necessity of learning of local language for comfortable life.
CO2	To Speak, read and write Kannada language as per requirement.
CO3	To communicate (converse) in Kannada language in their daily life Kannada speakers.
CO4	To listen and understand the Kannada language properly.
CO5	To speak in polite conversation

ASSESSMENT DETAILS (Both CIE and SEE)

Assessment Type	Maximum Marks	Minimum Passing Marks	Evaluation Details
CIE – IA Tests (A)	30	-	Average of three internal assessment tests (MCQs) each conducted for 30 marks
Alternate Assessment (B)	20	-	Any two assessment methods scale to 20 marks
Total CIE (A+B)	50	20	CIE evaluation is done for a maximum of 50 marks
SEE (C)	50	18	Question papers having 50 MCQs with each questions carrying 01 mark, and examination duration is 1 hour
CIE + SEE (A+B+C)	100	40	Final marks shall be the sum of marks scored in components A, B, and C
The minimum marks to be secured in CIE are 20 out of allotted 50 marks to appear for SEE, with minimum 40 % scored in every component of CIE.			

Suggested Learning Resources:

1. ಹೆಚ್ಚಿನ ಮಾಹಿತಿ ಮತ್ತು ವಿವರಣೆಗಳಿಗೆ ಡಾ. ಎಲ್ . ತಿಮ್ಮೇಶ್ (9900832331) ಇವರನ್ನು ಸಂಪರ್ಕಿಸಿ
2. ಮಾದರಿ ಪ್ರಶ್ನೆ ಪರ್ತಿ, ಕೋರ್ಸ್ ಆಯ್ಕೆ ಮಾಹಿತಿ, ಅಧ್ಯಯನ ಸಾಮಗ್ರಿ ಮತ್ತು ಬಹು ಆಯ್ಕೆ ಮಾದರಿಯ ಪ್ರಶ್ನೆಗಳ ಕೈ ಪಿಡಿಗಾಗಿ ವಿಶ್ವವಿದ್ಯಾಲಯದ ವೆಬ್ ಸೈಟ್ ನೋಡುವುದು

NON CREDIT MANDATORY COURSES		
1	BICHD107/207	INDIAN CONSTITUTION & ENGINEERING ETHICS
2	BSSHD106/206	SOFT SKILLS

B.E. (Common to All Branches of Engineering) Outcome Based Education(OBE) and Choice Based Credit System(CBCS) SEMESTER – I and II			
Course Title:	Indian Constitution and Engineering Ethics		
Course Code:	BICHD107/207	CIE MARKS	100
(L: T : P) + SL	1:0:0 + (15 hours)	SEE MARKS	—
Credits:	00	EXAM HOURS	—
COURSE LEARNING OBJECTIVES: <i>The purpose of the course is to facilitate the learner to:</i> 1. To know about the basic structure of the Indian Constitution. 2. To know the Fundamental Rights (FRs), DPSP's, and Fundamental Duties of our constitution. 3. To know about our Union Government, political structure & codes, and procedures. 4. To know the State Executive & Elections system of India, Amendments and Emergency Provisions, other important provisions given by the constitution. 5. To know about Ethics, Trust & Reliability in Engineering, IPRs (Intellectual Property Rights), Risks, Safety and liability in Engineering.			
Module-1: Introduction to Indian Constitution			3 hrs
The Necessity of the Constitution, The Societies before and after the Constitution adoption. Introduction to the Indian constitution, The Framing of the Constitution, The Role of the Constituent Assembly. The Preamble of Indian Constitution & Key concepts of the Preamble. Salient features of India Constitution.			
Module-2: FR's, FD's and DPSP's			3 hrs
Fundamental Rights and its Restriction and limitations, Landmark Caselaws in FR, Directive Principles of State Policy (DPSP) and its present relevance to our society with examples. Fundamental Duties and its Scope and significance in Nation building.			
Module-3: Union Executive			3 hrs
Parliamentary System, Union Executive – President, Prime Minister, Union Cabinet, Parliament – Lok Sabha and Rajya Sabha, Parliamentary Committees, Public Interest Litigation, Supreme Court of India, Judicial Reviews and Judicial Activism.			
Module-4: State Executive & Elections, Amendments and Emergency Provisions			3 hrs
State Executive & Elections, Amendments and Emergency Provisions: State Executive, Election Commission, Elections. Amendment to Constitution (How and Why) and Important Constitutional Amendments till today. Emergency Provisions			
Module-5: Professional Ethics			3Hrs
Ethics & Values. Types of Ethics. Scope & Aims of Professional & Engineering Ethics. Positive and Negative Faces of Engineering Ethics. Clash of Ethics, Conflicts of Interest. The impediments to Responsibility. Trust & Reliability in Engineering, IPRs (Intellectual Property Rights), Risks, Safety and liability in Engineering.			

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Analyse the basic structure of Indian Constitution
CO2	Remember their Fundamental Rights, DPSP's and Fundamental Duties (FD's) of our constitution
CO3	Know about our Union Government, political structure & codes, procedures.
CO4	Understand our State Executive & Elections system, Amendments and Emergency Provisions, other important provisions given by the constitution
CO5	Know about Ethics, Trust & Reliability in Engineering, IPRs (Intellectual Property Rights), Risks, Safety and liability in Engineering.

ASSESSMENT DETAILS (Both CIE and SEE)

Zero-credit NCMC courses (MCQs for assessment)			
Assessment Type	Maximum Marks	Minimum Passing Marks	Evaluation Details
CIE - IA Tests (A)	60	-	Sum of Two Internal Assessment Tests (MCQs) each conducted for 30 marks.
Continuous and Comprehensive Evaluation (B)	40	-	Any two Assessment methods as per 24RNBE4.2, scaled to 40 marks.
Total CIE (A+B)	100	40	CIE Evaluation is done for a maximum of 100 marks.
The minimum marks to be secured in CIE is 40 (40%) out of allotted 100 marks to Pass.			

Textbooks

1. "Constitution of India" (for Competitive Exams) – Published by Naidhruva Edutech Learning Solutions, Bengaluru. – 2022
2. "Introduction to the Constitution of India", (Students Edition.) by Durga Das Basu (DD Basu).
3. "Engineering Ethics", M.Govindarajan, S.Natarajan, V.S.Senthilkumar, Prentice –Hall, 2004

Reference Books:-

1. "The Constitution of India" by Merunandan K B: published by Merugu Publication, Second Edition
2. "Samvidhana Odu" – for Students & Youths by Justice HN Nagamohan Dhas, Sahayana, kerekon.

B.E. (Common to All Branches of Engineering) Outcome Based Education (OBE) and Choice Based Credit System (CBCS) SEMESTER – I/II			
Course Title:	Soft Skills		
Course Code:	BSSHD106/206	CIE MARKS	100
(L: T : P) + SL	1:0:0 + (15 hours)	SEE MARKS	—
Credits:	00	EXAM HOURS	—
COURSE OBJECTIVES: <i>The purpose of the course is to facilitate the learner to:</i> 1. Apply social skills for clear communication, persuasion, self-awareness, and active listening. 2. Use emotional skills to build confidence, manage stress, and adapt to change. 3. Set ambitious goals, practice empathy, and apply creativity for problem-solving. 4. Demonstrate discipline, time management, and structured problem-solving. 5. Work in teams, negotiate, resolve conflicts, and think critically.			
Module I – Social Skills			3 hrs
• 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.			
Module II Emotional Skills I			3 hrs
• 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. • Adaptability and resilience: Handling change, bouncing back from setbacks, and developing a growth mindset.			
Module 3 Emotional Skills II			3 hrs
• 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).			
Module 4 Professional Skills I			3 hrs
• Problem Solving: Identifying root causes, analysing 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, avoiding procrastination.			

Module 5 Professional Skills II	3 hrs
• 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: The ability to analyse, evaluate, and synthesize information to make well-reasoned decisions.	

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Ability to communicate convincingly and negotiate diplomatically for professional interactions.
CO2	Apply systematic approaches to prioritize tasks and manage time efficiently.
CO3	Develop the ability to theorize, discuss, elaborate, criticize and defend their ideas.
CO4	Analyse complex problems and develop effective, structured solutions.
CO5	Demonstrate emotional intelligence and to work effectively in teams.

Assessment Details:

Zero-credit NCMC courses (MCQs for assessment)			
Assessment Type	Maximum Marks	Minimum Passing Marks	Evaluation Details
CIE - IA Tests (A)	60	-	Sum of Two Internal Assessment Tests (MCQs) each conducted for 30 marks.
Continuous and Comprehensive Evaluation (B)	40	-	Any two Assessment methods as per 24RNBE4.2, scaled to 40 marks.
Total CIE (A+B)	100	40	CIE Evaluation is done for a maximum of 100 marks.
• The minimum marks to be secured in CIE is 40 (40%) out of allotted 100 marks to Pass.			

Textbook:

1. Principles of Scientific and Technical Writing, 1e, By Pratap K. J. Mohapatra, Sanjib Moulick, © 2025 | Published: December 23, 2024
2. Soft Skills, 1e, By Soma Mahesh Kumar © 2024 | Published: June 8, 2023
3. Effective Technical Communication, 3e, By Ashraf M. Rizvi, Priyadarshi Patnaik, © 2024 Published: September 12, 2024
4. Yadav, D. P. (2022). *A course in English pronunciation*. Notion Publications.

Learning Resources:

1. Oxford Advance Learners Dictionary

2. Cambridge English Skills Real Listening and Speaking by Miles Craven
3. Communicative English for Professionals by Nitin Bhatnagar and Mamta Bhatnagar

Digital Resources

1. Google Docs + Voice Typing - <https://docs.google.com>
2. Learn English – <https://learnenglish.britishcouncil.org/>
3. Take IELTS - <https://www.britishcouncil.in/exam/ielts>
4. British Council Apps - BBC Learn English online Grammar
5. Learn English Podcasts IELTS WordPower
6. BBC Learn English online Grammar online Sounds Right (Phonemic Charts)



ADDITIONAL REQUIREMENTS FOR THE AWARD OF B.E DEGREE

Student's Induction Program

Motivating (Inspiring) Activities under the Induction program – The main aim of the induction program is to provide newly admitted students a broad understanding of society, relationships, and values. Along with the knowledge and skill of his/her study, students' character needs to be nurtured as an essential quality by which he/she would understand and fulfil the responsibility as an engineer. The following activities are to be covered in 21 days. Physical Activity, Creative Arts, Universal Human Values, Literary, Proficiency Modules, Lectures by Eminent People, Visits to Local areas, Familiarization with Department/Branch and Innovation, etc.

AICTE Activity Points Requirement for B.E / B.Tech Programmes

As per AICTE guidelines, in addition to academic requirements, students must earn a specified number of Activity Points to be eligible for the award of the degree. The points to be earned is:

1. Regular students admitted to a 4-year degree program must earn 100 Activity Points.
2. Lateral entry students (joining from the second year) must earn 75 Activity Points.
3. Students transferred from other universities directly into the fifth semester must earn 50 Activity Points from the date of entry into VTU.

These Activity Points are non-credit and will not be considered for the SGPA/CGPA or be used for vertical progression. However, earning Activity Points is mandatory for the award of the degree, and the points earned will be reflected on the eighth semester Grade Card. If a student completes all the semesters (eight or six) at the end of the programme but fails to earn the required Activity Points, the eighth-semester Grade Card will be withheld until the requirement is fulfilled. Also, the degree will be awarded only after the Grade Card has been released. The hours spent earning the activity points will not be counted for regular attendance requirements. Students can accumulate these points at any time during their program period, including weekends, holidays, and vacations, starting from the year of admission, provided they meet the minimum hours of engagement prescribed for each activity by AICTE.

Skill Labs

In order to enhance the employability and strengthen the hands on training, experiential learning, innovation, design thinking, prototyping, industry collaboration and domain specific skill development, thereby enhancing student's technical competence, professional skills, Skill Labs are introduced as an integral part of the curriculum for under graduate (UG) programmes of the university. The Skill Labs are mandatory for all UG students admitted under the 2025- Scheme of programmes.

Each skill lab shall have a minimum duration of 25-30 hours. Successful Completion of one Skill Lab of 25-30 hours shall carry one credit.

Students admitted to the 2025 Scheme of all UG programmes through regular admission shall successfully complete five (05) skill labs:

- a) Students admitted in the year 2025 under regular scheme shall complete these labs between 3rd to 7th semester for a total of 5 credits.
- b) Lateral entry students (joining from the second year) under regular scheme shall complete these labs between 3rd to 7th semester for a total of 4 credits.
- c) Students admitted in the year 2026 under regular scheme shall complete these labs between 1st to 6th semester for a total of 5 credits.
- d) Lateral entry students (joining from the second year) under regular scheme shall complete these labs between 3rd to 6th semester for a total of 4 credits.
- e) However, the additional Skill Lab credits shall not be considered for the award of rank, programme cumulative grade point average (CGPA) or vertical progression.
- f) The successful completion of the prescribed Skill labs shall however be reflected in the **Eighth Semester Grade Card**.

The detailed guidelines regarding the implementation, conduct and evaluation of Skill Labs will be intimated.









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RNS INSTITUTE OF TECHNOLOGY

AN AUTONOMOUS INSTITUTION, AFFILIATED TO VTU, APPROVED BY AICTE, NAAC WITH A+ GRADE



Dr. B. N. Murthy



SUSTAINABLE DEVELOPMENT GOALS





BACHELOR OF ENGINEERING

Scheme and Syllabus of I & II Semesters
(2025 Autonomous Scheme)



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