KARNATAK LAW SOCIETY'S

GOGTE INSTITUTE OF TECHNOLOGY

UDYAMBAG, BELAGAVI-590008

(An Autonomous Institution under Visvesvaraya Technological University, Belagavi)

(APPROVED BY AICTE, NEW DELHI)

Scheme and Syllabus
Of
FIRST Year Bachelor of Engineering (B.E.)
(2025 Scheme)

FROM AY 2025-26

INSTITUTION VISION

Gogte Institute of Technology shall stand out as an institution of excellence in technical education and in training individuals for outstanding caliber, character coupled with creativity and entrepreneurial skills.

MISSION

To train the students to become Quality Engineers with High Standards of Professionalism and Ethics who have Positive Attitude, a Perfect blend of Techno-Managerial Skills and Problem solving ability with an analytical and innovative mindset.

QUALITY POLICY

- Imparting value added technical education with state-of-the-art technology in a congenial, disciplined and a research oriented environment.
- Fostering cultural, ethical, moral and social values in the human resources of the institution.
- Reinforcing our bonds with the Parents, Industry, Alumni, and to seek their suggestions for innovating and excelling in every sphere of quality education.

DEPARTMENT VISION

MISSION

PROGRAM OUTCOMES (POs)	
1.	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2.	Problem analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3.	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4.	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5.	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6.	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.
7.	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
8.	Individual and collaborative team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
9.	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
10.	Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
11.	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

KLS Gogte Institute of Technology
1st Year B.E.
Scheme of Teaching and Examination- 2025
Outcome-Based Education (OBE) and Choice Based Credit System (CBCS)
(Effective from the academic year 2025-26)

Total credits for B.E. Program: 160

Credit definition:

Offline Courses	Online Courses
• 1-hour Lecture **(L)** per week = 1 Credit • 2 hours Tutorial **(T)** per week = 1 Credit, • 2 hours Practical /Drawing **(P)** per week = 1 Credit	• 04 weeks =1 Credit • 08 weeks = 2 Credit • 12 weeks = 3 Credit
• 04-Credit theory courses are designed for 50 hours of Teaching-Learning Session • 04-Credit (IC) course is designed for 40 hours' theory and 16-20 hours of practical sessions • 03-Credit theory courses are designed for 40 hours of Teaching-Learning Session • 03-Credit (IC) course is designed for 25 hours' theory and 16-20 hours of practical sessions • 02- Credit theory courses are designed for 25 hours of Teaching-Learning Session • 01-Credit theory courses are to be designed for 12-13 hours of Teaching-Learning sessions • 01- Credit lab courses are to be designed for 10-12 practical sessions of 2 hours each.	

Semester wise distribution of credits for B.E program

Year	Semester	Credits	Total/Year	Cumulative Credits
1st	**I**	20	**40**	**40**
	II	20		
2nd	**III**	20	**40**	**40**
	IV	20		
3rd	**V**	20	**40**	**40**
	VI	20		
4th	**VII**	20	**40**	**40**
	VIII	20		
Total				**160**

Curriculum frame work:

General Structure of Undergraduate Engineering program

S.No.	Category of courses	Breakup of credits (Tentative)
1	Humanities and Social Sciences including Management courses (English, Kannada, Indian Constitution, Environmental Sciences and Management)	10
2	Basic Science courses	22
3	Engineering Science courses including workshop, drawing	24
4	Professional Core Courses	54
5	Professional Elective courses relevant to chosen specialization/branch	12
6	Open electives – Electives from other technical, emerging, arts commerce and	9
7	Mini, Project, Major Project work and Seminar	10
8	Summer Internship and Research /Industrial Internship	10
9	Ability Enhancement Courses, including Research Methodology, NCC/NSS/ Sports/Ex- Curricular, Online Certification Course	7
10	Universal Human Values	2
	TOTAL	**160**

L-T-P Model for Courses

	Contact Hours				Credits	
S.No.	**L-T-P**	**Lecture**	**Tutorial**	**Practical**	**L-T-P**	**Total**
1	3 - 0 - 0	3	0	0	3 - 0 - 0	3
2	3 - 2 - 0	3	2	0	3 - 1 - 0	4
3	3 - 0 - 2	3	0	2	3 - 0 - 1	4
4	2 - 0 - 2	2	0	2	2 - 0 - 1	3
5	1 - 0 - 4	1	0	4	1 - 0 - 2	3
6	1 - 0 - 0	1	0	0	1 - 0 - 0	1
7	0 - 0 - 2	0	0	2	0 - 0 - 1	1

Nomenclature

ASC-Applied Science Course, **IC** – Integrated Course (Practical Course Integrated with Theory Course), PSC-Programme Specific Course, **ESC**- Engineering Science Courses, **ETC**- Emerging Technology Course, **AEC**-Ability Enhancement Course, **NCMC:** Non Credit Mandatory Course, **PP**: (Pass/Pass) is assigned to a noncredit course. "PP" represents pass in course provided students have successfully completed the CIE requirements. Otherwise, "NP-not pass shall be awarded. "PP" is essential for the award of the degree. **PLC(IC)**- Programming Language Course (Integrated Course), **AEC/SDC**- Ability Enhancement Course/Skill Development course, **TD/PSB**- Teaching Department / Paper Setting Board, **HSMS**-Humanity, Social Science and management Course, **S- (SAAE)** Students' Academic Activity Engagement Hours, **CIE –**Continuous Internal Evaluation, **SEE-**Semester End Examination,

Scheme of Teaching and Examinations (2025)

Outcome-Based Education (OBE)and Choice-Based Credit System (CBCS) (Effective from the academic year 2025-26) for **EC. ME, CV, AE departments**

I Semester **(Physics Group)**

Sl. No	Course and Course Code		Course Title	TD/PSB	Teaching Hours/Week				Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	SAAE	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	ASC(IC)	1BMATx101	Applied Mathematics -I (Stream Specific)	Maths Dept	3	0	2		03	100	100	200	04
2	ASC(IC)	1BPHYx102	Applied Physics (Stream Specific)	PHY Dept	3	0	2		03	100	100	200	04
3	ESC(IC)	1BCEDx103	Computer-Aided Engineering Drawing (Stream Specific)	ME Dept	2	0	2		03	100	100	200	03
4	ESC	1BXXX104x	Engineering Science Courses-I	Respective Engg Dept	3	0	0		03	100	100	200	03
5	PSC	1Bxxx105	Program- Specific Course	Respective Engg Dept	3	0	0		03	100	100	200	03
6	AEC (NCMC)	1Bxxx106	Soft Skills	Humanities Dept	1	0	0		--	100	--	100	--
7	PSC	1BxxxL107	Program- Specific Course Lab	Respective Engg Dept	0	0	2		02	50	50	100	01
8	AEC/SDC	1BIDTL158	Innovation and Design Thinking Lab (**Project-based learning)**	Respective Dept	0	0	2		02	50	50	100	01
9	HSMS	1BKSK109(BKSK107)/ 1BKBK109(BKBK107)	Samskrutika Kannada/ Balake Kannada	Humanities Dept	1	0	0		01	50	50	100	01
				TOTAL	16	0	10		20	750	650	**1400**	**20**
10	**AICTE Activity Points** (students have to earn **100** activity points between 01 to 08 semester)				Compulsory requirement for the award of a degree								

ASC-Applied Science Course, **IC** – Integrated Course (Practical Course Integrated with Theory Course), PSC-Programme Specific Course, **ESC**- Engineering Science Courses, **ETC**-Emerging Technology Course, **AEC**- Ability Enhancement Course, **NCMC:** Non Credit Mandatory Course, **PP**: (Pass/Pass) is assigned to a noncredit course. "PP" represents pass in course provided students have successfully completed the CIE requirements. Otherwise, "NP-not pass shall be awarded. "PP" is essential for the award of the degree. **PLC(IC)**-Programming Language Course (Integrated Course), **AEC/SDC**- Ability Enhancement Course/Skill Development course, **TD/PSB**- Teaching Department / Paper Setting Board, **HSMS**-Humanity, Social Science and management Course, **S- (SAAE)** Students' Academic Activity Engagement Hours, **CIE** –Continuous Internal Evaluation, **SEE**-Semester End Examination,

Credit Definition:
1-hour Lecture **(L)** per week=**1Credit**
2-hoursTutorial**(T)** per week=**1Credit**
2-hours Practical / Drawing (**P**) per week=**1Credit**

04-Credit courses are designed for 50 hours of Teaching-Learning Session
04-Credit (IC) is designed for 40 hours' theory and 10-12 hours of practical sessions
03-Credit courses are designed for 40 hours of Teaching-Learning Session
02- Credit courses are designed for 25 hours of Teaching-Learning Session
01-Credit courses are to be designed for 12 hours of Teaching-Learning sessions

Applied Mathematics-I					Applied Physics				
Code	**Title**	**L**	**T**	**P**	**Code**	**Title**	**L**	**T**	**P**
1BMATM101	Differential Calculus and Differential Equations (Mech, Civ, Aero)	3	0	2	1BPHYC102	Physics for Sustainable Structural Systems (CV stream)	3	0	2
1BMATE101	Differential Calculus and Differential Equations (EE ,EC)	3	0	2	1BPHYM102	Physics of Materials (ME, AE stream)	3	0	2
1BMATS101	Linear Algebra And Transforms (CS ,AIML)	3	0	2	1BPHEC102	Quantum Physics and Electronics Sensors (EC, EEE stream)	3	0	2
					1BPHYS102	Quantum Physics and Applications (CSE, AI stream)	3	0	2
Computer-Aided Engineering Drawing					**Engineering Science Courses-I(ESC-I)**				
1BCEDAE103	Computer-Aided Engineering Drawing for AE Stream	2	0	2	1BESC104A	Introduction to Building Sciences	3	0	0
1BCEDC103	Computer-Aided Engineering Drawing for CV Stream	2	0	2	1BESC104B	Introduction to Electrical Engineering	3	0	0
1BCEDM103	Computer-Aided Engineering Drawing for ME stream	2	0	2	1BESC104C	Introduction to Electronics & Communication Engineering	3	0	0
1BCEDEC103	Computer-Aided Engineering Drawing for ECE stream	2	0	2	1BESC104D	Introduction to Mechanical Engineering	3	0	0
1BCEDEE103	Computer-Aided Engineering Drawing for EEE stream	2	0	2	1BESC104E	Essentials of Information Technology	3	0	0
1BCEDS103	Computer-Aided Engineering Drawing for CSE, AI stream	2	0	2	1BESC104F	Introduction to Aeronautical Engineering	3	0	0
Program- Specific Courses (PSC)					**Program-Specific Course Lab (PSCL)**				
1BCIV105	Engineering Mechanics	3	0	0	1BMEML107	Mechanics and Materials Lab	0	0	2
1BEEE105	Basics of Electrical Engineering	3	0	0	1BEEEL107	Basic Electrical Engineering Lab	0	0	2
1BBEC105	Fundamentals of Electronics & Communication Engineering	3	0	0	1BBEEL107	Fundamentals of Electronics & Communication Engineering Lab	0	0	2
1BEME105	Elements of Mechanical Engineering	3	0	0	1BEMEL107	Elements of Mechanical Engineering Lab	0	0	2
1BEIT105	Programming in C	3	0	0	1BPOPL107	C Programming Lab	0	0	2
1BEAE105	Elements of Aeronautical Engineering	3	0	0	1BEAEL107	Elements of Aeronautical Engineering Lab	0	0	2

Integrated courses (IC), combining theory with practical components.

(i) Theory sessions shall be conducted for 2/ 3 hours per week, while the practical sessions shall be conducted for 2 hours per week.

(ii) Theory components shall be evaluated through both Continuous Internal Evaluation (CIE) and Semester End Examination (SEE) depending on the course.

(iii) The practical component shall be assessed only through CIE.

The Mathematics/Physics courses shall be taught by a single faculty member per session, with no sharing of the course (subject) modules. The **lab/tutorial sessions** for the **Mathematics course** shall be conducted in the laboratory environment using **MATLAB/Scilab software** to enhance computational understanding and application skills.

All students admitted to the engineering program have to complete **Applied Mathematics-I and Applied Mathematics-II** in I and II semesters by selecting the courses prescribed for their respective stream.

Those who have completed the physics course under the heading Applied Physics in I semester have to select the prescribed stream wise chemistry course under the heading Applied chemistry during II semester.

Programme Specific Courses (PSC): Programme Specific Courses (PSC) are a set of core courses tailored to a specific branch or discipline of engineering in which a student is enrolled (e.g., Mechanical Engineering, Computer Science, Civil Engineering, etc.). These courses are intended to provide students with in-depth knowledge and specialized skills essential for professional competence in the chosen field. Students must select and complete the course from this group that **corresponds to their admitted program stream.** Similarly, students are also required to choose and pass laboratory courses that are specific to their stream from the **Programme Specific Courses Laboratory (PSCL) group.**

Engineering Sciences Courses-I(ESC-I): These courses are designed to broaden the technical knowledge of students beyond their core area of study. These courses enable students to gain a foundational understanding of engineering principles from other stream courses. Students are required to select and complete two courses that are not belong to their admitted program stream. For example, a student admitted to the any programme of the Civil Engineering stream should not select Introduction to Building Sciences but any other two. One course shall be selected under ESC-I and another course under ESC-II. The two courses must be different from the other.

Computer-Aided Engineering Drawing: The courses under this category are stream-specific. Students must select and complete the course that is relevant to their admitted engineering stream**.**

The **Student Induction Programme** (SIP), initiated by the All India Council for Technical Education (AICTE), is designed to help newly admitted students in technical institutions transition smoothly into the higher education environment. It aims to familiarize students with the institutional culture, foster connections with peers and faculty, and provide a foundation for holistic learning. Activities under SIP may include Physical Activities, Creative Arts, Universal Human Values, Literary Events, Proficiency Modules. Lectures shall be by Eminent Personalities, Local Area Visits, Department/Branch Familiarization, and Innovation-related sessions.

The first year of the Engineering programmes is composed of I semester, II semester and Summer Semester. SIP activities shall be scheduled in the afternoon sessions during the first week of class commencement of I and II semesters only.

The specific programmes to be conducted will be notified separately through a separate notification.

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

As per AICTE guidelines (refer Chapter 6 – *AICTE Activity Point Program, Model Internship Guidelines*), in addition to academic requirements, students must earn a specified number of **Activity Points** to be earned is to be eligible for the award of their degree.

- **Regular students** admitted to a 4-year degree program must earn **100 Activity Points**.
- **Lateral entry students** (joining from the second year) must earn **75 Activity Points**.
- **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, they are mandatory for the **award of the degree**, and the points earned will be reflected in the **eighth semester Grade Card**.

The hours spent for earning the activity points shall not be counted for regular attendance requirements. Students can accumulate these points at any time during their program, including on weekends, holidays, and vacations starting from the year of admission, provided they meet the minimum hours of engagement prescribed for each activity.

If a student fails to earn the required Activity Points, the eighth-semester Grade Card will be withheld until the requirement is fulfilled. Consequently, the degree will be awarded only after the Grade Card has been released.

Sl No	Stream	UG Programmes under the stream with code
1	Civil Engineering Stream (CV)	(1) Civil engineering (CV), (2) Mining Engineering (MI)
2	Mechanical Engineering Stream (ME)	(1)Aeronautical Engineering (AE), (2)Aerospace Engineering (AS),(3) Agricultural Engineering (AG),(4)Automation and Robotics (AR), (5)Automobile Engineering (AU), (6)Chemical Engineering (CH), (7) Industrial & Production Engineering (IP), (8)Industrial Engineering & Management (IM), (9) Manufacturing Science and Engineering (MS), (10) Marine Engineering (MR), (11) Mechanical & Smart Manufacturing (MM), (12) Mechanical Engineering (ME), (13)Mechatronics (MT), (14) Petrochem Engineering (PC), (15)Robotics & Automation (RA),(16) Robotics and Artificial Intelligence (RI),(17)Silk Technology (ST), (18) Textile Technology (TX),(19)Energy Engineering (ER),(20) Smart Agritech (SA).
3	Electrical and Electronics Engineering Stream (EEE)	(1) Electronics & Communication Engineering (EC), (2) Biomedical Engineering (BM), (3) Electrical & Electronics Engineering (EE), (4) Electronics & Instrumentation Engineering (EI), (5) Electronics & Telecommunication Engineering (ET), (6) Industrial IoT (IO), (7) Medical Electronics Engineering (ML),(8) Electronics Engineering (VLSI Design and Technology) (VL),(9) Electronics & Communication(Advanced Communication Technology) (EA),(10) Electronics & Computer Engineering (UE).
4	Computer Science and Engineering Stream (CSE)	(1) Computer Science and Engineering (CS), (2) Computer Engineering (CE), (3)Artificial Intelligence and Data Science (AD), (4) Artificial Intelligence and Machine Learning (AI),(5) Biotechnology (BT),(6)Computer & Communication Engineering (CM), (7) Computer Science and Business System (CB),(8) Computer Science and Design (CG),(9) Computer Science and Engineering (IoT) (CO), (10)CSE(Artificial Intelligence and Machine Learning) (CI),(11) CSE(Artificial Intelligence) (CA),(12) CSE(Cyber Security) (CY), (13)CSE(Data Science) (CD),(14) CSE(IoT and Cyber Security including Block Chain Technology) (IC), (15) Data Science (DS), (16) Information Science & Engineering (IS),(17) Computer Science (CR).

Scheme of Teaching and Examinations (2025)

Outcome-Based Education (OBE)and Choice-Based Credit System (CBCS) (Effective from the academic year 2025-26) for **EC. ME, CV, AE departments**

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

Sl. No	Course and Course Code		Course Title	TD/PSB	Teaching Hours/Week				Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	SAAE	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	ASC(IC)	1BMATx201	Applied Mathematics -II (Stream Specific)	Maths Dept	3	0	2		03	100	100	200	04
2	ASC(IC)	1BCHEx202	Applied Chemistry (Stream Specific)	CHE Dept	3	0	2		03	100	100	200	04
3	ETC	1BAIA203	Introduction to AI and Applications	Any Dept	3	0	0		03	100	100	200	03
4	ESC	1BESC204x	Engineering Science Course-II	Respective Engg Dept	3	0	0		03	100	100	200	03
5	PLC(IC)	1BPLC205x	Programming Language Course	CSE & allied Dept	3	0	2		03	100	100	200	04
6	AEC	1BENGL206	Communication Skills	Humanities Dept	1	0	1		02	50	50	100	01
7	AEC (NCMC)	1BICO207	Indian Constitution & Engineering Ethics	Respective Dept	1	0	0		01	100	--	100	--
8	AEC/SDC	1BPRJ258	Interdisciplinary Project-Based Learning	Respective Dept (Multiple Dept)	0	0	0	2	02	100	--	100	01
				TOTAL	17	0	07	02	20	750	550	**1300**	**20**

ASC-Applied Science Course, **IC** – Integrated Course (Practical Course Integrated with Theory Course), **ESC**- Engineering Science Courses, **PLC(IC)**- Programming Language Course (Integrated Course), **AEC**- Ability Enhancement Course, **NCMC**: Non Credit Mandatory Course, **TD/PSB**- Teaching Department / Paper Setting Board, **HSMC**- Humanity, Social Science and management Course, **S- (SAAE)**- Students' Academic Activity Engagement Hours, **AEC/SDC**- Ability Enhancement Course/Skill Development course, **CIE** – Continuous Internal Evaluation, **SEE**- Semester End Examination, **PP** : (Pass/Pass) is assigned to a noncredit course. "PP" represents pass in course provided students have successfully completed the CIE requirements. Otherwise, "NP-not pass shall be awarded. "PP" is essential for the award of the degree

Integrated courses (IC), combining theory with practical components.

The theory sessions shall be conducted for 2/ 3 hours per week, while the practical sessions shall be conducted for 2 hours per week.

- The theory component will be evaluated through both Continuous Internal Evaluation (CIE) and Semester End Examination (SEE) depending on the course.
- The practical component will be assessed only through CIE.

Applied Mathematics-II					Applied Chemistry				
Code	**Title**	**L**	**T**	**P**	**Code**	**Title**	**L**	**T**	**P**
1BMATM201	Linear Algebra and Integral Calculus (Civ,Mech,Aero)	3	0	2	1BCHEC202	Applied Chemistry for Sustainable Built Environment (CV)	3	0	2
1BMATE201	Calculus And Linear Algebra(EE,EC)	3	0	2	1BCHEM202	Applied Chemistry for Metal Protection and Sustainable Energy (ME,AE)	3	0	2
1BMATS201	Statistics And Probability(CS,AIML)	3	0	2	1BCHEE202	Applied Chemistry for Futuristic Devices (EEE, ECE)	3	0	2
					1BCHES202	Applied Chemistry for Smart Systems (CSE,AI)	3	0	2
Engineering Sciences Courses II(ESC-II)					**Programming Language Courses (PLC)**				
1BESC204A	Introduction to Building Sciences	3	0	0	1BPLC205E	Introduction to C Programming (for non-IT programmes)	3	0	2
1BESC204B	Introduction to Electrical Engineering	3	0	0	1BPLC205B	Python Programming (For CSE and allied programmes)	3	0	2
1BESC204C	Introduction to Electronics & Communication Engineering	3	0	0					
1BESC204D	Introduction to Mechanical Engineering	3	0	0					
1BESC204E	Essentials of Information Technology	3	0	0					
1BESC204F	Introduction to Aeronautical Engineering	3	0	0					

The Mathematics/Chemistry courses shall be taught by a single faculty member per session, with no sharing of the course (subject) modules. The **lab/tutorial sessions** for the **Mathematics course** shall be conducted in the laboratory environment using **MATLAB/Scilab software** to enhance computational understanding and application skills.

Students admitted to a specific engineering stream are required to select and successfully complete **Applied Mathematics-II** and **Applied Chemistry courses** that are aligned to their program stream.

Engineering Sciences Courses-II(ESC-II): These courses are designed to broaden the technical knowledge of students beyond their core area of study. These courses enable students to gain a foundational understanding of engineering principles from other disciplines. Students are required to select and complete a course under ESC-II that does not belong to their admitted program stream. Students should select a course other than that was selected under ESC-I and other than course not belonging to their stream.

For the course ***Interdisciplinary Project*** **(BPRJ258)**, it is mandatory to form a team comprising students from multiple engineering disciplines. For example, a project team may include students from Mechanical Engineering, Electronics and Communication Engineering (ECE) and Computer Science and Engineering (CSE), working collaboratively to design and implement the project.

Scheme of Teaching and Examinations-2025

Outcome-Based Education (OBE) and Choice-Based Credit System (CBCS) (Effective from the academic year 2025-26) for **CS. AI-ML & EE departments**

I Semester **(Chemistry Group)**

Sl. No	Course and Course Code		Course Title	TD/PSB	Teaching Hours/Week				Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	SAAE	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	ASC(IC)	1BMATx101	Applied Mathematics-I (Stream Specific)	Maths Dept	3	0	2		03	100	100	200	04
2	ASC(IC)	1BCHEx102	Applied Chemistry (Stream Specific)	CHE Dept	3	0	2		03	100	100	200	04
3	ETC	1BAIA103	Introduction to AI and Applications	Any Dept	3	0	0		03	100	100	200	03
4	ESC	1BESC104x	Engineering Science Course I	Respective Engg Dept	3	0	0		03	100	100	200	03
5	PLC(IC)	1BPLC105x	Programming Language Course	CSE & allied Dept	3	0	2		03	100	100	200	04
6	AEC(NCMC)	1Bxxx106	Soft Skills	Humanities Dept	1	0	0		--	100	--	100	--
7	AEC (NCMC)	1BICO107	Indian Constitution & Engineering Ethics	Respective Dept	1	0	0		--	100	--	100	--
8	AEC/SDC	1BIDTL158	Innovation and Design Thinking Lab (**Project-based learning)**	Any Dept	0	0	2		02	50	50	100	01
	TOTAL				17	0	08		17	750	550	**1300**	**19**
9	**AICTE Activity Points** (students have to earn **100** activity points between 01 to 08 semesters)				Compulsory requirement for the award of a degree								

ASC-Applied Science Course, **ESC**- Engineering Science Courses, **IC** – Integrated Course (Practical Course Integrated with Theory Course), **PLC(IC)**- Programming Language Course (Integrated Course), **AEC**- Ability Enhancement Course, **NCMC:** Non Credit Mandatory Course, **AEC/SDC**- Ability Enhancement Course/Skill Development course, **TD/PSB**- Teaching Department / Paper Setting Board, **S- (SAAE)-**Students' Academic Activity Engagement Hours, **CIE** –Continuous Internal Evaluation, **SEE**- Semester End Examination, **PP** : (Pass/Pass) is assigned to a noncredit course. "PP" represents pass in a course provided students have successfully completed the CIE requirements. Otherwise, "NP-not pass shall be awarded. "PP" is essential for the award of the degree

Credit Definition:

1-hour Lecture **(L)** per week=**1Credit**

2-2-hoursTutorial**(T)** per week=**1Credit**

3-hours Practical / Drawing (**P**) per week=**1Credit**

04-Credit courses are designed for 50 hours of Teaching-Learning sessions

04-Credit (IC) courses are designed for 40 hours' theory and 10-12 hours of practical sessions

03-Credit courses are designed for 40 hours of Teaching-Learning Session

02- Credit courses are designed for 25 hours of Teaching-Learning Session

01-Credit courses are designed for 12 hours of Teaching-Learning sessions

Applied Mathematics-I					Applied Chemistry				
Code	**Title**	**L**	**T**	**P**	**Code**	**Title**	**L**	**T**	**P**
1BMATM101	Differential Calculus and Differential Equations (Mech, Civ, Aero)	3	0	2	1BCHEC102	Applied Chemistry for Sustainable Built Environment (CV)	3	0	2
1BMATE101	Differential Calculus and Differential Equations (EE ,EC)	3	0	2	1BCHEM102	Applied Chemistry for Metal Protection and Sustainable Energy (ME,AE)	3	0	2
1BMATS101	Linear Algebra And Transforms (CS ,AIML)	3	0	2	1BCHEE102	Applied Chemistry for Futuristic Devices (EEE, ECE)	3	0	2
					1BCHES102	Applied Chemistry for Smart Systems (CSE,AI)	3	0	2
Engineering Science Courses-I (ESC-I)					**Programming Language Courses (PLC)**				
Code	**Title**	**L**	**T**	**P**	**Code**	**Title**	**L**	**T**	**P**
1BESC104A	Introduction to Building Sciences	3	0	0	1BPLC105E	Introduction to C Programming (for non-IT programmes)	3	0	2
1BESC104B	Introduction to Electrical Engineering	3	0	0	1BPLC105B	Python Programming (For CSE and allied programmes)	3	0	2
1BESC104C	Introduction to Electronics & Communication Engineering	3	0	0					
1BESC104D	Introduction to Mechanical Engineering	3	0	0					
1BESC104E	Essentials of Information Technology	3	0	0					
1BESC104F	Introduction to Aeronautical Engineering	3	0	0					

Integrated courses (IC), combining theory with practical components.

(i) Theory sessions shall be conducted for 2/ 3 hours per week, while the practical sessions shall be conducted for 2 hours per week.

(ii) Theory components shall be evaluated through both Continuous Internal Evaluation (CIE) and Semester End Examination (SEE), depending on the course.

(iii) The practical component shall be assessed only through CIE.

The Mathematics/Chemistry courses shall be taught by a single faculty member per session, with no sharing of the course (subject) modules. The **lab/tutorial sessions** for the **mathematics course** shall be conducted in the laboratory envir651onment using **MATLAB.Scilab software** to enhance computational understanding and application skills.

All students admitted to the engineering program have to complete **Applied Mathematics-I and Applied Mathematics-II** in I and II semesters by selecting the subjects prescribed for their stream, viz. CV, ME, EEE or CSE, under the heading Mathematics-I and Mathematics-II.

Those who have completed the chemistry course under the heading Applied Chemistry in I semester have to select the prescribed stream wise physics course under the heading Applied physics during II semester.

Engineering Sciences Courses-I (ESC-I): These courses are designed to broaden the technical knowledge of students beyond their core area of study. These courses enable students to gain a foundational understanding of engineering principles from other stream courses. Students are required to select and complete two courses that

are not belong to their admitted program stream. For example, a student admitted to the any programme of the Civil Engineering stream should not select Introduction to Building Sciences but any other two. One course shall be selected under ESC-I and another course under ESC-II. The two courses must be different from the other.

The **Student Induction Programme** (SIP), initiated by the All India Council for Technical Education (AICTE), is designed to help newly admitted students in technical institutions transition smoothly into the higher education environment. It aims to familiarize students with the institutional culture, foster connections with peers and faculty, and provide a foundation for holistic learning. Activities under SIP may include Physical Activities, Creative Arts, Universal Human Values, Literary Events, and Proficiency Modules. Lectures shall be by Eminent Personalities, Local Area Visits, Department/Branch Familiarization, and Innovation-related sessions.

The first year of the Engineering programmes is composed of I semester, II semester and Summer Semester. SIP activities shall be scheduled in the afternoon sessions during the first week of class commencement of I and II semesters only. The specific programmes to be conducted will be notified separately through a separate notification.

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

As per AICTE guidelines (refer Chapter 6 – *AICTE Activity Point Program, Model Internship 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 in 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.

Sl. No	Stream	UG Programmes under the stream with code
1	Civil Engineering Stream (CV)	(1) Civil engineering (CV), (2) Mining Engineering (MI)
2	Mechanical Engineering Stream (ME)	(1)Aeronautical Engineering (AE), (2)Aerospace Engineering (AS),(3) Agricultural Engineering (AG),(4)Automation and Robotics (AR), (5)Automobile Engineering (AU), (6)Chemical Engineering (CH), (7) Industrial & Production Engineering (IP), (8)Industrial Engineering & Management (IM), (9) Manufacturing Science and Engineering (MS), (10) Marine Engineering (MR), (11) Mechanical & Smart Manufacturing (MM), (12) Mechanical Engineering (ME), (13)Mechatronics (MT), (14) Petrochem Engineering (PC), (15)Robotics & Automation (RA),(16) Robotics and Artificial Intelligence (RI),(17)Silk Technology (ST), (18) Textile Technology (TX),(19)Energy Engineering (ER),(20) Smart Agritech (SA).
3	Electrical and Electronics Engineering Stream (EEE)	(1) Electronics & Communication Engineering (EC), (2) Biomedical Engineering (BM), (3) Electrical & Electronics Engineering (EE), (4) Electronics & Instrumentation Engineering (EI), (5) Electronics & Telecommunication Engineering (ET), (6) Industrial IoT (IO), (7) Medical Electronics Engineering (ML),(8) Electronics Engineering (VLSI Design and Technology) (VL),(9) Electronics & Communication(Advanced Communication Technology) (EA),(10) Electronics & Computer Engineering (UE).
4	Computer Science and Engineering Stream (CSE)	(1) Computer Science and Engineering (CS), (2)Computer Engineering (CE), (3) Artificial Intelligence and Data Science (AD), (4)Artificial Intelligence and Machine Learning (AI),(5)Biotechnology (BT),(6)Computer & Communication Engineering (CM), (7) Computer Science and Business System (CB),(8)Computer Science and Design (CG),(9)Computer Science and Engineering (IoT) (CO), (10)CSE(Artificial Intelligence and Machine Learning) (CI),(11) CSE(Artificial Intelligence) (CA),(12) CSE(Cyber Security) (CY), (13)CSE(Data Science) (CD),(14) CSE(IoT and Cyber Security including Block Chain Technology) (IC), (15) Data Science (DS), (16) Information Science & Engineering (IS),(17) Computer Science (CR).

Scheme of Teaching and Examinations-2025

Outcome-Based Education(OBE) and Choice Based Credit System(CBCS) (Effective from the academic year 2025-26) for **CS. AI-ML & EE departments**

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

Sl. No	Course and Course Code		Course Title	TD/PSB	Teaching Hours/Week				Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	SAAE	Duration in hours	CIE Marks	SEE Marks	Total Mark	
					L	T	P	S					
1	ASC(IC)	1BMATx201	Applied Mathematics -II (Stream Specific)	Maths Dept	3	0	2		03	100	100	200	04
2	ASC(IC)	1BPHYx202	Applied Physics (Stream Specific)	PHY Dept	3	0	2		03	100	100	200	04
3	ESC(IC)	1BCEDx203	Computer-Aided Engineering Drawing (Stream Specific)	ME dept	2	0	2		03	100	100	200	03
4	ESC	1Bxxx204x	Engineering Science Course-II	Respective Engg Dept	3	0	0		03	100	100	200	03
5	PSC	1Bxxx205	Program- Specific Courses	Respective Engg Dept	3	0	0		03	100	100	200	03
6	AEC	1BENGL206	Communication Skills	Humanities Dept	1	0	1		01	50	50	100	01
7	PSC	1Bxxxl207x	Program- Specific Course Lab	Respective dept	0	0	2		02	50	50	100	01
8	AEC/SDC	1BPRJ258	Interdisciplinary Project-Based Learning	Combination of Departments	0	0	0	02	00	100	--	100	01
9	HSMC	1BKSK209(BKSK107)/ 1BKBK209(BKBK107)	Samskrutika Kannada/ Balake Kannada	Humanities Dept	1	0	0		01	50	50	100	01
	TOTAL				16	0	09	02	19	750	650	**1400**	**21**

ASC-Applied Science Course, **IC** – Integrated Course (Practical Course Integrated with Theory Course), **ESC**- Engineering Science Courses, **PSC**-Programme Specific Course, **ESC**-Engineering Science Courses, **ETC**- Emerging Technology Course, **AEC**- Ability Enhancement Course, **NCMC:** Non Credit Mandatory Course, **PP**: (Pass/Pass) is assigned to a non credit course. "PP" represents pass in course provided students have successfully completed the CIE requirements. Otherwise, "NP-not pass shall be awarded. "PP" is essential for the award of the degree **HSMC**-Humanity, Social Science and management Course, **AEC/SDC**- Ability Enhancement Course/Skill Development course, **TD/PSB**- Teaching Department / Paper Setting Board, **CIE** –Continuous Internal Ev0aluation, **SEE**- Semester End Examination, **S- (SAAE)-**Students' Academic Activity Engagement Hours,

Applied Mathematics-II					Applied Physics				
Code	**Title**	**L**	**T**	**P**	**Code**	**Title**	**L**	**T**	**P**
1BMATM201	Linear Algebra and Integral Calculus (Civ,Mech,Aero)	3	0	2	1BPHYC202	Physics for Sustainable Structural Systems (CV Stream)	3	0	2
1BMATE201	Calculus And Linear Algebra(EE,EC)	3	0	2	1BPHYM202	Physics of Materials (ME, AE stream)	3	0	2
1BMATS201	Statistics And Probability(CS,AIML)	3	0	2	1BPHEC202	Quantum Physics and Electronics Sensors (EC, EEE stream)	3	0	2
					1BPHYS202	Quantum Physics and Applications (CSE, AI stream)	3	0	2
Program- Specific Courses (PSC)					**Program- Specific Courses Lab (PSCL)**				
1BCIV205	Engineering Mechanics	3	0	0	1BMEML207	Mechanics and Materials Lab	0	0	2
1BEEE205	Basics of Electrical Engineering	3	0	0	1BEEEL207	Basic Electrical Engineering Lab	0	0	2
1BBEC205	Fundamentals of Electronics & Communication Engineering	3	0	0	1BBEEL207	Fundamentals of Electronics & Communication Engineering Lab	0	0	2
1BEME205	Elements of Mechanical Engineering	3	0	0	1BEMEL207	Elements of Mechanical Engineering Lab	0	0	2
1BEIT205	Programming in C	3	0	0	1BPOPL207	C Programming Lab	0	0	2
1BEAE205	Elements of Aeronautical Engineering	3	0	0	1BEAEL207	Elements of Aeronautical Engineering Lab	0	0	2
Engineering Science Courses-II (ESC-II)					**Computer-Aided Engineering Drawing**				
1BESC204A	Introduction to Building Sciences	3	0	0	**Code**	**Title**	**L**	**T**	**P**
1BESC204B	Introduction to Electrical Engineering	3	0	0	1BCEDAE203	Computer-Aided Engineering Drawing for AE Stream	2	0	2
1BESC204C	Introduction to Electronics & Communication Engineering	3	0	0	1BCEDC203	Computer-Aided Engineering Drawing for CV Stream	2	0	2
1BESC204D	Introduction to Mechanical Engineering	3	0	0	1BCEDM203	Computer-Aided Engineering Drawing for ME stream	2	0	2
1BESC204E	Essentials of Information Technology	3	0	0	1BCEDEC203	Computer-Aided Engineering Drawing for ECE stream	2	0	2
1BESC204F	Introduction to Aeronautical Engineering	3	0	0	1BCEDEE203	Computer-Aided Engineering Drawing for EEE stream	2	0	2
					1BCEDS203	Computer-Aided Engineering Drawing for CSE, AI stream	2	0	2

Integrated courses (IC), combining theory with practical components.

(i) Theory sessions will be conducted for 2/ 3 hours per week, while the practical sessions will be conducted for 2 hours per week.

(ii) Theory component shall be evaluated through both Continuous Internal Evaluation (CIE) and Semester End Examination (SEE) depending on the course.

(iii) The practical component will be assessed only through CIE.

The Mathematics/Physics courses shall be taught by a single faculty member per session, with no sharing of the course (subject) modules. The **tutorial sessions** for the **Mathematics course** shall be conducted in a laboratory environment using **MATLAB.Scilab software** to enhance computational understanding and application skills.

Students admitted to a specific engineering stream are required to select and successfully complete **Applied Mathematics-I** and **Applied Physics courses** that are aligned to their program stream.

Programme Specific Courses (PSC): Programme Specific Courses (PSC) are a set of core courses tailored to a specific branch or discipline of engineering in which a student is enrolled (e.g., Mechanical Engineering, Computer Science, Civil Engineering, etc.). These courses are intended to provide students with in-depth knowledge and specialized skills essential for professional competence in the chosen field. Students must select and complete the course from this group that **corresponds to their admitted program stream**. Similarly, students are also required to choose and pass laboratory courses that are specific to their stream from the **Programme Specific Courses Laboratory (PSCL)** group.
Computer-Aided Engineering Drawing: The courses under this category are stream-specific. Students must select and complete the course that is relevant to their admitted engineering stream**.**
Engineering Sciences Courses-II (ESC-II): These courses are designed to broaden the technical knowledge of students beyond their core area of study. These courses enable students to gain a foundational understanding of engineering principles from other disciplines. Students are required to select and complete a course that does not belong to their admitted program stream. Students should select a course other than that was selected under ESC-I and other than course not belonging to their stream.
For the course ***Interdisciplinary Project*** **(BPRJ258)**, it is mandatory to form a team comprising students from multiple engineering disciplines. For example, a project team may include students from Mechanical Engineering, Electronics and Communication Engineering (ECE), and Computer Science and Engineering (CSE), working collaboratively to design and implement the project.

Engineering Science Courses (ESC)

Code	Title	L	T	P	1st Semester	2nd Semester
1BESC104/204A	Introduction to Building Sciences	3	0	0	**AE,ME,EE,CSE,EC,AI**	**AE,ME,EE,CSE,EC,AI**
1BESC104/204B	Introduction to Electrical Engineering	3	0	0	**AE,CV,ME,CSE,EC,AI**	**AE,CV,ME,CSE,EC,AI**
1BESC104/204C	Introduction to Electronics & Communication Engineering	3	0	0	**AE,CV,ME,EE,CSE,AI**	**AE,CV,ME,EE, CSE,AI**
1BESC104/204D	Introduction to Mechanical Engineering	3	0	0	**AE,CV,EE,CSE,EC,AI**	**AE,CV,EE,CSE,EC,AI**
1BESC104/204E	Essentials of Information Technology	3	0	0	**AE,CV,ME,EE,EC**	**AE,CV,ME,EE, EC**
1BESC104/204F	Introduction to Aeronautical Engineering	3	0	0	**CV,ME,EE,CSE,EC,AI**	**CV,ME,EE,CSE,EC,AI**

Engineering Technology Courses (ETC)

Code	Title	L	T	P	1st Semester	2nd Semester
1BAIA103/ 203	Introduction to AI and Applications	3	0	0	**CSE,AI,EE**	**AE,ME,EC,CV**

Programming Language Courses (PLC)

Code	Title	L	T	P	1st Semester-Che	2nd Semester-Che
BPLC105/205E	Introduction to C (for Non- IT programmes)	3	0	2		**ME,CV,AE**
BPLC105/205F	Python Programming (For CSE and allied programmes)	3	0	2	**CSE,AI,EE**	**EC**

- The student has to select one course from the ESC group.
- The students have to opt for the courses from ESC group without repeating the course in either 1st or 2nd semester.
- Students will be undergoing an ETC course on "Introduction to AI and Applications" in either 1st or 2nd semester.
- PLC consists of Introduction to C (for Non- IT programmes) & Python Programming (For CSE and allied programmes).
- All students will be undergoing Soft Skills in 1st sem and Communication Skills in 2nd sem.

APPLIED MATHEMATICS I and II Semester

INDEX

Applied Mathematics-I	
Code	**Title**
1BMATM101	Differential Calculus and Differential Equations (Mech, Civ, Aero)
1BMATE101	Differential Calculus and Differential Equations (EE ,EC)
1BMATS101	Linear Algebra And Transforms (CS ,AIML)

Applied Mathematics-II	
Code	**Title**
1BMATM201	Linear Algebra and Integral Calculus (Civ, Mech,Aero)
1BMATE201	Calculus And Linear Algebra(EE,EC)
1BMATS201	Statistics And Probability(CS,AIML)

Differential Calculus and Differential Equations(Mech,Civ,Aero)

Course Code	1BMATM101	Course type	Integrated	**Credits L-T-P**	3-0-1
Hours/week: L - T- P	3-0-2			**Total credits**	4
Total Contact Hours	L =40 Hrs; T =0 Hrs; P = 20 Hrs Total = 60Hrs			**CIE Marks**	100
Flipped Classes content	05 Hours			**SEE Marks**	100

Course learning objectives	
1.	To understand the concepts of curvature in various forms.
2.	To apply series expansion to functions for approximation.
3.	To understand the relevance of differential equations of first and higher order.
4.	To apply numerical methods to solve ordinary differential equations.

Pre-requisites : Basic Algebra, Limits, Continuity

Unit – I: Polar Curves and Curvature	**Contact Hours = 8 Hours**
Polar coordinates, Polar curves, angle between the radius vector and the tangent, angle between two curves. Curve tracing, Curvature and radius of curvature - Cartesian, parametric, polar form.	

Unit – II: Multivariable Calculus	**Contact Hours = 8 Hours**
Statement and problems on Taylor's and Maclaurin's series expansion for two variables. Partial differentiation, total derivative - differentiation of composite functions, Jacobian, Maxima and minima for the function of two variables.	

Unit – III: Vector Differential Calculus	**Contact Hours = 8 Hours**
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 and curl and scalar potential.	

Unit – IV: Ordinary Differential Equations of Higher Order	**Contact Hours = 8 Hours**
Higher-order linear ordinary differential equations with constant coefficients, homogeneous and non- homogeneous equations (e^{ax}, sin(ax+b), cos(ax+b), polynomial only), Method of variation of parameters, Cauchy's and Legendre's homogeneous differential equations. Applications: Solving governing differential equations of Mass Spring.	

Unit – V: Numerical Solutions of ODE	**Contact Hours = 8 Hours**
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 and Adam's-Bashforth predictor-corrector method Numerical solution of second order ordinary differential equations by Runge-Kutta method and Milnes method.	

Flipped Classroom Details

Unit No.	I	II	III	IV	V
No. for Flipped Classroom Sessions	1	1	1	1	1

List of Experiments

Unit No.	No. of Experiments	Topic(s) related to Experiment
1	3	1.2D plots for Cartesian and polar curves. 2.Finding angle between polar curves. 3.Finding Radius of curvature.
2	2	4.Expansion of Taylor's and Maclaurin's series. 5.Finding partial derivatives and Jacobian.
3	1	6.Finding gradient, divergence and curl
4	1	7.Solution of order ordinary differential equations and Plotting solution of ODE
5	3	8.Solution of ODE by Modified Euler's Method. 9.Solution of ODE by Runge Kutta Method. 10.Solution of ODE by Milne's Predictor and corrector Method

Unit No.	Self-Study Topics
1	Pedal equation, Radius of curvature in pedal form.
2	Lagrange's Multipliers
3	Vector Identities
4	Centre of curvature and evolute
5	Numerical solution of second order ordinary differential equations by Euler's method

Books	
	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.
3.	Gilbert Strang, Linear Algebra and its Applications, Cengage Publications, 4th Ed., 2022.
	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.
4.	H. K. Dass and Er. Rajnish Verma, Higher Engineering Mathematics, S. Chand Publication, 3rd Ed., 2014.
5.	David C Lay, Linear Algebra and its Applications, Pearson Publishers, 4th Ed., 2018.
	E-resources (NPTEL/SWAYAM.. Any Other)- mention links
1.	http://academicearth.org/
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/

Course delivery methods		**Assessment methods**	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Lab Test
3.	Flipped Classes	3.	Semester End Examination
4.	Practice session/Demonstrations in Labs	4.	
5.	Virtual Labs (if present)		

Course Outcome (COs) **Learning Levels:** Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create				
At the end of the course, the student will be able to (Highlight the **action verb** representing the learning level.)		**Learning Level**	**PO(s)**	**PSO(s)**
1.	Apply foundational concepts of calculus, multi variable calculus and vector calculus and model physical phenomena in science and engineering.	L1,L2,L3	1	
2.	Solve higher-order ordinary differential equations and apply appropriate numerical methods to find approximate solutions of ordinary differential equations in engineering contexts.	L1,L2,L3	1	
3.	Demonstrate the ability to apply MATLAB tool for solving engineering problems.	L2	5	

Scheme of Continuous Internal Evaluation (CIE):

For integrated courses, a lab test also will be conducted at the end of the semester. The lab test **(COMPULSORY)** will be part of the CIE. **No SEE for Lab**.

THEORY (60 marks)		**LAB (40 marks)**		Total
IA test 1	IA test 2	Average of Lab Conduction & Assignment/Open ended Expt/CP	Lab test	
30 marks	30 marks	10 marks	30 marks	100 marks

IA Test:
1. 10 marks questions in Part A of IA question paper should also include an OBE related question (max 2 marks).
2. Remaining 20 marks questions in Part B & C should be descriptive.

Conduct of Lab:
1. a. Conducting the experiment and journal: 5 marks
   b. Calculations, results, graph, conclusion and Outcome: 5 marks
2. The Assignment (Certification), open ended experiment or a course project will be conducted for 10 marks & the Average of both components will be taken to award 10 marks.

Lab test: (Batchwise with 15 students/batch)
1. Test will be conducted at the end of the semester
2. Timetable, Batch details and examiners will be declared by Exam section
3. Conducting the experiment and writing report: 5 marks
4. Calculations, results, graph and conclusion: 15 marks
5. Viva voce: 10 marks

Eligibility for SEE:
1. **Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests. Lack of minimum score in IA test will make the student Not Eligible for SEE**

2. **Student should score minimum 40% of 30 marks (i.e. 12 marks) in Lab test & should score 40% of 40 marks (i.e. 16 marks) in Lab component.**
3. Lab test is COMPULSORY
4. **Minimum score in CIE to be eligible for SEE: 40 OUT OF 100.**
5. Not eligible in any one of the two components will make the student **Not Eligible** for SEE

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 100 marks of 3 hours duration.
2.	**Minimum marks required in SEE to pass:** Score should be ≥35 &, however overall score of CIE+SEE should be ≥40%.
3.	Question paper contains three parts **A,B and C**. Students have to answer 1. From Part A answer any 5 out of 7 questions, each Question Carries 6 Marks. 2. From Part B answer 5 out of 10 questions choosing any one full question from each unit, each Question Carries 10 Marks. 3. From Part C answer 1 out of 2 questions, each Question Carries 20 Marks.

CO-PO Mapping (Planned)												**CO-PSO Mapping (Planned)**		
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PSO1**	**PSO2**	**PSO3**
1	✓													
2	✓													
3					✓									
4														
5														
Tick mark the CO, PO and PSO mapping														

Name & Signature of Faculty members involved in designing the syllabus

Name & Signature of Faculty members verifying/approving the syllabus

DIFFERENTIAL CALCULUS AND DIFFERENTIAL EQUATIONS (EE ,EC)

Course Code	1BMATE101	Course type	BS	Credits L-T-P	3-0-1
Hours/week: L - T- P	3-0-2			Total credits	4
Total Contact Hours	L =40 Hrs.; T =0 Hrs.; P = 20 Hrs. Total =60 Hrs.			CIE Marks	100
Flipped Classes content	05 Hrs.			SEE Marks	100

Course learning objectives	
1.	**Apply** foundational concepts of calculus and differential equations to analyze geometric properties of curves, understand the vector differentiation, solve higher-order ordinary differential equations, and model physical phenomena in science and engineering.
2.	**Apply** the principles of numerical methods to solve algebraic, transcendental and differential equations and **analyze** real-world problems.
3.	**Demonstrate** the applications of electrical engineering and allied engineering science using modern ICT tools.

Pre-requisites: Differentiation, Integration, etc.,

Unit – I: Differential Calculus	Contact Hours = 8 Hours
Polar curves, angle between the radius vector and the tangent, angle between the polar curves, pedal equations. Curvature and radius of curvature in Cartesian, polar, parametric and pedal forms.	

Unit – II: Multivariable Calculus	Contact Hours = 8 Hours
Partial Differentiation, total derivative - differentiation of composite functions. Jacobian. Statement and problems on Taylor's and Maclaurin's series expansion for two variables Maxima and minima for a function of two variables.	

Unit – III: Vector Calculus	Contact Hours = 8 Hours
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 and curl and scalar potential	

Unit – IV: Ordinary Differential Equations of Higher Order	Contact Hours = 8 Hours
Higher-order linear ODEs with constant coefficients, homogeneous and non-homogeneous equations- e^{ax} , $\sin(ax+b)$, $\cos(ax+b)$, and x^n only. Method of variation of parameters, Cauchy's and Legendre's homogeneous differential equations. Applications to *LCR* circuits.	

Unit – V: Numerical Methods	Contact Hours = 8 Hours
Solution of algebraic and transcendental equations: Regula-Falsi method and Newton-Raphson method. 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, Adam's-Bashforth predictor-corrector method.	

Flipped Classroom Details

Unit No.	I	II	III	IV	V
No. for Flipped Classroom Sessions	1	1	1	1	1

List of Experiments

Unit No.	No. of Experiments	Topic(s) related to Experiment
1	3	2D plots for Cartesian and polar curves,
1		Finding angle between polar curves,
1		Finding Radius of curvature,
2	2	Expansion using Taylor's and Maclaurin's series,
2		Finding partial derivatives and Jacobian
3	1	Finding gradient, divergence and curl
4	1	Solution of higher order ordinary differential equations
5	3	Regula Falsi and Newton Raphson method
5		Taylor's series solution of ODE
5		Modified Euler's method, RK method of order 4

Unit No.	Self-Study Topics
1	Centre and Circle of curvature
2	Taylor's & Maclaurin's series for single variable
3	Non-linear differential equations solvable for x & y
4	Solution of differential equation by the method of undetermined coefficients

Books	
	Text Books:
1.	B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44thEd., 2021.
2.	E. Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 10thEd., 2018.
3.	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.	V. Ramana, Higher Engineering Mathematics" McGraw-Hill Education, 11th Ed., 2017
2.	N.P Bali and Manish Goyal, A Textbook of Engineering Mathematics, Laxmi Publications, 10th Ed., 2022.
3	James Stewart, Calculus, Cengage Publications, 7thEd., 2019
4	H. K. Dass and Er. Rajnish Verma, Higher Engineering Mathematics, S. Chand Publication, 3rd Ed., 2014.
5	Steven V. Chapra and Raymond P. Canale, Applied Numerical Methods with Matlab for Engineers and Scientists, McGraw-Hill, 3rd Ed., 2011
6	S.S. Sastry, "Introductory Methods of Numerical Analysis", PHI Learning Private Limited, 5th Ed., 2012.

Course delivery methods		**Assessment methods**	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Lab Test
3.	Flipped Classes	3.	Semester End Examination
4.	Practice session/Demonstrations in Labs	4.	
5.	Virtual Labs (if present)		

Course Outcome (COs) **Learning Levels:** Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create				
At the end of the course, the student will be able to (Highlight the **action verb** representing the learning level.)		**Learning Level**	**PO(s)**	**PSO(s)**
1.	Apply the concepts of foundational calculus and differential equations to analyse geometric properties of curves, solve higher order differential equations, and vector calculus to model and solve problems in engineering applications such as area, volume, heat conduction, and field analysis.	1,2,3	1	
2.	Apply appropriate numerical methods to find approximate solutions of algebraic, transcendental, and ordinary differential equations and to perform interpolation and numerical integration in engineering contexts.	1,2,3	1	
3.	Demonstrate the applications of electrical engineering and allied engineering science using modern ICT tools.	1,2,3	1	

Scheme of Continuous Internal Evaluation (CIE):
For integrated courses, a lab test also will be conducted at the end of the semester. The lab test **(COMPULSORY)** will be part of the CIE. **No SEE for Lab**.

THEORY (60 marks)		**LAB (40 marks)**		**Total**
IA test 1	**IA test 2**	**Average of Lab Conduction & Assignment/Open ended Expt/CP**	**Lab test**	
30 marks	**30 marks**	**10 marks**	**30 marks**	**100 marks**

IA Test:
1. 10 marks questions in Part A of IA question paper should also include an OBE related question (max 2 marks).
2. Remaining 20 marks questions in Part B & C should be descriptive.

Conduct of Lab:
1. a. Conducting the experiment and journal: 5 marks
b. Calculations, results, graph, conclusion and Outcome: 5 marks
2. The Assignment (Certification), open ended experiment or a course project will be conducted for 10 marks & the Average of both components will be taken to award 10 marks.

Lab test: (Batch wise with 15 students/batch)
1. Test will be conducted at the end of the semester
2. Timetable, Batch details and examiners will be declared by Exam section
3. Conducting the experiment and writing report: 5 marks
4. Calculations, results, graph and conclusion: 15 marks
5. Viva voce: 10 marks

Eligibility for SEE:
1. Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests. Lack of minimum score in IA test will make the student Not Eligible for SEE
2. Student should score minimum 40% of 30 marks (i.e. 12 marks) in Lab test & should score 40% of 40 marks (i.e. 16 marks) in Lab component.
3. Lab test is COMPULSORY
4. Minimum score in CIE to be eligible for SEE: 40 OUT OF 100.
5. Not eligible in any one of the two components will make the student **Not Eligible** for SEE

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 100 marks of 3 hrs. duration.

2.	**Minimum marks required in SEE to pass:** Score should be ≥35 &, however overall score of CIE+SEE should be ≥40%.
3.	Question paper contains three parts **A, B and C**. Students have to answer 1. From Part A answer any 5 out of 7 questions, each Question Carries 6 Marks. 2. From Part B answer 5 out of 10 questions choosing any one full question from each unit, each Question Carries 10 Marks. 3. From Part C answer 1 out of 2 questions, each Question Carries 20 Marks.

CO-PO Mapping (Planned)												**CO-PSO Mapping (Planned)**		
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO1	PSO2	PSO3
1	√													
2	√													
3					√									
4														
5														
Tick mark the CO, PO and PSO mapping														

Name & Signature of Faculty members involved in designing the syllabus

Name & Signature of Faculty members verifying/approving the syllabus

LINEAR ALGEBRA AND TRANSFORMS (CS,AIML)

Course Code	1BMATS101	Course type	Integrated	**Credits L-T-P**	3-0-1
Hours/week: L - T- P	3-0-2			**Total credits**	4
Total Contact Hours	L =40 Hrs; T =0 Hrs; P = 20 Hrs Total = 60 Hrs			**CIE Marks**	100
Flipped Classes content	5 Hours			**SEE Marks**	100

Course learning objectives	
1.	**Develop** the knowledge of Linear Algebra to solve the system of equations.
2.	**Apply** the knowledge of modular arithmetic to computer algorithms
3.	**Apply** the knowledge of Fourier Series, Fourier transforms, Laplace and Z Transforms in engineering fields.

Pre-requisites : Basic knowledge of differential and integral Calculus, Matrices

Unit–I System of Linear Equations, Eigenvalues and Eigenvectors	**Contact Hours = 8 Hours**
Elementary row transformation of a matrix, Echelon form, rank of a matrix. Consistency and solution of system of linear equations, Gauss elimination method, Gauss Jordan method. Applications: Traffic flow. Eigenvalues and Eigenvectors, modal matrix, diagonalization of the matrix	

Unit – II : Numerical solutions for system of linear equations	**Contact Hours = 8 Hours**
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.	

Unit–III : Introduction of modular arithmetic and its applications in Computer Science and Engineering	**Contact Hours = 8 Hours**
Introduction to Congruences, Linear Congruences, The Chinese Remainder theorem, Solving Polynomials, Linear Diophantine Equation, System of Linear Congruences, Euler's Theorem, Wilson Theorem and Fermat's little theorem. Applications of Congruences-RSA algorithm	

Unit – IV : Fourier Techniques	**Contact Hours = 8 Hours**
Periodic functions. Dirichlet's conditions, Fourier series, Half range Fourier sine and cosine series. Practical examples, Harmonic analysis. Fourier Transforms: Infinite Fourier transforms, Fourier sine and cosine transforms. Inverse Fourier transforms. Problems.	

Unit – V : **Laplace Transforms and Z transforms**	**Contact Hours = 8 Hours**
Laplace Transform: Definition and Laplace transforms of elementary functions (statements only). Laplace transforms of Periodic functions (statement only) and unit-step function – problems 2. Inverse Laplace Transform: Definition & problems, Convolution theorem to find the inverse Laplace Transforms (without Proof) Solution of linear differential equations using Laplace Transforms.	

Z-transforms: Difference equations, basic definition, z transform-definition, standard z-transforms, damping and shifting rules, initial value and final value theorems (without proof) and problems.

Flipped Classroom Details

Unit No.	I	II	III	IV	V
No. for Flipped Classroom Sessions	1	1	1	1	1

List of Experiments

Unit No.	No. of Experiments	Topic(s) related to Experiment
1	3	Finding rank, reduced echelon form, solving system of linear equations using Gauss elimination method
1		Solving system of linear equations using Gauss-Seidel method
1		Determine Eigenvalues and Eigenvectors
2	2	Norms, Condition number
2		Rayleigh power's method
3	2	Finding GCD using Euclid's Algorithm
3		Applications of Wilson theorem
4	2	Program on Fourier series of standard functions
4		Program on Fourier transform of standard functions
5	1	Program on Laplace and Z transform of standard functions

Unit No.	**Self-Study Topics**
1	Solution of system of equations by Gauss-Jacobi iterative method. Inverse of a square matrix by Cayley- Hamilton theorem.
2	Normalization of matrices.
3	Divisibility, GCD, Properties of Prime Numbers, Fundamental theorem of Arithmetic.
4	Inversion formula and the Parseval identity.
5	Relation of Laplace Transforms to other transforms.

Books	
	Text Books:
1.	B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44th Ed., 2021
2.	Gilbert Strang, Linear Algebra and its Applications, Cengage Publications, 4th Ed., 2022
3.	David C Lay, Linear Algebra and its Applications, Pearson Publishers, 5th Ed., 2023.
4.	Seymour Lipschutz and Marc Lipson, Linear Algebra, Schaum's outlines series, 4th Ed., 2008.
	Reference Books:
1.	V. Ramana, Higher Engineering Mathematics" McGraw-Hill Education, 11th Ed., 2017
2.	N.P Bali and Manish Goyal, A Textbook of Engineering Mathematics, Laxmi Publications, 10th Ed., 2022.
3.	James Stewart, Calculus, Cengage Publications, 7thEd., 2019.
4.	David Poole, Linear Algebra, a modern introduction, Cengage publishers, 4th Ed., 2014.
5.	Gareth Williams, Linear Algebra with applications, Jones Bartlett Publishers Inc., 6th Ed., 2017
6.	William Stallings: "Cryptography and Network Security" Pearson Prentice Hall, 6th Ed.,2013

	E-resources (NPTEL/SWAYAM.. Any Other)- mention links
1.	• 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/

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Lab Test
3.	Flipped Classes	3.	Semester End Examination
4.	Practice session/Demonstrations in Labs	4.	
5.	Virtual Labs (if present)		

Course Outcome (COs) **Learning Levels:** Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create				
At the end of the course, the student will be able to (Highlight the **action verb** representing the learning level.)		**Learning Level**	**PO(s)**	**PSO(s)**
1.	**Solve** system of linear equations and **determine** eigenvalues and eigenvectors using direct and iterative methods. To get **acquainted** and to **apply** modular arithmetic to computer algorithms	1,2,3	1	
2.	**Construction** of Fourier series for periodic signals and Fourier series to analyze circuits. **Determine** Fourier transformation for continuous time signals and systems. **Understanding** the characteristics and properties of Laplace and Z-transform,	1,2,3	1	
3.	**Demonstrate** the applications of computer science and allied engineering Science using modern ICT tools.	1,2,3	5	

Scheme of Continuous Internal Evaluation (CIE):

For integrated courses, a lab test also will be conducted at the end of the semester. The lab test **(COMPULSORY)** will be part of the CIE. **No SEE for Lab**.

THEORY (60 marks)		**LAB (40 marks)**		Total
IA test 1	IA test 2	Average of Lab Conduction & Assignment/Open ended Expt/CP	Lab test	
30 marks	30 marks	10 marks	30 marks	100 marks

IA Test:

1. 10 marks questions in Part A of IA question paper should also include an OBE related question (max 2 marks).
2. Remaining 20 marks questions in Part B & C should be descriptive.

Conduct of Lab:

1. a. Conducting the experiment and journal: 5 marks
   b. Calculations, results, graph, conclusion and Outcome: 5 marks
2. The Assignment (Certification), open ended experiment or a course project will be conducted for 10 marks & the Average of both components will be taken to award 10 marks.

Lab test: (Batchwise with 15 students/batch)

1. Test will be conducted at the end of the semester
2. Timetable, Batch details and examiners will be declared by Exam section
3. Conducting the experiment and writing report: 5 marks

4. Calculations, results, graph and conclusion: 15 marks 5. Viva voce: 10 marks
Eligibility for SEE: 1. **Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests. Lack of minimum score in IA test will make the student Not Eligible for SEE** 2. **Student should score minimum 40% of 30 marks (i.e. 12 marks) in Lab test & should score 40% of 40 marks (i.e. 16 marks) in Lab component.** 3. Lab test is COMPULSORY 4. **Minimum score in CIE to be eligible for SEE: 40 OUT OF 100.** 5. Not eligible in any one of the two components will make the student **Not Eligible** for SEE

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 100 marks of 3 hours duration.
2.	**Minimum marks required in SEE to pass:** Score should be ≥35 &, however overall score of CIE+SEE should be ≥40%.
3.	Question paper contains three parts **A,B and C**. Students have to answer 1. From Part A answer any 5 out of 7 questions, each Question Carries 6 Marks. 2. From Part B answer 5 out of 10 questions choosing any one full question from each unit, each Question Carries 10 Marks. 3. From Part C answer 1 out of 2 questions, each Question Carries 20 Marks.

CO-PO Mapping (Planned)												**CO-PSO Mapping (Planned)**		
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PSO1**	**PSO2**	**PSO3**
1	✓													
2	✓													
3					✓									
4														
5														
Tick mark the CO, PO and PSO mapping														

Name & Signature of Faculty members involved in designing the syllabus

Name & Signature of Faculty members verifying/approving the syllabus

Linear Algebra and Integral Calculus(Civ,Mech,Aero)

Course Code	1BMATM201	Course type	Integrated	**Credits L-T-P**	3-0-1
Hours/week: L - T- P	3-0-2			**Total credits**	4
Total Contact Hours	L =40 Hrs; T =0 Hrs; P = 20 Hrs Total =60 Hrs			**CIE Marks**	100
Flipped Classes content	05 Hours			**SEE Marks**	100

Course learning objectives	
1.	To get acquainted with concepts connected with a system of linear equations
2.	To get familiar with eigenvalues, eigenvectors and inverse of a matrix.
3.	To apply finite difference approach in real life situations.
4.	To get familiarized with vector and integral calculus

Pre-requisites : Basic Trigonometry, Calculus, Algebra, Matrices

Unit – I :Linear Algebra	**Contact Hours = 8 Hours**
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.	

Unit – II: Partial Differential Equations	**Contact Hours = 8 Hours**
Formation of PDEs by elimination of arbitrary constants and functions. Solution of non- homogeneous PDE by direct integration. Homogeneous PDEs involving derivatives with respect to one independent variable only. Method of Separation of variables. Application of PDE: Derivation of one-dimensional heat equation and wave equation.	

Unit – III: Numerical Methods 1	**Contact Hours = 8 Hours**
Solution of algebraic and transcendental equations: Regula- Falsi and Newton-Raphson methods. Interpolation: Finite differences, Interpolation using Newton's forward and backward difference formulae, Newton's divided difference formula and Lagrange's interpolation formula. Numerical integration: Trapezoidal, Simpson's 1/3rd and 3/8th rules.	

Unit – IV: Integral Calculus	**Contact Hours = 8 Hours**
Multiple Integrals: Definition, Evaluation of double and triple integrals, evaluation of double integrals by change of order of integration, changing into polar coordinates. Applications to find Area and Volume by double integral.	

Unit – V: Vector Calculus	**Contact Hours = 8 Hours**
Beta and Gamma functions: Definitions, properties, relation between Beta and Gamma functions. Vector Integration: Line integrals, Surface integral, Volume integral, Statement of Green's and Stokes' theorem, Gauss divergence theorem without verification problems	

Flipped Classroom Details

Unit No.	I	II	III	IV	V
No. for Flipped Classroom Sessions	1	1	1	1	1

List of Experiments

Unit No.	No. of Experiments	Topic(s) related to Experiment
1	3	1.Finding rank, reduced echelon form, solving system of linear equations using Gauss elimination method 2.Solving system of linear equations using Gauss-Seidel method 3.Determine Eigenvalues and Eigenvectors
2	1	4. Solution of Partial Differential Equations
3	3	5.Regula Falsi and Newton Raphson method 6.Interpolation 7.Numerical integration
4	1	8. Evaluate double and triple integration and compute area and volume
5	2	9.Evaluate line integrals 10.Finding gradient, divergence and curl

Unit No.	Self-Study Topics
1	Inverse of a matrix by linear transformations
2	Fixed point iteration method
3	Vector identities
4	Lagrange's Linear PDE

Books	
	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.
3.	Gilbert Strang, Linear Algebra and its Applications, Cengage Publications, 4th Ed., 2022.
	Reference Books:
1.	B.V. Ramana, Higher Engineering Mathematics, McGraw-Hill Education, 11th Ed., 2017
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3.	N. P. Bali and Manish Goyal, A Textbook of Engineering Mathematics, Laxmi Publications, 10th Ed., 2022.
4.	H. K. Dass and Er. Rajnish Verma, Higher Engineering Mathematics, S. Chand Publication, 3rd Ed., 2014.
5.	David C Lay, Linear Algebra and its Applications, Pearson Publishers, 4th Ed., 2018.
6.	Gareth Williams, Linear Algebra with Applications" Jones Bartlett Publishers Inc., 6th Ed., 2017.
	E-resources (NPTEL/SWAYAM.. Any Other)- mention links
1.	http://academicearth.org/
2.	VTU e-Shikshana Program
3.	VTU EDUSAT Program
4.	https://ocw.mit.edu/courses/18-06-linear-algebra-spring-2010/

Course delivery methods		**Assessment methods**	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Lab Test

3.	Flipped Classes	3.	Semester End Examination
4.	Practice session/Demonstrations in Labs	4.	
5.	Virtual Labs (if present)		

Course Outcome (COs) **Learning Levels:** Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create				
At the end of the course, the student will be able to (Highlight the **action verb** representing the learning level.)		**Learning Level**	**PO(s)**	**PSO(s)**
1.	Apply the principles of linear algebra to solve systems of linear equations and analyze real-world problems such as traffic flow and appropriate numerical methods to find approximate solutions of algebraic, transcendental equations, and to perform interpolation and numerical integration in engineering contexts.	L1,L2,L3	1	
2.	Apply the concepts of integral calculus, partial differential equations, and vector integral calculus to model and solve problems in engineering applications such as area, volume, heat conduction, and field analysis.	L1,L2,L3	1	
3.	Demonstrate the ability to apply MATLAB tool for solving engineering problems	L2	5	

Scheme of Continuous Internal Evaluation (CIE):

For integrated courses, a lab test also will be conducted at the end of the semester. The lab test **(COMPULSORY)** will be part of the CIE. **No SEE for Lab**.

THEORY (60 marks)		**LAB (40 marks)**		Total
IA test 1	IA test 2	Average of Lab Conduction & Assignment/Open ended Expt/CP	Lab test	
30 marks	30 marks	10 marks	30 marks	100 marks

IA Test:

1. 10 marks questions in Part A of IA question paper should also include an OBE related question (max 2 marks).
2. Remaining 20 marks questions in Part B & C should be descriptive.

Conduct of Lab:

1. a. Conducting the experiment and journal: 5 marks
   b. Calculations, results, graph, conclusion and Outcome: 5 marks
2. The Assignment (Certification), open ended experiment or a course project will be conducted for 10 marks & the Average of both components will be taken to award 10 marks.

Lab test: (Batchwise with 15 students/batch)

1. Test will be conducted at the end of the semester
2. Timetable, Batch details and examiners will be declared by Exam section
3. Conducting the experiment and writing report: 5 marks
4. Calculations, results, graph and conclusion: 15 marks
5. Viva voce: 10 marks

Eligibility for SEE:

1. **Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests. Lack of minimum score in IA test will make the student Not Eligible for SEE**
2. **Student should score minimum 40% of 30 marks (i.e. 12 marks) in Lab test & should score 40% of 40 marks (i.e. 16 marks) in Lab component.**
3. Lab test is COMPULSORY
4. **Minimum score in CIE to be eligible for SEE: 40 OUT OF 100.**
5. Not eligible in any one of the two components will make the student **Not Eligible** for SEE

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 100 marks of 3 hours duration.
2.	**Minimum marks required in SEE to pass:** Score should be ≥35 &, however overall score of CIE+SEE should be ≥40%.
3.	Question paper contains three parts **A, B and C**. Students have to answer 1. From Part A answer any 5 out of 7 questions, each Question Carries 6 Marks. 2. From Part B answer 5 out of 10 questions choosing any one full question from each unit, each Question Carries 10 Marks. 3. From Part C answer 1 out of 2 questions, each Question Carries 20 Marks.

CO-PO Mapping (Planned)												CO-PSO Mapping (Planned)		
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PSO1**	**PSO2**	**PSO3**
1	✓													
2	✓													
3					✓									
4														
5														
Tick mark the CO, PO and PSO mapping														

Name & Signature of Faculty members involved in designing the syllabus

Name & Signature of Faculty members verifying/approving the syllabus

CALCULUS AND LINEAR ALGEBRA(EE,EC)

Course Code	1BMATE201	Course type	BS	Credits L-T-P	3-0-1
Hours/week: L - T- P	3-0-2			Total credits	4
Total Contact Hours	L =40 Hrs.; T =0 Hrs.; P = 20 Hrs. Total =60 Hrs.			CIE Marks	100
Flipped Classes content	05 Hrs.			SEE Marks	100

Course learning objectives	
1.	**Apply** the concepts of integral calculus and vector calculus to model and solve problems in engineering applications such as area, volume.
2.	**Apply** appropriate numerical methods to find approximate solutions of interpolation and numerical integration in engineering contexts.
3.	**Apply** the principles of linear algebra to solve systems of linear equations, determine eigenvalues and eigenvectors, and **analyze** real-world problems such as traffic flow. To understand the significance of properties of complex numbers.

Pre-requisites: Integration, Vector Algebra, Matrices and Determinants.

Unit – I: Integral Calculus and its Applications	**Contact Hours = 8 Hours**
Multiple Integrals: Evaluation of double and triple integrals, change of order of integration, changing to polar coordinates. Area and volume using double and triple integrals.	

Unit – II: Integral and Vector Calculus	**Contact Hours = 8 Hours**
Beta and Gamma functions: Definitions, properties, relation between Beta and Gamma functions.Vector Integration: Line integrals, Statement of Green's and Stokes' theorem without verification problems.	

Unit – III: Interpolation and Numerical Integration	**Contact Hours = 8 Hours**
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.	

Unit – IV: Linear Algebra	**Contact Hours = 8 Hours**
Elementary transformations on a matrix, Echelon form, rank of a matrix, consistency of system of linear equations. Gauss elimination, Gauss –Seidel method to solve system of linear equations. Eigen values and eigen vectors of a matrix, Rayleigh power method to determine the dominant eigen value of a matrix.	

Unit – V: Complex Analysis	**Contact Hours = 8 Hours**
Basics of complex numbers. De Movire's theorem statement and proof and examples. Circular functions, Hyperbolic functions. Differentiability of complex valued functions, Cauchy-Riemann equations necessary and sufficient conditions for differentiability, Analytical functions, Harmonic functions. Analyticity and zero of exponential, logarithmic and trigonometric functions.	

Flipped Classroom Details

Unit No.	I	II	III	IV	V
No. for Flipped Classroom Sessions	1	1	1	1	1

List of Experiments

Unit No.	No. of Experiments	Topic(s) related to Experiment
1	2	Evaluate double integration and compute area and volume
1		Evaluate triple integration and compute volume,
2	2	Evaluate line integrals
2	2	Evaluate surface and volume integrals
3		Interpolation,
3	1	Numerical integration,
4	3	Finding rank, reduced echelon form, solving system of linear equations using Gauss elimination method
5	3	Solving system of linear equations using Gauss-Seidel method
5		Determine Eigenvalues and Eigenvectors.
5	1	Verify Cauchy Riemann equations

Unit No.	Self-Study Topics
1	Centre and Circle of curvature
2	Taylor's & Maclaurin's series for single variable
3	Non-linear differential equations solvable for x & y
4	Solution of differential equation by the method of undetermined coefficients

Books	
	Text Books:
1.	B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44thEd., 2021.
2.	E. Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 10thEd., 2018.
3.	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.	V. Ramana, Higher Engineering Mathematics" McGraw-Hill Education, 11th Ed., 2017
2.	N.P Bali and Manish Goyal, A Textbook of Engineering Mathematics, Laxmi Publications, 10th Ed., 2022.
3	James Stewart, Calculus, Cengage Publications, 7thEd., 2019
4	H. K. Dass and Er. Rajnish Verma, Higher Engineering Mathematics, S. Chand Publication, 3rd Ed., 2014.
5	Steven V. Chapra and Raymond P. Canale, Applied Numerical Methods with Matlab for Engineers and Scientists, McGraw-Hill, 3rd Ed., 2011
6	S.S. Sastry, "Introductory Methods of Numerical Analysis", PHI Learning Private Limited, 5th Ed., 2012.

Course delivery methods		**Assessment methods**	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Lab Test
3.	Flipped Classes	3.	Semester End Examination

4.	Practice session/Demonstrations in Labs	4.	
5.	Virtual Labs (if present)		

Course Outcome (COs) **Learning Levels:** Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create				
At the end of the course, the student will be able to (Highlight the **action verb** representing the learning level.)		Learning Level	PO(s)	PSO(s)
1.	Apply the concepts of integral calculus and vector calculus to model and solve problems in engineering applications such as area, volume, surface integral, volume integral	1,2,3	1	
2.	Apply appropriate numerical methods to find approximate solutions of algebraic, transcendental, and ordinary differential equations and to perform interpolation and numerical integration in engineering contexts. Apply the concept of complex variables to find equipotential lines.	1,2,3	1	
3.	Demonstrate the applications of electrical engineering and allied engineering science using modern ICT tools	1,2,3	1	

Scheme of Continuous Internal Evaluation (CIE):
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1. a. Conducting the experiment and journal: 5 marks
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1. Test will be conducted at the end of the semester
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Eligibility for SEE:
1. Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests. Lack of minimum score in IA test will make the student Not Eligible for SEE
2. Student should score minimum 40% of 30 marks (i.e. 12 marks) in Lab test & should score 40% of 40 marks (i.e. 16 marks) in Lab component.
3. Lab test is COMPULSORY
4. Minimum score in CIE to be eligible for SEE: 40 OUT OF 100.
5. Not eligible in any one of the two components will make the student **Not Eligible** for SEE

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 100 marks of 3 hrs. duration.
2.	**Minimum marks required in SEE to pass:** Score should be ≥35 &, however overall score of CIE+SEE should be ≥40%.
3.	Question paper contains three parts **A, B and C**. Students have to answer 1. From Part A answer any 5 out of 7 questions, each Question Carries 6 Marks. 2. From Part B answer 5 out of 10 questions choosing any one full question from each unit, each Question Carries 10 Marks. 3. From Part C answer 1 out of 2 questions, each Question Carries 20 Marks.

CO-PO Mapping (Planned)												CO-PSO Mapping (Planned)		
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO1	PSO2	PSO3
1	√													
2	√													
3					√									
4														
5														
Tick mark the CO, PO and PSO mapping														

Name & Signature of Faculty members involved in designing the syllabus

Name & Signature of Faculty members verifying/approving the syllabus

STATISTICS AND PROBABILITY(CS,AIML)

Course Code	1BMATS201	Course type	Integrated	Credits L-T-P	3-0-1
Hours/week: L - T- P	3-0-2			Total credits	4
Total Contact Hours	L =40 Hrs; T =0 Hrs; P = 20 Hrs Total = 60 Hrs			CIE Marks	100
Flipped Classes content	5 Hours			SEE Marks	100

Course learning objectives	
1.	**Understand** different terminology in statistics and Get knowledge about various Dispersion parameters moments skewness
2.	**Get familiar** with Multiple Correlation and Regression
3.	**Get knowledge** about various probability distributions involving discrete /continuous random Variable and **Understand** Joint discrete PDF and various stochastic processes.

Pre-requisites : Basics in probability, statistics

Unit – I: Descriptive Statistics	Contact Hours = 8 Hours
Discrete and continuous data, Simple descriptive statistics - Mean, Median, Quantiles, percentiles, and quartiles, Variance, and standard deviation, Inter quartile range. Moments, Skewness and Kurtosis: Introduction to moments, Moments about the mean, Skewness , Negative Skewness , Positive Skewness, Kurtosis, Mesokurtic, Leptokurtic, Platykurtic -Practical, engineering related examples	

Unit – II: Correlation and Regression	Contact Hours = 8 Hours
Curve fitting by least square method $y = a + bx, y = ae^{bx}, y = ax^b$. Karl Pearson coefficient of correlation, Regression: Lines of regression Problems. Multiple correlation and regression. Partial correlation and regression.	

Unit – III: Discrete Random Variable (DRV)	Contact Hours = 8 Hours
Revision of basic probability, conditional probability up to Baye's theorem. Discrete Probability Distribution Functions (PDF) and Cumulative Distribution Functions(CDF), Expectations, Mean, Variance. Binomial, Poisson. Practical examples.	

Unit – IV: Continuous Random variable (CRV)	Contact Hours = 8 Hours
Continuous Random Variable Probability Distribution Functions (PDF) and Cumulative Distribution Functions(CDF), Expectations, Mean, Variance. Exponential and Normal Distributions. Practical examples	

Unit – V: Joint Probability Distribution and Random Processes	Contact Hours = 8 Hours
Joint PDF and Stochastic Process: Discrete Multivariable Joint PDF, Multivariable Conditional Joint PDF, Expectations (Mean, Variance and Covariance). Definition and classification of stochastic processes. Discrete state and discrete parameter stochastic process, Unique fixed probability vector, Regular Stochastic Matrix, Transition probability, Markov chain.	

Flipped Classroom Details

Unit No.	I	II	III	IV	V
No. for Flipped Classroom Sessions	1	1	1	1	1

List of Experiments

Unit No.	No. of Experiments	Topic(s) related to Experiment
1	2	Program to find mean, median and standard deviation for the discrete data.
1		Program on Skewness and Moments for the data set.
2	2	Program to fit a curve by least squares approximation method.
2		Program to find simple correlation coefficients and line of regressions, also multiple and partial correlation coefficients
3	2	Program to fit binomial distribution for the give data and find its mean and standard deviation.
3		Program to fit Poisson's distribution for the given data.
4	2	Program on Exponential distribution for the continuous data.
4		Program on Normal distribution for the continuous data.
5	2	Program on Joint Probability Distribution
5		Program to check whether given stochastic matrix is regular or not.

Unit No.	Self-Study Topics
1	Percentile ranks, quartile ranks, Skewness and Kurtosis in Data Science.
2	Multiple regression in Machine Learning.
3,4	Discrete and Continuous Random vectors in different areas such as Mutual funds, lottery draw, decision making, decision trees etc…
5	Monte Carlo Simulation.

Books	
	Text Books:
1.	B. S. Grewal – Higher Engineering Mathematics, Khanna Publishers, 42nd Edition, 2012 and onwards.
2.	Fundamentals of Mathematical Statistics by S. C. Gupta and V. K. Kapoor., Sultan Chand and Sons, 2009 and onwards.
	Reference Books:
1.	Probability and Statistics Schaum series second edition TATA Mc Graw Hill publication
2.	Business Statistics, N. D. Vohra, 2nd Ed. Mc. Graw Hill Publications
	E-resources (NPTEL/SWAYAM.. Any Other)- mention links
1.	https://archive.nptel.ac.in/courses/111/102/111102111/ (Prob and Stochastic)
2.	https://archive.nptel.ac.in/courses/111/104/111104147/(Linear regression)

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Lab Test
3.	Flipped Classes	3.	Semester End Examination
4.	Practice session/Demonstrations in Labs	4.	
5.	Virtual Labs (if present)		

Course Outcome (COs) **Learning Levels:** Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create				
At the end of the course, the student will be able to (Highlight the **action verb** representing the learning level.)		Learning Level	PO(s)	PSO(s)
1.	To **UNDERSTAND** different measures of Statistics and the concept Moments, Skewness and Kurtosis. To **APPLY** methods of Multiple Correlation and Regression	1,2,3	1	
2.	**Apply** the knowledge of Discrete and Continuous Random vectors in different areas such as Mutual funds, lottery draw, decision making, decision trees etc **Understand** Joint discrete PDF and various stochastic processes	1,2,3	1	
3.	**Demonstrate** the applications of computer science and allied engineering Science using modern ICT tools.	1,2,3	5	

Scheme of Continuous Internal Evaluation (CIE):
For integrated courses, a lab test also will be conducted at the end of the semester. The lab test **(COMPULSORY)** will be part of the CIE. **No SEE for Lab**.

THEORY (60 marks)		LAB (40 marks)		Total
IA test 1	IA test 2	Average of Lab Conduction & Assignment/Open ended Expt/CP	Lab test	
30 marks	30 marks	10 marks	30 marks	100 marks

IA Test:
1. 10 marks questions in Part A of IA question paper should also include an OBE related question (max 2 marks).
2. Remaining 20 marks questions in Part B & C should be descriptive.

Conduct of Lab:
1. a. Conducting the experiment and journal: 5 marks
b. Calculations, results, graph, conclusion and Outcome: 5 marks
2. The Assignment (Certification), open ended experiment or a course project will be conducted for 10 marks & the Average of both components will be taken to award 10 marks.

Lab test: (Batchwise with 15 students/batch)
1. Test will be conducted at the end of the semester
2. Timetable, Batch details and examiners will be declared by Exam section
3. Conducting the experiment and writing report: 5 marks
4. Calculations, results, graph and conclusion: 15 marks
5. Viva voce: 10 marks

Eligibility for SEE:
1. Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests. Lack of minimum score in IA test will make the student Not Eligible for SEE
2. Student should score minimum 40% of 30 marks (i.e. 12 marks) in Lab test & should score 40% of 40 marks (i.e. 16 marks) in Lab component.
3. Lab test is COMPULSORY
4. Minimum score in CIE to be eligible for SEE: 40 OUT OF 100.
5. Not eligible in any one of the two components will make the student **Not Eligible** for SEE

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 100 marks of 3 hours duration.
2.	**Minimum marks required in SEE to pass:** Score should be ≥35 &, however overall score of CIE+SEE should be ≥40%.
3.	Question paper contains three parts **A,B and C**. Students have to answer 1. From Part A answer any 5 out of 7 questions, each Question Carries 6 Marks. 2. From Part B answer 5 out of 10 questions choosing any one full question from each unit, each Question Carries 10 Marks. 3. From Part C answer 1 out of 2 questions, each Question Carries 20 Marks.

CO-PO Mapping (Planned)												CO-PSO Mapping (Planned)		
CO	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PSO1	PSO2	PSO3
1	✓													
2	✓													
3					✓									
4														
5														
Tick mark the CO, PO and PSO mapping														

Name & Signature of Faculty members involved in designing the syllabus

Name & Signature of Faculty members verifying/approving the syllabus

Applied Physics

INDEX

Physics for Sustainable Structural Systems (For CV branch)

Course Code	**BPHYC102/202**	Course type	Integrated	Credits L-T-P	3-0-1
Hours/week: L - T- P	3-0-2			Total credits	4
Total Contact Hours	L =40 Hrs; T =0 Hrs; P = 20 Hrs Total = 60 Hrs			CIE Marks	100
Flipped Classes content	5 Hours			SEE Marks	100

Course learning objectives	
1.	To understand the types of oscillations and applications.
2.	To Study the elastic properties of materials and waves..
3.	To Study the acoustics buildings and the essentials of radiometry and photometry.
4.	To understand the principles of photonic devices and their application relevant to civil engineering.
5.	To understand the various Smart Materials for Sustainable Structures.

Pre-requisites : Student should have studied Physics at 10+2 level.

Unit – I	Contact Hours = 8 Hours

Oscillations:
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, Sharpness of resonance. Resonance in LCR Circuits (Qualitative), Numerical Problems.

Unit – II	Contact Hours = 8 Hours

Elasticity and Waves:
Review Stress-Strain Curve, Strain hardening and softening. Elastic Moduli, Poisson's ratio, Relation between Young's modulus (E), Rigidity modulus (G) and Poisson's ratio (*v)* (with derivation), mention relation between elastic constants, limiting values of Poisson's ratio. Elastic materials (qualitative). Numerical problems.
Types of waves, Wave propagation in beams, rods and slabs, Energy dissipation techniques in structures, Physics of earthquakes - introduction, Types and general characteristics., Richter scale of measurement and earthquake-resistant measures, Seismometer and Seismograph. Ultrasonic waves, Application-SONAR, Numerical problems.

Unit – III	Contact Hours = 8 Hours

Acoustics, Radiometry and Photometry:
Acoustics: Introduction to Acoustics, Types of Acoustics, Reverberation and reverberation time, Absorption power and Absorption coefficient, Requisites for acoustics in auditorium, Sabine's formula (derivation), Measurement of absorption coefficient, Factors affecting the acoustics and remedial measures, Sound insulation and its measurements. Noise and its measurements,

Remedies to reduce noise in real time applications, 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).

Unit – IV	Contact Hours = 8 Hours
Photonics: LASER-Interaction of radiation with matter, Conditions for lasing action, Components of a laser, Types of LASERs – Semiconductor diode LASER, LASER Range finder, LIDAR, Road profiling, Bridge deflection, Laser Triangulation, Numerical problems. Optical Fiber-Principle and Construction of Optical fibers, Acceptance angle and Numerical Aperture (NA), Expression for NA, V-number, Number of modes, Types of optical fibers, losses in optical fiber, Fiber optic displacement sensor, Fiber optic Temperature sensor, Numerical problems.	

Unit – V	Contact Hours = 8 Hours
Smart Materials for Sustainable Structures: Types of smart materials, Piezo, Magnetostrictive, Electrostrictive, Electro-rheological, Magneto-rheological, Shape memory alloys, Phase transformation in shape memory alloys, Overview of sensor technology applicable to structures, Classification of sensors, Vibration Sensor, Strain Gauge sensors. Non Destructive Testing – Working principle with formula. Microstructures of materials: Characterization techniques- XRD, SEM, EDS and spectrophotometry.	

Flipped Classroom Details

Unit No.	I	II	III	IV	V
No. for Flipped Classroom Sessions	1	1	1	1	1

Unit No.	Self-Study Topics
1	Resonance in LCR Circuits
2	Elastic materials
3	Impact of noise in multi-storied buildings
4	Bridge deflection, Road Profiling
5	Spectrophotometry

List of Experiments

Unit No.	No. of Experiments	Topic(s) related to Experiment
I	03	Data analysis using least square fit
		Error analysis
		Study of the frequency response of Series & Parallel LCR circuits.
II	04	Determination of effective spring constant of the given springs in series and parallel combinations.

		Determination of Young's Modulus of the material of the given bar using Single Cantilever.
		Determination of thickness of a thin object using Air-wedge.
		Determination of Rigidity modulus of the Material of the wire using Torsional Pendulum.
III	02	Determination of velocity of ultrasonic waves using Ultrasonic Interferometer.
		Simple case study on acoustics (Auditorium, Cinema Hall, Etc).
IV	03	Verification of Inverse Square Law of Intensity of Light.
		Determination of wavelength of LASER using Diffraction Grating.
		Determination of acceptance angle and numerical aperture of the given Optical Fiber.
V	01	Particle size analysis using XRD pattern.

Books	
	Text Books:
1.	H M Agarwal and R M Agarwal Physics, Oscillations, Waves, Optics and Quantum Mechanics, Pearson Publication, 2025
2.	M. N. Avadhanulu and P. G. Kshirsagar, A textbook of Engineering Physics, S. Chand, 2019
3.	R. K. Gaur and S. L. Gupta, Engineering Physics, Dhanpat Rai Publications Ltd. New Delhi , 2018.
	Reference Books:
1.	A P French, Vibrations and Waves, , MIT introductory Physics, 2003.
2.	S L Kakani, Shubra Kakani , Engineering Physics, CBS Publishers and Distributers Pvt. Ltd., 2020.
3.	Stein, Seth, and Michael Wysession, Introduction to Seismology, Earthquakes, and Earth Structure, Blackwell Publishing, 2003.
4.	Micheal Bukshtab, Photometry Radiometry and Measurements of Optical Losses, Springer, 2nd edition,2019.
5.	B. P. Singh and Devaraj Singh, Building Science: Lighting and Accoustics, Dhanpat Rai Publications (P) Ltc.,2013
	E-resources (NPTEL/SWAYAM. Any Other)- mention links
1.	Simple Harmonic Motion (SHM) – NPTEL Lecture: https://www.youtube.com/watch?v=gnD8Se92hfk
2.	Waves and Oscillations Playlist (SHM, damping, resonance, etc.)– NPTEL https://www.youtube.com/playlist?list=PLyqSpQzTE6M9X7oRXliYM8t0aaR_N0Csd
3.	Acoustics: https://www.youtube.com/watch?v=fHBPvMDFyO8
4.	Smart Structures (IIT Kharagpur) – Covers smart materials, actuators, SHM: https://onlinecourses.nptel.ac.in/noc23_ae19/preview

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Lab Test
3.	Flipped Classes	3.	Semester End Examination
4.	Practice session/Demonstrations in Labs		
5.	Virtual Labs (if present)		

Course Outcome (COs) Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create				
At the end of the course, the student will be able to (Highlight the action verb representing the learning level.)		Learning Level	PO(s)	PSO(s)
1.	**Remember** the fundamentals of oscillations, waves, elasticity, acoustics, photonics and smart materials.	Re	1, 8	
2.	**Understand** principles of oscillations, waves, elasticity, acoustics, photonics and smart materials.	Un	1, 8	
3.	**Apply** the concepts oscillations, waves, elasticity, acoustics, photonics and smart materials..	Ap	1, 8	
4.	**Analyze** the experiment in a group, Design and Develop the innovative experiment.	Re, Un, Ap, An	1, 8	

Scheme of Continuous Internal Evaluation (CIE):

For integrated courses, a lab test also will be conducted at the end of the semester. The lab test (COMPULSORY) will be part of the CIE. No SEE for Lab.

THEORY (60 marks)		LAB (40 marks)		Total
IA test 1	IA test 2	Average of Lab Conduction & Assignment/Open ended Experiment	Lab test	
30 marks	30 marks	10 marks	30 marks	100 marks

IA Test:
1. 10 marks questions in Part A of IA question paper should also include an OBE related question (max 2 marks).
2. Remaining 20 marks questions in Part B & C should be descriptive.

Conduct of Lab:
1. a. Conducting the experiment and journal: 5 marks
b. Calculations, results, graph, conclusion and Outcome: 5 marks
2. The Assignment (Certification), open ended experiment or a course project will be conducted for 10 marks & the Average of both components will be taken to award 10 marks.

Lab test: (Batch-wise with 15 students/batch)
1. Test will be conducted at the end of the semester
2. Timetable, Batch details and examiners will be declared by Exam section
3. Conducting the experiment and writing report: 5 marks
4. Calculations, results, graph and conclusion: 15 marks
5. Viva voce: 10 marks

Eligibility for SEE:
1. Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests. Lack of

minimum score in IA test will make the student Not Eligible for SEE 2. Student should score minimum 40% of 30 marks (i.e. 12 marks) in Lab test & should score 40% of 40 marks (i.e. 16 marks) in Lab component. 3. Lab test is COMPULSORY 4. Minimum score in CIE to be eligible for SEE: 40 OUT OF 100. 5. Not eligible in any one of the two components will make the student Not Eligible for SEE

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 100 marks of 3 hours duration.
2.	Minimum marks required in SEE to pass: Score should be ≥35 &, however overall score of CIE+SEE should be ≥40%.
3.	Question paper contains three parts A, B and C. Students have to answer 1. From Part A answer any 5 out of 7 questions, each Question Carries 6 Marks. 2. From Part B answer 5 out of 10 questions choosing any one full question from each unit, each Question Carries 10 Marks. 3. From Part C answer 1 out of 2 questions, each Question Carries 20 Marks.

Assignment (10 marks)				
Rubric/Level	Exemplary=A (Far Exceeds Standard)	Above Average=B (Exceeds Standard)	Adequate= C (Meets Standard)	Inadequate= D (Below Standard)
Technical Content (8 marks)	Comprehensive, accurate, in-depth understanding; shows original thinking and mastery of concepts. (7-8)	Mostly accurate, good understanding, minor gaps; shows good application of concepts. (5-6)	Basic coverage, some understanding, lacks depth or clarity. (3-4)	Incomplete, inaccurate, poor understanding; shows little effort. (1-2)
Results & learning Outcome (2 marks)	Clear, correct results with excellent insights and reflection on learning. (2)	Mostly correct results; good understanding of learning outcomes. (1.5)	Basic results; limited insights or superficial learning. (1)	Incorrect or missing results; no evident learning. (0.5)

Course Project (10 marks)				
Rubric/Level	Exemplary=A (Far Exceeds Standard)	Above Average=B (Exceeds Standard)	Adequate= C (Meets Standard)	Inadequate =D (Below Standard)
Innovative Idea (1 Marks)	Highly original, creative, and impactful idea (1)	Original idea with moderate creativity (0.75)	Common idea with minor innovation (0.5)	Unoriginal or poorly thought-out idea (0.25)
Work Plan/methodology (1 Mark)	Clear, logical, and detailed work plan with effective methodology (1)	Mostly clear and practical plan with some details (0.75)	Basic plan; lacks clarity or depth (0.5)	Poor or vague plan and methodology (0.25)
Work content/Use of Technology (5 Marks)	Comprehensive, technically sound; advanced and appropriate use of technology (5)	Good technical depth; reasonable use of technology (4)	Adequate work; technology used with limitations (3-2)	Superficial or minimal work; poor use of technology (1)

Project Presentation (1 Marks)	Clear, engaging, confident delivery; excellent visuals (1)	Clear and coherent; good use of visuals (0.75)	Understandable but lacks engagement or clarity (0.5)	Disorganized or hard to follow (0.25)
Individual Contribution (1 Marks)	Fully engaged and contributed significantly to all aspects (1)	Active contribution with few gaps (0.75)	Some participation; effort uneven (0.5)	Minimal or unclear contribution (0.25)
Report (1 Marks)	Well-structured, detailed, no errors; excellent formatting (1)	Mostly well-written with minor issues (0.75)	Adequate but with some errors (0.5)	Poorly written; lacks structure (0.25)

CO-PSO Mapping (Planned)											
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11
1	√							√			
2	√							√			
3	√							√			
4	√							√			

Name & Signature of Faculty members involved in designing the syllabus

Name & Signature of Faculty members verifying/approving the syllabus

Physics of Materials(For ME/AE branches)

Course Code	**BPHYM102/202**	Course type	Integrated	Credits L-T-P	3-0-1
Hours/week: L - T- P	3-0-2			Total credits	4
Total Contact Hours	L =40Hrs; T =0 Hrs; P = 20 Hrs Total =60 Hrs			CIE Marks	100
Flipped Classes content	5 Hours			SEE Marks	100

Course learning objectives	
1.	To understand the types of oscillations and shock waves.
2.	To Study the elastic properties of materials and failures.
3.	To understand the fundamentals of thermoelectric materials, devices and their application.
4.	To understand the Concepts in Low temperature phenomena and generation of low temperature.
5.	To study the nanostructures and characterization techniques.

Pre-requisites : Student should have studied Physics at 10+2 level.

Unit – I	Contact Hours = 8 Hours

Oscillations and Shock waves

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, Types of damping (Graphical Approach). Engineering applications of damped oscillations, Theory of forced oscillations with derivation, Resonance, Sharpness of resonance, Resonance in LCR Circuits (Qualitative), Numerical problems.

Shock waves: Mach number and Mach Angle, Mach Regimes, Construction and working of Reddy Shock tube, Applications of Shock Waves, Numerical problems

Unit – II	Contact Hours = 8 Hours

Elasticity:

Review Stress-Strain Curve, properties of elasticity and plasticity, Elastic Moduli, Poisson's ratio, Relation between Young's modulus (E), Rigidity modulus (G) and Poisson's ratio (ν) (with derivation, mention relation between elastic constants, limiting values of Poisson's ratio.

Beam: Types, bending moment and Moment of Inertia equation, Torsion and Expression for couple per unit twist.

Types of failures : Fatigue and factors affecting fatigue (only qualitative explanation), Ductile fracture, Brittle fracture, Cup and cone, fatigue Curve (S- N curve), Numerical problems

Unit – III	Contact Hours = 8 Hours
Thermoelectric materials and devices: Thermo emf and thermo current, Seebeck effect, Peltier effect, Seeback and Peltier coefficients, figure of merit (Mention Expression), laws of thermoelectricity. Expression for thermo emf in terms of junction temperatures, Thermo couples: working principle with types, thermopile, Construction and working of thermoelectric generators (TEG) and Thermoelectric coolers (TEC), low, mid and high temperature thermoelectric materials, Applications: Exhaust of automobiles, Refrigerator, Space program(Radioisotope Thermoelectric Generator- RTG), Non-contact temperature measurement, Numerical Problems	

Unit – IV	Contact Hours = 8 Hours
Cryogenics: Introduction to Thermodynamics, Carnot's principle, Efficiency, Production of low temperature - Joule Thomson effect (Derivation with 3 cases), Porous plug experiment with theory, Thermodynamical analysis of Joule Thomson effect, Liquefaction of Oxygen by cascade process, Lindey's air liquefier, Liquefaction of Helium and its properties (superfluidity), Platinum Resistance Thermometer, Applications of Cryogenics: Aerospace, Dewar Flask, Numerical Problems	

Unit – V	Contact Hours = 8 Hours
Nanomaterials and their characterization techniques Nanomaterials: Introduction, Quantum confinement, 0-D, 1-D, 2-D and 3-D nanostructures, Introduction of synthesis techniques and nanocomposites, Structure and applications of carbon nanotubes and graphene. Characterization Techniques: Bragg's law, X-Ray Diffractometer (XRD), Scanning Electron Microscope (SEM), X-ray Photoelectron Spectroscopy (XPS), Thermogravimetric Analysis (TGA), Numerical Problems.	

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Assignment
3.	Flipped Classes	3.	Lab Test
4.	Practice session/Demonstrations in Labs	4.	Semester End Examination
5.	Virtual Labs (if present)		

Flipped Classroom Details

Unit No.	I	II	III	IV	V
No. for Flipped Classroom Sessions	1	1	1	1	1

Unit No.	Self-Study Topics
1	Resonance in LCR Circuits
2	Poisson's ratio
3	Non-contact temperature measurement
4	Platinum Resistance Thermometer
5	Thermogravimetric Analysis (TGA)

List of Experiments

Unit No.	No. of Experiments	Topic(s) related to Experiment
I	05	Data analysis using least square fit
		Error analysis
		To determine damping factor of spring mass damper system.
		Determination of effective spring constant of the given springs in series and parallel combinations.
		STEP Interactive Physical Simulations. (Springs, Simple Pendulum)
II	03	Determination of Young's modulus of the material of the given bar Uniform Bending.
		Determination of Rigidity modulus of the Material of the wire using Torsional Pendulum.
		Determination of Young's modulus of the material of the given bar using Single Cantilever.
III	02	Determination of thickness of a thin object using Air-wedge.
		Study the working of Peltier Modules
IV	01	Study of variation of resistance with temperature for a metal.
V	03	Determination of Grating constant using LASER Diffraction
		Estimation of particle size of lycopodium powder using Laser Diffraction
		Particle size analysis using XRD pattern.

Books	
	Text Books:
1.	H M Agarwal and R M Agarwal Physics, Oscillations, Waves, Optics and Quantum Mechanics, Pearson Publication, 2025
2.	M. N. Avadhanulu and P. G. Kshirsagar, A textbook of Engineering Physics, S. Chand , 9th edition, 2014
3.	R. K. Gaur and S. L. Gupta, Engineering Physics, Dhanpat Rai Publications Ltd. New Delhi , 2018.
	Reference Books:
1.	S L Kakani, Shubra Kakani, Engineering Physics, CBS Publishers and Distributers Pvt. Ltd., 3rd Edition, 2020
2.	Sulabha Kulkarni, Nanotechnology: Principles and Practices, Capital Publishing Company, 2011
3.	A P French, Vibrations and Waves, A P French, MIT introductory Physics, 2003.
4.	Cryogenics: A Text Book, S.S. Thipse, Alpha Science International , Limited, 2013.

	E-resources (NPTEL/SWAYAM.. Any Other)- mention links
1.	Lecture Series on Physics - I: Oscillations and Waves by Prof.S.Bharadwaj, Department of Physics and Meteorology, IIT Kharagpurn: https://www.youtube.com/watch?v=gnD8Se92hfk
2.	Waves and Oscillations: https://www.youtube.com/watch?v=xoJWoMQwTAw&list=PLyqSpQzTE6M9X7oRXliYM8t0aaR_N0Csd
3.	Cryogenic Engineering by Prof. M.D. Atrey , Department of Mechanical Engineering, IIT Bombay.: https://www.youtube.com/watch?v=4gGMBNEzeuc
4.	Liquefaction of gases: https://www.youtube.com/watch?v=aMelwOsGpIs

Course Outcome (COs)

Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create

At the end of the course, the student will be able to (Highlight the action verb representing the learning level.)		Learning Level	PO(s)	PSO(s)
1.	**Remember** the fundamentals of oscillations, waves, elasticity, thermoelectric properties, cryogenics and material characterization techniques.	Re	1, 8	
2.	**Understand** principles of fundamentals of oscillations, waves, elasticity, thermoelectric properties, cryogenics and material characterization techniques.	Un	1, 8	
3.	**Apply** the concepts fundamentals of oscillations, waves, elasticity, thermoelectric properties, cryogenics and material characterization techniques.	Ap	1, 8	
4.	**Analyze** the experiment in a group, Design and Develop the innovative experiment.	Re, Un, Ap, An	1, 8	

Scheme of Continuous Internal Evaluation (CIE):

For integrated courses, a lab test also will be conducted at the end of the semester. The lab test **(COMPULSORY)** will be part of the CIE. **No SEE for Lab**.

THEORY (60 marks)		LAB (40 marks)		Total
IA test 1	IA test 2	Average of Lab Conduction & Assignment/Open ended experiment	Lab test	
30 marks	30 marks	10 marks	30 marks	100 marks

IA Test:
1. 10 marks questions in Part A of IA question paper should also include an OBE related question (max 2 marks).
2. Remaining 20 marks questions in Part B & C should be descriptive.

Conduct of Lab:
1. a. Conducting the experiment and journal: 5 marks
b. Calculations, results, graph, conclusion and Outcome: 5 marks
2. The Assignment (Certification), open ended experiment or a course project will be conducted for 10 marks & the Average of both components will be taken to award 10 marks.

Lab test: (Batchwise with 15 students/batch)
1. Test will be conducted at the end of the semester

2. Timetable, Batch details and examiners will be declared by Exam section 3. Conducting the experiment and writing report: 5 marks 4. Calculations, results, graph and conclusion: 15 marks 5. Viva voce: 10 marks
Eligibility for SEE: 1. Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests. Lack of minimum score in IA test will make the student Not Eligible for SEE 2. Student should score minimum 40% of 30 marks (i.e. 12 marks) in Lab test & should score 40% of 40 marks (i.e. 16 marks) in Lab component. 3. Lab test is COMPULSORY 4. Minimum score in CIE to be eligible for SEE: 40 OUT OF 100. 5. Not eligible in any one of the two components will make the student **Not Eligible** for SEE

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 100 marks of 3 hours duration.
2.	**Minimum marks required in SEE to pass:** Score should be ≥35 &, however overall score of CIE+SEE should be ≥40%.
3.	Question paper contains three parts **A,B and C**. Students have to answer 1. From Part A answer any 5 out of 7 questions, each Question Carries 6 Marks. 2. From Part B answer 5 out of 10 questions choosing any one full question from each unit, each Question Carries 10 Marks. 3. From Part C answer 1 out of 2 questions, each Question Carries 20 Marks.

Assignment (10 marks)				
Rubric/Level	Exemplary=A (Far Exceeds Standard)	Above Average=B (Exceeds Standard)	Adequate= C (Meets Standard)	Inadequate= D (Below Standard)
Technical Content (8 marks)	Comprehensive, accurate, in-depth understanding; shows original thinking and mastery of concepts. (7-8)	Mostly accurate, good understanding, minor gaps; shows good application of concepts. (5-6)	Basic coverage, some understanding, lacks depth or clarity. (3-4)	Incomplete, inaccurate, poor understanding; shows little effort. (1-2)
Results & learning Outcome (2 marks)	Clear, correct results with excellent insights and reflection on learning. (2)	Mostly correct results; good understanding of learning outcomes. (1.5)	Basic results; limited insights or superficial learning. (1)	Incorrect or missing results; no evident learning. (0.5)

Course Project (10 marks)				
Rubric/Level	Exemplary=A (Far Exceeds Standard)	Above Average=B (Exceeds Standard)	Adequate= C (Meets Standard)	Inadequate =D (Below Standard)
Innovative Idea (1 Marks)	Highly original, creative, and impactful idea (1)	Original idea with moderate creativity	Common idea with minor innovation	Unoriginal or poorly thought-

		(0.75)	(0.5)	out idea (0.25)
Work Plan/methodology (1 Mark)	Clear, logical, and detailed work plan with effective methodology (1)	Mostly clear and practical plan with some details (0.75)	Basic plan; lacks clarity or depth (0.5)	Poor or vague plan and methodology (0.25)
Work content/Use of Technology (5 Marks)	Comprehensive, technically sound; advanced and appropriate use of technology (5)	Good technical depth; reasonable use of technology (4)	Adequate work; technology used with limitations (3-2)	Superficial or minimal work; poor use of technology (1)
Project Presentation (1 Marks)	Clear, engaging, confident delivery; excellent visuals (1)	Clear and coherent; good use of visuals (0.75)	Understandable but lacks engagement or clarity (0.5)	Disorganized or hard to follow (0.25)
Individual Contribution (1 Marks)	Fully engaged and contributed significantly to all aspects (1)	Active contribution with few gaps (0.75)	Some participation; effort uneven (0.5)	Minimal or unclear contribution (0.25)
Report (1 Marks)	Well-structured, detailed, no errors; excellent formatting (1)	Mostly well-written with minor issues (0.75)	Adequate but with some errors (0.5)	Poorly written; lacks structure (0.25)

CO-PSO Mapping (Planned)											
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11
1	√							√			
2	√							√			
3	√							√			
4	√							√			

Name & Signature of Faculty members involved in designing the syllabus

Name & Signature of Faculty members verifying/approving the syllabus

Quantum Physics and Electronic sensors (For EC/EE branches)

Course Code	**BPHEC102/202**	Course type	Integrated	Credits L-T-P	3-0-1
Hours/week: L - T- P	3-0-2			Total credits	4
Total Contact Hours	L =40 Hrs; T =0 Hrs; P = 20 Hrs Total = 60 Hrs			CIE Marks	100
Flipped Classes content	5 Hours			SEE Marks	100

Course learning objectives	
1.	To study the principles of quantum mechanics and its applications.
2.	To study the electrical properties of metals and semiconductors.
3.	To study the essentials of photonics and its applications.
4.	To understand the vector calculus, Maxwell's equations and EM waves.
5.	To study the properties of dielectrics, thermoelectricity and sensors.

Pre-requisites : Student should have studied Physics at 10+2 level.

Unit – I	Contact Hours = 8 Hours

Quantum Mechanics:

Classical vs. quantum mechanics, de Broglie Hypothesis, Heisenberg's Uncertainty Principle and its application – Non-existence of electron in the nucleus of an atom, Principle of Complementarity, Wave Function and its properties, Time dependent and independent Schrödinger wave equation in one dimension, Physical significance of a wave function - Born Interpretation, Particle in one dimensional infinite potential well-eigenfunction, energy eigenvalues and probabilities, Particle in a finite potential well and quantum tunneling, Numerical Problems.

Unit – II	Contact Hours = 8 Hours

Electrical Properties of Metals and Semiconductors:

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, Fermi Energy, Variation of Fermi Factor with Temperature and Energy, Expression for carrier concentration, Derivation of electron concentration in an intrinsic semiconductor, Expression for electron and hole concentration in extrinsic semiconductor, Fermi level for intrinsic(with derivation) and extrinsic semiconductor (no derivation), Direct and indirect band gap, Hall effect (Derivation) Numerical Problems.

Unit – III	Contact Hours = 8 Hours

Photonics:

Interaction of radiation with matter – Einstein's A and B coefficients, energy density (derivation), Prerequisites for lasing action, Components of a laser, Types of LASERs – Semiconductor diode LASER, Applications: Laser printer, Bar code scanner.

Optical Fiber- Derivation of Numerical aperture, Number of modes, losses in optical fiber, Intermodal dispersion, Intra-modal dispersion (material and waveguide dispersion), Optical fiber communication, Numerical problems.

Unit – IV	Contact Hours = 8 Hours
Maxwell's Equations: Fundamentals of Vector Calculus, Gradient, Divergence and Curl of Electric field and Magnetic field (static), Maxwell's equations and its physical significance. EM Waves: Speed of EM waves in free space (Derivation), transverse nature EM waves, Impedance of EM waves, Waveguides –Transverse electric mode, transverse magnetic mode, Numerical Problems.	

Unit – V	Contact Hours = 8 Hours
Dielectric, Thermoelectric Materials and Sensors Dielectric polarization mechanisms, Clausius Mossotti Equation(Derivation), Frequency dependence of dielectric constant, dielectric loss. Thermoelectric effect- Seebeck effect, Peltier effect, laws of thermoelectricity, thermoelectric generator. Sensors - LED, Photo Diode, Piezo electric Sensor, Metal Oxide Semiconductor (MOS) sensor and Hall sensor, Numerical Problems.	

List of Experiments

Unit No.	No. of Experiments	Topic(s) related to Experiment
I	03	Data analysis using least square fit
		Error analysis
		Determination of Planck's Constant using LEDs.
II	03	Determination of Energy gap of the given Semiconductor.
		Resonance in LCR circuit.
		Determination of Fermi Energy of Copper.
III	01	Black-Box Experiment (Identification of basic Electronic Components)
IV	03	Determination of wavelength of LASER using Diffraction Grating.
		Determination of acceptance angle and numerical aperture of the given Optical Fiber.
		Study the Characteristics of a Photo-Diode and to determine the power responsivity
V	02	Determination of dielectric constant of the material of capacitor by Charging and Discharging method.
		Construction and Analyzing Electronic circuits (Expeyes Simulator / circuit lab)

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Assignment
3.	Flipped Classes	3.	Lab Test
4.	Practice session/Demonstrations in Labs	4.	Semester End Examination
5.	Virtual Labs (if present)		

Flipped Classroom Details

Unit No.	I	II	III	IV	V
No. for Flipped Classroom Sessions	1	1	1	1	1

Unit No.	Self-Study Topics
1	quantum tunneling
2	Direct and indirect band gap
3	Bar code scanner
4	Impedance of EM waves
5	dielectric loss

Books	
	Text Books:
1.	M. N. Avadhanulu and P. G. Kshirsagar, A textbook of Engineering Physics, S. Chand , , 2019
2.	S L Kakani, Shubra Kakani, Engineering Physics, CBS Publishers and Distributers Pvt. Ltd., 2020
3.	B. E. A. Saleh., & M. C. Teich, Fundamentals of Photonics, Wiley, 2019.
4.	S. O. Pillai , Solid State Physics, , New Age International, 2025
	Reference Books:
1.	Ghatak, Optics, McGraw Hill.,2020.
2.	S Mani Naidu, Engineering Physics, Pearson, 2024.
3.	A. Beiser, Concepts of Modern Physics, McGraw-Hill Education, 2007.
	E-resources (NPTEL/SWAYAM.. Any Other)- mention links
1.	NPTEL – Quantum Mechanics I (IIT Madras): https://nptel.ac.in/courses/115106066
2.	Solid State Physics – NPTEL (IIT Madras) https://nptel.ac.in/courses/115106127
3.	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

4.	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

Course Outcome (COs)				
Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create				
At the end of the course, the student will be able to (Highlight the action verb representing the learning level.)		Learning Level	PO(s)	PSO(s)
1.	**Remember** the fundamentals of Quantum mechanics, electromagnetism , electrical properties of metals and semiconductors, photonics and sensors.	Re	1, 8	
2.	**Understand** principles of Quantum mechanics, electromagnetism , electrical properties of metals and semiconductors, photonics and sensors.	Un	1, 8	
3.	**Apply** the concepts of Quantum mechanics, electromagnetism , electrical properties of metals and semiconductors, photonics and sensors.	Ap	1, 8	
4.	**Analyze** the experiment in a group, Design and Develop the innovative experiment.	Re, Un, Ap, An	1, 8	

Scheme of Continuous Internal Evaluation (CIE):

For integrated courses, a lab test also will be conducted at the end of the semester. The lab test (COMPULSORY) will be part of the CIE. No SEE for Lab.

THEORY (60 marks)		LAB (40 marks)		Total
IA test 1	IA test 2	Average of Lab Conduction & Assignment/ Open ended Experiment	Lab test	
30 marks	30 marks	10 marks	30 marks	100 marks
IA Test: 1. 10 marks questions in Part A of IA question paper should also include an OBE related question (max 2 marks). 2. Remaining 20 marks questions in Part B & C should be descriptive.				
Conduct of Lab: 1. a. Conducting the experiment and journal: 5 marks b. Calculations, results, graph, conclusion and Outcome: 5 marks 2. The Assignment (Certification), open ended experiment or a course project will be conducted for 10 marks & the Average of both components will be taken to award 10 marks.				

Lab test: (Batchwise with 15 students/batch) 1. Test will be conducted at the end of the semester 2. Timetable, Batch details and examiners will be declared by Exam section 3. Conducting the experiment and writing report: 5 marks 4. Calculations, results, graph and conclusion: 15 marks 5. Viva voce: 10 marks
Eligibility for SEE: 1. Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests. Lack of minimum score in IA test will make the student Not Eligible for SEE 2. Student should score minimum 40% of 30 marks (i.e. 12 marks) in Lab test & should score 40% of 40 marks (i.e. 16 marks) in Lab component. 3. Lab test is COMPULSORY 4. Minimum score in CIE to be eligible for SEE: 40 OUT OF 100. 5. Not eligible in any one of the two components will make the student Not Eligible for SEE

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 100 marks of 3 hours duration.
2.	Minimum marks required in SEE to pass: Score should be ≥35 &, however overall score of CIE+SEE should be ≥40%.
3.	Question paper contains three parts A,B and C. Students have to answer 1. From Part A answer any 5 out of 7 questions, each Question Carries 6 Marks. 2. From Part B answer 5 out of 10 questions choosing any one full question from each unit, each Question Carries 10 Marks. 3. From Part C answer 1 out of 2 questions, each Question Carries 20 Marks.

Assignment (10 marks)				
Rubric/Level	Exemplary=A (Far Exceeds Standard)	Above Average=B (Exceeds Standard)	Adequate= C (Meets Standard)	Inadequate= D (Below Standard)
Technical Content (8 marks)	Comprehensive, accurate, in-depth understanding; shows original thinking and mastery of concepts. (7-8)	Mostly accurate, good understanding, minor gaps; shows good application of concepts. (5-6)	Basic coverage, some understanding, lacks depth or clarity. (3-4)	Incomplete, inaccurate, poor understanding; shows little effort. (1-2)
Results & learning Outcome (2 marks)	Clear, correct results with excellent insights and reflection on learning. (2)	Mostly correct results; good understanding of learning outcomes. (1.5)	Basic results; limited insights or superficial learning. (1)	Incorrect or missing results; no evident learning. (0.5)

Course Project (10 marks)				
Rubric/Level	Exemplary=A (Far Exceeds Standard)	Above Average=B (Exceeds Standard)	Adequate= C (Meets Standard)	Inadequate =D (Below Standard)
Innovative Idea (1 Marks)	Highly original, creative, and impactful idea (1)	Original idea with moderate creativity (0.75)	Common idea with minor innovation (0.5)	Unoriginal or poorly thought-out idea (0.25)
Work Plan/methodology (1 Mark)	Clear, logical, and detailed work plan with effective methodology (1)	Mostly clear and practical plan with some details (0.75)	Basic plan; lacks clarity or depth (0.5)	Poor or vague plan and methodology (0.25)
Work content/Use of Technology (5 Marks)	Comprehensive, technically sound; advanced and appropriate use of technology (5)	Good technical depth; reasonable use of technology (4)	Adequate work; technology used with limitations (3-2)	Superficial or minimal work; poor use of technology (1)
Project Presentation (1 Marks)	Clear, engaging, confident delivery; excellent visuals (1)	Clear and coherent; good use of visuals (0.75)	Understandable but lacks engagement or clarity (0.5)	Disorganized or hard to follow (0.25)
Individual Contribution (1 Marks)	Fully engaged and contributed significantly to all aspects (1)	Active contribution with few gaps (0.75)	Some participation; effort uneven (0.5)	Minimal or unclear contribution (0.25)
Report (1 Marks)	Well-structured, detailed, no errors; excellent formatting (1)	Mostly well-written with minor issues (0.75)	Adequate but with some errors (0.5)	Poorly written; lacks structure (0.25)

CO-PSO Mapping (Planned)											
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11
1	√							√			
2	√							√			
3	√							√			
4	√							√			

Name & Signature of Faculty members involved in designing the syllabus

Name & Signature of Faculty members verifying/approving the syllabus

Quantum Physics and Applications (For CS/AIML branches)

Course Code	**BPHYS102/202**	Course type	Integrated	Credits L-T-P	3-0-1
Hours/week: L - T- P	3-0-2			Total credits	4
Total Contact Hours	L =40 Hrs; T =0 Hrs; P = 20 Hrs Total =60 Hrs			CIE Marks	100
Flipped Classes content	5 Hours			SEE Marks	100

Course learning objectives	
1.	To study the principles of quantum mechanics and its applications.
2.	To study the foundations of quantum computing.
3.	To study the realization of quantum circuits and quantum computers .
4.	To study the electrical properties of metals, semiconductors and superconductors.
5.	To study the essentials of photonics and its applications.

Pre-requisites : Student should have studied Physics at 10+2 level.

Unit – I	Contact Hours = 8 Hours
Quantum Mechanics: Classical vs. quantum mechanics, de Broglie Hypothesis, Heisenberg's Uncertainty Principle and its application – Non-existence of electron in the nucleus of an atom, Principle of Complementarity, Wave Function and its properties, Time dependent and independent Schrödinger wave equation in one dimension, Physical significance of a wave function - Born Interpretation, Particle in one dimensional infinite potential well-eigen function, energy eigenvalues and probabilities, Particle in a finite potential well and quantum tunneling, Numerical Problems.	

Unit – II	Contact Hours = 8 Hours
Quantum Computation foundation: Introduction to Quantum Computing, Moore's law & its end, Differences between Classical & Quantum computing. Concept of qubit and its properties. Representation of qubit by Bloch sphere. Single and Two qubits. Quantum entanglement Matrix representation of quantum mechanics- Basis and linear dependence, linear operators and matrices, The Pauli Matrices, Inner products, Eigenvectors and eigenvalues, Adjoint and Hermitian operators, Tensor products, N qubits, Operator functions, The commutator and anti-commutator. Numerical Problems	

Unit – III	Contact Hours = 8 Hours
Quantum computation realization: Quantum circuits: Quantum algorithms, single qubit operations, controlled operations, optimization of quantum circuits, Universal quantum gates Quantum computers: Conditions for quantum computation, Harmonic oscillator quantum computer- Physical apparatus and quantum computation, Optical photon quantum computer- Physical apparatus and quantum computation. Numerical Problems	

Unit – IV	Contact Hours = 8 Hours
Electrical Properties of Materials: Metals and semiconductors: Distinguishable and indistinguishable particles, Density of states (qualitative), Fermi Dirac statistics, Fermi Energy in metals, Variation of Fermi Factor with Temperature and Energy, Expression for electrical conductivity in intrinsic semiconductor, Fermi level for intrinsic semiconductor (with derivation), Hall effect (derivation), Numerical Problems. Superconductors: Meissner effect, Critical temperature, Critical field, BCS Theory, Josephson junction, Superconducting Qubits (Charge, flux, phase), Numerical Problems.	

Unit – V	Contact Hours = 8 Hours
Photonics: Interaction of radiation with matter, Relation between Einstein's coefficients using Plank's radiation law, population inversion, uncertainty principle and metastable state, Components of a laser, Types of Lasers – Semiconductor diode Laser, Applications- Laser printer and Bar code scanner Optical fiber-Derivation of Numerical aperture, Types of optical fibers, losses in optical fiber, Application- Fiber Optic Communication, Numerical problems	

Flipped Classroom Details

Unit No.	I	II	III	IV	V
No. for Flipped Classroom Sessions	1	1	1	1	1

Unit No.	Self-Study Topics
I	Quantum tunneling
II	Operator functions
III	Conditions for quantum computation
IV	Fermi level for intrinsic and extrinsic semiconductor
V	Bar code scanner

List of Experiments

Unit No.	No. of Experiments	Topic(s) related to Experiment
I	03	Data analysis by least square fit
		Error analysis
		Determination of Planck's Constant using LEDs.
II	01	Predicting the outputs of various combinations of single and two-qubit gates using QUIRK Quantum Simulator.
III	01	Predicting the outputs of various combinations of single and two-qubit gates using QISKIT.
IV	04	Study the Characteristics of a Photo-Diode and to determine the power responsivity
		Determination of Fermi Energy of Copper.
		Determination of Energy gap of the given Semiconductor.
		Resonance in LCR circuit.
V	02	Determination of wavelength of LASER using Diffraction Grating.
		Determination of acceptance angle and numerical aperture of the given Optical Fiber.

Books	
	Text Books:
1.	Nielsen, M. A., & Chuang, I. L., Quantum Computation and Quantum Information, Cambridge University Press. 2010.
2.	M. N. Avadhanulu and P. G. Kshirsagar, A textbook of Engineering Physics, S. Chand , , 2014
3.	B. E. A. Saleh., & M. C. Teich, Fundamentals of Photonics, Wiley, 3rd edition, 2019.
	Reference Books:
1.	S L Kakani, Shubra Kakani, Engineering Physics, CBS Publishers and Distributers Pvt. Ltd., 3rd Edition, 2020
2.	Parag K Lala ,Quantum Computing, , McGraw Hill, 2020.
3.	Vishal Sahani, Quantum Computing, McGraw Hill Education, 2007 Edition.
4.	B B Loud ,LASERS and Non-Linear Optics, New Age International, , 4th edition, 2022
5.	R. Murgeshan, Modern Physics, S. Chand. 18th edition,2017
	E-resources (NPTEL/SWAYAM.. Any Other)- mention links

1.	NPTEL – Quantum Mechanics I (IIT Madras): https://nptel.ac.in/courses/115106066
2.	Concepts in Magnetism and Superconductivity – NOC (IIT Kharagpur)Series start (Lecture 1): https://digimat.in/nptel/courses/video/115105131/L01.html
3.	Lecture 04 – Quantum Computing Basics: https://www.youtube.com/watch?v=-fttE1SzpD8

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Assignment
3.	Flipped Classes	3.	Lab Test
4.	Practice session/Demonstrations in Labs	4.	Semester End Examination
5.	Virtual Labs (if present)		

Course Outcome (COs)
Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create

At the end of the course, the student will be able to (Highlight the action verb representing the learning level.)		Learning Level	PO(s)	PSO(s)
1.	**Remember** the fundamentals of Quantum mechanics, Quantum computing, electrical properties of materials and photonics	Re	1, 8	
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3.	**Apply** the concepts of Quantum mechanics, Quantum computing, electrical properties of materials and photonics.	Ap	1, 8	
4.	**Analyze** the experiment in a group, Design and Develop the innovative experiment.	Re, Un, Ap, An	1, 8	

Scheme of Continuous Internal Evaluation (CIE):
For integrated courses, a lab test also will be conducted at the end of the semester. The lab test **(COMPULSORY)** will be part of the CIE. **No SEE for Lab**.

THEORY (60 marks)		LAB (40 marks)		Total
IA test 1	IA test 2	Average of Lab Conduction & Assignment/Open ended Expt	Lab test	
30 marks	30 marks	10 marks	30 marks	100 marks

IA Test:
1. 10 marks questions in Part A of IA question paper should also include an OBE related question (max 2 marks).
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Conduct of Lab:
1. a. Conducting the experiment and journal: 5 marks
b. Calculations, results, graph, conclusion and Outcome: 5 marks
2. The Assignment (Certification), open ended experiment or a course project will be conducted for 10 marks & the Average of both components will be taken to award 10 marks.

Lab test: (Batch wise with 15 students/batch)
1. Test will be conducted at the end of the semester
2. Timetable, Batch details and examiners will be declared by Exam section
3. Conducting the experiment and writing report: 5 marks
4. Calculations, results, graph and conclusion: 15 marks
5. Viva voce: 10 marks

Eligibility for SEE:
1. Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests. Lack of minimum score in IA test will make the student Not Eligible for SEE
2. Student should score minimum 40% of 30 marks (i.e. 12 marks) in Lab test & should score 40% of 40 marks (i.e. 16 marks) in Lab component.

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Results & learning Outcome (2 marks)	Clear, correct results with excellent insights and reflection on learning. (2)	Mostly correct results; good understanding of learning outcomes. (1.5)	Basic results; limited insights or superficial learning. (1)	Incorrect or missing results; no evident learning. (0.5)

Course Project (10 marks)				
Rubric/Level	Exemplary=A (Far Exceeds Standard)	Above Average=B (Exceeds Standard)	Adequate= C (Meets Standard)	Inadequate =D (Below Standard)
Innovative Idea (1 Marks)	Highly original, creative, and impactful idea (1)	Original idea with moderate creativity (0.75)	Common idea with minor innovation (0.5)	Unoriginal or poorly thought-out idea (0.25)
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Report (1 Marks)	Well-structured, detailed, no errors; excellent formatting (1)	Mostly well-written with minor issues (0.75)	Adequate but with some errors (0.5)	Poorly written; lacks structure (0.25)

CO-PSO Mapping (Planned)											
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11
1	√							√			
2	√							√			
3	√							√			
4	√							√			

Name & Signature of Faculty members involved in designing the syllabus

Name & Signature of Faculty members verifying/approving the syllabus

Applied Chemistry

INDEX

Applied Chemistry for Materials and Sustainable Structures (CV)

Course Code	1BCHEC102/202	Course type	Integrated	Credits L-T-P	3-0-1
Hours/week: L - T- P	3-0-2			Total credits	4
Total Contact Hours	L =40 Hrs; T =0 Hrs; P = 20 Hrs Total = 60 Hrs			CIE Marks	100
Flipped Classes content	5 Hours			SEE Marks	100

Course learning objectives: The students should be able to	
1.	Understand the composition, properties, and applications of metals, alloys, polymers, composites, nanomaterials, and sustainable construction materials.
2.	Analyze corrosion, energy systems, and water chemistry processes, including relevant numerical problem-solving.
3.	Apply eco-friendly technologies and innovative materials to improve structural integrity and sustainability in construction.

Pre-requisites : Basic knowledge of chemistry concepts learnt in 10+2 level

Unit – I: Alloys, corrosion science and surface protection	Contact Hours = 8 Hours

Metals and Alloys: Introduction, classification of metals: ferrous and non-ferrous, Iron and Its Alloys (Wrought Iron, Cast Iron and Steel) - composition, properties, applications. Aluminum and Its Alloys (Duralumin and Magnalium) composition, properties, applications.

Corrosion: Introduction, electrochemical corrosion of steel in concrete, types- differential metal corrosion, types-differential aeration corrosion, Stress corrosion in civil structures, Corrosion control by galvanization and anodization, Corrosion Penetration Rate (CPR)- Introduction - Definition, formula and numerical.

Metal finishing: Introduction, Technological importance of metal finishing, Electroplating of Zinc. Throwing-power determination by Haring-Blum Cell, numerical on Throwing power.

Unit – II: Energy systems & Alternative energy resources	Contact Hours = 8 Hours

Energy systems: Introduction, Electrode potential, Nernst equation (Derivation), concentration cell, numerical problems.

Battery Technology: Introduction, Classification of batteries, characteristics (Capacity, power density, cell balancing & cycle life), construction, working and applications of Lithium-ion battery and Sodium-ion battery.

Fuel cells: Introduction, classification based on electrolyte, difference between battery and fuel cell, construction and working of Direct methanol-oxygen fuel cell (Advantages and Applications),

Solar Energy: Introduction, construction and working of silicon solar cell, advantages, applications and limitations. Numerical on solar cell efficiency.

Green Fuels: Introduction, Green hydrogen production by TiO_2 (Photocatalytical method).

Unit – III: Water Chemistry and Analytical techniques	Contact Hours = 8 Hours

Water quality parameters: Introduction, water quality parameters (pH, Turbidity, Chlorides, & Alkalinity) for construction applications: hard water, types, determination of total hardness by EDTA method, numerical problems.

Waste water Analysis and Treatment: Introduction, COD: determination, numerical problems, determination of dissolved oxygen (DO) by modified Winkler's method, Sewage treatment (Primary treatments, Secondary treatment (Activated sludge process) & Tertiary treatment.

Advanced water treatment processes: Desalination of water by reverse osmosis and electro-dialysis, water treatment by Moving bed biological reactor (MBBR).
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.

Unit – IV: Materials for Structural Integrity	Contact Hours = 8 Hours

Polymer: Introduction, Polymer, polymerization, types of polymerization, Synthesis, properties and engineering applications of PVC, Kevlar Fiber and Epoxy Resins (Bisphenol A + Epichlorohydrin), Molecular weight of polymers: Number and Weight average Molecular weight of polymers, numerical problems. Chemical Recycling of plastics.
Biopolymers: Polylactic Acid (PLA)-Synthesis, properties and applications (construction)
Composite Materials: Introduction, Preparation of Epoxy resin based glass fiber composites (Silane as a Coupling Agent) Properties and its applications.
Nanomaterials: Introduction, Size dependent Properties (Surface area, water Absorption & Permeability, Thermal Properties and Antimicrobial Activity), Composition of Nanoconcrete, comparison between Nanoconcrete and Normal Concrete.

Unit – V: Chemistry of Sustainable Construction Materials	Contact Hours = 8 Hours

Cement: Introduction to Dry and wet Process of manufacturing of cement, Mechanism of setting and hardening of cement, Special Cements-High alumina cement and Water proof cement (Composition, Properties and Uses). Numerical on heat of hydration.
Geo-polymer Concrete: Introduction, manufacturing process of Geo-polymer concrete. Advantages over ordinary Portland cement concrete.
Photochromic coatings: Spiropyran as Photochromic coating working principle with chemical reactions and applications in construction.
Piezoelectric cement composites: Piezoelectric materials in cement composites and its applications in civil engineering.
Glass: Introduction, Composition, Types, Preparation of Soda-lime glass, properties and applications.

Flipped Classroom Details

Unit No.	I	II	III	IV	V
No. for Flipped Classroom Sessions	1	1	1	1	1

List of Experiments

Unit No.	No. of Experiments	Topic(s) related to Experiment
3	1	Estimation of acid mixture by conductometric sensor.
3	2	Estimation of iron in rust sample by Potentiometric sensor.
3	3	Determination of pKa of vinegar using pH sensor.
3	4	Estimation of copper present in industrial plating effluent by optical sensor.
1	5	Estimation of iron in TMT bar by diphenyl amine indicator method.
2	6	Estimation of acid concentration in Pb-Acid battery and evaluation of dilution factor.
4	7	Synthesis of conducting polyaniline to detect its conductivity.
3	8	Estimation of total hardness of water by EDTA method.
5	9	Estimation of % CaO in cement by EDTA method.
3	10	Determination of chemical oxygen demand (COD) of industrial waste water.

Unit No.	Self-Study Topics
1	Salt spray method of corrosion testing
2	Construction and working Vanadium redox flow battery
3	Softening of water by ion exchange method
4	Synthesis, properties and engineering applications of ABS
5	Manufacturing of cement by the dry process

Books	
	Text Books:
	Name of the author(s), Title of the Book, Publisher, Edition/Year _____ and onwards
1.	Nanomaterials: Synthesis, Properties and Applications: A. K. Bandyopadhyay, Publisher: New Age International Publishers, ISBN: 978-8122419369.
2.	Polymer Science: V. R. Gowariker, N. V. Viswanathan, Jayadev Sreedhar, Publisher: New Age International Publishers, ISBN: 978-8122418607.
3.	Materials Science: S. K. Malik, Publisher: New Age International Publishers, ISBN: 978-8122418713.
4.	Nanomaterials and Nanochemistry: S. K. Kulkarni (IIT Bombay), Publisher: e- Book available through IIT Bombay NPTEL repository (free PDF), ISBN: Not applicable (e-resource) [Access via NPTEL or institutional repository]
5.	Polymer and Nanomaterials (Chapter on Quantum Dots included): Dr. R. K. Gupta (IIT Delhi) Publisher: Open-access lecture notes, available on IIT Delhi website or repositories.
6.	Electrochemical Energy System: Dr. K. K. Rajeshwar (IIT Madras), Publisher: IIT Madras Open Courseware (Free PDF & videos), ISBN: N/A (Open Educational Resource).
7.	Engineering Chemistry: Jain & Jain, Publisher: Dhanpat Rai Publishing Company, ISBN: 978-935316118.
8.	Analytical Chemistry: G. Chatwal & S. Anand, Himalaya Publishing House, ISBN: 978-9352025460.
9.	Textbook of Engineering Chemistry: S. S. Dara & S. S. Umare, S. Chand Publishing, ISBN:9788121903593
10.	Wiley's Engineering Chemistry (Wiley India), Dr. Shubha Ramesh et al., 2nd Edition, 2013.
	Reference Books:
	Name of the author(s), Title of the Book, Publisher, Edition/Year _____ and onwards
1.	A Text book of Engineering Chemistry, SS Dara & Dr. SS Umare, S Chand & Company Ltd., 12th Edition, 2011.
2.	Engineering Chemistry, Satyaprakash & Manisha Agrawal, Khanna Book Publishing, Delhi, 1st edition, 2012.
	E-resources (NPTEL/SWAYAM.. Any Other)- mention links
1.	https://nptel.ac.in/courses/113/104/113104021/
2.	**https://nptel.ac.in/courses/103/102/103102103/**
3.	https://www.youtube.com/watch?v=JvzH4QQOfSw
4.	https://www.youtube.com/watch?v=1F9Vjae7k60
5.	https://www.youtube.com/watch?v=xrsK9FUdvRE
6.	https://www.youtube.com/watch?v=QNKPaZkWC9Q
7.	https://www.youtube.com/watch?app=desktop&v=dwUVMVNSO2k
8.	https://www.youtube.com/watch?v=MzTiZp01_qs
9.	https://nptel.ac.in/courses/103/102/103102014/
10.	https://www.youtube.com/watch?app=desktop&v=4Ur3eqGiLzc

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Lab Test
3.	Flipped Classes	3.	Semester End Examination
4.	Practice session/Demonstrations in Labs	4.	Assignment/Seminar/Lab activity
5.	Virtual Labs (if present)		

Course Outcome (COs) **Learning Levels:** 1 - Remember; 2 - Understand; 3 - Apply; 4 - Analysis; 5 - Evaluate; 6 - Create				
At the end of the course, the student will be able to (Highlight the **action verb** representing the learning level.)		Learning Level	PO(s)	PSO(s)
1.	**Identify** the terms involved in scientific and engineering application processes	1	1,10	NA
2.	**Explain** the phenomena of chemistry to describe the methods of engineering processes	2	1,9,10,11	NA
3.	**Apply** the basic concepts of chemistry to explain the chemical properties and processes and **solve** the problems in chemistry that are pertinent in engineering applications	3	1,9,10,11	NA
4.	**Analyze** properties and Processes associated with chemical substances in multidisciplinary situations	4	1	NA

Scheme of Continuous Internal Evaluation (CIE):

For integrated courses, a lab test also will be conducted at the end of the semester. The lab test **(COMPULSORY)** will be part of the CIE. **No SEE for Lab**.

THEORY (60 marks)		LAB (40 marks)		Total
IA test 1	IA test 2	Average of Lab Conduction & Assignment/Open ended Expt/CP	Lab test	
30 marks	30 marks	10 marks	30 marks	100 marks

IA Test:
1. 10 marks questions in Part A of IA question paper should also include an OBE related question (max 2 marks).
2. Remaining 20 marks questions in Part B & C should be descriptive.

Conduct of Lab:
1. a. Conducting the experiment and journal: 5 marks
b. Calculations, results, graph, conclusion and Outcome: 5 marks
2. The Assignment (Certification), open ended experiment or a course project will be conducted for 10 marks & the Average of both components will be taken to award 10 marks.

Lab test: (Batchwise with 15 students/batch)
1. Test will be conducted at the end of the semester
2. Timetable, Batch details and examiners will be declared by Exam section
3. Conducting the experiment and writing report: 5 marks
4. Calculations, results, graph and conclusion: 15 marks
5. Viva voce: 10 marks

Eligibility for SEE:
1. Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests. Lack of minimum score in IA test will make the student Not Eligible for SEE
2. Student should score minimum 40% of 30 marks (i.e. 12 marks) in Lab test & should score 40% of 40 marks (i.e. 16 marks) in Lab component.

3. Lab test is COMPULSORY 4. Minimum score in CIE to be eligible for SEE: 40 OUT OF 100. 5. Not eligible in any one of the two components will make the student **Not Eligible** for SEE

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 100 marks of 3 hours duration.
2.	**Minimum marks required in SEE to pass:** Score should be ≥35 &, however overall score of CIE+SEE should be ≥40%.
3.	Question paper contains three parts **A,B and C**. Students have to answer 1. From Part A answer any 5 out of 7 questions, each Question Carries 6 Marks. 2. From Part B answer 5 out of 10 questions choosing any one full question from each unit, each Question Carries 10 Marks. 3. From Part C answer 1 out of 2 questions, each Question Carries 20 Marks.

Assignment (10 marks)				
Rubric/Level	Exemplary=A (Far Exceeds Standard)	Above Average=B (Exceeds Standard)	Adequate= C (Meets Standard)	Inadequate= D (Below Standard)
Technical Content (8 marks)	Comprehensive, accurate, in-depth understanding; shows original thinking and mastery of concepts. (7-8)	Mostly accurate, good understanding, minor gaps; shows good application of concepts. (5-6)	Basic coverage, some understanding, lacks depth or clarity. (3-4)	Incomplete, inaccurate, poor understanding; shows little effort. (1-2)
Results & learning Outcome (2 marks)	Clear, correct results with excellent insights and reflection on learning. (2)	Mostly correct results; good understanding of learning outcomes. (1.5)	Basic results; limited insights or superficial learning. (1)	Incorrect or missing results; no evident learning. (0.5)

Course Project (10 marks)				
Rubric/Level	Exemplary=A (Far Exceeds Standard)	Above Average=B (Exceeds Standard)	Adequate= C (Meets Standard)	Inadequate =D (Below Standard)
Innovative Idea (1 Marks)	Highly original, creative, and impactful idea (1)	Original idea with moderate creativity (0.75)	Common idea with minor innovation (0.5)	Unoriginal or poorly thought-out idea (0.25)
Work Plan/methodology (1 Mark)	Clear, logical, and detailed work plan with effective methodology (1)	Mostly clear and practical plan with some details (0.75)	Basic plan; lacks clarity or depth (0.5)	Poor or vague plan and methodology (0.25)
Work content/Use of Technology (5 Marks)	Comprehensive, technically sound; advanced and appropriate use of technology (5)	Good technical depth; reasonable use of technology (4)	Adequate work; technology used with limitations (3-2)	Superficial or minimal work; poor use of technology (1)
Project Presentation (1 Marks)	Clear, engaging, confident delivery; excellent visuals (1)	Clear and coherent; good use of visuals (0.75)	Understandable but lacks engagement or clarity (0.5)	Disorganized or hard to follow (0.25)
Individual Contribution (1 Marks)	Fully engaged and contributed significantly to all aspects (1)	Active contribution with few gaps (0.75)	Some participation; effort uneven (0.5)	Minimal or unclear contribution (0.25)

Report (1 Marks)	Well-structured, detailed, no errors; excellent formatting (1)	Mostly well-written with minor issues (0.75)	Adequate but with some errors (0.5)	Poorly written; lacks structure (0.25)

CO-PO Mapping (Planned)												**CO-PSO Mapping (Planned)**		
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PSO1**	**PSO2**	**PSO3**
1	✓									✓				
2	✓								✓	✓	✓			
3	✓								✓	✓	✓			
4	✓													
Tick mark the CO, PO and PSO mapping														

Name & Signature of Faculty members involved in designing the syllabus

Name & Signature of Faculty members verifying/approving the syllabus

Applied Chemistry for Advanced Metal Protection and Sustainable Energy Systems (ME & AE)

Course Code	1BCHEM102/202	**Course type**	Integrated	**Credits L-T-P**	3-0-1
Hours/week: L - T- P	3-0-2			**Total credits**	4
Total Contact Hours	L =40Hrs; T =0 Hrs; P = 20 Hrs Total = 60 Hrs			**CIE Marks**	100
Flipped Classes content	5 Hours			**SEE Marks**	100

Course learning objectives: Students should be able to	
1.	**Understand** the principles and applications of sustainable fuels, corrosion science, surface coatings, and sensor technologies for engineering applications.
2.	**Apply** the fundamental concepts of nanomaterials, polymers, and functional materials in energy storage, lubrication, and industrial systems.
3.	**Analyze** the green chemistry principles for renewable energy, advanced materials, and eco-friendly engineering solutions.

Pre-requisites : Basic knowledge of chemistry concepts learnt in 10+2 level

Unit – I: Sustainable Chemistry and Green Energy Fuels	**Contact Hours = 8 Hours**

Fuels: Introduction, calorific value, determination of calorific value using bomb calorimeter, numerical problems on GCV and NCV. Knocking- Introduction and its mechanism in IC (internal combustion engines), antiknocking agents (MTBE and ETBE); octane and cetane number.
Bio-fuels: Introduction, power alcohol, synthesis of biodiesel by Trans-esterification method, advantages and it applications.
Rocket Fuels: Introduction, Classification (based on Physical State) and Characteristics of Rocket Fuels.
Green Fuels: Introduction, Production of green hydrogen by Photocatalytic water splitting (TiO_2) method and its advantages, Hydrogen Storage Methods (Physical and chemical methods).

Unit – II: Corrosion Science and Surface Coating Technologies	**Contact Hours = 8 Hours**

Corrosion Science: Introduction, electrochemical theory of corrosion, types of corrosion differential metal and differential aeration. Corrosion control-galvanization and anodization, cathodic protection (Impressed voltage and sacrificial anode method), corrosion Penetration Rate (CPR) -Introduction and numerical.
Surface coating technologies: Introduction, technological importance, Electroplating, electroplating of chromium (hard and decorative), Throwing-power determination by Haring-Blum Cell, numerical on Throwing power, Difference between Electroplating & Electroless plating, Electroless plating of Nickel,
Nano-coatings: Introduction, spray coating-working principle, applications and limitations.

Unit – III: Fluid Technology and Sensors	**Contact Hours = 8 Hours**

Lubricants: Introduction, classification, properties and industrial applications of lubricants. Synthesis of Graphene Oxide (GO) based Lubricant (Ultrasonic Dispersion Method), properties and advantages.
Biodegradable lubricants: Introduction, Base-Catalyzed Transesterification of Oil and advantages.
Industrial coolants: Introduction, properties and industrial applications of coolants, Preparation of Silicone Oil Coolants (Additive Blending Method), properties and advantages.
Sensors: Introduction, principle and instrumentation of Optical sensors; its application in the estimation of copper, principle and instrumentation of Potentiometric sensors; its application in the estimation of pKa using glass electrode, Numerical on pH measurement. Conductometric sensors; its application in the estimation of acid mixture.

Unit – IV: Nanomaterials and Energy Storage Systems	Contact Hours = 8 Hours
Nanochemistry: Introduction, size dependent properties of nanomaterials (surface area, catalytical and thermal), Synthesis of TiO_2 nanoparticles by the sol-gel method for catalytic converter applications in automobiles. Synthesis of SiC nanoparticle-reinforced ceramic nanocomposites, advantages and Space Applications. **Energy storage devices:** Introduction, classification of batteries, characteristics (Capacity, power density, cell balancing & cycle life), Construction, working and applications of Lithium-ion battery in EVs. **Fuel cells and renewable energy:** Introduction, classification of fuel cell based on electrolyte, difference between fuel cell and battery, construction and working of solid oxide fuel cell(SOFCs) for Auxiliary Power Units (APUs) applications: Silicon based Photovoltaic cells-construction, working, Advantages and applications. Numerical on solar cell efficiency.	

Unit – V: Functional Materials for Engineering Applications	Contact Hours = 8 Hours
Alloys: Introduction, classification, composition, properties and applications of Stainless Steel, Brass and Advanced Al–Cu–Li (Third-Generation) Alloy. **Engineering Polymers:** Introduction, Synthesis of PVC and PMMA and its properties and applications, Glass transition temperature (Tg), factor affecting on Tg and its significance, Numerical on number average and weight average molecular weight of polymers. Chemical recycling of plastics. **Polymer Composites:** Introduction, properties and industrial applications of carbon-based reinforced composites (graphene/carbon nano-tubes as fillers), Kevlar-Synthesis, properties and industrial applications. **Conducting polymers:** Introduction, Synthesis, conducting mechanism of polyaniline & commercial applications. **Nanomaterials:** Introduction, properties and engineering applications of carbon nanotubes and graphene.	

Flipped Classroom Details

Unit No.	I	II	III	IV	V
No. for Flipped Classroom Sessions	1	1	1	1	1

List of Experiments

Unit No.	No. of Experiments	Topic(s) related to Experiment
3	1	Estimation of acid mixture by conductometric sensor.
3	2	Estimation of iron in rust sample by Potentiometric sensor.
3	3	Determination of pKa of vinegar using pH sensor.
3	4	Estimation of copper present in e-waste by optical sensor.
5	5	Estimation of iron in TMT Steel by diphenyl amine indicator method.
4	6	Estimation of acid concentration in Pb-Acid battery and evaluation of dilution factor.
5	7	Synthesis of conducting polyaniline to detect its conductivity.
2	8	Electroless plating of copper on surface active material.
3	9	Determination of viscosity coefficient of lubricant using Ostwald's viscometer.
1	10	Synthesis of biodiesel from non-edible/used oil

Unit No.	Self-Study Topics
1	Construction of catalytic converter
2	Salt spray method for corrosion testing
3	Characteristic properties and applications of lubricant
4	Construction and working of Direct Methanol-oxygen fuel cell
5	Synthesis, properties and applications of ABS

Books	
	Text Books:
	Name of the author(s), Title of the Book, Publisher, Edition/Year _____ and onwards
1.	Fuel Technology & Internal Combustion Engines, Avinash K. Agarwal, Santanu De, Ashok Pandey, Akhilendra P. Singh, Springer (2017), ISBN: 978981 1037856
2.	Biofuels & Biodiesel Production: Avinash K. Agarwal, Rashmi A. Agarwal, Tarun Gupta, Bhola R. Gurjar, Springer (2017), ISBN: 9789811037917
3.	Rocket Propellants: Haridwar Singh, National/Academic Press,
4.	Green Hydrogen & Photocatalysis: Balasubramanian Viswanathan & M. Aulice Scibioh, Alpha Science Intl Ltd, ISBN: 9781842657126
5.	Material Science & Engineering: P. S. Gill, S. K. Kataria & Sons, SBN 10: 9350145863
6.	Modern Technology of Plastic & Polymer Processing Industries: Entrepreneur India (2nd Edition)
7.	Science & Technology of Solid State Metallurgy: IACS series, ISBN: 978 0750675093
8.	Engineering Materials and Metallurgy: Vijay & Nicole, Vijay Nicole Imprint, India, ISBN 13: 978 9394524286.
9.	Handbook of Sustainable Polymers: Structure and Chemistry – Vijay Kumar Thakur, Springer Nature.
10.	Energy Sources: Fundamentals of Chemical Conversion Processes and Applications: Balasubramanian Viswanathan, Elsevier (2017), ISBN 13: 978 0128134631.
	Reference Books:
	Name of the author(s), Title of the Book, Publisher, Edition/Year _____ and onwards
1.	Energy Sources: Fundamentals of Chemical Conversion Processes and Applications: Balasubramanian Viswanathan, Elsevier (2017), ISBN 13: 978 0128134631.
2.	Nano: The Essentials – Understanding Nanoscience and Nanotechnology: Thalappil Pradeep, Tata McGraw Hill (Latest reprint 2020), ISBN 13: 978 0070681970
3.	Sensors and Instrumentation" by Dr. O. N. Pandey, S. K. Kataria & Sons, ISBN: 978 93 5014 4831.
4.	Instrumentation Measurement & Analysis" by R. S. Khandpur (McGraw Hill India), ISBN: 978 0070604605
5	Corrosion and Corrosion Control; Raji Viswanathan, Narosa Publishing House, ISBN 13: 978 8173193538
6.	Electroplating & Plating Technology: P. K. Sahu, Standard Publishers Distributors, ISBN 13: 978 8185739165
7.	E Waste Management; Dr. Suresh Kumar, Authors Press (India), ISBN 13: 978 939131455… (first edition 2021)
8.	E Waste Regulations & Practices: Rakesh Johri, TERI Press (India), ISBN 13: 978 8179931530
9.	E Waste Management: Challenges & Opportunities in India: Varsha Bhagat Ganguly, ISBN 13: 978 0367147242
	E-resources (NPTEL/SWAYAM.. Any Other)- mention links
1.	https://www.vturesource.com/post/1570/News/Bomb-calorimeter-construction-working-vtu-chemistry.html?utm_source
2.	https://pubs.acs.org/doi/10.1021/acsomega.3c00963?utm_source

3.	https://youtu.be/qTw_p9dkiVU
4.	https://youtu.be/wdCYXj-bI-U
5.	https://youtu.be/Y0EkLYK5i-c
6.	https://youtu.be/tzTxMF7CDd4
7.	https://youtu.be/YxrpQEX9ORA
8.	https://youtu.be/Gxv4r9qoRf8

Course delivery methods		**Assessment methods**	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Lab Test
3.	Flipped Classes	3.	Semester End Examination
4.	Practice session/Demonstrations in Labs	4.	Assignment/Seminar/Lab activity
5.	Virtual Labs (if present)		

Course Outcome (COs) **Learning Levels:** 1 - Remember; 2 - Understand; 3 - Apply; 4 - Analysis; 5 - Evaluate; 6 - Create				
At the end of the course, the student will be able to (Highlight the **action verb** representing the learning level.)		Learning Level	PO(s)	PSO(s)
1.	**Identify** the terms involved in scientific and engineering application processes	1	1,10	NA
2.	**Explain** the phenomena of chemistry to describe the methods of engineering processes	2	1,9,10,11	NA
3.	**Apply** the basic concepts of chemistry to explain the chemical properties and processes and **solve** the problems in chemistry that are pertinent in engineering applications	3	1,9,10,11	NA
4.	**Analyze** properties and Processes associated with chemical substances in multidisciplinary situations	4	1	NA

Scheme of Continuous Internal Evaluation (CIE):

For integrated courses, a lab test also will be conducted at the end of the semester. The lab test **(COMPULSORY)** will be part of the CIE. **No SEE for Lab**.

THEORY (60 marks)		**LAB (40 marks)**		Total
IA test 1	IA test 2	Average of Lab Conduction & Assignment/Open ended Expt/CP	Lab test	
30 marks	30 marks	10 marks	30 marks	100 marks

IA Test:

1. 10 marks questions in Part A of IA question paper should also include an OBE related question (max 2 marks).
2. Remaining 20 marks questions in Part B & C should be descriptive.

Conduct of Lab:

1. a. Conducting the experiment and journal: 5 marks
   b. Calculations, results, graph, conclusion and Outcome: 5 marks
2. The Assignment (Certification), open ended experiment or a course project will be conducted for 10 marks & the Average of both components will be taken to award 10 marks.

Lab test: (Batch wise with 15 students/batch)

1. Test will be conducted at the end of the semester
2. Timetable, Batch details and examiners will be declared by Exam section
3. Conducting the experiment and writing report: 5 marks
4. Calculations, results, graph and conclusion: 15 marks
5. Viva voce: 10 marks

Eligibility for SEE:

1. **Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests. Lack of minimum score in IA test will make the student Not Eligible for SEE**
2. **Student should score minimum 40% of 30 marks (i.e. 12 marks) in Lab test & should score 40% of 40 marks (i.e. 16 marks) in Lab component.**
3. Lab test is COMPULSORY
4. **Minimum score in CIE to be eligible for SEE: 40 OUT OF 100.**
5. Not eligible in any one of the two components will make the student **Not Eligible** for SEE

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 100 marks of 3 hours duration.
2.	**Minimum marks required in SEE to pass:** Score should be ≥35 &, however overall score of CIE+SEE should be ≥40%.
3.	Question paper contains three parts **A,B and C**. Students have to answer 1. From Part A answer any 5 out of 7 questions, each Question Carries 6 Marks. 2. From Part B answer 5 out of 10 questions choosing any one full question from each unit, each Question Carries 10 Marks. 3. From Part C answer 1 out of 2 questions, each Question Carries 20 Marks.

Assignment (10 marks)				
Rubric/Level	**Exemplary=A (Far Exceeds Standard)**	**Above Average=B (Exceeds Standard)**	**Adequate= C (Meets Standard)**	**Inadequate= D (Below Standard)**
Technical Content (8 marks)	Comprehensive, accurate, in-depth understanding; shows original thinking and mastery of concepts. (7-8)	Mostly accurate, good understanding, minor gaps; shows good application of concepts. (5-6)	Basic coverage, some understanding, lacks depth or clarity. (3-4)	Incomplete, inaccurate, poor understanding; shows little effort. (1-2)
Results & learning Outcome (2 marks)	Clear, correct results with excellent insights and reflection on learning. (2)	Mostly correct results; good understanding of learning outcomes. (1.5)	Basic results; limited insights or superficial learning. (1)	Incorrect or missing results; no evident learning. (0.5)

Course Project (10 marks)				
Rubric/Level	**Exemplary=A (Far Exceeds Standard)**	**Above Average=B (Exceeds Standard)**	**Adequate= C (Meets Standard)**	**Inadequate =D (Below Standard)**
Innovative Idea (1 Marks)	Highly original, creative, and impactful idea (1)	Original idea with moderate creativity (0.75)	Common idea with minor innovation (0.5)	Unoriginal or poorly thought-out idea (0.25)
Work Plan/methodology (1 Mark)	Clear, logical, and detailed work plan with effective methodology (1)	Mostly clear and practical plan with some details (0.75)	Basic plan; lacks clarity or depth (0.5)	Poor or vague plan and methodology (0.25)
Work content/Use of Technology (5 Marks)	Comprehensive, technically sound; advanced and appropriate use of technology (5)	Good technical depth; reasonable use of technology (4)	Adequate work; technology used with limitations (3-2)	Superficial or minimal work; poor use of technology (1)

Project Presentation (1 Marks)	Clear, engaging, confident delivery; excellent visuals (1)	Clear and coherent; good use of visuals (0.75)	Understandable but lacks engagement or clarity (0.5)	Disorganized or hard to follow (0.25)
Individual Contribution (1 Marks)	Fully engaged and contributed significantly to all aspects (1)	Active contribution with few gaps (0.75)	Some participation; effort uneven (0.5)	Minimal or unclear contribution (0.25)
Report (1 Marks)	Well-structured, detailed, no errors; excellent formatting (1)	Mostly well-written with minor issues (0.75)	Adequate but with some errors (0.5)	Poorly written; lacks structure (0.25)

CO-PO Mapping (Planned)												**CO-PSO Mapping (Planned)**		
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PSO1**	**PSO2**	**PSO3**
1	✓									✓				
2	✓								✓	✓	✓			
3	✓								✓	✓	✓			
4	✓													
Tick mark the CO, PO and PSO mapping														

Name & Signature of Faculty members involved in designing the syllabus

Name & Signature of Faculty members verifying/approving the syllabus

Applied Chemistry for Emerging Electronics and Futuristic Devices (EEE and ECE)

Course Code	1BCHEE102/202	Course type	Integrated	Credits L-T-P	3-0-1
Hours/week: L - T- P	3-0-2			Total credits	4
Total Contact Hours	L =40Hrs; T =0 Hrs; P = 20 Hrs Total = 60 Hrs			CIE Marks	100
Flipped Classes content	5 Hours			SEE Marks	100

Course learning objectives: Students should be able to	
1.	Understand materials and technologies for sustainable, energy-efficient electronics.
2.	Apply chemical principles to functional polymers, composites, quantum dots, and sensors.
3.	Analyze corrosion, e-waste, and emerging materials for advanced electronic applications.

Pre-requisites : Basic knowledge of chemistry concepts learnt in 10+2 level

Unit – I: Materials & Technologies for Energy-Efficient Electronics	Contact Hours = 8 Hours

Energy storage devices: Introduction, classification of batteries, characteristics (Capacity, power density, cell balancing & cycle life), construction and working of Lithium-ion battery for EV applications, Construction and working of ultra-small asymmetric super capacitor and its applications in IoT/wearable devices.

Next generation batteries: Construction, working and applications of Sodium-ion battery and Vanadium redox flow battery.

Energy Conversion Devices: Introduction, construction, working principal, advantages and applications of Silicon based Photovoltaic cell of (PV cell), Numerical on solar cell efficiency, Fuel Cells: Introduction, classification of fuel cells based on electrolyte, construction, working and applications of Direct Methanol–Oxygen fuel cell.

Unit – II : Functional Polymers and Hybrid Composites in Flexible Electronics	Contact Hours = 8 Hours

Stretchable and Wearable Microelectronics: Introduction, Basic principle and working of Lithography (micropatterned copper deposition on flexible plastic substrates): synthesis, properties of PDMS (polydimethylsiloxane) and e-skin applications.

Polymers: Introduction, Synthesis, conduction mechanism of Polyaniline and applications, Number average and weight average molecular weight of polymer and numerical. Synthesis and properties of Poly(3,4-ethylenedioxythiophene):poly(styrenesulphonate) (PEDOT:PSS) in RFID applications. Synthesis and properties of Polyvinylidene Fluoride (PVDF) applications in E-nose devices.

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.

Unit – III : Corrosion Science and E-waste Management	Contact Hours = 8 Hours
Corrosion Chemistry: Introduction, electrochemical theory of corrosion, types of corrosion differential metal (electronic circuits) and differential aeration. Corrosion control-galvanization and anodization, Cathodic protection (Sacrificial anode method and impressed current method), Corrosion Penetration Rate (CPR) -Introduction and numerical. **Metal finishing:** Introduction, Electroplating of chromium (hard and decorative). Electroless plating of copper on PCBs. Throwing-power determination by Haring-Blum Cell, numerical on Throwing power. **E-waste:** Introduction, Need of e-waste management, sources & effects of e-waste on environment and human health, Extraction of gold from e-waste by bioleaching method. Role of stakeholders in e-waste management.	

Unit – IV: Quantum Dot Technologies and Display system	Contact Hours = 8 Hours
Quantum Dot materials: Introduction, Types: Inorganic and Organic Quantum Dot materials, Optical and Electronic Properties of Quantum Dots (QDs) **Inorganic Quantum Dot materials (IQDMs):** Synthesis, properties and applications of silicon based QDs (Sol-Gel Method). Quantum Dot-based Copper Conductive Ink-Wet Chemical Reduction method, properties and applications. **Organic Quantum Dot materials (OQDMs):** Introduction, Chitosan-Carbon Quantum Dots Hydrogel-Synthesis, Properties and applications in next-generation flexible and wearable electronics; Graphene Quantum Dots- Synthesis, properties and emerging electronics applications. **Display Systems:** Liquid crystals (LC's) - Introduction, classification, properties and applications (Seven segment numeric display) in Liquid Crystal Displays (LCDs). Properties and application of Organic Light Emitting Diodes (OLED's) and Quantum Light emitting diodes (QLED's).	

Unit – V: Electrode System and Electrochemical Sensors	Contact Hours = 8 Hours
Electrode System: Introduction, types of electrodes, Nernst equation derivation, Reference electrode, construction, working and applications of calomel electrode. Ion selective electrode- definition, construction, working of glass electrode. Determination of pH using glass electrode, Numerical on pH measurement. Construction and working of Concentration cell and numerical. **Sensing Methods:** Introduction, principle and instrumentation of Optical sensors; its application in the estimation of copper, principle and instrumentation of Potentiometric sensors; applications in the estimation of iron, Conductometric sensors; its application in the estimation of acid mixture.	

Flipped Classroom Details

Unit No.	I	II	III	IV	V
No. for Flipped Classroom Sessions	1	1	1	1	1

List of Experiments

Unit No.	No. of Experiments	Topic(s) related to Experiment
5	1	Estimation of acid mixture by conductometric sensor.
5	2	Estimation of iron in rust sample by Potentiometric sensor.
5	3	Determination of pKa of vinegar using pH sensor.
3	4	Estimation of copper present in e-waste by optical sensor.
3	5	Chemical Analysis of Corroded Steel in Computer/Electronic Hardware Using Diphenylamine Indicator Method.

1	6	Estimation of acid concentration in Pb-Acid battery and evaluation of dilution factor.
3	7	Extraction of Copper from PCB and estimation of copper by iodometry.
3	8	Electroless plating of copper on surface active material.
2	9	Synthesis of conducting polyaniline to detect its conductivity.
4	10	Green synthesis of copper nanoparticles for conductive ink applications

Unit No.	Self-Study Topics
1	Recycling of lithium batteries.
2	Chemical Recycling of plastics.
3	Difference between Electroplating & Electroless plating
4	Difference between LED and OLEDs
5	Construction, working and applications of Ag/AgCl electrode

Books	
Text Books:	
Name of the author(s), Title of the Book, Publisher, Edition/Year and onwards	
1.	John O'M Bockris and Amulya K. N. Reddy, "Modern Electrochemistry", 2nd Ed. Vol. 2B, Electrodics in Chemistry, Engineering, Biology, and Environmental Science.
2.	Shashi Chawla, "A text Book of Engineering Chemistry" Dhanpat Rai and Co. (Pvt) Ltd., 3rd Ed. Reprint 2013.
3.	Monika Jain and P. C. Jain, "Engineering Chemistry" 17th Ed. Dhanpat Rai and Co. (Pvt) Ltd., 2019.
4.	R. V. Gadag and A. N. Shetty, "Engineering Chemistry", IK International Publishing House, New Delhi, 3rd Edition 2014.
5.	B. S. Jai Prakash, R. Venugopal, Shivakumariah and Pushpa Iyengar, "Chemistry for Engineering Students", Subhash Stores, Bengaluru, 2014.
6.	National Research Council 1995. Expanding the Vision of Sensor Materials. Washington, DC: The National Academies Press. https://doi.org/10.17226/4782.
7.	K. Kalyanasundaram, Dye-sensitized Solar Cells, EPFL Press, 03-Aug-2010.
8.	Surana K., Mehra R.M. Quantum Dot Sensitized Solar Cells (QDSSCs). In: Khan Z. (eds) Nanomaterials and Their Applications. Advanced Structured Materials, Vol 84. Springer, Singapore 2018. https://doi.org/10.1007/978-981-10-6214-8_12
9.	Dr. H. Panda, "Handbook on Electroplating with Manufacture of Electrochemicals", ASIA PACIFIC BUSINESS PRESS Inc., 2017.
10.	D. Pletcher, F.C. Walsh, "Industrial Electrochemistry", Springer Netherlands, 2012.
Reference Books:	
1.	V R Gowariker,"Polymer Science",2019, New Age International Publishers.
2.	Mars Fontana,"CORROSION ENGINEERING", 2017, McGraw Hill Education.
E-resourses (NPTEL/SWAYAM.. Any Other)- mention links	
1.	Electrochemistry: https://nptel.ac.in/downloads/122101001/
2.	Polymers: https://nptel.ac.in/courses/113105028/
3.	Chemistry of materials: https://nptel.ac.in/courses/104/103/104103019/
4	https://www.vlab.co.in/broad-area-chemical-sciences
5	https://demonstrations.wolfram.com/topics.php
6	https://interestingengineering.com/science
7	http://libgen.rs/

8	https://nptel.ac.in/downloads/122101001/
9	https://nptel.ac.in/courses/104/103/104103019/
10	https://ndl.iitkgp.ac.in/
11	https://www.youtube.com/watch?v=faESCxAWR9k
12	https://www.youtube.com/watch?v=TBqXMWaxZYM&list=PLyhmwFtznRhuz8L1bb3X-9IbHrDMjHWWh
13	https://www.youtube.com/watch?v=j5Hml6KN4TI
14	https://www.youtube.com/watch?v=X9GHBdyYcyo
15	https://www.youtube.com/watch?v=1xWBPZnEJk8
16	https://www.youtube.com/watch?v=wRAo-M8xBHM

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Lab Test
3.	Flipped Classes	3.	Semester End Examination
4.	Practice session/Demonstrations in Labs	4.	Assignment/Seminar/Lab activity
5.	Virtual Labs (if present)		

Course Outcome (COs) **Learning Levels:** 1 - Remember; 2 - Understand; 3 - Apply; 4 - Analysis; 5 - Evaluate; 6 - Create				
At the end of the course, the student will be able to (Highlight the **action verb** representing the learning level.)		Learning Level	PO(s)	PSO(s)
1.	**Identify** the terms involved in scientific and engineering application processes	1	1,10	NA
2.	**Explain** the phenomena of chemistry to describe the methods of engineering processes	2	1,9,10,11	NA
3.	**Apply** the basic concepts of chemistry to explain the chemical properties and processes and **solve** the problems in chemistry that are pertinent in engineering applications	3	1,9,10,11	NA
4.	**Analyze** properties and Processes associated with chemical substances in multidisciplinary situations	4	1	NA

Scheme of Continuous Internal Evaluation (CIE):
For integrated courses, a lab test also will be conducted at the end of the semester. The lab test **(COMPULSORY)** will be part of the CIE. **No SEE for Lab**.

THEORY (60 marks)		LAB (40 marks)		Total
IA test 1	IA test 2	Average of Lab Conduction & Assignment/Open ended Expt/CP	Lab test	
30 marks	30 marks	10 marks	30 marks	100 marks
IA Test: 1. 10 marks questions in Part A of IA question paper should also include an OBE related question (max 2 marks). 2. Remaining 20 marks questions in Part B & C should be descriptive.				
Conduct of Lab: 1. a. Conducting the experiment and journal: 5 marks b. Calculations, results, graph, conclusion and Outcome: 5 marks				

2. The Assignment (Certification), open ended experiment or a course project will be conducted for 10 marks & the Average of both components will be taken to award 10 marks.
Lab test: (Batchwise with 15 students/batch) 1. Test will be conducted at the end of the semester 2. Timetable, Batch details and examiners will be declared by Exam section 3. Conducting the experiment and writing report: 5 marks 4. Calculations, results, graph and conclusion: 15 marks 5. Viva voce: 10 marks
Eligibility for SEE: 1. Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests. Lack of minimum score in IA test will make the student Not Eligible for SEE 2. Student should score minimum 40% of 30 marks (i.e. 12 marks) in Lab test & should score 40% of 40 marks (i.e. 16 marks) in Lab component. 3. Lab test is COMPULSORY 4. Minimum score in CIE to be eligible for SEE: 40 OUT OF 100. 5. Not eligible in any one of the two components will make the student **Not Eligible** for SEE

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 100 marks of 3 hours duration.
2.	**Minimum marks required in SEE to pass:** Score should be ≥35 &, however overall score of CIE+SEE should be ≥40%.
3.	Question paper contains three parts **A,B and C**. Students have to answer 1. From Part A answer any 5 out of 7 questions, each Question Carries 6 Marks. 2. From Part B answer 5 out of 10 questions choosing any one full question from each unit, each Question Carries 10 Marks. 3. From Part C answer 1 out of 2 questions, each Question Carries 20 Marks.

Assignment (10 marks)				
Rubric/Level	Exemplary=A (Far Exceeds Standard)	Above Average=B (Exceeds Standard)	Adequate= C (Meets Standard)	Inadequate= D (Below Standard)
Technical Content (8 marks)	Comprehensive, accurate, in-depth understanding; shows original thinking and mastery of concepts. (7-8)	Mostly accurate, good understanding, minor gaps; shows good application of concepts. (5-6)	Basic coverage, some understanding, lacks depth or clarity. (3-4)	Incomplete, inaccurate, poor understanding; shows little effort. (1-2)
Results & learning Outcome (2 marks)	Clear, correct results with excellent insights and reflection on learning. (2)	Mostly correct results; good understanding of learning outcomes. (1.5)	Basic results; limited insights or superficial learning. (1)	Incorrect or missing results; no evident learning. (0.5)

Course Project (10 marks)				
Rubric/Level	Exemplary=A (Far Exceeds Standard)	Above Average=B (Exceeds Standard)	Adequate= C (Meets Standard)	Inadequate =D (Below Standard)

Innovative Idea (1 Marks)	Highly original, creative, and impactful idea (1)	Original idea with moderate creativity (0.75)	Common idea with minor innovation (0.5)	Unoriginal or poorly thought-out idea (0.25)
Work Plan/methodology (1 Mark)	Clear, logical, and detailed work plan with effective methodology (1)	Mostly clear and practical plan with some details (0.75)	Basic plan; lacks clarity or depth (0.5)	Poor or vague plan and methodology (0.25)
Work content/Use of Technology (5 Marks)	Comprehensive, technically sound; advanced and appropriate use of technology (5)	Good technical depth; reasonable use of technology (4)	Adequate work; technology used with limitations (3-2)	Superficial or minimal work; poor use of technology (1)
Project Presentation (1 Marks)	Clear, engaging, confident delivery; excellent visuals (1)	Clear and coherent; good use of visuals (0.75)	Understandable but lacks engagement or clarity (0.5)	Disorganized or hard to follow (0.25)
Individual Contribution (1 Marks)	Fully engaged and contributed significantly to all aspects (1)	Active contribution with few gaps (0.75)	Some participation; effort uneven (0.5)	Minimal or unclear contribution (0.25)
Report (1 Marks)	Well-structured, detailed, no errors; excellent formatting (1)	Mostly well-written with minor issues (0.75)	Adequate but with some errors (0.5)	Poorly written; lacks structure (0.25)

CO-PO Mapping (Planned)												CO-PSO Mapping (Planned)		
CO	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PSO1	PSO2	PSO3
1	✓									✓				
2	✓								✓	✓	✓			
3	✓								✓	✓	✓			
4	✓													
Tick mark the CO, PO and PSO mapping														

Name & Signature of Faculty members involved in designing the syllabus

Name & Signature of Faculty members verifying/approving the syllabus

Applied Chemistry for Smart Systems (CSE & CSE AI-ML)

Course Code	1BCHES102/202	**Course type**	Integrated	**Credits L-T-P**	3-0-1
Hours/week: L - T- P	3-0-2			**Total credits**	4
Total Contact Hours	L =40Hrs; T =0 Hrs; P = 20 Hrs Total = 60 Hrs			**CIE Marks**	100
Flipped Classes content	5 Hours			**SEE Marks**	100

Course learning objectives: The students should be able to	
1.	Understand the principles and applications of sensors, green materials, and biomaterials in electronics.
2.	Apply the concepts of functional materials like polymer, and quantum materials for energy, memory, and display devices.
3.	Analyze sustainable chemistry solutions for energy generation/storage, corrosion prevention, and e-waste management in electronic applications.

Pre-requisites : Basic knowledge of chemistry concepts learnt in 10+2 level

Unit – I: Chemical Sensors and Green Materials	**Contact Hours = 8 Hours**

Sensors: Introduction, working principle and applications- conductometric sensor (conductometry) and Optical sensors (colorimetry): principle and instrumentation of Potentiometric sensors; its application in the estimation of pKa using glass electrode, Numericals on pH measurement, Principle & working mechanism of Electrochemical gas sensors for NOx, and Biosensor for detection of glucose in biofluids.

Green Materials: Introduction, properties and uses of green solvents for server heat management, Biosynthesis and properties of Glycerol Trioleate ester for server and IT infrastructure applications.

Biomaterials: Introduction, synthesis and properties of Polylactic Acid (PLA) and polyethylene glycol (PEG) for touch screen applications, Synthesis and properties of Alginate Hydrogel for Brain-Computer Interfaces (BCIs) applications.

Unit – II: Functional Materials for Memory and Display Systems	**Contact Hours = 8 Hours**

Memory Devices: Introduction, organic semiconductors; Types of organic semiconductors used in memory devices (p-type semiconductor-Pentacene; n-type -Perfluoropentacene), Introduction and Difference Between Organic and Inorganic Memory Devices. Construction, working and advantages of organic semiconductor chip (pentacene).

Resistive RAM (ReRAM) Materials: Introduction, synthesis and properties of TiO_2-RAM nanomaterial (sol-gel method), ZnO RAM nanomaterial (hydrothermal method) and applications.

Display Systems: Introduction, classification of Liquid crystals (LCs), properties and applications (Seven segment numeric display) in Liquid Crystal Displays (LCDs), Overview of LEDs and OLEDs, construction, working principle and applications of Active Matrix Organic Light-Emitting Diodes (AMOLEDs) and Quantum Light emitting diodes (QLEDs).

Unit – III: Sustainable Chemistry for Energy Devices	Contact Hours = 8 Hours
Electrochemistry and Advanced Batteries: Introduction, Nernst equation (Derivation), Concentration cell and numerical problems. Classification of batteries, Construction, Working & applications of Li Ion Battery. **Next-Generation energy solutions:** Introduction, construction and working of Sodium ion battery for EV applications, Construction and working of ultra-small asymmetric super capacitor and its applications in IoT/wearable devices. **Clean Energy Chemistry:** Introduction to Fuel cells, Classification based on electrolyte, difference between fuel cell and battery, construction and working Solid-oxide Fuel Cell (SOFCs), design and working of Silicon based Solar Cell (applications & limitations), Numerical on solar cell efficiency, Green hydrogen as a Clean Fuel, Production of green hydrogen by Photocatalytic water splitting (TiO2) method and its advantages.	

Unit – IV: Quantum Materials and Polymers	Contact Hours = 8 Hours
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 and working Principle. **Polymer:** Introduction, Molecular weight of polymers: Number and Weight Average Molecular weight of polymers, numerical problems: Synthesis and properties of Photopolymer resin- Disulfide methacrylate resin (DSMR) for 3D printing applications. Synthesis, properties of PVC and PMMA for device applications. Chemical recycling of plastics. **Conducting polymers:** Introduction, Synthesis, conducting mechanism of polyaniline & commercial applications.	

Unit – V: Corrosion Science and E-Waste Management	Contact Hours = 8 Hours
Corrosion: Introduction, electrochemical theory of corrosion, types (differential metal and aeration), Corrosion control: Galvanization and anodization, Vapour corrosion inhibitors for protecting computer circuit boards, Corrosion Penetration Rate (CPR)- Definition, formula and importance, numerical problems. **Metal finishing:** Introduction, difference between Electroplating & Electroless plating, Electroplating of chromium (hard and decorative). Electroless plating of copper on PCBs. **E-waste:** Introduction, sources, composition of e-waste, Effects of E-waste on environment (Water, air & soil Pollution) & Human health, Artificial intelligence in e-waste management (applications and benefits), Extraction of gold from e-waste by bioleaching method. Role of stake holders in e-waste management.	

Flipped Classroom Details

Unit No.	I	II	III	IV	V
No. for Flipped Classroom Sessions	1	1	1	1	1

List of Experiments

Unit No.	No. of Experiments	Topic(s) related to Experiment
1	1	Estimation of acid mixture by conductometric sensor.

1	2	Estimation of iron in rust sample by Potentiometric sensor.
1	3	Determination of pKa of vinegar using pH sensor.
5	4	Estimation of copper present in e-waste by optical sensor.
5	5	Chemical Analysis of Corroded Steel in Computer/Electronic Hardware Using Diphenylamine Indicator Method.
3	6	Estimation of acid concentration in Pb-Acid battery and evaluation of dilution factor.
5	7	Extraction of Copper from PCB and estimation of copper by iodometry.
5	8	Electroless plating of copper on surface active material.
4	9	Synthesis of conducting polyaniline to detect its conductivity.
4	10	Green synthesis of copper nanoparticles for conductive ink applications

Unit No.	Self-Study Topics
1	Applications of Artificial intelligence in Chemistry
2	Non-Resistive RAM (ReRAM) Materials
3	Construction and working Direct Methanol-Oxygen Fuel Cell
4	Synthesis, properties of ABS
5	Salt spray method for corrosion testing

Books	
	Text Books:
1.	John O'M Bockris and Amulya K. N. Reddy, "Modern Electrochemistry", 2nd Ed. Vol. 2B, Electrodics in Chemistry, Engineering, Biology, and Environmental Science.
2.	Shashi Chawla, "A text Book of Engineering Chemistry" Dhanpat Rai and Co. (Pvt) Ltd., 3rd Ed. Reprint 2013.
3.	Monika Jain and P. C. Jain, "Engineering Chemistry" 17th Ed. Dhanpat Rai and Co. (Pvt) Ltd., 2019.
4.	R. V. Gadag and A. N. Shetty, "Engineering Chemistry", IK International Publishing House, New Delhi, 3rd Edition 2014.
5.	B. S. Jai Prakash, R. Venugopal, Shivakumariah and Pushpa Iyengar, "Chemistry for Engineering Students", Subhash Stores, Bengaluru, 2014.
6.	National Research Council 1995. Expanding the Vision of Sensor Materials. Washington, DC: The National Academies Press. https://doi.org/10.17226/4782.
7.	K. Kalyanasundaram, Dye-sensitized Solar Cells, EPFL Press, 03-Aug-2010.
8.	Surana K., Mehra R.M. Quantum Dot Sensitized Solar Cells (QDSSCs). In: Khan Z. (eds) Nanomaterials and Their Applications. Advanced Structured Materials, Vol 84. Springer, Singapore 2018. https://doi.org/10.1007/978-981-10-6214-8_12
9.	Dr. H. Panda, "Handbook on Electroplating with Manufacture of Electrochemicals", ASIA PACIFIC BUSINESS PRESS Inc., 2017.
10.	D. Pletcher, F.C. Walsh, "Industrial Electrochemistry", Springer Netherlands, 2012.
	Reference Books:
1.	Robert Baboian, "Corrosion Tests and Standards Application and Interpretation", ASTM International, 2005.
2.	A.K.Shaha, "Combustion Engineering and Fuel Technology", Oxford & IBH Publishing Company.

3.	Fred W. Billmeyer, “Textbook of Polymer Science”, 3rd Ed.2007, Wiley Publication.
4.	C. D. Varghese, “Electroplating and other Surface Treatments- A Practical Guide”, Tata Mcgraw-Hill Publishing Co. Ltd. 3rd Reprint 2003.
5.	EIRI Board of Consultants and Engineers, “Hand Book of Electroplating anodizing and Surface Finishing Technology”, Engineers India Research Institute, New Delhi.
6.	V R Gowariker,”Polymer Science”,2019, New Age International Publishers.
7.	Mars Fontana,”CORROSION ENGINEERING”, 2017, McGraw Hill Education.
	E-resources (NPTEL/SWAYAM.. Any Other)- mention links
1.	Electrochemistry: https://nptel.ac.in/downloads/122101001/
2.	Polymers: https://nptel.ac.in/courses/113105028/
3.	Chemistry of materials: https://nptel.ac.in/courses/104/103/104103019/
4	https://www.vlab.co.in/broad-area-chemical-sciences
5	https://demonstrations.wolfram.com/topics.php
6	https://interestingengineering.com/science
7	http://libgen.rs/
8	https://nptel.ac.in/downloads/122101001/
9	https://nptel.ac.in/courses/104/103/104103019/
10	https://ndl.iitkgp.ac.in/
11	https://www.youtube.com/watch?v=faESCxAWR9k
12	https://www.youtube.com/watch?v=TBqXMWaxZYM&list=PLyhmwFtznRhuz8L1bb3X-9IbHrDMjHWWh
13	https://www.youtube.com/watch?v=j5Hml6KN4TI
14	https://www.youtube.com/watch?v=X9GHBdyYcyo
15	https://www.youtube.com/watch?v=1xWBPZnEJk8
16	https://www.youtube.com/watch?v=wRAo-M8xBHM

Course delivery methods		**Assessment methods**	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Lab Test
3.	Flipped Classes	3.	Semester End Examination
4.	Practice session/Demonstrations in Labs	4.	Assignment/Seminar/Lab activity
5.	Virtual Labs (if present)		

Course Outcome (COs)

Learning Levels: 1 - Remember; 2 - Understand; 3 - Apply; 4 - Analysis; 5 - Evaluate; 6 - Create

At the end of the course, the student will be able to (Highlight the **action verb** representing the learning level.)		Learning Level	PO(s)	PSO(s)
1.	**Identify** the terms involved in scientific and engineering application processes	1	1,10	NA
2.	**Explain** the phenomena of chemistry to describe the methods of engineering processes	2	1,9,10,11	NA
3.	**Apply** the basic concepts of chemistry to explain the chemical properties and processes and **solve** the problems in chemistry that are pertinent in engineering applications	3	1,9,10,11	NA
4.	**Analyze** properties and Processes associated with chemical substances in multidisciplinary situations	4	1	NA

Scheme of Continuous Internal Evaluation (CIE):

For integrated courses, a lab test also will be conducted at the end of the semester. The lab test **(COMPULSORY)** will be part of the CIE. **No SEE for Lab**.

THEORY (60 marks)		**LAB (40 marks)**		Total
IA test 1	IA test 2	Average of Lab Conduction & Assignment/Open ended Expt/CP	Lab test	
30 marks	30 marks	10 marks	30 marks	100 marks

IA Test:

1. 10 marks questions in Part A of IA question paper should also include an OBE related question (max 2 marks).
2. Remaining 20 marks questions in Part B & C should be descriptive.

Conduct of Lab:

1. a. Conducting the experiment and journal: 5 marks
   b. Calculations, results, graph, conclusion and Outcome: 5 marks
2. The Assignment (Certification), open ended experiment or a course project will be conducted for 10 marks & the Average of both components will be taken to award 10 marks.

Lab test: (Batchwise with 15 students/batch)

1. Test will be conducted at the end of the semester
2. Timetable, Batch details and examiners will be declared by Exam section
3. Conducting the experiment and writing report: 5 marks
4. Calculations, results, graph and conclusion: 15 marks
5. Viva voce: 10 marks

Eligibility for SEE:

1. **Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests. Lack of minimum score in IA test will make the student Not Eligible for SEE**
2. **Student should score minimum 40% of 30 marks (i.e. 12 marks) in Lab test & should score 40% of 40 marks (i.e. 16 marks) in Lab component.**
3. Lab test is COMPULSORY
4. **Minimum score in CIE to be eligible for SEE: 40 OUT OF 100.**
5. Not eligible in any one of the two components will make the student **Not Eligible** for SEE

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 100 marks of 3 hours duration.
2.	**Minimum marks required in SEE to pass:** Score should be ≥35 &, however overall score of CIE+SEE should be ≥40%.
3.	Question paper contains three parts **A,B and C**. Students have to answer 1. From Part A answer any 5 out of 7 questions, each Question Carries 6 Marks. 2. From Part B answer 5 out of 10 questions choosing any one full question from each unit, each Question Carries 10 Marks. 3. From Part C answer 1 out of 2 questions, each Question Carries 20 Marks.

Assignment (10 marks)				
Rubric/Level	**Exemplary=A (Far Exceeds Standard)**	**Above Average=B (Exceeds Standard)**	**Adequate= C (Meets Standard)**	**Inadequate= D (Below Standard)**
Technical Content (8 marks)	Comprehensive, accurate, in-depth understanding; shows original thinking and	Mostly accurate, good understanding, minor gaps; shows good	Basic coverage, some understanding,	Incomplete, inaccurate, poor understanding;

	mastery of concepts. (7-8)	application of concepts. (5-6)	lacks depth or clarity. (3-4)	shows little effort. (1-2)
Results & learning Outcome (2 marks)	Clear, correct results with excellent insights and reflection on learning. (2)	Mostly correct results; good understanding of learning outcomes. (1.5)	Basic results; limited insights or superficial learning. (1)	Incorrect or missing results; no evident learning. (0.5)

Course Project (10 marks)				
Rubric/Level	**Exemplary=A (Far Exceeds Standard)**	**Above Average=B (Exceeds Standard)**	**Adequate= C (Meets Standard)**	**Inadequate =D (Below Standard)**
Innovative Idea (1 Marks)	Highly original, creative, and impactful idea (1)	Original idea with moderate creativity (0.75)	Common idea with minor innovation (0.5)	Unoriginal or poorly thought-out idea (0.25)
Work Plan/methodology (1 Mark)	Clear, logical, and detailed work plan with effective methodology (1)	Mostly clear and practical plan with some details (0.75)	Basic plan; lacks clarity or depth (0.5)	Poor or vague plan and methodology (0.25)
Work content/Use of Technology (5 Marks)	Comprehensive, technically sound; advanced and appropriate use of technology (5)	Good technical depth; reasonable use of technology (4)	Adequate work; technology used with limitations (3-2)	Superficial or minimal work; poor use of technology (1)
Project Presentation (1 Marks)	Clear, engaging, confident delivery; excellent visuals (1)	Clear and coherent; good use of visuals (0.75)	Understandable but lacks engagement or clarity (0.5)	Disorganized or hard to follow (0.25)
Individual Contribution (1 Marks)	Fully engaged and contributed significantly to all aspects (1)	Active contribution with few gaps (0.75)	Some participation; effort uneven (0.5)	Minimal or unclear contribution (0.25)
Report (1 Marks)	Well-structured, detailed, no errors; excellent formatting (1)	Mostly well-written with minor issues (0.75)	Adequate but with some errors (0.5)	Poorly written; lacks structure (0.25)

CO-PO Mapping (Planned)												**CO-PSO Mapping (Planned)**		
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PSO1**	**PSO2**	**PSO3**
1	✓									✓				
2	✓								✓	✓	✓			
3	✓								✓	✓	✓			
4	✓													
Tick mark the CO, PO and PSO mapping														

Name & Signature of Faculty members involved in designing the syllabus

Name & Signature of Faculty members verifying/approving the syllabus

Computer-Aided Engineering Drawing

INDEX

Code	Title
1BCEDAE103/203	Computer-Aided Engineering Drawing for AE Stream
1BCEDC103/203	Computer-Aided Engineering Drawing for CV Stream
1BCEDM103/203	Computer-Aided Engineering Drawing for ME stream
1BCEDEC103/203	Computer-Aided Engineering Drawing for ECE stream
1BCEDEE103/203	Computer-Aided Engineering Drawing for EEE stream
1BCEDS103/203	Computer-Aided Engineering Drawing for CSE, AI stream

Computer Aided Engineering Drawing

Course Code	**1BCEDAE103**	**Course type**	**Integrated**	**Credits L-T-P**	**2-0-1**
Hours/week: L - T- P	**2-0-2**			**Total credits**	**3**
Total Contact Hours	**L =28 Hrs; T=0 Hrs; P= 22 Hrs Total = 50 Hrs**			**CIE Marks**	**100**
Flipped Classes content	**05 Hours**			**SEE Marks**	**100**

Course learning objectives	
1.	To understand the basic principles and conventions of engineering drawing.
2.	To use drawing as a communication mode and visualize engineering components.
3.	To generate orthographic and pictorial views and 3D Models using CAD software.
4.	To understand the development of surfaces.

Pre-requisites: Usage of drawing instruments.

Unit – I (Common to all branches – Theory & Lab)	**Contact Hours = 12 Hours**

Introduction to CAD tools, software and Significance of Engineering drawing: BIS Conventions of Engineering Drawing, Engineering drawing scales., Co-ordinate system and reference planes HP, VP, RPP & LPP in 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.
Introduction to Orthographic projections of points in 1st and 3rd quadrants.
Orthographic projections of lines placed in First quadrant only.
Orthographic projections of planes: Orthographic projections of square, rectangle, pentagon, hexagon, and circular lamina placed in First quadrant and on HP only, using change of position method.
(Exercises on Projections of planes only to be considered for SEE)

Unit – II (Common to all branches – Theory & Lab)	**Contact Hours = 12 Hours**

Orthographic Projections of Solids: Orthographic projections of right regular solids: Prisms & Pyramids (square, rectangle, pentagon, hexagon); Cylinders, Cones; Cube & Tetrahedron (All solids Resting on HP only).

Unit – III (Common to all branches – Theory & Lab)	**Contact Hours = 18 Hours**

Isometric Projections: Isometric scale, Isometric projection of hexahedron (cube), right regular prisms, pyramids (types covered in unit II), cylinders, cones and spheres. Isometric projection of combination of two simple solids with their axes coinciding.
Development of Lateral Surfaces of Solids: Concept of Section of Solid. development of lateral surfaces of right regular prisms, pyramids (types covered in unit II), cylinders and cones resting with base on HP only. Development of lateral surfaces of their frustums and truncations with a single section plane only. (section plane perpendicular to VP and inclined to HP only). Problems on applications of development of lateral surfaces like funnels and trays.

Unit – IV (Branch specific – Lab only)	**Contact Hours = 04 Hours**

Introduction to xDesign platform, collaborative workspace, and related tools, introduction to 3D modeling: reference planes, basic sketching, and key commands including Spline, Pad, Pocket, material assignment, and drafting techniques. Hands-on practice on modeling basic aircraft components: wing, rib and spar.

Unit – V (Branch specific – Lab only)	Contact Hours = 04 Hours
Aircraft Fuselage Design: Modelling of fuselage by lofting between multiple cross-sectional profiles to form a smooth, aerodynamic outer shell. Internal structural components: frames, bulkheads, and stringers using Boolean operations.	

Flipped Classroom Details

Unit No.	I	II	III	IV	V
No. for Flipped Classroom Sessions	01	01	01	01	01

List of Experiments

Unit No.	No. of Lab Sessions	Topic(s) related to Lab Session
1	3	Introduction, projections of points, Projections of straight lines, Projections of planes
2	2	Projections of solids
3	2	Isometric projections & Development of Lateral surfaces
4	2	Branch specific simple application-oriented exercises
5	2	Branch specific simple application-oriented exercises

Books	
	Text Books:
1.	K. R. Gopalakrishna, & Sudhir Gopalakrishna: Textbook of Computer Aided Engineering Drawing, 39th Edition, Subash Stores, Bangalore, 2010
2.	Parthasarathy N. S., Vela Murali, Engineering Drawing, Oxford University Press, 2015
3.	S.N. Lal, & T.Madhusudhan: Engineering Visualization, 1st Edition, Cengage Publication, 2012
	Reference Books:
1.	Bhatt, N.D., Engineering Drawing: Plane and Solid Geometry, 53rd edition, Charotar Publishing House Pvt. Limited, 2019.
2.	Bhattacharya S. K., Electrical Engineering Drawing, New Age International publishers, second edition 1998, reprint 2005.
	E-resources
1.	https://nptel.ac.in/courses/112/105/112105294/
2.	https://nptel.ac.in/courses/112/103/112103019/
3.	https://nptel.ac.in/courses/105/104/105104148/
4.	https://nptel.ac.in/courses/112/102/112102304/
5.	Building plans- https://www.designingbuildings.co.uk/wiki/Engineering_drawing
6.	Circuits- https://www.smartdraw.com/circuit-diagram/
7.	Mechanical Components-http://ecoursesonline.iasri.res.in/mod/page/view. php?id=2474

Course delivery methods		Assessment methods	
1.	Chalk and talk	1.	IA tests
2.	PPT and Videos	2.	Lab Test
3.	Flipped Classes	3.	Semester End Examination
4.	Practice session/Demonstrations in Labs	4.	CAD Print outs/sketches
5.	Virtual Labs (if present)	5.	Assignment/Project

Course Outcome (COs) **Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create**				
At the end of the course, the student will be able to (Highlight the action verb representing the learning level.)		**Learning Level**	**PO(s)**	**PSO(s)**
1.	Visualize and apply basic drafting fundamentals	Ap	1	1
2.	Apply basic concepts to develop construction/drawing technique	Ap	1	1
3.	Create detailed standard drawings and 3D models using CAD tool	Ap	1,5	1

Scheme of Continuous Internal Evaluation (CIE):
For integrated courses, a lab test also will be conducted at the end of the semester. The lab test (COMPULSORY) will be part of the CIE. No SEE for Lab.

THEORY (60 marks)		**LAB (40 marks)**		**Total**
IA test 1	**IA test 2**	**Average of Lab Conduction & Assignment/Open ended Expt/CP**	**Lab test**	
30 marks	**30 marks**	**10 marks**	**30 marks**	**100 marks**

IA Test:

1. The question paper will consist of PART-A & PART-B, each part consisting of two questions of 15marks each.
2. Students have to attempt any 1 question from each part.

Conduct of Lab:

1. Assignments, conduction of lab and printouts from UNIT1, UNIT2, UNIT3 together will carry 10 marks.
2. UNIT4 & UNIT5, conduction of lab and printouts will carry 10 marks.
3. The average of the two above components will be considered for 10 marks.

Lab test: (Batchwise with 15 students/batch)

1. Test will be conducted at the end of the semester
2. Timetable, Batch details and examiners will be declared by Exam section
3. The lab CIE test will consist of 4 questions of 7.5marks each from UNIT1, UNIT2, UNIT3 & one question from either UNIT4 or UNIT5.

Eligibility for SEE:

1. Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests. Lack of minimum score in IA test will make the student Not Eligible for SEE
2. Student should score minimum 40% of 30 marks (i.e. 12 marks) in Lab test & should score 40% of 40 marks (i.e. 16 marks) in Lab component.
3. Lab test is COMPULSORY
4. Minimum score in CIE to be eligible for SEE: 40 OUT OF 100.
5. Not eligible in any one of the two components will make the student Not Eligible for SEE

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 100 marks of 3 hours duration.
2.	Minimum marks required in SEE to pass: Score should be ≥35 &, however overall score of CIE+SEE should be ≥40%.

3.	Question paper contains four PARTS carrying two questions of 25 marks each. PART A – two questions from UNIT1 (Projection of Planes) PART B – two questions from UNIT2 (Projection of Solids) PART C – two questions from UNIT3 (Isometric Projections) PART D – two questions from UNIT3 (Development of Lateral Surfaces) Students have to answer one full question from each PART, only by drawing to the scale in answer script. (No print out)

3. Assignment (10 marks)

Rubric/Level	**Exemplary=A (Far Exceeds Standard)**	**Above Average=B (Exceeds Standard)**	**Adequate= C (Meets Standard)**	**Inadequate= D (Below Standard)**
Technical Content (8 marks)	Comprehensive, accurate, in-depth understanding; shows original thinking and mastery of concepts. (7-8)	Mostly accurate, good understanding, minor gaps; shows good application of concepts. (5-6)	Basic coverage, some understanding, lacks depth or clarity. (3-4)	Incomplete, inaccurate, poor understanding; shows little effort. (1-2)
Results & learning Outcome (2 marks)	Clear, correct results with excellent insights and reflection on learning. (2)	Mostly correct results; good understanding of learning outcomes. (1.5)	Basic results; limited insights or superficial learning. (1)	Incorrect or missing results; no evident learning. (0.5)

4. Course Project (10 marks)

Rubric/Level	**Exemplary=A (Far Exceeds Standard)**	**Above Average=B (Exceeds Standard)**	**Adequate= C (Meets Standard)**	**Inadequate =D (Below Standard)**
Innovative Idea (1 Marks)	Highly original, creative, and impactful idea (1)	Original idea with moderate creativity (0.75)	Common idea with minor innovation (0.5)	Unoriginal or poorly thought-out idea (0.25)
Work Plan/methodology (1 Mark)	Clear, logical, and detailed work plan with effective methodology (1)	Mostly clear and practical plan with some details (0.75)	Basic plan; lacks clarity or depth (0.5)	Poor or vague plan and methodology (0.25)
Work content/Use of Technology (5 Marks)	Comprehensive, technically sound; advanced and appropriate use of technology (5)	Good technical depth; reasonable use of technology (4)	Adequate work; technology used with limitations (3-2)	Superficial or minimal work; poor use of technology (1)
Project Presentation (1 Marks)	Clear, engaging, confident delivery; excellent visuals (1)	Clear and coherent; good use of visuals (0.75)	Understandable but lacks engagement or clarity (0.5)	Disorganized or hard to follow (0.25)
Individual Contribution (1 Marks)	Fully engaged and contributed significantly to all aspects (1)	Active contribution with few gaps (0.75)	Some participation; effort uneven (0.5)	Minimal or unclear contribution (0.25)
Report (1 Marks)	Well-structured, detailed, no errors; excellent formatting (1)	Mostly well-written with minor issues (0.75)	Adequate but with some errors (0.5)	Poorly written; lacks structure (0.25)

CO-PO Mapping (Planned)												CO-PSO Mapping (Planned)		
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PSO1**	**PSO2**	**PSO3**
1	✓											✓		
2	✓											✓		
3	✓				✓							✓		

Name & Signature of Faculty members involved in designing the syllabus

(Dr. Tushar T. Hawal)

Name & Signature of Faculty verifying/approving the syllabus

(Prof. Basavraj S. Jagathi)

Computer Aided Engineering Drawing

Course Code	**1BCEDC103**	**Course type**	**Integrated**	**Credits L-T-P**	**2-0-1**
Hours/week: L - T- P	**2-0-2**			**Total credits**	**3**
Total Contact Hours	**L =28 Hrs; T=0 Hrs; P= 22 Hrs Total = 50 Hrs**			**CIE Marks**	**100**
Flipped Classes content	**05 Hours**			**SEE Marks**	**100**

Course learning objectives	
1.	To understand the basic principles and conventions of engineering drawing.
2.	To use drawing as a communication mode and visualize engineering components.
3.	To generate orthographic and pictorial views and 3D Models using CAD software.
4.	To understand the development of surfaces.

Pre-requisites: Usage of drawing instruments.

Unit – I (Common to all branches – Theory & Lab)	**Contact Hours = 14 Hours**

Introduction to CAD tools, software and Significance of Engineering drawing: BIS Conventions of Engineering Drawing, Engineering drawing scales., Co-ordinate system and reference planes HP, VP, RPP & LPP in 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.
Introduction to Orthographic projections of points in 1st and 3rd quadrants.
Orthographic projections of lines placed in First quadrant only.
Orthographic projections of planes: Orthographic projections of square, rectangle, pentagon, hexagon, and circular lamina placed in First quadrant and on HP only, using change of position method.
(Exercises on Projections of planes only to be considered for SEE)

Unit – II (Common to all branches – Theory & Lab)	**Contact Hours = 14 Hours**

Orthographic Projections of Solids: Orthographic projections of right regular solids: Prisms & Pyramids (square, rectangle, pentagon, hexagon); Cylinders, Cones; Cube & Tetrahedron (All solids Resting on HP only).

Unit – III (Common to all branches – Theory & Lab)	**Contact Hours = 14 Hours**

Isometric Projections: Isometric scale, Isometric projection of hexahedron (cube), right regular prisms, pyramids (types covered in unit II), cylinders, cones and spheres. Isometric projection of combination of two simple solids with their axes coinciding.
Development of Lateral Surfaces of Solids: Concept of Section of Solid. development of lateral surfaces of right regular prisms, pyramids (types covered in unit II), cylinders and cones resting with base on HP only. Development of lateral surfaces of their frustums and truncations with a single section plane only. (section plane perpendicular to VP and inclined to HP only). Problems on applications of development of lateral surfaces like funnels and trays.

Unit – IV (Branch specific – Lab only)	**Contact Hours = 04 Hours**

Introduction to Sheet layout – Sheet sizes, margins, border lines, grid reference system, title block, drawing scales. Lines, lettering and dimensioning – Line thickness, types of lines and their use, lettering, dimensioning terms and notations, general rules for dimensioning

Introduction to basic components of a building – substructure and superstructure, ground, plinth, sill, lintel and slab levels, common sizes and dimensions of buildings and openings

Unit – V (Branch specific – Lab only)	**Contact Hours = 04 Hours**
Two-dimensional views in Civil Engineering drawing – plan, elevation, section Preparing 2D drawing for a single storey building (at the most 3 rooms) (layout and typical details only), given the line drawing or requirements in words using computer applications Developing three-dimensional views – using the 2D drawings to develop 3D views with the help of computer applications	

Flipped Classroom Details

Unit No.	**I**	**II**	**III**	**IV**	**V**
No. for Flipped Classroom Sessions	01	01	01	01	01

List of Experiments

Unit No.	**No. of Lab Sessions**	**Topic(s) related to Lab Session**
1	**3**	Introduction, projections of points, Projections of straight lines, Projections of planes
2	**2**	Projections of solids
3	**2**	Isometric projections & Development of Lateral surfaces
4	**2**	Branch specific simple application-oriented exercises
5	**2**	Branch specific simple application-oriented exercises

Books	
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1.	K. R. Gopalakrishna, & Sudhir Gopalakrishna: Textbook of Computer Aided Engineering Drawing, 39th Edition, Subash Stores, Bangalore, 2010
2.	Parthasarathy N. S., Vela Murali, Engineering Drawing, Oxford University Press, 2015
3.	S.N. Lal, & T.Madhusudhan: Engineering Visualization, 1st Edition, Cengage Publication, 2012
	Reference Books:
1.	Bhatt, N.D., Engineering Drawing: Plane and Solid Geometry, 53rd edition, Charotar Publishing House Pvt. Limited, 2019.
2.	Bhattacharya S. K., Electrical Engineering Drawing, New Age International publishers, second edition 1998, reprint 2005.
	E-resources
1.	https://nptel.ac.in/courses/112/105/112105294/
2.	https://nptel.ac.in/courses/112/103/112103019/
3.	https://nptel.ac.in/courses/105/104/105104148/
4.	https://nptel.ac.in/courses/112/102/112102304/
5.	Building plans- https://www.designingbuildings.co.uk/wiki/Engineering_drawing
6.	Circuits- https://www.smartdraw.com/circuit-diagram/
7.	Mechanical Components-http://ecoursesonline.iasri.res.in/mod/page/view. php?id=2474

Course delivery methods		**Assessment methods**	
1.	Chalk and talk	**1.**	IA tests
2.	PPT and Videos	**2.**	Lab Test

3.	Flipped Classes	**3.**	Semester End Examination
4.	Practice session/Demonstrations in Labs	**4.**	CAD Print outs/sketches
5.	Virtual Labs (if present)	**5.**	Assignment/Project

Course Outcome (COs)

Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create

	At the end of the course, the student will be able to (Highlight the action verb representing the learning level.)	**Learning Level**	**PO(s)**	**PSO(s)**
1.	Visualize and apply basic drafting fundamentals	Ap	1	1
2.	Apply basic concepts to develop construction/drawing technique	Ap	1	1
3.	Create detailed standard drawings and 3D models using CAD tool	Ap	1,5	1

Scheme of Continuous Internal Evaluation (CIE):

For integrated courses, a lab test also will be conducted at the end of the semester. The lab test (COMPULSORY) will be part of the CIE. No SEE for Lab.

THEORY (60 marks)		**LAB (40 marks)**		**Total**
IA test 1	**IA test 2**	**Average of Lab Conduction & Assignment/Open ended Expt/CP**	**Lab test**	
30 marks	**30 marks**	**10 marks**	**30 marks**	**100 marks**

IA Test:

1. The question paper will consist of PART-A & PART-B, each part consisting of two questions of 15marks each.
2. Students have to attempt any 1 question from each part.

Conduct of Lab:

1. Assignments, conduction of lab and printouts **from UNIT1, UNIT2, UNIT3** together will carry 10 marks.
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3. The lab CIE test will consist of 4 questions of 7.5marks each from UNIT1, UNIT2, UNIT3 & one question from either UNIT4 or UNIT5.

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1. Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests. Lack of minimum score in IA test will make the student Not Eligible for SEE
2. Student should score minimum 40% of 30 marks (i.e. 12 marks) in Lab test & should score 40% of 40 marks (i.e. 16 marks) in Lab component.
3. Lab test is COMPULSORY
4. Minimum score in CIE to be eligible for SEE: 40 OUT OF 100.
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1.	It will be conducted for 100 marks of 3 hours duration.

2.	Minimum marks required in SEE to pass: Score should be ≥35 &, however overall score of CIE+SEE should be ≥40%.
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Assignment (10 marks)				
Rubric/Level	**Exemplary=A (Far Exceeds Standard)**	**Above Average=B (Exceeds Standard)**	**Adequate= C (Meets Standard)**	**Inadequate= D (Below Standard)**
Technical Content (8 marks)	Comprehensive, accurate, in-depth understanding; shows original thinking and mastery of concepts. (7-8)	Mostly accurate, good understanding, minor gaps; shows good application of concepts. (5-6)	Basic coverage, some understanding, lacks depth or clarity. (3-4)	Incomplete, inaccurate, poor understanding; shows little effort. (1-2)
Results & learning Outcome (2 marks)	Clear, correct results with excellent insights and reflection on learning. (2)	Mostly correct results; good understanding of learning outcomes. (1.5)	Basic results; limited insights or superficial learning. (1)	Incorrect or missing results; no evident learning. (0.5)

Course Project (10 marks)				
Rubric/Level	**Exemplary=A (Far Exceeds Standard)**	**Above Average=B (Exceeds Standard)**	**Adequate= C (Meets Standard)**	**Inadequate =D (Below Standard)**
Innovative Idea (1 Marks)	Highly original, creative, and impactful idea (1)	Original idea with moderate creativity (0.75)	Common idea with minor innovation (0.5)	Unoriginal or poorly thought-out idea (0.25)
Work Plan/methodology (1 Mark)	Clear, logical, and detailed work plan with effective methodology (1)	Mostly clear and practical plan with some details (0.75)	Basic plan; lacks clarity or depth (0.5)	Poor or vague plan and methodology (0.25)
Work content/Use of Technology (5 Marks)	Comprehensive, technically sound; advanced and appropriate use of technology (5)	Good technical depth; reasonable use of technology (4)	Adequate work; technology used with limitations (3-2)	Superficial or minimal work; poor use of technology (1)
Project Presentation (1 Marks)	Clear, engaging, confident delivery; excellent visuals (1)	Clear and coherent; good use of visuals (0.75)	Understandable but lacks engagement or clarity (0.5)	Disorganized or hard to follow (0.25)
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CO-PO Mapping (Planned)												**CO-PSO Mapping (Planned)**		
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PSO1**	**PSO2**	**PSO3**
1	✓											✓		
2	✓											✓		
3	✓				✓							✓		

Name & Signature of Faculty members involved in designing the syllabus

(Dr. Tushar T. Hawal)

Name & Signature of Faculty verifying/approving the syllabus

(Prof. Basavraj S. Jagathi)

Computer Aided Engineering Drawing

Course Code	**1BCEDEC103**	**Course type**	**Integrated**	**Credits L-T-P**	**2-0-1**
Hours/week: L - T- P	**2-0-2**			**Total credits**	**3**
Total Contact Hours	**L =28 Hrs; T=0 Hrs; P= 22 Hrs Total = 50 Hrs**			**CIE Marks**	**100**
Flipped Classes content	**05 Hours**			**SEE Marks**	**100**

Course learning objectives	
1.	To understand the basic principles and conventions of engineering drawing.
2.	To use drawing as a communication mode and visualize engineering components.
3.	To generate orthographic and pictorial views and 3D Models using CAD software.
4.	To understand the development of surfaces.

Pre-requisites: Usage of drawing instruments.

Unit – I (Common to all branches – Theory & Lab)	**Contact Hours = 14 Hours**

Introduction to CAD tools, software and Significance of Engineering drawing: BIS Conventions of Engineering Drawing, Engineering drawing scales., Co-ordinate system and reference planes HP, VP, RPP & LPP in 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.
Introduction to Orthographic projections of points in 1st and 3rd quadrants.
Orthographic projections of lines placed in First quadrant only.
Orthographic projections of planes: Orthographic projections of square, rectangle, pentagon, hexagon, and circular lamina placed in First quadrant and on HP only, using change of position method.
(Exercises on Projections of planes only to be considered for SEE)

Unit – II (Common to all branches – Theory & Lab)	**Contact Hours = 14 Hours**

Orthographic Projections of Solids: Orthographic projections of right regular solids: Prisms & Pyramids (square, rectangle, pentagon, hexagon); Cylinders, Cones; Cube & Tetrahedron (All solids Resting on HP only).

Unit – III (Common to all branches – Theory & Lab)	**Contact Hours = 14 Hours**

Isometric Projections: Isometric scale, Isometric projection of hexahedron (cube), right regular prisms, pyramids (types covered in unit II), cylinders, cones and spheres. Isometric projection of combination of two simple solids with their axes coinciding.
Development of Lateral Surfaces of Solids: Concept of Section of Solid. development of lateral surfaces of right regular prisms, pyramids (types covered in unit II), cylinders and cones resting with base on HP only. Development of lateral surfaces of their frustums and truncations with a single section plane only. (section plane perpendicular to VP and inclined to HP only). Problems on applications of development of lateral surfaces like funnels and trays.

Unit – IV (Branch specific – Lab only)	**Contact Hours = 04 Hours**

Introduction to x3D Design Platform, Creating Collaborative workspace. Creating sketch entities using Line, Rectangle, Arc, Circle Sketch commands. Trim or Extend Sketch Entities. Creating solid, thin or surface extrude.

Unit – V (Branch specific – Lab only)	Contact Hours = 04 Hours
Introduction to sketch tools. Overview of features such as linear pattern, circular pattern. Simple exercises utilizing these commands. Example of drawing shape of diode, transformer and different types of antennas.	

Flipped Classroom Details

Unit No.	I	II	III	IV	V
No. for Flipped Classroom Sessions	01	01	01	01	01

List of Experiments

Unit No.	No. of Lab Sessions	Topic(s) related to Lab Session
1	3	Introduction, projections of points, Projections of straight lines, Projections of planes
2	2	Projections of solids
3	2	Isometric projections & Development of Lateral surfaces
4	2	Branch specific simple application-oriented exercises
5	2	Branch specific simple application-oriented exercises

Books	
	Text Books:
1.	K. R. Gopalakrishna, & Sudhir Gopalakrishna: Textbook of Computer Aided Engineering Drawing, 39th Edition, Subash Stores, Bangalore, 2010
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	E-resources
1.	https://nptel.ac.in/courses/112/105/112105294/
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3.	https://nptel.ac.in/courses/105/104/105104148/
4.	https://nptel.ac.in/courses/112/102/112102304/
5.	Building plans- https://www.designingbuildings.co.uk/wiki/Engineering_drawing
6.	Circuits- https://www.smartdraw.com/circuit-diagram/
7.	Mechanical Components-http://ecoursesonline.iasri.res.in/mod/page/view. php?id=2474

Course delivery methods		Assessment methods	
1.	Chalk and talk	1.	IA tests
2.	PPT and Videos	2.	Lab Test
3.	Flipped Classes	3.	Semester End Examination
4.	Practice session/Demonstrations in Labs	4.	CAD Print outs/sketches
5.	Virtual Labs (if present)	5.	Assignment/Project

Course Outcome (COs) Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create				
At the end of the course, the student will be able to (Highlight the action verb representing the learning level.)		**Learning Level**	**PO(s)**	**PSO(s)**
1.	Visualize and apply basic drafting fundamentals	Ap	1	1
2.	Apply basic concepts to develop construction/drawing technique	Ap	1	1
3.	Create detailed standard drawings and 3D models using CAD tool	Ap	1,5	1

Scheme of Continuous Internal Evaluation (CIE):
For integrated courses, a lab test also will be conducted at the end of the semester. The lab test (COMPULSORY) will be part of the CIE. No SEE for Lab.

THEORY (60 marks)		**LAB (40 marks)**		**Total**
IA test 1	**IA test 2**	**Average of Lab Conduction & Assignment/Open ended Expt/CP**	**Lab test**	
30 marks	**30 marks**	**10 marks**	**30 marks**	**100 marks**

IA Test:

1. The question paper will consist of PART-A & PART-B, each part consisting of two questions of 15marks each.
2. Students have to attempt any 1 question from each part.

Conduct of Lab:

1. Assignments, conduction of lab and printouts **from UNIT1, UNIT2, UNIT3** together will carry 10 marks.
2. UNIT4 & UNIT5, conduction of lab and printouts will carry 10 marks.
3. The average of the two above components will be considered for 10 marks.

Lab test: (Batchwise with 15 students/batch)

1. Test will be conducted at the end of the semester
2. Timetable, Batch details and examiners will be declared by Exam section
3. The lab CIE test will consist of 4 questions of 7.5marks each from UNIT1, UNIT2, UNIT3 & one question from either UNIT4 or UNIT5.

Eligibility for SEE:

1. Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests. Lack of minimum score in IA test will make the student Not Eligible for SEE
2. Student should score minimum 40% of 30 marks (i.e. 12 marks) in Lab test & should score 40% of 40 marks (i.e. 16 marks) in Lab component.
3. Lab test is COMPULSORY
4. Minimum score in CIE to be eligible for SEE: 40 OUT OF 100.
5. Not eligible in any one of the two components will make the student Not Eligible for SEE

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 100 marks of 3 hours duration.
2.	Minimum marks required in SEE to pass: Score should be ≥35 &, however overall score of CIE+SEE should be ≥40%.
3.	Question paper contains four PARTS carrying two questions of 25 marks each. PART A – two questions from UNIT1 (Projection of Planes)

	PART B – two questions from UNIT2 (Projection of Solids) PART C – two questions from UNIT3 (Isometric Projections) PART D – two questions from UNIT3 (Development of Lateral Surfaces) Students have to answer one full question from each PART, only by drawing to the scale in answer script. (No print out)

Assignment (10 marks)				
Rubric/Level	**Exemplary=A (Far Exceeds Standard)**	**Above Average=B (Exceeds Standard)**	**Adequate= C (Meets Standard)**	**Inadequate= D (Below Standard)**
Technical Content (8 marks)	Comprehensive, accurate, in-depth understanding; shows original thinking and mastery of concepts. (7-8)	Mostly accurate, good understanding, minor gaps; shows good application of concepts. (5-6)	Basic coverage, some understanding, lacks depth or clarity. (3-4)	Incomplete, inaccurate, poor understanding; shows little effort. (1-2)
Results & learning Outcome (2 marks)	Clear, correct results with excellent insights and reflection on learning. (2)	Mostly correct results; good understanding of learning outcomes. (1.5)	Basic results; limited insights or superficial learning. (1)	Incorrect or missing results; no evident learning. (0.5)

Course Project (10 marks)				
Rubric/Level	**Exemplary=A (Far Exceeds Standard)**	**Above Average=B (Exceeds Standard)**	**Adequate= C (Meets Standard)**	**Inadequate =D (Below Standard)**
Innovative Idea (1 Marks)	Highly original, creative, and impactful idea (1)	Original idea with moderate creativity (0.75)	Common idea with minor innovation (0.5)	Unoriginal or poorly thought-out idea (0.25)
Work Plan/methodology (1 Mark)	Clear, logical, and detailed work plan with effective methodology (1)	Mostly clear and practical plan with some details (0.75)	Basic plan; lacks clarity or depth (0.5)	Poor or vague plan and methodology (0.25)
Work content/Use of Technology (5 Marks)	Comprehensive, technically sound; advanced and appropriate use of technology (5)	Good technical depth; reasonable use of technology (4)	Adequate work; technology used with limitations (3-2)	Superficial or minimal work; poor use of technology (1)
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CO-PO Mapping (Planned)												CO-PSO Mapping (Planned)		
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PSO1**	**PSO2**	**PSO3**
1	✓											✓		
2	✓											✓		
3	✓				✓							✓		

Name & Signature of Faculty members involved in designing the syllabus

(Dr. Tushar T. Hawal)

Name & Signature of Faculty verifying/approving the syllabus

(Prof. Basavraj S. Jagathi)

Computer Aided Engineering Drawing

Course Code	**1BCEDEE103**	**Course type**	**Integrated**	**Credits L-T-P**	**2-0-1**
Hours/week: L - T- P	**2-0-2**			**Total credits**	**3**
Total Contact Hours	**L =28 Hrs; T=0 Hrs; P= 22 Hrs Total = 50 Hrs**			**CIE Marks**	**100**
Flipped Classes content	**05 Hours**			**SEE Marks**	**100**

Course learning objectives	
1.	To understand the basic principles and conventions of engineering drawing.
2.	To use drawing as a communication mode and visualize engineering components.
3.	To generate orthographic and pictorial views and 3D Models using CAD software.
4.	To understand the development of surfaces.

Pre-requisites: Usage of drawing instruments.

Unit – I (Common to all branches – Theory & Lab)	**Contact Hours = 14 Hours**

Introduction to CAD tools, software and Significance of Engineering drawing: BIS Conventions of Engineering Drawing, Engineering drawing scales., Co-ordinate system and reference planes HP, VP, RPP & LPP in 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.
Introduction to Orthographic projections of points in 1st and 3rd quadrants.
Orthographic projections of lines placed in First quadrant only.
Orthographic projections of planes: Orthographic projections of square, rectangle, pentagon, hexagon, and circular lamina placed in First quadrant and on HP only, using change of position method.
(Exercises on Projections of planes only to be considered for SEE)

Unit – II (Common to all branches – Theory & Lab)	**Contact Hours = 14 Hours**

Orthographic Projections of Solids: Orthographic projections of right regular solids: Prisms & Pyramids (square, rectangle, pentagon, hexagon); Cylinders, Cones; Cube & Tetrahedron (All solids Resting on HP only).

Unit – III (Common to all branches – Theory & Lab)	**Contact Hours = 14 Hours**

Isometric Projections: Isometric scale, Isometric projection of hexahedron (cube), right regular prisms, pyramids (types covered in unit II), cylinders, cones and spheres. Isometric projection of combination of two simple solids with their axes coinciding.
Development of Lateral Surfaces of Solids: Concept of Section of Solid. development of lateral surfaces of right regular prisms, pyramids (types covered in unit II), cylinders and cones resting with base on HP only. Development of lateral surfaces of their frustums and truncations with a single section plane only. (section plane perpendicular to VP and inclined to HP only). Problems on applications of development of lateral surfaces like funnels and trays.

Unit – IV (Branch specific – Lab only)	**Contact Hours = 04 Hours**

Introduction to xDesign platform, collaborative workspace, and related tools, introduction to 3D modeling. Basic sketching techniques, creating simple electrical parts using command features such as extrusion and shaft to cut the slots on outer and inner periphery.

Unit – V (Branch specific – Lab only)	Contact Hours = 04 Hours
Introduction to sketch tools and end condition features. Overview of features such as linear circular pattern, chamfer, fillet, and extruded cut. Simple exercises utilizing these commands cruciform form of transformer core.	

Flipped Classroom Details

Unit No.	I	II	III	IV	V
No. for Flipped Classroom Sessions	01	01	01	01	01

List of Experiments

Unit No.	No. of Lab Sessions	Topic(s) related to Lab Session
1	3	Introduction, projections of points, Projections of straight lines, Projections of planes
2	2	Projections of solids
3	2	Isometric projections & Development of Lateral surfaces
4	2	Branch specific simple application-oriented exercises
5	2	Branch specific simple application-oriented exercises

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Course delivery methods		Assessment methods	
1.	Chalk and talk	1.	IA tests
2.	PPT and Videos	2.	Lab Test
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THEORY (60 marks)		**LAB (40 marks)**		**Total**
IA test 1	**IA test 2**	**Average of Lab Conduction & Assignment/Open ended Expt/CP**	**Lab test**	
30 marks	**30 marks**	**10 marks**	**30 marks**	**100 marks**

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1. Assignments, conduction of lab and printouts **from UNIT1, UNIT2, UNIT3** together will carry 10 marks.
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1. Test will be conducted at the end of the semester
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1. Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests. Lack of minimum score in IA test will make the student Not Eligible for SEE
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Course Project (10 marks)				
Rubric/Level	**Exemplary=A (Far Exceeds Standard)**	**Above Average=B (Exceeds Standard)**	**Adequate= C (Meets Standard)**	**Inadequate =D (Below Standard)**
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CO-PO Mapping (Planned)												CO-PSO Mapping (Planned)		
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PSO1**	**PSO2**	**PSO3**
1	✓											✓		
2	✓											✓		
3	✓				✓							✓		

Name & Signature of Faculty members involved in designing the syllabus

(Dr. Tushar T. Hawal)

Name & Signature of Faculty verifying/approving the syllabus

(Prof. Basavraj S. Jagathi)

Computer Aided Engineering Drawing

Course Code	**1BCEDM103**	**Course type**	**Integrated**	**Credits L-T-P**	**2-0-1**
Hours/week: L - T- P	**2-0-2**			**Total credits**	**3**
Total Contact Hours	**L =28 Hrs; T=0 Hrs; P= 22 Hrs Total = 50 Hrs**			**CIE Marks**	**100**
Flipped Classes content	**05 Hours**			**SEE Marks**	**100**

Course learning objectives	
1.	To understand the basic principles and conventions of engineering drawing.
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Pre-requisites: Usage of drawing instruments.

Unit – I (Common to all branches – Theory & Lab)	**Contact Hours = 14 Hours**

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(Exercises on Projections of planes only to be considered for SEE)

Unit – II (Common to all branches – Theory & Lab)	**Contact Hours = 14 Hours**

Orthographic Projections of Solids: Orthographic projections of right regular solids: Prisms & Pyramids (square, rectangle, pentagon, hexagon); Cylinders, Cones; Cube & Tetrahedron (All solids Resting on HP only).

Unit – III (Common to all branches – Theory & Lab)	**Contact Hours = 14 Hours**

Isometric Projections: Isometric scale, Isometric projection of hexahedron (cube), right regular prisms, pyramids (types covered in unit II), cylinders, cones and spheres. Isometric projection of combination of two simple solids with their axes coinciding.
Development of Lateral Surfaces of Solids: Concept of Section of Solid. development of lateral surfaces of right regular prisms, pyramids (types covered in unit II), cylinders and cones resting with base on HP only. Development of lateral surfaces of their frustums and truncations with a single section plane only. (section plane perpendicular to VP and inclined to HP only). Problems on applications of development of lateral surfaces like funnels and trays.

Unit – IV (Branch specific – Lab only)	**Contact Hours = 04 Hours**

Introduction to xDesign platform, collaborative workspace, and related tools, introduction to 3D modeling. Basic sketching techniques, creating simple mechanical parts using command features such as extrusion and shaft.

Unit – V (Branch specific – Lab only)	Contact Hours = 04 Hours
Introduction to sketch tools and end condition features. Overview of features such as linear pattern, circular pattern, chamfer, fillet, and extruded cut. Simple exercises utilizing these commands.	

Flipped Classroom Details

Unit No.	I	II	III	IV	V
No. for Flipped Classroom Sessions	01	01	01	01	01

List of Experiments

Unit No.	No. of Lab Sessions	Topic(s) related to Lab Session
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Course Project (10 marks)				
Rubric/Level	**Exemplary=A (Far Exceeds Standard)**	**Above Average=B (Exceeds Standard)**	**Adequate= C (Meets Standard)**	**Inadequate =D (Below Standard)**
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Work Plan/methodology (1 Mark)	Clear, logical, and detailed work plan with effective methodology (1)	Mostly clear and practical plan with some details (0.75)	Basic plan; lacks clarity or depth (0.5)	Poor or vague plan and methodology (0.25)
Work content/Use of Technology (5 Marks)	Comprehensive, technically sound; advanced and appropriate use of technology (5)	Good technical depth; reasonable use of technology (4)	Adequate work; technology used with limitations (3-2)	Superficial or minimal work; poor use of technology (1)
Project Presentation (1 Marks)	Clear, engaging, confident delivery; excellent visuals (1)	Clear and coherent; good use of visuals (0.75)	Understandable but lacks engagement or clarity (0.5)	Disorganized or hard to follow (0.25)
Individual Contribution (1 Marks)	Fully engaged and contributed significantly to all aspects (1)	Active contribution with few gaps (0.75)	Some participation; effort uneven (0.5)	Minimal or unclear contribution (0.25)
Report (1 Marks)	Well-structured, detailed, no errors; excellent formatting (1)	Mostly well-written with minor issues (0.75)	Adequate but with some errors (0.5)	Poorly written; lacks structure (0.25)

CO-PO Mapping (Planned)												CO-PSO Mapping (Planned)		
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PSO1**	**PSO2**	**PSO3**
1	✓											✓		
2	✓											✓		
3	✓				✓							✓		

Name & Signature of Faculty members involved in designing the syllabus

(Dr. Tushar T. Hawal)

Name & Signature of Faculty verifying/approving the syllabus

(Prof. Basavraj S. Jagathi)

Computer Aided Engineering Drawing

Course Code	**1BCEDS103**	**Course type**	**Integrated**	**Credits L-T-P**	**2-0-1**
Hours/week: L - T- P	**2-0-2**			**Total credits**	**3**
Total Contact Hours	**L =28 Hrs; T=0 Hrs; P= 22 Hrs Total = 50 Hrs**			**CIE Marks**	**100**
Flipped Classes content	**05 Hours**			**SEE Marks**	**100**

Course learning objectives	
1.	To understand the basic principles and conventions of engineering drawing.
2.	To use drawing as a communication mode and visualize engineering components.
3.	To generate orthographic and pictorial views and 3D Models using CAD software.
4.	To understand the development of surfaces.

Pre-requisites: Usage of drawing instruments.

Unit – I (Common to all branches – Theory & Lab)	**Contact Hours = 14 Hours**

Introduction to CAD tools, software and Significance of Engineering drawing: BIS Conventions of Engineering Drawing, Engineering drawing scales., Co-ordinate system and reference planes HP, VP, RPP & LPP in 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.
Introduction to Orthographic projections of points in 1st and 3rd quadrants.
Orthographic projections of lines placed in First quadrant only.
Orthographic projections of planes: Orthographic projections of square, rectangle, pentagon, hexagon, and circular lamina placed in First quadrant and on HP only, using change of position method.
(Exercises on Projections of planes only to be considered for SEE)

Unit – II (Common to all branches – Theory & Lab)	**Contact Hours = 14 Hours**

Orthographic Projections of Solids: Orthographic projections of right regular solids: Prisms & Pyramids (square, rectangle, pentagon, hexagon); Cylinders, Cones; Cube & Tetrahedron (All solids Resting on HP only).

Unit – III (Common to all branches – Theory & Lab)	**Contact Hours = 14 Hours**

Isometric Projections: Isometric scale, Isometric projection of hexahedron (cube), right regular prisms, pyramids (types covered in unit II), cylinders, cones and spheres. Isometric projection of combination of two simple solids with their axes coinciding.
Development of Lateral Surfaces of Solids: Concept of Section of Solid. development of lateral surfaces of right regular prisms, pyramids (types covered in unit II), cylinders and cones resting with base on HP only. Development of lateral surfaces of their frustums and truncations with a single section plane only. (section plane perpendicular to VP and inclined to HP only). Problems on applications of development of lateral surfaces like funnels and trays.

Unit – IV (Branch specific – Lab only)	**Contact Hours = 04 Hours**

Introduction to 2D drawing with wired and wireless, Network topology- wired and wireless. 3D Modelling: Routers, Switches

Unit – V (Branch specific – Lab only)	Contact Hours = 04 Hours
3D modelling of keyboards, mouse shells, touch interfaces, Design of interface panels: button layouts, display windows, Design of CPU Cabinet.	

Flipped Classroom Details

Unit No.	I	II	III	IV	V
No. for Flipped Classroom Sessions	01	01	01	01	01

List of Experiments

Unit No.	No. of Lab Sessions	Topic(s) related to Lab Session
1	3	Introduction, projections of points, Projections of straight lines, Projections of planes
2	2	Projections of solids
3	2	Isometric projections & Development of Lateral surfaces
4	2	Branch specific simple application-oriented exercises
5	2	Branch specific simple application-oriented exercises

Books	
	Text Books:
1.	K. R. Gopalakrishna, & Sudhir Gopalakrishna: Textbook of Computer Aided Engineering Drawing, 39th Edition, Subash Stores, Bangalore, 2010
2.	Parthasarathy N. S., Vela Murali, Engineering Drawing, Oxford University Press, 2015
3.	S.N. Lal, & T.Madhusudhan: Engineering Visualization, 1st Edition, Cengage Publication, 2012
	Reference Books:
1.	Bhatt, N.D., Engineering Drawing: Plane and Solid Geometry, 53rd edition, Charotar Publishing House Pvt. Limited, 2019.
2.	Bhattacharya S. K., Electrical Engineering Drawing, New Age International publishers, second edition 1998, reprint 2005.
	E-resources
1.	https://nptel.ac.in/courses/112/105/112105294/
2.	https://nptel.ac.in/courses/112/103/112103019/
3.	https://nptel.ac.in/courses/105/104/105104148/
4.	https://nptel.ac.in/courses/112/102/112102304/
5.	Building plans- https://www.designingbuildings.co.uk/wiki/Engineering_drawing
6.	Circuits- https://www.smartdraw.com/circuit-diagram/
7.	Mechanical Components-http://ecoursesonline.iasri.res.in/mod/page/view. php?id=2474

Course delivery methods		Assessment methods	
1.	Chalk and talk	1.	IA tests
2.	PPT and Videos	2.	Lab Test
3.	Flipped Classes	3.	Semester End Examination
4.	Practice session/Demonstrations in Labs	4.	CAD Print outs/sketches
5.	Virtual Labs (if present)	5.	Assignment/Project

Course Outcome (COs) **Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create**				
At the end of the course, the student will be able to (Highlight the action verb representing the learning level.)		**Learning Level**	**PO(s)**	**PSO(s)**
1.	Visualize and apply basic drafting fundamentals	Ap	1	1
2.	Apply basic concepts to develop construction/drawing technique	Ap	1	1
3.	Create detailed standard drawings and 3D models using CAD tool	Ap	1,5	1

Scheme of Continuous Internal Evaluation (CIE):
For integrated courses, a lab test also will be conducted at the end of the semester. The lab test (COMPULSORY) will be part of the CIE. No SEE for Lab.

THEORY (60 marks)		**LAB (40 marks)**		**Total**
IA test 1	**IA test 2**	**Average of Lab Conduction & Assignment/Open ended Expt/CP**	**Lab test**	
30 marks	**30 marks**	**10 marks**	**30 marks**	**100 marks**

IA Test:

1. The question paper will consist of PART-A & PART-B, each part consisting of two questions of 15marks each.
2. Students have to attempt any 1 question from each part.

Conduct of Lab:

1. Assignments, conduction of lab and printouts from UNIT1, UNIT2, UNIT3 together will carry 10 marks.
2. UNIT4 & UNIT5, conduction of lab and printouts will carry 10 marks.
3. The average of the two above components will be considered for 10 marks.

Lab test: (Batchwise with 15 students/batch)

1. Test will be conducted at the end of the semester
2. Timetable, Batch details and examiners will be declared by Exam section
3. The lab CIE test will consist of 4 questions of 7.5marks each from UNIT1, UNIT2, UNIT3 & one question from either UNIT4 or UNIT5.

Eligibility for SEE:

1. Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests. Lack of minimum score in IA test will make the student Not Eligible for SEE
2. Student should score minimum 40% of 30 marks (i.e. 12 marks) in Lab test & should score 40% of 40 marks (i.e. 16 marks) in Lab component.
3. Lab test is COMPULSORY
4. Minimum score in CIE to be eligible for SEE: 40 OUT OF 100.
5. Not eligible in any one of the two components will make the student Not Eligible for SEE

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 100 marks of 3 hours duration.
2.	Minimum marks required in SEE to pass: Score should be ≥35 &, however overall score of CIE+SEE should be ≥40%.
3.	Question paper contains four PARTS carrying two questions of 25 marks each. PART A – two questions from UNIT1 (Projection of Planes)

	PART B – two questions from UNIT2 (Projection of Solids) PART C – two questions from UNIT3 (Isometric Projections) PART D – two questions from UNIT3 (Development of Lateral Surfaces) Students have to answer one full question from each PART, only by drawing to the scale in answer script. (No print out)

Assignment (10 marks)				
Rubric/Level	**Exemplary=A (Far Exceeds Standard)**	**Above Average=B (Exceeds Standard)**	**Adequate= C (Meets Standard)**	**Inadequate= D (Below Standard)**
Technical Content (8 marks)	Comprehensive, accurate, in-depth understanding; shows original thinking and mastery of concepts. (7-8)	Mostly accurate, good understanding, minor gaps; shows good application of concepts. (5-6)	Basic coverage, some understanding, lacks depth or clarity. (3-4)	Incomplete, inaccurate, poor understanding; shows little effort. (1-2)
Results & learning Outcome (2 marks)	Clear, correct results with excellent insights and reflection on learning. (2)	Mostly correct results; good understanding of learning outcomes. (1.5)	Basic results; limited insights or superficial learning. (1)	Incorrect or missing results; no evident learning. (0.5)

Course Project (10 marks)				
Rubric/Level	**Exemplary=A (Far Exceeds Standard)**	**Above Average=B (Exceeds Standard)**	**Adequate= C (Meets Standard)**	**Inadequate =D (Below Standard)**
Innovative Idea (1 Marks)	Highly original, creative, and impactful idea (1)	Original idea with moderate creativity (0.75)	Common idea with minor innovation (0.5)	Unoriginal or poorly thought-out idea (0.25)
Work Plan/methodology (1 Mark)	Clear, logical, and detailed work plan with effective methodology (1)	Mostly clear and practical plan with some details (0.75)	Basic plan; lacks clarity or depth (0.5)	Poor or vague plan and methodology (0.25)
Work content/Use of Technology (5 Marks)	Comprehensive, technically sound; advanced and appropriate use of technology (5)	Good technical depth; reasonable use of technology (4)	Adequate work; technology used with limitations (3-2)	Superficial or minimal work; poor use of technology (1)
Project Presentation (1 Marks)	Clear, engaging, confident delivery; excellent visuals (1)	Clear and coherent; good use of visuals (0.75)	Understandable but lacks engagement or clarity (0.5)	Disorganized or hard to follow (0.25)
Individual Contribution (1 Marks)	Fully engaged and contributed significantly to all aspects (1)	Active contribution with few gaps (0.75)	Some participation; effort uneven (0.5)	Minimal or unclear contribution (0.25)
Report (1 Marks)	Well-structured, detailed, no errors; excellent formatting (1)	Mostly well-written with minor issues (0.75)	Adequate but with some errors (0.5)	Poorly written; lacks structure (0.25)

CO-PO Mapping (Planned)												CO-PSO Mapping (Planned)		
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PSO1**	**PSO2**	**PSO3**
1	✓											✓		
2	✓											✓		
3	✓				✓							✓		

Name & Signature of Faculty members involved in designing the syllabus

(Dr. Tushar T. Hawal)

Name & Signature of Faculty verifying/approving the syllabus

(Prof. Basavraj S. Jagathi)

Emerging Technology Courses

INDEX

Code	Title
1BAIA103/203	Introduction to AI and Applications

Introduction to AI and Applications

Course Code	1BAIA103/203	Course type	ETC	Credits L-T-P	3-0-0
Hours/week: L - T- P	3-0-0			Total credits	3
Total Contact Hours	L = 40 Hrs; T = 0 Hrs; P = 0 Hrs Total = 40 Hrs			CIE Marks	100
Flipped Classes content	5 Hours			SEE Marks	100

Course learning objectives	
1.	To Understand the fundamentals of Artificial Intelligence
2.	To Analyze the role of data in AI systems and governance principles for responsible AI.
3.	To Apply search algorithms, prompt engineering techniques, and knowledge representation methods to design intelligent systems.
4.	To Explain AI applications in various real-world scenarios.

Pre-requisites : NIL

Unit – I	Contact Hours = 8 Hours

Introduction to Artificial Intelligence: 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.

Artificially Intelligent Machine: Defining Intelligence, Components of Intelligence, Differences between Human and Machine Intelligence, Agent and Environment, Search, Uninformed Search Algorithms-DFS,BFS,UCS. Informed Search Algorithms-Best First Search, A* Search.

Knowledge Representation: Introduction, Knowledge Representation, Knowledge-Based Agent, Types of Knowledge. Introduction to Propositional Logic.

Unit – II	Contact Hours = 8 Hours

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.

Unit – III	Contact Hours = 8 Hours
Machine Learning: Standard Deviation, The normal distribution, bayes' theorem, Correlation, feature extraction. Machine Learning Process, Machine Learning Model, Regression Analysis in Machine Learning, Classification Techniques, Clustering Techniques, Naïve Bayes Classification, Neural Network, Support Vector Machine (SVM). Data-The fuel for AI : Data Basics, Types of data, Big Data, Data process, Ethics and Governance.	

Unit – IV	Contact Hours = 8 Hours
Trends in AI: AI and Ethical Concerns, AI as a Service (AIaaS), Recent trends in AI, Expert System, Internet of Things, Artificial Intelligence of Things (AIoT).	

Unit – V	Contact Hours = 8 Hours
Applications of AI : Application of AI in Healthcare, Application of AI in Finance, Deep Learning AI for Wireless communication, Machine Learning to build condition model for Industrial Machinery and Manufacturing Process, Deep Learning AI for Predictive Maintenance (machine-health monitoring), Application of AI in Education, Application of AI in Transportation, AI and Climate Change, Air pollution management in India with AI and machine learning , Landslide detection using Deep Learning Techniques, AI in Experimentation and Multi-disciplinary research .	

Flipped Classroom Details

Unit No.	I	II	III	IV	V
No. for Flipped Classroom Sessions	1	1	1	1	1

Unit No.	Self-Study Topics
I	The Future of AI.
II	Hill Climbing Algorithm in Artificial Intelligence.
IV	AI Tools - Gamma, Napkin, Whimsical. Frameworks to create AI Models-TensorFlow, Keras.

Books	
	Text Books:
1.	Reema Thareja, Artificial Intelligence –Beyond Classical AI, Pearson, 9 June 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
4.	Tom Taulli, Artificial Intelligence Basics- A Non- Technical Introduction,Apress,2019
	Reference Books:
1.	Stuart Russell and Peter Norvig , Artificial Intelligence, A Modern Approach, Pearson, 3 rd Edition.
	E-resources (NPTEL/SWAYAM.. Any Other)- mention links
1.	https://www.coursera.org/learn/ai-for-everyone
2.	https://www.coursera.org/learn/ai-and-public-health
3	https://www.coursera.org/learn/ai-and-climate-change
4.	https://ieeexplore.ieee.org/document/9914567
5.	https://www.nature.com/articles/s41598-024-71269-7
6.	https://www.nrsc.gov.in/sites/default/files/ScienceStory/Science-story_landslide.pdf

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Assignment- Open/Industry/Certification
3.	Flipped Classes	3.	Course Project
4.	Online classes	4.	Semester End Examination
5.		5.	

Course Outcome (COs) **Learning Levels:** Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create				
At the end of the course, the student will be able to (Highlight the **action verb** representing the learning level.)		Learning Level	PO(s)	PSO(s)
1.	Explain the fundamental concepts of Artificial Intelligence.	**Un**	1	
2.	Apply Search algorithms, machine learning algorithms and Prompt Engineering Techniques to solve simple problems.	**Ap**	1,2,3,4,5,7	
3.	Analyze the applications of Artificial Intelligence across diverse domains.	**An**	1,2,4,6,11	
4.	Understand the learnings inculcated throughout the course and develop a course project.	**Re,Un,Ap**	1,2,3,4,5,6,7,8,9,11	

Scheme of Continuous Internal Evaluation (CIE):

Components	Addition of two IA tests	Two Assignments – (Open /Industry/Certification etc)	Course project (CP)/ Case study etc	Total Marks
Marks	30+30 = 60	10 + 10 = 20	20 marks (with report & presentation)	100

IA Test: 1. 10 marks questions in Part A of IA question paper should also include an OBE related question (max 2 marks). 2. Remaining 20 marks questions in Part B & C should be descriptive -Certification earned by passing the standard Online MOOCs course (1 course of atleast 8 hours defined by BOS) can be considered as a Course activity and awarded maximum of 10 marks.
Eligibility for SEE: -Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests. -Lack of minimum score in IA test will make the student Not Eligible for SEE. -Minimum score in CIE to be eligible for SEE: 40 OUT OF 100.

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 100 marks of 3 hours duration.
2.	**Minimum marks required in SEE to pass:** Score should be $\geq$ 35%, however overall score of CIE + SEE should be $\geq$ 40%.
3.	Question paper contains three parts **A,B and C**. Students have to answer 1. From Part A answer any 5 out of 7 questions, each Question Carries 6 Marks. 2. From Part B answer 5 out of 10 questions choosing any one full question from each unit, each Question Carries 10 Marks. 3. From Part C answer 1 out of 2 questions, each Question Carries 20 Marks.

Assignment (10 marks)				
Rubric/Level	Exemplary=A (Far Exceeds Standard)	Above Average=B (Exceeds Standard)	Adequate= C (Meets Standard)	Inadequate= D (Below Standard)
Technical Content (8 marks)	Comprehensive, accurate, in-depth understanding; shows original thinking and mastery of concepts. (7-8)	Mostly accurate, good understanding, minor gaps; shows good application of concepts. (5-6)	Basic coverage, some understanding, lacks depth or clarity. (3-4)	Incomplete, inaccurate, poor understanding; shows little effort. (1-2)
Results & learning Outcome (2 marks)	Clear, correct results with excellent insights and reflection on learning. (2)	Mostly correct results; good understanding of learning outcomes. (1.5)	Basic results; limited insights or superficial learning. (1)	Incorrect or missing results; no evident learning. (0.5)

Course Project (20 marks)				
Rubric/Level	Exemplary=A (Far Exceeds Standard)	Above Average=B (Exceeds Standard)	Adequate= C (Meets Standard)	Inadequate =D (Below Standard)
Innovative Idea (2 Marks)	Highly original, creative, and impactful idea (2)	Original idea with moderate creativity (1.5)	Common idea with minor innovation (1)	Unoriginal or poorly thought-out idea (0.5)
Work Plan/methodology (2 Marks)	Clear, logical, and detailed work plan with effective methodology (2)	Mostly clear and practical plan with some details (1.5)	Basic plan; lacks clarity or depth (1)	Poor or vague plan and methodology (0.5)
Work content/Use of Technology (10 Marks)	Comprehensive, technically sound; advanced and appropriate use of technology (10-9)	Good technical depth; reasonable use of technology (8-7)	Adequate work; technology used with limitations (6-4)	Superficial or minimal work; poor use of technology (3-1)
Project Presentation (2 Marks)	Clear, engaging, confident delivery; excellent visuals (2)	Clear and coherent; good use of visuals (1.5)	Understandable but lacks engagement or clarity (1)	Disorganized or hard to follow (0.5)
Individual Contribution (2 Marks)	Fully engaged and contributed significantly to all aspects (2)	Active contribution with few gaps (1.5)	Some participation; effort uneven (1)	Minimal or unclear contribution (0.5)
Report (2 Marks)	Well-structured, detailed, no errors; excellent formatting (2)	Mostly well-written with minor issues (1.5)	Adequate but with some errors (1)	Poorly written; lacks structure (0.5)

Sl.No	Activity on Creating Effective Prompts
Note: To conduct the activity students can use any of the AI tools such as ChatGPT.	
1	**Basic Prompt writing:** Create two different prompts to ask an AI about the topic "Electricity." The first prompt should be vague, and the second prompt should be clear and specific. Compare the responses you get and describe which prompt gave a better answer and why.
2	**Zero-Shot Prompting:** Create a prompt that asks an AI to explain Ohm's Law without giving any example or background. Evaluate how well the AI explains the concept based on your prompt alone.
3	**One-Shot and Few-Shot Prompting**: Provide the AI with a single example of how to calculate the resistance in a simple circuit. Then write your own prompt asking the AI to solve a similar resistance calculation. After that, add two more examples to your prompt and observe any changes in the AI's response quality.
4	**Chain-of-Thought Prompting**: Develop a prompt that guides the AI step-by-step through calculating current flow in a circuit using Ohm's Law with resistors in series. Then, ask a final question for the AI to solve. Analyze how breaking down the reasoning steps impacts the accuracy of the answer.
5	**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. 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.
6	**Creative Engineering Problem Prompts:** Craft a prompt that asks the AI to brainstorm ideas for designing a low-cost water purification system suitable for rural areas. Encourage creativity by adding phrases like "limited resources" and "sustainability"
7	**Ethical Prompt Design Discussion:** Identify a biased prompt related to job descriptions (e.g. language with respect to a gender). Rewrite the prompt to remove bias and create a neutral, inclusive version. Explain why this revision is more ethical.
8	**Simulated Customer Support Chatbot:** Develop a prompt that instructs the AI to play the role of a technical support agent helping a customer troubleshoot a failure in an electronic circuit. Include instructions to keep the tone friendly and professional and to ask diagnostic questions.
9	**Multi-Language Prompting:** Develop a prompt that asks the AI to translate a simple engineering glossary (5 technical terms) from English to your native language. Then modify the prompt to request additional explanations of these terms in the translated language.
10	Review a curated set of different prompt types (e.g., for summarization, information extraction, paraphrasing, question answering) from a "Prompt Gallery." For each prompt type, match it with a real world task (e.g., summarizing a lecture note, extracting names from a project report). Test at least three prompt templates on an AI tool or by role-play (students simulate being the AI), with varied wording. Record the outcomes and discuss which prompt (or template) was most effective for each task, and explain why you think it worked best. Reflect on how changing small parts of a prompt can alter model response quality, completeness, or accuracy.
11	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 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.

CO-PO Mapping (Planned)												CO-PSO Mapping (Planned)		
CO	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PSO1	PSO2	PSO3
1	✓													
2	✓	✓	✓	✓	✓		✓							
3	✓	✓		✓		✓					✓			
4	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓			
Tick mark the CO, PO and PSO mapping														

Name & Signature of Faculty members involved in designing the syllabus

1. Prof. Shubha G.Sanu
2. Prof. Savita Bakre

Name & Signature of Faculty members verifying/approving the syllabus

Engineering Science Courses I and II

INDEX

INTRODUCTION TO BUILDING SCIENCES

Course Code	1BESC104A/204A	Course type	ESC	Credits L-T-P	3– 0 - 0
Hours/week: L - T- P	3-0-0			Total credits	3
Total Contact Hours	L = 40Hrs; T = 0 Hrs; P = 0 Hrs Total = 40Hrs			CIE Marks	100
Flipped Classes content	10 Hours			SEE Marks	100

Course learning objectives	
1.	To make students learn the scope of various specializations of civil engineering.
2.	To make students learn the concepts of sustainable infrastructure
3.	To develop students ability to analyze the problems involving forces, moments with their applications.
4.	To develop the students ability to find out the center of gravity and moment of inertia and their applications.

Pre-requisites : Physics and Mathematics

Unit – I	Contact Hours = 8 Hours
Introduction to Civil Engineering: Surveying, Structural Engineering, Geotechnical Engineering, Hydraulics & Water Resources, Transportation Engineering, Environmental Engineering, Construction planning & Project management. Marvels of civil engineering Basic Materials of Construction: Bricks, Cement & mortars, Plain, Reinforced & Pre-stressed Concrete, Structural steel.	

Unit – II	Contact Hours = 8 Hours
Structural elements of a building: Foundation, plinth, lintel, chajja, Masonry wall, column, beam, and slab Infrastructure & Environment: Introduction to sustainable development, Smart city concept, Introduction to Water Supply and Sanitary system. Introduction to Force: Concept of idealization, system of forces, principles of superposition and transmissibility.	

Unit – III	Contact Hours = 8 Hours
Analysis of force systems: Resolution and composition of forces, Resultant of concurrent and non-concurrent coplanar force systems, moment of forces, couple, Varignon's theorem, free body diagram, equations of equilibrium, equilibrium of concurrent and non-concurrent coplanar force systems and numerical examples	

Unit – IV	Contact Hours = 8 Hours
Centroid of plane sections: Importance of centroid and center of gravity, methods of determining the centroid, locating the centroid of plane laminae from first principles, centroid of built-up sections. Numerical examples.	

Unit – V	Contact Hours = 8 Hours
Moment of inertia: Importance of Moment of Inertia, method of determining the second moment of area (moment of inertia) of plane sections from first principles, parallel axis theorem and perpendicular axis theorem, radius of gyration, moment of inertia of built-up sections, Numerical Examples.	

Flipped Classroom Details

Unit No.	I	II	III	IV	V
No. for Flipped Classroom Sessions	02	02	02	02	02

Unit No.	Self-Study Topics
1	Basic materials of construction.
2	Structural elements of a building, Infrastructure & Environment.

Books	
	Text Books:
1.	Bansal R. K., Rakesh Ranjan Beohar and Ahmad Ali Khan, “Basic Civil Engineering and Engineering Mechanics”, Laxmi Publications, 2015
2.	Kolhapure B K, “Elements of Civil Engineering and Engineering Mechanics”, EBPB, 2014
3.	Bhavikatti S S, “Engineering Mechanics”, New Age International Publications, 2019
	Reference Books:
1.	Beer F.P. and Johnston E. R., “Mechanics for Engineers”, Statics and Dynamics,, McGraw Hill, 1987
2.	Irving H. Shames, “Engineering Mechanics”, Prentice-Hall, 2019
	E-resources (NPTEL/SWAYAM.. Any Other)- mention links
1.	https://www.youtube.com/watch?v=nGfVTNfNwnk&list=PLOSWwFV98rfKXq2KBphJz95rao7q8PpwT
2.	https://www.youtube.com/watch?v=atoP5_DeTPE

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Assignment- Open/ Industry/ Certification
3.	Flipped Classes	3.	Course Project
4.	Online classes	4.	Semester End Examination
5.		5.	

Course Outcome (COs)

Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create

At the end of the course, the student will be able to (Highlight the **action verb** representing the learning level.)		Learning Level	PO(s)	PSO(s)
1.	**Identify** and describe the various disciplines and applications of Civil Engineering, highlighting their role in infrastructure development.	Un	1	1
2.	**Explain** the properties and suitability of basic construction materials and differentiate their applications in structural systems.	Un	1	1
3.	**Identify** the significance of sustainability in infrastructure and propose basic strategies for integrating sustainable practices in civil engineering projects.	Un	1,6	1
4.	**Apply** the principles of engineering mechanics to solve problems involving force systems, moments, equilibrium, centroid, and moment of inertia.	Ap, An	1,2	1
5.	**Analyze** simple structural components by applying equilibrium conditions under applied loads.	Ap, An	1,2	1

Scheme of Continuous Internal Evaluation (CIE):

Components	Addition of two IA tests	Two Assignments – (Open / Industry/ Certification etc)	Course project (CP)/ Case study etc	Total Marks
Marks	30+30 = 60	10 + 10 = 20	20 marks (with report & presentation)	100

IA Test:

1. 10 marks questions in Part A of IA question paper should also include an OBE related question (max 2 marks).
2. Remaining 20 marks questions in Part B & C should be descriptive

-Certification earned by passing the standard Online MOOCs course (1 course of atleast 8 hours defined by BOS) can be considered as a Course activity and awarded maximum of 10 marks.

Eligibility for SEE:

-Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests.

-Lack of minimum score in IA test will make the student Not Eligible for SEE.

-Minimum score in CIE to be eligible for SEE: 40 OUT OF 100.

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 100 marks of 3 hours duration.
2.	Minimum marks required in SEE to pass: Score should be $\geq$ 35%, however overall score of CIE + SEE should be $\geq$ 40%.
3.	Question paper contains three parts A,B and C. Students have to answer 1. From Part A answer any 5 out of 7 questions, each Question Carries 6 Marks. 2. From Part B answer 5 out of 10 questions choosing any one full question from each unit, each Question Carries 10 Marks. 3. From Part C answer 1 out of 2 questions, each Question Carries 20 Marks.

Assignment (10 marks)				
Rubric/Level	Exemplary=A (Far Exceeds Standard)	Above Average=B (Exceeds Standard)	Adequate= C (Meets Standard)	Inadequate= D (Below Standard)
Technical Content (8 marks)	Comprehensive, accurate, in-depth understanding; shows original thinking and mastery of concepts. (7-8)	Mostly accurate, good understanding, minor gaps; shows good application of concepts. (5-6)	Basic coverage, some understanding, lacks depth or clarity. (3-4)	Incomplete, inaccurate, poor understanding; shows little effort. (1-2)
Results & learning	Clear, correct results with excellent insights	Mostly correct results; good understanding of	Basic results; limited insights	Incorrect or missing results; no

Outcome (2 marks)	and reflection on learning. (2)	learning outcomes. (1.5)	or superficial learning. (1)	evident learning. (0.5)

Course Project (20 marks)				
Rubric/Level	Exemplary=A (Far Exceeds Standard)	Above Average=B (Exceeds Standard)	Adequate= C (Meets Standard)	Inadequate =D (Below Standard)
Innovative Idea (2 Marks)	Highly original, creative, and impactful idea (2)	Original idea with moderate creativity (1.5)	Common idea with minor innovation (1)	Unoriginal or poorly thought-out idea (0.5)
Work Plan/methodology (2 Marks)	Clear, logical, and detailed work plan with effective methodology (2)	Mostly clear and practical plan with some details (1.5)	Basic plan; lacks clarity or depth (1)	Poor or vague plan and methodology (0.5)
Work content/Use of Technology (10 Marks)	Comprehensive, technically sound; advanced and appropriate use of technology (10-9)	Good technical depth; reasonable use of technology (8-7)	Adequate work; technology used with limitations (6-4)	Superficial or minimal work; poor use of technology (3-1)
Project Presentation (2 Marks)	Clear, engaging, confident delivery; excellent visuals (2)	Clear and coherent; good use of visuals (1.5)	Understandable but lacks engagement or clarity (1)	Disorganized or hard to follow (0.5)
Individual Contribution (2 Marks)	Fully engaged and contributed significantly to all aspects (2)	Active contribution with few gaps (1.5)	Some participation; effort uneven (1)	Minimal or unclear contribution (0.5)
Report (2 Marks)	Well-structured, detailed, no errors; excellent formatting (2)	Mostly well-written with minor issues (1.5)	Adequate but with some errors (1)	Poorly written; lacks structure (0.5)

CO-PO Mapping (Planned)												CO-PSO Mapping (Planned)		
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO1	PSO2	PSO3
1	√											√		
2	√											√		
3	√					√						√		
4	√	√										√		
5	√	√												
Tick mark the CO, PO and PSO mapping														

Kanchan Kanagali

Vikhyat Katti

Name & Signature of Faculty members involved in designing the syllabus

Name & Signature of Faculty members verifying/approving the syllabus

Introduction to Electrical Engineering

Course Code	1BESC104B	**Course type**	ESC	**Credits L-T-P**	3– 0 - 0
Hours/week: L - T- P	3-0-0			**Total credits**	3
Total Contact Hours	L = 40 Hrs; T = 0 Hrs; P = 0 Hrs Total = 40 Hrs			**CIE Marks**	100
Flipped Classes content	5 Hours			**SEE Marks**	100

Course learning objectives	
1.	To understand the basics of typical power system and operation of various domestic appliances.
2.	To understand the basics of DC circuits, single-phase AC circuits and three phase AC circuits.
3.	To understand the working principle, operation, construction and types of Electrical machines.
4.	To understand the fundamentals of different EV subsystems.

Pre-requisites: Fundamentals of electrical circuits.

Unit – I	**Contact Hours = 8 Hours**
Typical Electrical System: A typical power system single line diagram, typical domestic wiring layout, protection of electrical systems using fuse & MCB, earthing and energy billing, safety measures. **Domestic Appliances:** Construction and working of Ceiling Fan, Water Heater and UPS – online, offline (Block diagram approach)	

Unit – II	**Contact Hours = 8 Hours**
DC circuits: Ohm's law and Kirchhoff's laws, analysis of series, parallel and series-parallel circuits. **Single-phase AC circuits:** Generation of sinusoidal voltage, frequency of generated voltage, average value, RMS value, form factor and peak factor of sinusoidal voltage and currents. Phasor representation of alternating quantities. Analysis of R, L, C, R-L, R-C and R-L-C circuits with phasor diagrams, Real power, reactive power, apparent power, and Power factor, numerical.	

Unit – III	**Contact Hours = 8 Hours**
Three-phase AC circuits: Necessity and advantage of 3-phase system. Generation of 3-phase power. Definition of phase sequence. Balanced supply and balanced load. Relationship between line and phase values of balanced star and delta connections. Power in balanced 3-phase circuits. Measurement of 3-phase power by 2-wattmeter method (excluding derivations). Simple Numerical. **Three Phase Induction Motor:** Principle of operation, types and constructional features, slip and its significance, applications of squirrel cage and slip ring motors, necessity of a starter, illustrative examples on slip calculations.	

Unit – IV	**Contact Hours = 8 Hours**
Transformer: Principle of operation, working and construction of single-phase transformer (core and shell type), EMF equation, transformation ratio, losses, efficiency, voltage regulation and its significance, illustrative problems on EMF equation and efficiency only, applications of transformers. **DC Motor:** Principle of operation, construction and working, back Emf, torque equation. Shunt and series motors, operating characteristics and applications.	

Unit – V	Contact Hours = 8 Hours
Introduction to Electric Vehicles: Classification of EV, Comparison of EV with IC engines, EV architecture, operation of EV, Types of motors used for EV, Types of batteries and specifications, EV charger classifications.	

Flipped Classroom Details

Unit No.	I	II	III	IV	V
No. for Flipped Classroom Sessions	1	1	1	1	1

Unit No.	Self-Study Topics
1.	Water Heater
2.	Ohms law, Kirchhoff's laws
3.	Necessity of a starter for induction motor
4.	Faraday's law of Electromagnetics induction.
5.	Comparison of EV with IC engines

Books	
	Text Books:
1.	DC Kulshreshtha, Basic Electrical Engineering, Tata McGraw Hill, First Edition 2019.
2.	B.L.Theraja, A text book of Electrical Technology, S Chandand Company, reprint edition 2014.
	Reference Books:
1.	D.P.Kothari and I.J.Nagrath, Basic Electrical Engineering, Tata McGraw Hill 4th edition, 2019.
2.	V. K. Mehta, Rohit Mehta, Principles of Electrical Engineering & Electronics, S. Chand and Company Publications, 2nd edition, 2015.
	E-resources:
1.	https://onlinecourses.nptel.ac.in/noc25_ee91/preview
2.	https://nptel.ac.in/coursesc/117106108

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Assignment- Open/Industry/Certification
3.	Flipped Classes	3.	Course Project
4.	Online classes	4.	Semester End Examination

Course Outcome (COs)

Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create

At the end of the course, the student will be able to (Highlight the **action verb** representing the learning level.)		**Learning Level**	**PO(s)**	**PSO(s)**
1.	**Explain** the structure of typical electrical power systems, electric circuits, Construction and working of electrical machines, domestic appliances and EV.	Un	1,8,9,11	1
2.	**Determine** the electrical parameters of electrical circuits, energy bill calculations and performance of electrical machines.	Ap	1,8,9,11	1

3.	**Determine** the performance parameters of various electrical machines.	Ap	1,8,9,11	1
4.	**Analyze** the performance parameters and characteristics of various electrical circuits, electrical machines and energy savings in electrical systems.	Az	1,8,9,11	1

Scheme of Continuous Internal Evaluation (CIE):

Components	**Addition of two IA tests**	**Two assignments – (Open /Industry/Certification**	**Course project (CP)/ Case study etc**	**Total Marks**
Marks	30+30 = 60	10 + 10 = 20	20 marks (with report & presentation)	100

IA Test:
1. 10 marks questions in Part A of IA question paper should also include an OBE related question (max 2 marks).
2. Remaining 20 marks questions in Part B & C should be descriptive
-Certification earned by passing the standard Online MOOCs course (1 course of atleast 8 hours defined by BOS) can be considered as a Course activity and awarded maximum of 10 marks.

Eligibility for SEE:
-Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests.
-Lack of minimum score in IA test will make the student Not Eligible for SEE.
-Minimum score in CIE to be eligible for SEE: 40 OUT OF 100.

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 100 marks of 3 hours duration.
2.	**Minimum marks required in SEE to pass:** Score should be $\geq$ 35%, however overall score of CIE + SEE should be $\geq$ 40%.
3.	Question paper contains three parts **A, B and C**. Students have to answer 1. From Part A answer any 5 out of 7 questions, each Question Carries 6 Marks. 2. From Part B answer 5 out of 10 questions choosing any one full question from each unit, each Question Carries 10 Marks. 3. From Part C answer 1 out of 2 questions, each Question Carries 20 Marks.

Assignment (10 marks)				
Rubric/Level	**Exemplary=A (Far Exceeds Standard)**	**Above Average=B (Exceeds Standard)**	**Adequate= C (Meets Standard)**	**Inadequate= D (Below Standard)**
Technical Content (8 marks)	Comprehensive, accurate, in-depth understanding; shows original thinking and mastery of concepts. (7-8)	Mostly accurate, good understanding, minor gaps; shows good application of concepts. (5-6)	Basic coverage, some understanding, lacks depth or clarity. (3-4)	Incomplete, inaccurate, poor understanding; shows little effort. (1-2)
Results & learning Outcome (2 marks)	Clear, correct results with excellent insights and reflection on learning. (2)	Mostly correct results; good understanding of learning outcomes. (1.5)	Basic results; limited insights or superficial learning. (1)	Incorrect or missing results; no evident learning. (0.5)

Course Project (20 marks)				
Rubric/Level	**Exemplary=A (Far Exceeds Standard)**	**Above Average=B (Exceeds Standard)**	**Adequate= C (Meets Standard)**	**Inadequate =D (Below Standard)**
Innovative Idea (2 Marks)	Highly original, creative, and impactful idea (2)	Original idea with moderate creativity (1.5)	Common idea with minor innovation (1)	Unoriginal or poorly thought-out idea (0.5)
Work Plan/methodology (2 Marks)	Clear, logical, and detailed work plan with effective methodology (2)	Mostly clear and practical plan with some details (1.5)	Basic plan; lacks clarity or depth (1)	Poor or vague plan and methodology (0.5)
Work content/Use of Technology (10 Marks)	Comprehensive, technically sound; advanced and appropriate use of technology (10-9)	Good technical depth; reasonable use of technology (8-7)	Adequate work; technology used with limitations (6-4)	Superficial or minimal work; poor use of technology (3-1)
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Report (2 Marks)	Well-structured, detailed, no errors; excellent formatting (2)	Mostly well-written with minor issues (1.5)	Adequate but with some errors (1)	Poorly written; lacks structure (0.5)

CO-PO Mapping (Planned)												**CO-PSO Mapping (Planned)**			
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO1	PSO2	PSO3	PSO 4
1	✓							✓	✓		✓	✓			
2	✓							✓	✓		✓	✓			
3	✓							✓	✓		✓	✓			
4	✓							✓	✓		✓	✓			
Tick mark the CO, PO and PSO mapping															

Name & Signature of Faculty members involved in designing the syllabus

S.No	Name	Signature
1.	Prof.P.V.Datar	
2.	Prof.A.V.Deshpande	
3.	Prof.S.N.Dodamani	

Name & Signature of Faculty members verifying/approving the syllabus

S.No	Name	Signature
1.	Dr.D.B.Kulkarni	
2.	Dr.R.B.Magadum	

Introduction to Electronics and Communication Engineering

Course Code	**1BESC104C/204C**	**Course type**	**ESC**	**Credits L-T-P**	3 – 0 – 0
Hours/week: L - T- P	3 – 0 – 0			**Total credits**	3
Total Contact Hours	L = 40 Hrs; T = 0 Hrs; P = 0 Hrs Total = 40 Hrs			**CIE Marks**	100
Flipped Classes content	05 Hours			**SEE Marks**	100

Course learning objectives	
1.	To understand the role of rectifiers, regulators, and amplifiers in basic electronic circuits.
2.	To explore the working of op-amps and oscillators for signal processing tasks.
3.	To introduce analog and digital modulation techniques used in communication systems.
4.	To familiarize students with the basics of embedded systems and digital logic elements.
5.	To apply number systems and Boolean logic to design simple digital circuits.

Pre-requisites: Physics and Mathematics

Unit – I	**Contact Hours = 8 Hours**
Power Supplies: Block Diagram, Rectifiers, Reservoir and Smoothing Circuits, Improved Ripple Filters, Full Wave Rectifiers, Bi Phase Rectifiers Circuits, Bridge Rectifier Circuits, Voltage Regulators, Output Resistance and Voltage Regulation, Voltage Multipliers, (Only Voltage Doubler) Switched Mode Power Supplies. **Amplifiers:** Types of Amplifiers, Gain, Input and Output Resistance, Frequency Response, Bandwidth, Phase Shift, Negative Feedback.	

Unit – II	**Contact Hours = 8 Hours**
Oscillators: Positive Feedback, Condition for Oscillations, Ladder Network Oscillator, Wein Bridge Oscillator, Single-Stage Astable Oscillator, Crystal Controlled Oscillators (Only Concepts, Working, and Waveforms. No Mathematical Derivations) **Operational Amplifiers:** Operational Amplifier Parameters, Operational Amplifier Characteristics, Operational Amplifier Configurations, Operational Amplifier Circuits.	

Unit – III	**Contact Hours = 8 Hours**
Analog Communication Schemes: Introduction, Modern Communication System Scheme: Information Source and Input Transducer, Transmitter, Channel or Medium, Noise, Receiver, Concept of Modulation, Concept of Radio Wave Propagation (Ground, Space, Sky), Types of Communication Systems. **Modulation Schemes:** Amplitude Modulation, Angle Modulation, Advantages of Digital Communication Over Analog Communication, Multiplexing, Digital Modulation Schemes: ASK, FSK, PSK, (Explanation with Waveform)	

Unit – IV	Contact Hours = 8 Hours
Boolean Algebra and Logic Circuits: Binary Numbers, Number Base Conversion- Binary, Decimal And Octal and Hexa Decimal Numbers and Vice-Versa, Complements-1's and 2's, Basic Definitions, Basic Theorems and Properties of Boolean Algebra, Boolean Functions, Canonical and Standard Forms, Digital Logic Gates. **Combinational Logic:** Introduction, Design Procedure, Adders- Half Adder, Full Adder.	

Unit – V	Contact Hours = 8 Hours
Embedded Systems: Definition, Embedded Systems Vs General Computing Systems, Classification of Embedded Systems, Major Application Areas of Embedded Systems, Purpose of an Embedded System, **Core of The Embedded System:** Microprocessors, GPP Vs ASIP, Microcontrollers, Microprocessor Vs Microcontroller, DSP, RISC V/S CISC, **Memory:** ROM, Sensors, Actuators, LED, 7-Segment LED Display.	

Flipped Classroom Details

Unit No.	I	II	III	IV	V
No. for Flipped Classroom Sessions	1	1	1	1	1

Books	
	Text Books:
1.	Mike Tooley "Electronic Circuits Fundamentals & Applications,"5th Edition, Elsevier, 2020.
2.	S L Kakani and Priyanka Punglia, 'Communication Systems', Ist Edition, New Age International Publisher, 2017.
3.	K V Shibu, 'Introduction to Embedded Systems', 2nd Edition, McGraw Hill Education (India), Private Limited, 2019.
4.	Digital Logic and Computer Design, M. Morris Mano, Pearson Education, 2017, ISBN-978-93-325- 4252-5.
	E-resources (NPTEL/SWAYAM. Any Other)- mention links
1.	Basic Electronics and Lab, by Prof. T.S. Natarajan, IIT Madras **Link:** https://nptel.ac.in/courses/122106025
2.	Digital Electronic Circuits, by Prof. Goutam Saha, IIT Kharagpur **Link:** https://nptel.ac.in/courses/108105132

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Assignment- Open/Industry/Certification
3.	Flipped Classes	3.	Course Project
4.	Online classes	4.	Semester End Examination
5.		5.	

Course Outcome (COs) **Learning Levels:** Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create				
At the end of the course, the student will be able to (Highlight the **action verb** representing the learning level.)		**Learning Level**	**PO(s)**	**PSO(s)**
1.	***Interpret*** the structure and functionality of embedded systems and digital logic components such as microcontrollers, sensors, and logic gates.	Un	1	1
2.	***Illustrate*** the fundamental concepts of analog and digital modulation techniques based on their characteristics and suitability for communication systems.	Ap	1,2	1,2
3.	***Apply*** number system conversions and Boolean algebra to design and implement basic combinational logic circuits.	Ap	1,2	1,2
4.	***Analyse*** basic electronic circuits using the principles of rectifiers, voltage regulators, and amplifiers.	An	1,2,8,9	1,2
5.	***Analyse*** the behaviour of analog circuits including oscillators and operational amplifiers in signal generation and conditioning applications.	An	1,2,8,9	1,2

Scheme of Continuous Internal Evaluation (CIE):

Components	**Addition of two IA tests**	**Two Assignments – (Open /Industry/Certification**	**Course project (CP)/ Case study etc**	**Total Marks**
Marks	30+30 = 60	10 + 10 = 20	20 marks (with report & presentation)	100

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1. 10 marks questions in Part A of IA question paper should also include an OBE related question (max 2 marks).
2. Remaining 20 marks questions in Part B & C should be descriptive

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3.	Question paper contains three parts **A,B and C**. Students have to answer 1. From Part A answer any 5 out of 7 questions, each Question Carries 6 Marks.

	2. From Part B answer 5 out of 10 questions choosing any one full question from each unit, each Question Carries 10 Marks. 3. From Part C answer 1 out of 2 questions, each Question Carries 20 Marks.

Assignment (10 marks)				
Rubric/Level	**Exemplary=A (Far Exceeds Standard)**	**Above Average=B (Exceeds Standard)**	**Adequate= C (Meets Standard)**	**Inadequate= D (Below Standard)**
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Course Project (20 marks)				
Rubric/Level	**Exemplary=A (Far Exceeds Standard)**	**Above Average=B (Exceeds Standard)**	**Adequate= C (Meets Standard)**	**Inadequate =D (Below Standard)**
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Report (2 Marks)	Well-structured, detailed, no errors; excellent formatting (2)	Mostly well-written with minor issues (1.5)	Adequate but with some errors (1)	Poorly written; lacks structure (0.5)

CO-PO Mapping (Planned)												CO-PSO Mapping (Planned)		
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PSO1**	**PSO2**	**PSO3**
1	✓											✓		
2	✓	✓										✓	✓	
3	✓	✓										✓	✓	
4	✓	✓						✓	✓			✓	✓	
5	✓	✓						✓	✓			✓	✓	
Tick (✓) mark the CO, PO and PSO mapping														

Name & Signature of Faculty members involved in designing the syllabus

Name & Signature of Faculty members verifying/approving the syllabus

Introduction to Mechanical Engineering

Course Code	1BESC104D	**Course type**	ESC	**Credits L-T-P**	3
Hours/week: L - T- P	3-0-0			**Total credits**	3
Total Contact Hours	L = 40Hrs; T = 0 Hrs.; P= 0Hrs. Total = 40 Hrs.			**CIE Marks**	100
Flipped Classes content	2 Hours			**SEE Marks**	100

Course learning objectives	
1.	Explain the role of mechanical engineering in industries, society, and emerging energy/environmental technologies.
2.	Describe manufacturing processes, Industry 4.0, and sustainable production practices.
3.	Understand the IC engine principles, future mobility solutions, and drone fundamentals.
4.	Classify composites, smart materials, and sustainable engineering materials.
5.	Explain automation, mechatronics, robotics, CNC, 3D printing, and current digital manufacturing trends.

Pre-requisites : Basic idea on general Engineering Concepts

Unit – I	**Contact Hours = 8 Hours**
Introduction: Role of Mechanical Engineering in Industries and Society- Emerging Trends and Technologies in different sectors. **Energy:** Introduction and applications of Hydrogen energy, electric mobility, waste-to-energy technologies. **Environmental issues:** Global warming and Ozone depletion	

Unit – II	**Contact Hours = 8 Hours**
Overview of Manufacturing Systems: Casting process, forming process, machining process, joining process. Introduction to advanced Industry 4.0-enabled manufacturing, hybrid manufacturing processes, green manufacturing practices.	

Unit – III	**Contact Hours = 8 Hours**
Introduction to IC Engines: Components and Working Principles, 4-Strokes Petrol and Diesel Engines, Applications. Simple Numerical on performance parameters. **Insight into Future Mobility:** Electric and Hybrid Vehicles and their components, Advantages and disadvantages of EVs and Hybrid vehicles. **Flying machines:** Classification, Basic parts involved in drone making, working principle of Drones.	

Unit – IV	Contact Hours = 8 Hours
Engineering Materials: Introduction to ferrous and non-ferrous materials. Advantages, Disadvantages and Applications of composite materials. Composites-Constituents of a composite material, Classification, Matrix and Reinforcement materials, Advantages, Disadvantages and Applications of composite materials., smart materials, shape-memory alloys, bio-materials, sustainable material choices.	

Unit – V	Contact Hours = 8 Hours
Introduction to Automation, Mechatronics and Robotics: Types of Automation, Case study, open-loop and closed-loop mechatronic systems. Classification of robots based on robotics configuration. **Introduction to CNC:** Components, advantages and applications., Basic principles of 3D printing. **Current trends:** Digital twins, predictive maintenance, IoT-based monitoring.	

Flipped Classroom Details

Unit No.	I	II	III	IV	V
No. for Flipped Classroom Sessions	1	-	-	-	1

Unit No.	Self-Study Topics
1.	Global warming and Ozone depletion

Books	
	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
	Reference Books:
1.	Manufacturing Technology- Foundry, Forming and Welding, P.N.Rao Tata McGraw Hill 3rd Ed., 2003.
2.	Internal Combustion Engines, V. Ganesan, Tata McGraw Hill Education; 4th edition, 2017.
3.	Robotics, Appu Kuttan KK K. International Pvt. Ltd, volume 1.
	E-resources (NPTEL/SWAYAM.. Any Other)- mention links
1.	https://rakhoh.com/en/applications-and-advantages-of-steam-in-manufacturing-and-process industry/)
2.	https://www.makino.com/en-us/resources/content-library/videos

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Assignment- Open/Industry/Certification
3.	Flipped Classes	3.	Course Project
4.	Online classes	4.	Semester End Examination
5.	Lab Demo		

Course Outcome (COs) **Learning Levels:** Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create				
At the end of the course, the student will be able to (Highlight the **action verb** representing the learning level.)		Learning Level	PO(s)	PSO(s)
1.	**Explain** the role of mechanical engineering in industries, society, and emerging technologies related to energy and environment.	L2	1	1,2
2.	**Describe** manufacturing processes, Industry 4.0, hybrid and green manufacturing practices with sketches of tools and work pieces	L2	1	1,2
3.	**Explain** IC engine working, electric and hybrid vehicles, their advantages and disadvantages, and fundamentals of drones	L3	1	1,3
4.	**Classify** composites, smart materials, shape-memory alloys, biomaterials, and sustainable materials with their properties and applications	L2	1	1,2
5.	**Explain** automation, mechatronics, robotics, CNC, 3D printing, and current trends like digital twins, predictive maintenance, and IoT.	L2	1	1,2

Scheme of Continuous Internal Evaluation (CIE):

Components	**Addition of two IA tests**	**Two Assignments – (Open /Industry/Certification**	**Course project (CP)/ Case study etc**	**Total Marks**
Marks	30+30 = 60	10 + 10 = 20	20 marks (with report & presentation)	100

IA Test:

1. 10 marks questions in Part A of IA question paper should also include an OBE related question (max 2 marks).
2. Remaining 20 marks questions in Part B & C should be descriptive

-Certification earned by passing the standard Online MOOCs course (1 course of atleast 8 hours defined by BOS) can be considered as a Course activity and awarded maximum of 10 marks.

Eligibility for SEE:

-Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests.

-Lack of minimum score in IA test will make the student Not Eligible for SEE.

-Minimum score in CIE to be eligible for SEE: 40 OUT OF 100.

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 100 marks of 3 hours' duration.
2.	**Minimum marks required in SEE to pass:** Score should be $\geq$ 35%, however overall score of CIE + SEE should be $\geq$ 40%.
3.	Question paper contains three parts **A, B and C**. Students have to answer 1. From Part A answer any 5 out of 7 questions, each Question Carries 6 Marks. 2. From Part B answer 5 out of 10 questions choosing any one full question from each unit, each Question Carries 10 Marks. 3. From Part C answer 1 out of 2 questions, each Question Carries 20 Marks.

Assignment (10 marks)				
Rubric/Level	**Exemplary=A (Far Exceeds Standard)**	**Above Average=B (Exceeds Standard)**	**Adequate= C (Meets Standard)**	**Inadequate= D (Below Standard)**
Technical Content (8 marks)	Comprehensive, accurate, in-depth understanding; shows original thinking and mastery of concepts. (7-8)	Mostly accurate, good understanding, minor gaps; shows good application of concepts. (5-6)	Basic coverage, some understanding, lacks depth or clarity. (3-4)	Incomplete, inaccurate, poor understanding; shows little effort. (1-2)
Results & learning Outcome (2 marks)	Clear, correct results with excellent insights and reflection on learning. (2)	Mostly correct results; good understanding of learning outcomes. (1.5)	Basic results; limited insights or superficial learning. (1)	Incorrect or missing results; no evident learning. (0.5)

Course Project (20 marks)				
Rubric/Level	**Exemplary=A (Far Exceeds Standard)**	**Above Average=B (Exceeds Standard)**	**Adequate= C (Meets Standard)**	**Inadequate =D (Below Standard)**
Innovative Idea (2 Marks)	Highly original, creative, and impactful idea (2)	Original idea with moderate creativity (1.5)	Common idea with minor innovation (1)	Unoriginal or poorly thought-out idea (0.5)
Work Plan/methodology (2 Marks)	Clear, logical, and detailed work plan with effective methodology (2)	Mostly clear and practical plan with some details (1.5)	Basic plan; lacks clarity or depth (1)	Poor or vague plan and methodology (0.5)
Work content/Use of Technology (10 Marks)	Comprehensive, technically sound; advanced and appropriate use of technology (10-9)	Good technical depth; reasonable use of technology (8-7)	Adequate work; technology used with limitations (6-4)	Superficial or minimal work; poor use of technology (3-1)
Project Presentation (2 Marks)	Clear, engaging, confident delivery; excellent visuals (2)	Clear and coherent; good use of visuals (1.5)	Understandable but lacks engagement or clarity (1)	Disorganized or hard to follow (0.5)
Individual Contribution (2 Marks)	Fully engaged and contributed significantly to all aspects (2)	Active contribution with few gaps (1.5)	Some participation; effort uneven (1)	Minimal or unclear contribution (0.5)
Report (2 Marks)	Well-structured, detailed, no errors; excellent formatting (2)	Mostly well-written with minor issues (1.5)	Adequate but with some errors (1)	Poorly written; lacks structure (0.5)

CO-PO Mapping (Planned)												CO-PSO Mapping (Planned)		
CO	**PO 1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
1	✓											✓	✓	
2	✓											✓	✓	
3	✓											✓		
4	✓											✓	✓	
5	✓											✓		
Tick mark the CO, PO and PSO mapping														

VINAYAK V. KULKARNI

Name & Signature of Faculty members involved in designing the syllabus

Name & Signature of Faculty members verifying/approving the syllabus

UG Detailed Syllabus Template

Essentials of Information Technology

Course Code	**BESC104E**	Course type	ESC-II	Credits L-T-P	3 – 0 - 0
Hours/week: L - T- P	3 – 0 – 0			Total credits	3
Total Contact Hours	L = 40 Hrs; T = 0 Hrs; P = 0 Hrs Total = 40 Hrs			CIE Marks	100
Flipped Classes content	10 Hours			SEE Marks	100

Course learning objectives	
1.	To introduce students to the fundamentals of information representation, storage, and processing in digital systems.
2.	To develop an understanding of operating systems and software engineering concepts for practical computing applications.
3.	To provide knowledge of networking, the internet, cybersecurity, and security issues in Information Technology.
4.	To equip students with hands-on skills in databases, web technologies (HTML, CSS), and website development for real-world applications.

Pre-requisites : Basic Computer Literacy, Familiarity with Internet Use

Unit – I	Contact Hours = 8 Hours
Data Storage: Bits and Their Storage, Main Memory, Mass Storage, Representing Information as Bit Patterns, The Binary System, Storing Integers, Storing Fractions. **Data Manipulation:** Computer Architecture, Machine Language, Program Execution, Arithmetic/Logic Instructions, Communicating with Other Devices.	

Unit – II	Contact Hours = 8 Hours
Operating Systems: The History of Operating Systems, Operating System Architecture, Coordinating the Machine's Activities, Handling Competition Among Processes by using FCFS, Shortest Job Next,Round Robin Algorithms, Security. **Algorithms:** The Concept of an Algorithm, Algorithm Representation, Algorithm Discovery.	

Unit – III	Contact Hours = 8 Hours
Networking and the Internet: Network Fundamentals, The Internet, The World Wide Web: Internet Protocols -HTTP, DNS, Server, Browser, MIME, Internet, URL, 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.	

Unit – IV	Contact Hours = 8 Hours
Software Engineering: The Software Engineering Discipline, The Software Life Cycle, Software Engineering Methodologies, Modularity, Tools of the Trade. **Database Systems:** Database Fundamentals, Definition of Database, DBMS, Metadata,Applications and its advantages over Traditional system,The Relational Model.	

Unit – V	Contact Hours = 8 Hours
Introduction to HTML and Website Development: What is HTML?, Basic Tags of HTML,Cascading Style Sheets (CSS),Three ways to add CSS to HTML,CSS Selectors, Website Design and Storyboarding, Structure of a Website. **Computer Graphics:** The Scope of Computer Graphics, Overview of 3D Graphics, Basics of Modeling and Rendering.	

Learning Activity -1: Practical Assignment (Individual) INSTRUCTIONS:

1. ***Students must demonstrate the solutions to the course instructor and submit the record containing method (steps), program (if applicable), document (if applicable) and results/output.***
2. ***Course instructor must evaluate the student performance as per the rubrics.***

1.	Create files of specific types, changing file properties & permissions, search files based on criteria. Creating hierarchy of folders, folder paths, changing folder properties and related operations on folders. File compressions, file backup and cloud-based file management.
2.	Create word file with suitable content and performs various operations related to document Revision, Proofreading and references (As listed in the Textbook).
3.	Locate the templates available for a word processing application that you have access to. Search the templates for a "Resume." Review the "Resume" template of your choice. Identify all the word processing features used in the "Resume" template. Use the "Resume" template to create your own resume. As you fill out the template, be sure to use the application to check your spelling and grammar. Verify the print layout of your resume. Save the resume and print a copy.
4.	Consider the following data: Student First Name, Student Last Name, Student Age, Student Grade, Student School, Telephone Number, Sport (Volleyball, Basketball, Softball, Baseball, Soccer, or Football). Considering the data required in the list above, create a spreadsheet in a spreadsheet application you have access to. Add at least 10 rows of data to your spreadsheet. Once you add all the data to the spreadsheet, what is the average age for all the students? What formula did you use to calculate the average age?
5.	Add a chart to the above spreadsheet that illustrates the total number of students for each sport. Which sport has the highest number of students? What formula did you use to count the total number of students for each sport?
6.	Use the above spreadsheet to Analyzing and Organizing Data with suitable filters, sorting, conditional formatting and pivot tables.
7.	Create a presentation (power point) using a presentation application you have access to that meets the requirements of marketing of brand-new product. Apply a theme,

background, and professional layout for chosen product.
8. Create a Web page with basic HTML elements (tags). Insert lists, images, drop down lists and tables.
9. Create a Personal Website and host it on a free cloud-based Web hosting. Personal Web site should cover your complete biodata and your social activities.
10. Create a relational database model (MS Access or any other) for storing information about courses taken by students. Develop suitable queries to insert data onto tables, update fields, delete rows and query relevant information from the database model.

Rubrics for Learning Activity-1 (Practical Assignment):

Component & CO-PO Mapping	Outstanding (5)	Exceeds Expectations (4)	Meets Expectations (3)	Needs Improvement (2)	Unsatisfactory (1)
Clarity & Simplicity of procedure/ method .	procedure/ method is, specific, and well-structured for the intended activity; no ambiguity is present.	procedure/ methods are clear and mostly specific; minor ambiguity is present.	procedure/ methods are somewhat clear but could be more specific; moderate ambiguity.	procedure/ methods are vague and lack clarity; high ambiguity.	procedure/ methods are unclear, incomplete, or irrelevant to the activity.
Appropriate Use of elements/ techniques and design of solution.	Demonstrates precise and creative usage of the features, elements and techniques	Correctly applies the features and elements with minor gaps or missed opportunities.	Uses the features and elements, but with partial understanding or inconsistent usage.	Limited understanding of the features and elements; incorrect or weak usage.	No evidence of correct/relevant features and elements use.
Complete Solution & Comparison of Results/outp ut for various cases.	Provides clear and correct solution/results with analysis for multiple cases; comparisons among cases highlight key strengths and weaknesses.	Provides correct solution/results with analysis for multiple cases, though slightly less detailed.	Provides correct solution/results with limited analysis; comparisons are present but shallow.	Provides correct solution/results. Minimal analysis: comparisons are weak or incomplete.	Solution/results are partially correct. No meaningful analysis or comparison.
Creativity, efficiency of Problem-Solving	Demonstrates outstanding creativity and innovation in developing solution, especially	Demonstrates creativity and some innovation; developed solution is practical.	Shows moderate creativity; developed solution is functional but not innovative.	Minimal creativity; developed solution is repetitive or unimaginative.	No creativity or problem-solving/adequat e solution is evident.

Flipped Classroom Details

Unit No.	I	II	III	IV	V
No. for Flipped Classroom Sessions	2	2	2	2	2

Unit No.	Self-Study Topics
1.	File Management
2.	Word Processors,
3.	Introduction to Spreadsheets
4.	Introduction to Presentation Applications.
5.	Hosting a Static Website using free cloud based services like AWS

Books	
	Text Books:
1.	J. Glenn Brookshear and Dennis Brylow, Computer Science: An Overview, 12th Edition, Pearson Education Limited, 2017.
2.	Roy, Shambhavi; Daniel, Clinton; and Agrawal, Manish, "Fundamentals of Information Technology", Digital Commons at The University of South Florida (2023). https://digitalcommons.usf.edu/dit_tb_eng/19
	Reference Books:
1.	V. Rajaraman, “Introduction to Information Technology”, Third Edition, PHI Learning, 2018.
2.	Pelin Aksoy, Information Technology in Theory, First Edition, Cengage.
	E-resources (NPTEL/SWAYAM.. Any Other)- mention links
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

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Online Quizzes (Surprise and Scheduled)
3.	Flipped Classes	3.	Open Assignment (OA)/ Certification
4.	Online classes	4.	Course Project
		5.	Semester End Examination

Course Outcome (COs) At the end of the course, the student will be able to (Highlight the **action verb** representing the learning level.)				
Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create		Learning Level	PO(s)	PSO(s)
1.	Illustrate different information representation and manipulation schemes.	Un	1,2	1
2.	Make use of Information Technology (IT) infrastructure for information exchange.	Ap	1,2,3,5,9,10	1,2,3
3.	Apply basic software engineering concepts for Website and application development.	Un	1,2,9,10	1,3
4.	Develop queries for quick insert, access and updating of structured information.	Ap	1,2,3,5,9,10	1,2,3
5.	Identify role of cybersecurity and ethics issues in Information Technology (IT).	Un	1,2,7	1,2,3

Scheme of Continuous Internal Evaluation (CIE):

Components	Addition of two IA tests	*Open Assignments (OA)/ Industry/Certification etc)* ****(Learning Activities)**	Course project (CP)/Case Study	Total Marks
Marks	25+25 = 50	10+10= 20	20 marks (with report & presentation)	100

-Certification earned by passing the standard Online MOOCs course (1 course of atleast 8 hours defined byBOS) can be considered as a Course activity and awarded maximum of 10 marks.
-Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests.
-Lack of minimum score in IA test will make the student Not Eligible for SEE
-Minimum score in CIE to be eligible for SEE: 40 OUT OF 100.

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1.	It will be conducted for 100 marks of 3 hours duration.
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3.	Question paper contains three parts **A,B and C**. Students have to answer 1. From Part A answer any 5 out of 7 questions, each Question Carries 6 Marks. 2. From Part B answer 5 out of 10 questions choosing any one full question from each unit, each Question Carries 10 Marks. 3. From Part C answer 1 out of 2 questions, each Question Carries 20 Marks.

Sl No	Skill & competence enhanced after undergoing the course	Applicable Industry Sectors & domains	Job roles students can take up after undergoing the course
1	Understanding of computer hardware, software, and operating systems	IT Services, Computer Hardware Manufacturing, Technical Support	Computer Operator, Technical Support Executive
2	Proficiency in basic productivity tools	Corporate Offices, Education, Administration	Office Executive, Data Entry Operator
3	Awareness of cybersecurity basics and safe computing	Cybersecurity Firms, Banking, Government	Security Analyst (Entry Level), IT Support Staff

CO-PO Mapping (Planned)													CO-PSO Mapping (Planned)		
CO	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
1	√	√											√		
2	√	√	√		√				√	√			√	√	√
3	√	√							√	√			√		√
4	√	√	√		√				√	√			√	√	√
5	√	√					√						√	√	√
Tick mark the CO, PO and PSO mapping															

Name & Signature of Faculty members involved in designing the syllabus

Prof. Veena Kangralkar

Prof. Seena Kalghatgi

Name & Signature of Faculty members verifying/approving the syllabus

Introduction to Aeronautical Engineering

Course Code	1BESC104F	Course type	ESC	Credits L-T-P	3 – 0 - 0
Hours/week: L - T- P	3-0-0			Total credits	03
Total Contact Hours	L = 40 Hrs; T = 0 Hrs; P = 0 Hrs Total = 40 Hrs			CIE Marks	100
Flipped Classes content	10 Hours			SEE Marks	100

Course learning objectives	
1.	Gain awareness of the historical evolution of human flight and major global and Indian contributions.
2.	Understand the basic scientific principles that make flight possible.
3.	Learn about different types of flying machines and their practical applications.
4.	Become familiar with the structure of the aviation industry and the importance of regulations.
5.	Explore lighter-than-air systems and their uses in modern society.

Pre-requisites : Basic Physics, Mathematics

Unit – I Journey of Human Flight	Contact Hours = 8 Hours
Early dreams and attempts to fly: Great pioneers and inventors, Major milestones: Invention of the airplane, helicopters, important world events. India's journey in aviation: Key people, organizations (HAL, ISRO, NAL, DRDO etc.). The wonders of space: Satellites, Moon missions, India's achievements	

Unit – II How Aircraft Fly - Basic Concepts	Contact Hours = 8 Hours
The simple science behind flight- The four basic forces, How different flying machines work: Airplanes, gliders, and helicopters. Major parts of an aircraft (functional overview): wings, fuselage, tail, landing gear, engines.	

Unit – III Types of Flying Machines	Contact Hours = 8 Hours
Introduction to different types of aircraft: Airplanes used for transport and travel. Helicopters and what makes them unique (ambulance, rescue). Military Marvels: Fighters, Bombers, Giant cargo planes. Drones (UAVs) and their growing applications. Special aircraft: used for farming, rescue, firefighting, etc.	

Unit – IV Aviation Today: Industry and Regulations	Contact Hours = 8 Hours
Overview of air travel and cargo transportation; Airports, airlines, and aircraft maintenance operations with emphasis on behind-the-scenes processes. Regulatory and governing bodies: DGCA, CEMILAC, FAA, EASA, CAA, JCAB and other agencies like IATA, ICAO. Importance of regulations in aviation safety	

Unit – V Balloons and Airships: The Lighter Side of Aviation	Contact Hours = 8 Hours
Introduction to the development of hot-air balloons and airships; Simple concepts of buoyancy and lighter-than-air flight; Present-day uses of balloons and airships in tourism, rescue, and scientific studies; Overview of commercial applications of lighter-than-air technology.	

Flipped Classroom Details

Unit No.	I	II	III	IV	V
No. for Flipped Classroom Sessions	2	2	2	2	2

Unit No.	Self-Study Topics
1	India's Journey in Aviation: HAL, ISRO, NAL, DRDO
2	The Four Basic Forces of Flight
3	Helicopters and Their Unique Roles
4	Indian Regulatory Body: DGCA
5	Present-day uses of balloons and airships

Books	
	Text Books:
1.	John D. Anderson, "Introduction to Flight", McGraw-Hill Education, 2011. ISBN 9780071086059.
2.	Lalit Gupta and O P Sharma, "Fundamentals of Flight Vol-I to Vol-IV", Himalayan Books, 2006, ISBN-13: 978-8170020974
	Reference Books:
1.	Ian Moir, Allan Seabridge, "Aircraft Systems: Mechanical, Electrical and Avionics Subsystems Integration", John Wiley & Sons, 2011. ISBN 978111965006.
2.	Nelson R.C., "Flight stability and automatic control", McGraw-Hill International Editions, 1998. ISBN 9780071158381.
3.	Sutton G.P., "Rocket Propulsion Elements", John Wiley, New York, 8th Ed., 2011; ISBN: 1118174208, 9781118174203.
	E-resources (NPTEL/SWAYAM.. Any Other)- mention links
1.	NPTEL: Online Resources: Lecture by: Prof. Rajkumar S. Pant, IIT Bombay https://swayam.gov.in/nd1_noc19_ae05/preview
2.	NPTEL: (Unit III) Online Resources: Lecture by: Prof. Debi Prasad Mishra, IIT Kanpur https://swayam.gov.in/nd1_noc19_ae08/preview

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Assignment- Open/Industry/Certification
3.	Flipped Classes	3.	Course Project
4.	Online classes	4.	Semester End Examination
5.		5.	

Course Outcome (COs) **Learning Levels:** Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create				
At the end of the course, the student will be able to (Highlight the **action verb** representing the learning level.)		Learning Level	PO(s)	PSO(s)
1.	Outline key historical milestones in aviation and space, including India's achievements.	L2 (Un)	1	1
2.	Identify and describe the four basic forces of flight and the functions of major aircraft parts.	L3 (Ap)	1	1
3.	Classify different types of flying machines and summarize their applications in civil, military, and societal contexts.	L2 (Un))	1	1
4.	Explain the aviation ecosystem, including airlines, airports, maintenance, and the roles of regulatory bodies.	L2 (Un)	1	1
5.	Summarize the principles and applications of balloons and airships in tourism, rescue, and science.	L2 (Un)	1	1

Scheme of Continuous Internal Evaluation (CIE):

Components	Addition of two IA tests	Two Assignments – (Open /Industry/Certification etc)	Course project (CP)/ Case study etc	Total Marks
Marks	30+30 = 60	10 + 10 = 20	20 marks (with report & presentation)	100

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CO	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PSO1	PSO2	PSO 3
1	√											√		
2	√											√		
3	√											√		
4	√											√		
5	√											√		
Tick mark the CO, PO and PSO mapping														

Dr. Praveen Kumar Balguri

Name & Signature of Faculty members involved in designing the syllabus

Dr. Lokamanya Chikmath
Dr. Sundaramoorthy R

Name & Signature of Faculty members verifying/approving the syllabus

Programme Specific Course I & II semester

INDEX

ENGINEERING MECHANICS

Course Code	**1BCIV105**	**Course type**	**PSC**	**Credits L-T-P**	**3 – 0 - 0**
Hours/week: L - T- P	**3-0-0**			**Total credits**	**3**
Total Contact Hours	**L = 40 Hrs; T = 0 Hrs; P = 0 Hrs Total = 40 Hrs**			**CIE Marks**	**100**
Flipped Classes content	**10 Hours**			**SEE Marks**	**100**

Course learning objectives	
1.	To understand the action of forces on rigid bodies at rest.
2.	Outline the concept of equilibrium and its application to analyze problems on statics including friction and analysis of statically determinate beams.
3.	Learn to analyze pin-jointed plane trusses.
4.	Understand the concepts of Centroid and Moment of Inertia.

Pre-requisites : Fundamentals of Physics and Mathematics

Unit – I	**Contact Hours = 8 Hours**
Coplanar concurrent force system: Marvels in Civil Engineering, Introduction to Engineering Mechanics, Basic Idealizations, Forces, Types of forces, System of forces, principle of transmissibility of a force, principle of superposition of force, resolution of a force, Resultant and equilibrant, composition of forces, Free body diagrams. Numerical examples on Resultant of coplanar concurrent force system. Equilibrium of coplanar concurrent force system, Static Equilibrium conditions, Related Numerical examples.	

Unit – II	**Contact Hours = 8 Hours**
Coplanar non-concurrent force system: Principle of moments (Varignon's Theorem), moment, couple, characteristics of couple, Equivalent force couple system, Related Numerical examples. Resultant of coplanar non-concurrent force system. Equilibrium of coplanar non concurrent force system, Conditions of Equilibrium, Numerical problems. Types of beams, types of loads, types of supports, support reactions of statically determinate beams subjected to various types of loads, Numerical examples.	

Unit – III	**Contact Hours = 8 Hours**
Centroid of Plane areas: Introduction, Locating the centroid of rectangle, triangle, circle, semicircle, quadrant and sector of a circle from first principles (method of integration), centroid of composite areas and simple built up sections, Numerical examples.	

Unit – IV	Contact Hours = 8 Hours
Moment of inertia of plane areas: Introduction, Rectangular moment of inertia, polar moment of inertia, radius of gyration, parallel axes theorem, perpendicular axis theorem, moment of inertia of rectangular, triangular and circular areas from the method of integration, moment of inertia of composite areas and simple built-up sections, Numerical examples.	

Unit – V	Contact Hours = 8 Hours
Friction: Introduction, laws of Coulomb friction, co-efficient of friction, angle of friction and angle of repose, equilibrium of blocks on horizontal and inclined planes. **Analysis of Trusses:** Introduction, Classification of trusses, analysis of pin jointed plane perfect trusses by the method of joints.	

Flipped Classroom Details

Unit No.	I	II	III	IV	V
No. for Flipped Classroom Sessions	02	02	02	02	02

Unit No.	Self-Study Topics
1.	Law of triangle, polygon and parallelogram
2.	Statically determinate and indeterminate structures.
3.	Types of trusses.
4.	Applications of geometrical properties.
5.	Types of moment of inertia.

Books	
	Text Books:
1.	Nitsure S.P. and Sawant H. J., "Elements of Civil Engineering and Engineering Mechanics", Technical Publications, First Edition, 2014.
2.	Bansal R. K., Rakesh Ranjan Beohar and Ahmad Ali Khan, "Basic Civil Engineering and Engineering Mechanics", Laxmi Publications, 2015.
3.	Bhavikatti S. S., "Engineering Mechanics", New Age International, 2019.
4.	Kolhapure B K, Elements of Civil Engineering and Engineering Mechanics, Eleventh edition, 2018, Eastern Book Promoters Belgaum [EBPB], ISBN: 5551234003896.
	Reference Books:
1.	Beer F.P. and Johnston E. R., "Mechanics for Engineers, Statics and Dynamics", McGraw Hill, 1987.
2.	Timoshenko S, Young D. H., Rao J. V., "Engineering Mechanics", 5th Edition, Pearson Press, 2017.
3.	Irving H. Shames, "Engineering Mechanics", Prentice-Hall, 2019.
	E-resources (NPTEL/SWAYAM.. Any Other)- mention links
1.	https://nptel.ac.in/courses/122/102/122102004/
2.	https://unacademy.com/lesson/introduction-to-engineering-mechanics/2N4HJ9AB

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Assignment- Open/Industry/Certification
3.	Flipped Classes	3.	Course Project
4.	Online classes	4.	Semester End Examination

Course Outcome (COs) **Learning Levels:** Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create				
At the end of the course, the student will be able to (Highlight the **action verb** representing the learning level.)		Learning Level	PO(s)	PSO(s)
1.	***Understand*** the principles of Engineering Mechanics and apply them to analyze the rigid bodies under concurrent and non-concurrent force systems.	Un, Ap	1, 5, 8, 9	1, 2
2.	***Apply*** the conditions of static equilibrium to solve structural systems.	Ap	1, 5, 8, 9	1, 2
3.	***Understand*** the principles of Centroid, Moment of Inertia and apply to Engineering problems.	Un, Ap	1, 5, 8, 9	1, 2

Scheme of Continuous Internal Evaluation (CIE):

Components	Addition of two IA tests	Two Assignments – (Open /Industry/Certification etc)	Course project (CP)/ Case study etc	Total Marks
Marks	30+30 = 60	10 + 10 = 20	20 marks (with report & presentation)	100

IA Test:

1. 10 marks questions in Part A of IA question paper should also include an OBE related question (max 2 marks).
2. Remaining 20 marks questions in Part B & C should be descriptive

-Certification earned by passing the standard Online MOOCs course (1 course of atleast 8 hours defined by BOS) can be considered as a Course activity and awarded maximum of 10 marks.

Eligibility for SEE:

-Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests.
-Lack of minimum score in IA test will make the student Not Eligible for SEE.
-Minimum score in CIE to be eligible for SEE: 40 OUT OF 100.

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 100 marks of 3 hours duration.
2.	**Minimum marks required in SEE to pass:** Score should be $\geq$ 35%, however overall score of CIE + SEE should be $\geq$ 40%.
3.	Question paper contains three parts **A,B and C**. Students have to answer 1. From Part A answer any 5 out of 7 questions, each Question Carries 6 Marks. 2. From Part B answer 5 out of 10 questions choosing any one full question from each unit, each Question Carries 10 Marks.

	3. From Part C answer 1 out of 2 questions, each Question Carries 20 Marks.

Assignment (10 marks)				
Rubric/Level	Exemplary=A (Far Exceeds Standard)	Above Average=B (Exceeds Standard)	Adequate= C (Meets Standard)	Inadequate= D (Below Standard)
Technical Content (8 marks)	Comprehensive, accurate, in-depth understanding; shows original thinking and mastery of concepts. (7-8)	Mostly accurate, good understanding, minor gaps; shows good application of concepts. (5-6)	Basic coverage, some understanding, lacks depth or clarity. (3-4)	Incomplete, inaccurate, poor understanding; shows little effort. (1-2)
Results & learning Outcome (2 marks)	Clear, correct results with excellent insights and reflection on learning. (2)	Mostly correct results; good understanding of learning outcomes. (1.5)	Basic results; limited insights or superficial learning. (1)	Incorrect or missing results; no evident learning. (0.5)

Course Project (20 marks)				
Rubric/Level	Exemplary=A (Far Exceeds Standard)	Above Average=B (Exceeds Standard)	Adequate= C (Meets Standard)	Inadequate =D (Below Standard)
Innovative Idea (2 Marks)	Highly original, creative, and impactful idea (2)	Original idea with moderate creativity (1.5)	Common idea with minor innovation (1)	Unoriginal or poorly thought-out idea (0.5)
Work Plan/methodology (2 Marks)	Clear, logical, and detailed work plan with effective methodology (2)	Mostly clear and practical plan with some details (1.5)	Basic plan; lacks clarity or depth (1)	Poor or vague plan and methodology (0.5)
Work content/Use of Technology (10 Marks)	Comprehensive, technically sound; advanced and appropriate use of technology (10-9)	Good technical depth; reasonable use of technology (8-7)	Adequate work; technology used with limitations (6-4)	Superficial or minimal work; poor use of technology (3-1)
Project Presentation (2 Marks)	Clear, engaging, confident delivery; excellent visuals (2)	Clear and coherent; good use of visuals (1.5)	Understandable but lacks engagement or clarity (1)	Disorganized or hard to follow (0.5)
Individual Contribution (2 Marks)	Fully engaged and contributed significantly to all aspects (2)	Active contribution with few gaps (1.5)	Some participation; effort uneven (1)	Minimal or unclear contribution (0.5)
Report (2 Marks)	Well-structured, detailed, no errors; excellent formatting (2)	Mostly well-written with minor issues (1.5)	Adequate but with some errors (1)	Poorly written; lacks structure (0.5)

CO-PO Mapping (Planned)												CO-PSO Mapping (Planned)		
CO	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PSO1	PSO2	PSO3
1	√				√			√	√			√	√	
2	√				√			√	√			√	√	
3	√				√			√	√			√	√	
Tick mark the CO, PO and PSO mapping														

Name & Signature of Faculty members involved in designing the syllabus

Prof. R. D. Deshpande

Dr. Sachin R. Kulkarni

Name & Signature of Faculty members verifying/approving the syllabus

BASICS OF ELECTRICAL ENGINEERING

Course Code	1BBEE105/205	**Course type**	PSC	**Credits L-T-P**	3– 0 - 0
Hours/week: L - T- P	3-0-0			**Total credits**	3
Total Contact Hours	L = 40Hrs; T = 0 Hrs; P = 0 Hrs Total = 40Hrs			**CIE Marks**	100
Flipped Classes content	5 Hours			**SEE Marks**	100

Course learning objectives	
1.	To understand the basics of typical power system and operation of various sources of power.
2.	To understand the basics of DC circuits, single-phase AC circuits and three phase AC circuits.
3.	To understand the basic principles of electromagnetism and electromagnetic circuits.
4.	To understand the fundamentals of different EV subsystems.

Pre-requisites: Fundamentals of electrical circuits.

Unit – I	**Contact Hours = 8 Hours**
Power Generation: Sources of power generation, renewable and nonrenewable energy- Solar PV and thermal power plant, Indian energy generation scenario. **Typical Electrical System:** A typical power system single line diagram, typical domestic wiring layout, protection of electrical systems using fuse & MCB, necessity of earthing, Types of earthing, energy billing.	

Unit – II	**Contact Hours = 8 Hours**
DC Circuits: Ohm's Law and its limitations, series-parallel circuits, mesh and nodal analysis, numerical. **Single-phase A.C. Circuits:** Sinusoidal voltage, derivation of instantaneous value, average value, root mean square value, form factor and peak factor of sinusoidal varying voltage and current, phasor representation of alternating quantities. Analysis of R, L, C, RL, RC and RLC series circuit and numerical.	

Unit – III	**Contact Hours = 8 Hours**
Three Phase Circuits: Generation of three phase power, Comparison of three phase and single-phase systems, definition of phase sequence, derivation of relationship between line and phase values of balanced star and delta connections, power in balanced three-phase circuits, measurements of active and reactive power and power factor by using two- wattmeter method, numerical.	

Unit – IV	**Contact Hours = 8 Hours**
Electromagnetism: Electromagnets-direction of flux produced, right-hand rule, definition-magnetic circuit, mmf, magnetic field strength, free space and relative permeability, reluctance, permeance, useful and leakage flux, comparison of electrical and magnetic circuits, series and parallel circuit numerical.	

Electromagnetic Induction: Faraday's Laws of Electromagnetic Induction, Lenz's Law, Fleming's rules, statically and dynamically induced EMF concepts of self and mutual inductance, numerical.

Unit – V	**Contact Hours = 8 Hours**
Introduction to Electric Vehicles: Classification of EV, Comparison of EV with IC engines, EV architecture, operation of EV, Types of motors used for EV, Types of batteries and performance parameters, EV charger classifications.	

Flipped Classroom Details

Unit No.	I	II	III	IV	V
No. for Flipped Classroom Sessions	1	1	1	1	1

Unit No.	**Self-Study Topics**
1.	Indian energy generation scenario.
2.	Generation of 1-phase AC voltage, Analysis of R-C circuit.
3.	Comparison of three phase and single phase systems.
4.	Faraday's Laws of Electromagnetic Induction, Lenz's Law
5.	Comparison of EV with IC engines

Books	
	Text Books:
1.	DC Kulshreshtha, Basic Electrical Engineering, Tata McGraw Hill, First Edition 2019.
2.	B.L.Theraja, A text book of Electrical Technology, S Chand and Company, reprint edition 2014.
	Reference Books:
1.	D.P.Kothari and I.J.Nagrath, Basic Electrical Engineering, Tata McGraw Hill 4th edition, 2019.
2.	V. K. Mehta, Rohit Mehta, Principles of Electrical Engineering & Electronics, S. Chand and Company Publications, 2nd edition,2015.
	E-resources:
1.	https://onlinecourses.nptel.ac.in/noc25_ee91/preview
2.	https://nptel.ac.in/coursesc/117106108

Course delivery methods		**Assessment methods**	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Assignment- Open/Industry/Certification
3.	Flipped Classes	3.	Course Project
4.	Online classes	4.	Semester End Examination

Course Outcome (COs)				
Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create				
At the end of the course, the student will be able to (Highlight the **action verb** representing the learning level.)		**Learning Level**	**PO(s)**	**PSO(s)**
1.	**Explain** the structure of typical electrical power systems, construction and operational aspects of power plants and EVs	Un	1,8,9,11	1
2.	**Explain** the laws of electromagnetism and electrical circuits.	Up	1,8,9,11	1
3.	**Determine** the various parameters of electrical and magnetic circuits, and computation of energy bill.	Ap	1,8,9,11	1
4.	**Analyze** the performance parameters and characteristics of various electrical circuits, magnetic circuits, and energy savings in electrical systems.	An	1,8,9,11	1

Scheme of Continuous Internal Evaluation (CIE):

Components	**Addition of two IA tests**	**Two Assignments – (Open /Industry/Certification**	**Course project (CP)/ Case study etc**	**Total Marks**
Marks	30+30 = 60	10 + 10 = 20	20 marks (with report & presentation)	100

IA Test:

1. 10 marks questions in Part A of IA question paper should also include an OBE related question (max 2 marks).
2. Remaining 20 marks questions in Part B & C should be descriptive

-Certification earned by passing the standard Online MOOCs course (1 course of atleast 8 hours defined by BOS) can be considered as a Course activity and awarded maximum of 10 marks.

Eligibility for SEE:

-Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests.

-Lack of minimum score in IA test will make the student Not Eligible for SEE.

-Minimum score in CIE to be eligible for SEE: 40 OUT OF 100.

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 100 marks of 3 hours duration.
2.	**Minimum marks required in SEE to pass:** Score should be $\geq$ 35%, however overall score of CIE + SEE should be $\geq$ 40%.
3.	Question paper contains three parts **A, B and C**. Students have to answer 1. From Part A answer any 5 out of 7 questions, each Question Carries 6 Marks. 2. From Part B answer 5 out of 10 questions choosing any one full question from each unit, each Question Carries 10 Marks. 3. From Part C answer 1 out of 2 questions, each Question Carries 20 Marks.

Assignment (10 marks)				
Rubric/Level	**Exemplary=A (Far Exceeds Standard)**	**Above Average=B (Exceeds Standard)**	**Adequate= C (Meets Standard)**	**Inadequate= D (Below Standard)**
Technical Content (8 marks)	Comprehensive, accurate, in-depth understanding; shows original thinking and mastery of concepts. (7-8)	Mostly accurate, good understanding, minor gaps; shows good application of concepts. (5-6)	Basic coverage, some understanding, lacks depth or clarity. (3-4)	Incomplete, inaccurate, poor understanding; shows little effort. (1-2)
Results & learning Outcome (2 marks)	Clear, correct results with excellent insights and reflection on learning. (2)	Mostly correct results; good understanding of learning outcomes. (1.5)	Basic results; limited insights or superficial learning. (1)	Incorrect or missing results; no evident learning. (0.5)

Course Project (20 marks)				
Rubric/Level	**Exemplary=A (Far Exceeds Standard)**	**Above Average=B (Exceeds Standard)**	**Adequate= C (Meets Standard)**	**Inadequate =D (Below Standard)**
Innovative Idea (2 Marks)	Highly original, creative, and impactful idea (2)	Original idea with moderate creativity (1.5)	Common idea with minor innovation (1)	Unoriginal or poorly thought-out idea (0.5)
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Project Presentation (2 Marks)	Clear, engaging, confident delivery; excellent visuals (2)	Clear and coherent; good use of visuals (1.5)	Understandable but lacks engagement or clarity (1)	Disorganized or hard to follow (0.5)
Individual Contribution (2 Marks)	Fully engaged and contributed significantly to all aspects (2)	Active contribution with few gaps (1.5)	Some participation; effort uneven (1)	Minimal or unclear contribution (0.5)
Report (2 Marks)	Well-structured, detailed, no errors; excellent formatting (2)	Mostly well-written with minor issues (1.5)	Adequate but with some errors (1)	Poorly written; lacks structure (0.5)

CO-PO Mapping (Planned)												CO-PSO Mapping (Planned)			
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO1	PSO2	PSO3	PSO 4
1	✓							✓	✓		✓	✓			
2	✓							✓	✓		✓	✓			
3	✓							✓	✓		✓	✓			
4	✓							✓	✓		✓	✓			
Tick mark the CO, PO and PSO mapping															

Name & Signature of Faculty members involved in designing the syllabus

S.No	Name	Signature
1.	Prof.P.V.Datar	
2.	Prof.A.V.Deshpande	
3.	Prof.S.N.Dodamani	

Name & Signature of Faculty members verifying/approving the syllabus

S.No	Name	Signature
1.	Dr.D.B.Kulkarni	
2.	Dr.R.B.Magadum	

Fundamentals of Electronics and Communication Engineering

Course Code	**1BBEC105/205**	**Course type**	**PSC**	**Credits L-T-P**	**3 – 0 – 0**
Hours/week: L - T- P	**3 – 0 – 0**			**Total credits**	**3**
Total Contact Hours	**L = 40Hrs; T = 0 Hrs; P = 0 Hrs Total = 40**			**CIE Marks**	**100**
Flipped Classes content	**05 Hours**			**SEE Marks**	**100**

Course learning objectives:	
1.	To help students understand the role of diodes, transistors, and op-amps in circuits.
2.	To develop the ability to design and analyze basic rectifiers and amplifier circuits.
3.	To give a foundational view of analog and digital communication systems.
4.	To familiarize students with basic digital logic and circuit design.
5.	To connect concepts from analog, digital, and communication systems for real-world applications.

Pre-requisites: Basic of Physics and Mathematics

Unit – I	**Contact Hours = 8 Hours**
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, Introduction to Diode Clipping and Clamping Circuits. **Case Study:** Design of DC Power Supply	

Unit – II	**Contact Hours = 8 Hours**
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(N-Channel): Depletion type MOSFETS and Enhancement type MOSFETs Characteristics. **Case Study:** MOSFET as a Switch.	

Unit – III	**Contact Hours = 8 Hours**
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, Instrumentation Amplifier. **Op-Amp Applications**: Inverting Configuration, Non-Inverting Configuration, Differential Configuration, Voltage Follower, Integrator, Differentiator.	

Unit – IV	Contact Hours = 8 Hours
Number System: Representation Of Unsigned and Signed Numbers in Binary and Its Arithmetic, Hexadecimal Representation. **Boolean Algebra:** Boolean Rules, Laws and Theorems, Logic Gates, Universal Gates, Boolean Functions, Simplification Using Boolean Rules, Laws and Theorems and Realization Using Logic Gates and Universal Gates.	

Unit – V	Contact Hours = 8 Hours
Fundamentals Of Communication: Elements of a Communication System, Communication Channels and Their Characteristics: Wireline, Fiber Optic, Wireless Electromagnetic Channels **Introduction to Analog Modulation Types**: Amplitude Modulation, Frequency and Phase Modulation, Waveforms. (Excluding Derivation and Spectral Diagrams) **Applications:** AM Radio Broadcasting, Superheterodyne FM Receiver, Mobile Wireless Telephone Systems**.** Case Study of Converting Analog Signal to Digital Signal Using PCM	

Flipped Classroom Details

Unit No.	**I**	**II**	**III**	**IV**	**V**
No. for Flipped Classroom Sessions	**1**	**1**	**1**	**1**	**1**

Books	
	Text Books:
1.	David A Bell, Electronic Devices and Circuits, 5th Edition, Oxford University Press, 30th Impression, 2025.
2.	Ramakanth A Gayakwad, Op-amps and Linear Integrated Circuits, 4th Edition, Pearson Education, 2015.
3.	John G. Proakis, Masoud Saleh, Fundamentals of Communication Systems, Second Edition, Pearson Educations, Inc., 2014.
4.	D.P Kothari and I J Nagrath, Basic electronics, Second Edition, McGraw Hill Education Pvt ltd, 2018.
5.	Donald D Givone, Digital Principles and Design, McGraw-Hill Publications, 2003 onwards.
	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
	E-resources (NPTEL/SWAYAM. Any Other)- mention links
1.	Basic Electronics and Lab, by Prof. T.S. Natarajan, IIT Madras **Link:** https://nptel.ac.in/courses/122106025
2.	Digital Electronic Circuits, by Prof. Goutam Saha, IIT Kharagpur **Link:** https://nptel.ac.in/courses/108105132

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Assignment- Open/Industry/Certification
3.	Flipped Classes	3.	Course Project
4.	Online classes	4.	Semester End Examination

Course Outcome (COs)

Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create

At the end of the course, the student will be able to (Highlight the **action verb** representing the learning level.)		Learning Level	PO(s)	PSO(s)
1.	***Illustrate*** the fundamental concepts of communication systems and their applications	Un	1,11	1
2.	***Design*** basic combinational circuits using the fundamental principles of digital systems.	Ap	1,3,11	1
3.	***Apply*** the working principles, fundamental characteristics of various semiconductor devices including diodes, transistors and operational amplifiers in basic electronic circuits.	Ap	1,2,3,11	1,2
4.	***Analyze*** basic rectifier and amplifier circuits using the principles of diodes, BJTs, and operational amplifiers	An	1,2,3,5,8,9	1,2
5.	***Analyze*** the fundamental concepts of electronic circuits, communication systems, and digital systems for their role in building basic electronic applications.	An	1,2,3,5,8,9	1,2

Scheme of Continuous Internal Evaluation (CIE):

Components	Addition of two IA tests	Two Assignments – (Open /Industry/Certification	Course project (CP)/ Case study etc	Total Marks
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Course Project (20 marks)				
Rubric/Level	**Exemplary=A (Far Exceeds Standard)**	**Above Average=B (Exceeds Standard)**	**Adequate= C (Meets Standard)**	**Inadequate =D (Below Standard)**
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CO-PO Mapping (Planned)												CO-PSO Mapping (Planned)		
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PSO1**	**PSO2**	**PSO3**
1	✓										✓	✓		
2	✓		✓								✓	✓		
3	✓	✓	✓								✓	✓	✓	
4	✓	✓	✓		✓			✓	✓			✓	✓	
5	✓	✓	✓		✓			✓	✓			✓	✓	
Tick (✓) mark the CO, PO and PSO mapping														

Name & Signature of Faculty members involved in designing the syllabus

Name & Signature of Faculty members verifying/approving the syllabus

ELEMENTS OF MECHANICAL ENGINEERING

Course Code	**1BEME105**	**Course type**	**PSC**	**Credits L-T-P**	3 -0 - 0
Hours/week: L - T- P	3-0-0			**Total credits**	3
Total Contact Hours	L = 40 Hrs T-0 Hrs P- 0 Hrs			**CIE Marks**	100
Flipped Classes content	2 Hours			**SEE Marks**	100

Course learning objectives	
By the end of this course, **Students will be able to**:	
1.	Gain an understanding of engineering materials, their classifications, properties, and applications, including alloys and composites.
2.	Develop familiarity with basic manufacturing processes, joining techniques, automation, and robotics, along with safety considerations in welding.
3.	Learn fundamental design procedures, and basic power transmission elements.
4.	Understand the fundamentals of thermal engineering systems viz. internal combustion engines, and refrigeration systems, with exposure to relevant performance parameters
5.	Acquire knowledge of fluid power engineering, covering hydraulic and pneumatic components, basic circuits, and safety measures.

Pre-requisites : Fundamentals of Physics and Mathematics

Unit – I	**Contact Hours = 8 Hours**
Engineering Materials: **Introduction:** Classification, Ferrous, Non-Ferrous materials and their applications. Mechanical Properties of metals. Need for alloys, Various alloying elements and their impact on Mechanical Properties of base metal. Composites: Need and Classification Properties and their Applications. FC: Classification of various metals used in day today life as Metals, alloys and Composite	

Unit – II	**Contact Hours = 8 Hours**
Concepts of Production Engineering: Classification of manufacturing processes Introduction to metal casting, sand casting Metal Cutting: Basic Terminology, Classification of Machine Tools and selection criteria, Lathe and Drilling Machines Operations and Numericals Joining processes – welding, brazing, soldering – and their comparison. Automation – Types, applications, advantages and disadvantages, Robotics – Classification advantages and disadvantages, applications **FC:** Safety measures in Welding	

Unit – III:	Contact Hours = 8 Hours

Concepts Design Engineering:

Basics of Design of Machine elements: Basic procedure of Machine Design, types of stresses under various failure modes, concept of Factor of safety, permissible stress numerical, concept of bending and torsional shear stresses, numerical to find Torque, power and shear stress. Static and fatigue load considerations in design.

Power Transmission: Belt drives: Open, Crossed belt drives, Gear drives (No derivations) Spur Gear terminology, Types of gears, Gear trains: Simple, compound, reverted, planetary. Numerical problems.

Unit – IV:	Contact Hours = 8 Hours

Concepts of Thermal Engineering:

Internal combustion engines – Comparison of CI and SI engines (ONLY 4-S), performance parameters Numerical. Comparison of EV& ICE.

Refrigeration – Principle, applications, Terminology VCR and VAR systems, Refrigerants and their properties

FC: Emission Norms in India

Unit – V:	Contact Hours = 8 Hours

Fundamentals of Fluid Power Engineering:

Scope of fluid power Engineering, Basic components of Hydraulic and Pneumatic Systems and their Functions, Working of Basic hydraulic circuit, and Basic pneumatic circuit. Safety precautions in hydraulic and pneumatic systems

Flipped Classroom Details

Unit No.	I	II	III	IV	V
No. for Flipped Classroom Sessions	1	-	-	1	-

Unit No.	Self-Study Topics
I	Comparison of Impurity, alloying and Composite
II	Comparison of Production and manufacturing.
III	Applications of Gear Trains
IV	Terminology and classification of IC Engines
V	Comparison of Hydraulic and pneumatic systems.

Books	
	Text Books:
1.	Elements of Mechanical Engineering, K R Gopala Krishna, Subhash Publications, 2008 Onwards
2.	A Text Book of Elements of Mechanical Engineering, Dr.J.K.Kittur and G.D.Gokak, Wiley India Ltd, 2014 onwards
	Reference Books:

1.	Elements of Workshop Technology (Vol. 1 and 2), Hazra Choudhry and Nirzar Roy, Media Promoters and Publishers Pvt. Ltd., 2010. Onwards
2.	Saeed Moaveni, *Engineering Fundamentals: An Introduction to Engineering*, Cengage, 2020 Onwards
3.	Anthony Esposito, Fluid Power with Applications**.** Pearson Education, 6th Edition, onwards
4.	Yunus A. Cenegal, and John M. Cimbala, Fluid Mechanics, McGraw Hill Education (India) Pvt. Ltd, 2nd edition, 2013 onwards
	E-resources (NPTEL/SWAYAM.. Any Other)- mention links
1.	https://onlinecourses.nptel.ac.in/noc24_me104
2.	https://onlinecourses.nptel.ac.in/noc25_me09

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Assignment- Open/Industry/Certification
3.	Flipped Classes	3.	Course Project
4.	Online classes	4.	Semester End Examination
5.		5.	

Course Outcome (COs)

Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create

At the end of the course, the student will be able to (Highlight the **action verb** representing the learning level.)		**Learning Level**	**PO(s)**	**PSO(s)**
1.	**Represent and Explain** various mechanical engineering systems and identify their key functional elements.	Re, Un	1,4,10	1,3
2.	**Explain** and **Apply** the principles, classifications, and applications of core mechanical systems and processes across thermal, production, and design domains.	Ap	1,2,10	1,2
3.	**Apply** foundational knowledge from multiple mechanical engineering streams to support informed problem-solving and technical decision-making.	Ap	1,10	1,2,3

Scheme of Continuous Internal Evaluation (CIE):

Components	**Addition of two IA tests**	**Two Assignments – (Open /Industry/Certification etc)**	**Course project (CP)/ Case study etc**	**Total Marks**
Marks	30+30 = 60	10 + 10 = 20	20 marks (with report & presentation)	100

IA Test:

1. 10 marks questions in Part A of IA question paper should also include an OBE related question (max 2 marks).
2. Remaining 20 marks questions in Part B & C should be descriptive

-Certification earned by passing the standard Online MOOCs course (1 course of atleast 8 hours defined by BOS) can be considered as a Course activity and awarded maximum of 10 marks.

Eligibility for SEE:

-Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests.

-Lack of minimum score in IA test will make the student Not Eligible for SEE.

-Minimum score in CIE to be eligible for SEE: 40 OUT OF 100.

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 100 marks of 3 hours duration.
2.	**Minimum marks required in SEE to pass:** Score should be $\geq$ 35%, however overall score of CIE + SEE should be $\geq$ 40%.
3.	Question paper contains three parts **A,B and C**. Students have to answer 1. From Part A answer any 5 out of 7 questions, each Question Carries 6 Marks. 2. From Part B answer 5 out of 10 questions choosing any one full question from each unit, each Question Carries 10 Marks. 3. From Part C answer 1 out of 2 questions, each Question Carries 20 Marks.

CO-PO Mapping (Planned)												**CO-PSO Mapping (Planned)**		
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PSO1**	**PSO2**	**PSO3**
1	✓			✓						✓		✓	✓	
2	✓	✓								✓		✓		✓
3	✓	✓								✓		✓	✓	✓
Tick mark the CO, PO and PSO mapping														

Assignment (10 marks)				
Rubric/Level	**Exemplary=A (Far Exceeds Standard)**	**Above Average=B (Exceeds Standard)**	**Adequate= C (Meets Standard)**	**Inadequate= D (Below Standard)**
Technical Content (8 marks)	Comprehensive, accurate, in-depth understanding; shows original thinking and mastery of concepts. (7-8)	Mostly accurate, good understanding, minor gaps; shows good application of concepts. (5-6)	Basic coverage, some understanding, lacks depth or clarity. (3-4)	Incomplete, inaccurate, poor understanding; shows little effort. (1-2)
Results & learning Outcome (2 marks)	Clear, correct results with excellent insights and reflection on learning. (2)	Mostly correct results; good understanding of learning outcomes. (1.5)	Basic results; limited insights or superficial learning. (1)	Incorrect or missing results; no evident learning. (0.5)

Course Project (20 marks)				
Rubric/Level	**Exemplary=A (Far Exceeds Standard)**	**Above Average=B (Exceeds Standard)**	**Adequate= C (Meets Standard)**	**Inadequate =D (Below Standard)**
Innovative Idea (2 Marks)	Highly original, creative, and impactful idea (2)	Original idea with moderate creativity (1.5)	Common idea with minor innovation (1)	Unoriginal or poorly thought-out idea (0.5)
Work Plan/methodology (2 Marks)	Clear, logical, and detailed work plan with effective methodology (2)	Mostly clear and practical plan with some details (1.5)	Basic plan; lacks clarity or depth (1)	Poor or vague plan and methodology (0.5)
Work content/Use of Technology (10 Marks)	Comprehensive, technically sound; advanced and appropriate use of technology (10-9)	Good technical depth; reasonable use of technology (8-7)	Adequate work; technology used with limitations (6-4)	Superficial or minimal work; poor use of technology (3-1)
Project Presentation (2 Marks)	Clear, engaging, confident delivery; excellent visuals (2)	Clear and coherent; good use of visuals (1.5)	Understandable but lacks engagement or clarity (1)	Disorganized or hard to follow (0.5)
Individual Contribution (2 Marks)	Fully engaged and contributed significantly to all aspects (2)	Active contribution with few gaps (1.5)	Some participation; effort uneven (1)	Minimal or unclear contribution (0.5)
Report (2 Marks)	Well-structured, detailed, no errors; excellent formatting (2)	Mostly well-written with minor issues (1.5)	Adequate but with some errors (1)	Poorly written; lacks structure (0.5)

G D GOKAK

Name & Signature of Faculty members involved in designing the syllabus

Name & Signature of Faculty members verifying/approving the syllabus

Programming in C

Course Code	**1BEIT105**	**Course type**	**PSC**	**Credits L-T-P**	**3 – 0 - 0**
Hours/week: L - T- P	**3-0-0**			**Total credits**	**3**
Total Contact Hours	**L = 40 Hrs; T = 0 Hrs; P = 0 Hrs**			**CIE Marks**	**100**
Flipped Classes content	**10Hours**			**SEE Marks**	**100**

Course learning objectives	
1.	**Analyze problem and represent the solution in the form of flowchart/algorithm**
2.	**Apply programming constructs of C language to solve the real-world problems**
3.	**Explore user-defined data structures like arrays, structures and pointers in implementing solutions to problems**
4.	**Design and Develop Solutions to problems using structured programming constructs such as functions**

Pre-requisites : Problem solving skills & Strategic thinking

Unit – I	**Contact Hours = 8 Hours**
Introduction to Computing: Computer languages, Creating and Running Programs, System Development. Overview of C: A Brief History of C, C Is a Middle-Level Language, C Is a Structured Language, C Is a Programmer's Language, Compilers Vs. Interpreters, The Form of a C Program, The Library and Linking, Separate Compilation, Compiling a C Program, C's Memory Map. Expressions: The Basic Data Types, Modifying the Basic Types, Identifier Names, Variables, The Four C Scopes, Type Qualifiers, Storage Class Specifiers, Variable Initializations, Constants, Operators, Expressions. Managing Input and Output Operations: Formatted Input, Formatted Output	

Unit – II	**Contact Hours = 8 Hours**
Console I/O: Reading and Writing Characters, Reading and Writing Strings Statements: True and False in C, Selection Statements, Iteration Statements, Jump Statements, Expression Statements, Block Statements**.**	

Unit – III	**Contact Hours = 8 Hours**

Arrays and Strings: Single-Dimension Arrays, Generating a Pointer to an Array, Passing Single-Dimension Arrays to Functions, Strings, Two-Dimensional Arrays, Multidimensional Arrays, Array Initialization, Variable - Length Arrays.

Character Arrays and Strings: Declaring and Initializing String Variables, Reading Strings from Terminal, Writing Strings to Screen, string handling functions

Pointers: Overview of Pointers , Pointer Variables, The Pointer Operators, Pointer Expressions, Pointers and Arrays, Multiple Indirection, Initializing Pointers.

Unit – IV	**Contact Hours = 8 Hours**

Functions: The General Form of a Function, Understanding the Scope of a Function, Function Arguments, argc and argv—Arguments to main(), The return Statement, What Does main() Return?, Recursion, Function Prototypes, Declaring Variable Length Parameter Declarations, The inline Keyword.
User-defined Functions: Need for User-defined Functions, Elements , All Categories of Functions, Functions that Return Multiple Values.

Pointers (Contd…): Pointers to Functions, C's Dynamic Allocation Functions.

Unit – V	**Contact Hours = 8 Hours**

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.

Flipped Classroom Details

Unit No.	**I**	**II**	**III**	**IV**	**V**
No. for Flipped Classroom Sessions	**2**	**2**	**2**	**2**	**2**

Books	
	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.**
3	**E. Balaguruswamy , "Programming in ANSI C", Tata McGraw Hill, 5th edition,2010**
	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.
3	Peter Norton, "Introduction to Computers", Sixth edition, Tata McGraw Hill, 2005
	E-resources (NPTEL/SWAYAM.. Any Other)- mention links
1	elearning.vtu.ac.in/econtent/courses/video/BS/15PCD23.html
2	https://nptel.ac.in/courses/106/105/106105171/ MOOC courses can be adopted for more clarity in understanding the topics and verities of problem solving methods.
3	https://tinyurl.com/4xmrexre
4	Introduction to Programming in C [https://onlinecourses.nptel.ac.in/noc23_cs02/preview]
5	C for Everyone: Programming Fundamentals [https://www.coursera.org/learn/c-for-everyone] language-e187584209.html] https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_013843237039374336345 17_shared/overview C programming Tutorial: https://www.geeksforgeeks.org/c/c-programming-language/.
6	Computer Programming Virtual Lab [https://cse02-iiith.vlabs.ac.in/exp/pointers/]
7	C Programming: The ultimate way to learn the fundamentals of the C language [https://www.pdfdrive.com/c-programming-the-ultimate-way-to-learn-the-fundamentals-of-the-c-
8	C Programming: The Complete Reference [https://viden.io/knowledge/programming-in-c-language/attachment/28313/c-the-complete-reference-herbert-schildt-4th-edition-pdf/preview]

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Assignment-Open/Industry/Certification
3.	Flipped Classes	3.	Course Project
4.	Online classes	4.	Semester End Examination
5.		5.	

Course Outcome (COs)

Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create

At the end of the course, the student will be able to (Highlight the action verb representing the learning level.)		Learning Level	PO(s)	PSO(s)
1.	Design a computer program to solve simple and complex problems of different domains	L3	PO1,PO2	PSO1
2.	Apply programming constructs of C language to solve the real world problem.	L3	PO1,PO2	PSO1

3.	Explore user-defined data structures like arrays in implementing solutions to problems like searching and sorting.	L4	PO3,PO4,PO5	PSO1,PSO2
4.	Design and Develop Solutions to problems using modular programming constructs	L3	PO3,PO4,PO5,PO10,PO 11,PO12	PSO1,PSO2,PSO3
5.	Explore user-defined data structures like structures and pointers in implementing solutions	L4	PO3,PO4,PO5	PSO1,PSO2

Scheme of Continuous Internal Evaluation (CIE):

Components	Addition of two IA tests	Two Assignments – (Open /Industry/Certification	Course project (CP)/ Case study etc	Total Marks
Marks	30+30 = 60	10 + 10 = 20	20 marks (with report & presentation)	100

IA Test:
1. 10 marks questions in Part A of IA question paper should also include an OBE related question (max 2 marks).
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-Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests.
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Assignment (10marks)				
Rubric/Level	Exemplary=A (Far Exceeds Standard)	Above Average=B (Exceeds Standard)	Adequate= C (Meets Standard)	Inadequate= D (Below Standard)
Technical Content	Comprehensive, accurate, in-depth understanding;	Mostly accurate, good understanding, minor	Basic coverage, some	Incomplete, inaccurate, poor

(8 marks)	shows original thinking and mastery of concepts. (7-8)	gaps; shows good application of concepts. (5-6)	understanding, lacks depth or clarity. (3-4)	understanding; shows little effort. (1-2)
Results & learning Outcome (2 marks)	Clear, correct results with excellent insights and reflection on learning. (2)	Mostly correctresults; good understanding of learning outcomes. (1.5)	Basic results; limited insights or superficial learning. (1)	Incorrect or missing results; no evident learning. (0.5)

Course Project(20marks)				
Rubric/Level	Exemplary=A (FarExceeds Standard)	Above Average=B (Exceeds Standard)	Adequate= C (Meets Standard)	Inadequate =D(Below Standard)
Innovative Idea (2 Marks)	Highly original, creative, and impactful idea (2)	Original idea with moderate creativity (1.5)	Common idea with minor innovation (1)	Unoriginal or poorly thought-out idea (0.5)
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CO-PO Mapping (Planned)												CO-PSO Mapping (Planned)		
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO1	PSO2	PSO3
1	✓	✓										✓		
2	✓	✓										✓		
3			✓	✓	✓							✓	✓	
4			✓	✓	✓							✓	✓	
5			✓	✓	✓					✓	✓	✓	✓	✓
Tick mark the CO, PO and PSO mapping														

Name & Signature of Faculty members involved in designing the syllabus

Prof.Sudha V .Salake

Prof.Jyoti A.

Name & Signature of Faculty

Elements of Aeronautical Engineering

Course Code	1BEAE105	Course type	PSC	Credits L-T-P	3 – 0 - 0
Hours/week: L - T- P	3-0-0			Total credits	03
Total Contact Hours	L = 40 Hrs; T = 0 Hrs; P = 0 Hrs Total = 40 Hrs			CIE Marks	100
Flipped Classes content	10 Hours			SEE Marks	100

Course learning objectives	
1.	To provide students with comprehensive knowledge of the historical evolution of aviation and aerospace, covering early flight attempts through modern space exploration achievements.
2.	To introduce fundamental principles of flight and familiarize students with essential aircraft components and their functions in flight operations.
3.	To expose students to various aircraft classifications including fixed-wing, rotary-wing, hybrid, and unmanned aerial vehicles across different applications.
4.	To orient students with the aviation industry ecosystem, regulatory framework, and governing bodies that ensure aviation safety and operations.
5.	To educate students about lighter-than-air systems, their historical development, operating principles, and modern commercial applications.

Pre-requisites : Basic Physics, Mathematics.

Unit – I Historical Evolution of Aviation and Aerospace	Contact Hours = 8 Hours
Early flight attempts and pioneers of aviation, Development of fixed-wing aircraft, helicopters. Milestones in aviation: World Wars, jet age, supersonic flight, and commercial aviation, Introduction to Indian aviation: Pioneers, HAL, NAL, ISRO, DRDO, ADA, AIA, DGCA, CEMILAC Space exploration milestones: Sputnik, Apollo, ISRO achievements.	

Unit – II Principles of Flight and Aircraft Components	Contact Hours = 8 Hours
Basic principles of flight: Forces acting on the aircraft, working principles of airplanes, gliders, and helicopters. Aircraft components and their functions: Wings-Function and types, Fuselage- Structure and purpose, Empennage- Horizontal and vertical stabilizers, Landing gear systems. Basics of aircraft performance.	

Unit – III Classification of Aircrafts	Contact Hours = 8 Hours
Fixed-wing: General, civil, and military aircraft, Rotary-wing: Helicopters and their roles (transport, rescue, surveillance, medical evacuation), Hybrid aircraft concepts, Classification based on Propulsion systems, Special-purpose aircraft: Cargo, agricultural, firefighting, etc. Unmanned Aerial Vehicles (UAVs): Civil, commercial, and military applications.	

Unit – IV Aviation Industry and Regulatory Framework	Contact Hours = 8 Hours
Aviation ecosystem: Airlines, airports, MROs, and aerospace manufacturing. Basics of Airport operations and management. Regulatory and governing bodies: DGCA, CEMILAC, FAA, EASA, CAA, JCAB and other agencies like IATA, ICAO. Importance of regulations in aviation safety.	

Unit – V Basic Introduction to Lighter-than-Air (LTA) Systems	Contact Hours = 8 Hours
Historical evolution of LTA systems, Classifications – balloons, aerostats, airships; key differences. Principles of buoyancy, lift generation, and concept of static heaviness. Role of gases and materials. Basic components of LTA systems. Advantages and limitations of LTA flight. Commercial aspects – surveillance, communication, transport, scientific studies.	

Flipped Classroom Details

Unit No.	I	II	III	IV	V
No. for Flipped Classroom Sessions	2	2	2	2	2

Unit No.	Self-Study Topics
1	India's contributions to aviation and space
2	Types of Wings
3	Evolution and Applications of Military Unmanned Aerial Vehicles (UAVs)
4	Comparison of international aviation regulatory bodies (DGCA, FAA, EASA, ICAO, IATA)
5	Modern applications of airships and balloons in disaster management and communication

Books	
	Text Books:
1.	John D. Anderson, "Introduction to Flight", McGraw-Hill Education, 2011. ISBN 9780071086059.
2.	Lalit Gupta and O P Sharma, "Fundamentals of Flight Vol-I to Vol-IV", Himalayan Books, 2006, ISBN-13: 978-8170020974
	Reference Books:
1.	Ian Moir, Allan Seabridge, "Aircraft Systems: Mechanical, Electrical and Avionics Subsystems Integration", John Wiley & Sons, 2011. ISBN 978111965006.
2.	Nelson R.C., "Flight stability and automatic control", McGraw-Hill International Editions, 1998. ISBN 9780071158381.
3.	Sutton G.P., "Rocket Propulsion Elements", John Wiley, New York, 8th Ed., 2011; ISBN: 1118174208, 9781118174203.
	E-resources (NPTEL/SWAYAM.. Any Other)- mention links
1.	NPTEL: Online Resources: Lecture by: Prof. Rajkumar S. Pant, IIT Bombay https://swayam.gov.in/nd1_noc19_ae05/preview
2.	NPTEL: (Unit III) Online Resources: Lecture by: Prof. Debi Prasad Mishra, IIT Kanpur https://swayam.gov.in/nd1_noc19_ae08/preview

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Assignment- Open/Industry/Certification
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5.		5.	

Course Outcome (COs) **Learning Levels:** Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create				
At the end of the course, the student will be able to (Highlight the **action verb** representing the learning level.)		Learning Level	PO(s)	PSO(s)
1.	**Summarize** the major historical milestones in aviation and aerospace, including Indian contributions	L2 (Un)	1	1
2.	**Explain** the fundamental principles of flight and the roles of primary aircraft components	L2 (Un)	1	1
3.	**Identify** various categories of aircraft and their applications	L3 (Ap)	1	1
4.	**Interpret** the structure of the aviation ecosystem and the importance of regulatory bodies in ensuring safety	L2 (Un)	1	1
5.	**Illustrate** the principles, types, and applications of lighter-than-air systems in modern contexts	L2 (Un)	1	1

Scheme of Continuous Internal Evaluation (CIE):

Components	Addition of two IA tests	Two Assignments – (Open /Industry/Certification etc)	Course project (CP)/ Case study etc	Total Marks
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Eligibility for SEE:

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Scheme of Semester End Examination (SEE):	
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Course Project (20 marks)				
Rubric/Level	Exemplary=A (Far Exceeds Standard)	Above Average=B (Exceeds Standard)	Adequate= C (Meets Standard)	Inadequate =D (Below Standard)
Innovative Idea (2 Marks)	Highly original, creative, and impactful idea (2)	Original idea with moderate creativity (1.5)	Common idea with minor innovation (1)	Unoriginal or poorly thought-out idea (0.5)
Work Plan/methodology (2 Marks)	Clear, logical, and detailed work plan with effective methodology (2)	Mostly clear and practical plan with some details (1.5)	Basic plan; lacks clarity or depth (1)	Poor or vague plan and methodology (0.5)
Work content/Use of Technology (10 Marks)	Comprehensive, technically sound; advanced and appropriate use of technology (10-9)	Good technical depth; reasonable use of technology (8-7)	Adequate work; technology used with limitations (6-4)	Superficial or minimal work; poor use of technology (3-1)

Project Presentation (2 Marks)	Clear, engaging, confident delivery; excellent visuals (2)	Clear and coherent; good use of visuals (1.5)	Understandable but lacks engagement or clarity (1)	Disorganized or hard to follow (0.5)
Individual Contribution (2 Marks)	Fully engaged and contributed significantly to all aspects (2)	Active contribution with few gaps (1.5)	Some participation; effort uneven (1)	Minimal or unclear contribution (0.5)
Report (2 Marks)	Well-structured, detailed, no errors; excellent formatting (2)	Mostly well-written with minor issues (1.5)	Adequate but with some errors (1)	Poorly written; lacks structure (0.5)

CO-PO Mapping (Planned)												CO-PSO Mapping (Planned)		
CO	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PSO1	PSO2	PS O3
1	√											√		
2	√											√		
3	√											√		
4	√											√		
5	√											√		
Tick mark the CO, PO and PSO mapping														

Dr. Praveen Kumar Balguri

Name & Signature of Faculty members involved in designing the syllabus

Dr. Lokamanya Chikmath
Prof. Dharmendra A P

Name & Signature of Faculty members verifying/approving the syllabus

Programming Language Courses (PLC)

INDEX

Introduction to C (For non IT programmes)
1BPLC105E/205E

Course Code	1BPLC105E	Course type	PLC	**Credits L-T-P**	3-0-1
Hours/week: L - T- P	3-0-2			**Total credits**	4
Total Contact Hours	L =40 Hrs; T =0 Hrs; P = 20 Hrs. Total = 60 Hrs			**CIE Marks**	100
Flipped Classes content	5 Hours			**SEE Marks**	100

Course learning objectives	
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.

Pre-requisites : Basic computer knowledge**,** Basic Mathematics and problem solving skills.

Unit – I	**Contact Hours = 8 Hours**

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 and use of escape sequences for formatted input/output. Introduction to common syntax and logical errors, along with basic debugging techniques.

Unit – II	**Contact Hours = 8 Hours**

Operators: Introduction to Operators, Arithmetic Operators, Relational Operators, Logical Operators, Assignment Operators, Increment and Decrement Operators, Conditional Operators, Precedence of Arithmetic Operators, type casting, and type conversion rules.

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.

Unit – III	**Contact Hours = 8 Hours**

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.

Unit – IV	Contact Hours = 8 Hours
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.	

Unit – V	Contact Hours = 8 Hours
Structures: 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.	

Flipped Classroom Details

Unit No.	I	II	III	IV	V
No. for Flipped Classroom Sessions	1	1	1	1	1

List of Experiments

Unit No.	No. of Experiments	Topic(s) related to Experiment
1	**2**	1. C Program to find Mechanical Energy of a moving particle with a velocity v, having mass m and height h. 2. Implement C Program to find Area of geometrical figures (square, rectangle, circle and triangle).
2	**3**	3. Read roll number of a students. Check whether roll number is palindrome or not. 4. A school is developing a maths quiz program in c. They need a function to check whether a given number is prime or composite. 5. Write a C program to enter 3 sides of a triangle and print the type of a triangle (Isosceles, Scalene, Equilateral).
3	**2**	6. Sort the given set of N numbers from a set of integers using optimal Bubble sort technique. 7. Write a code to perform matrix multiplication between two compatible matrices.
4	**2**	8. Write a program to enter any character from keyboard. Print whether that character is numeric character, alphabetic character or Special Character. 9. Write a program to perform the following operations on strings i. concatenate two strings ii. compare strings iii. finding length of a string.
5	**1**	10. Implement calculator program using user defined functions.

Open Ended Programs	11. Write a program to find the sum of principle diagonal elements of a square matrix. 12. Write a program to swap the content of two memory location using pointer. 13. Write a program to find mean, variance and standard deviation of marks of a student's using pointer. 14. Write a program using structure to perform the following i. Read Employees data ii. Print Employees data iii. Calculate the average salary of the employees Print all the employees records whose salary is above the average salary and below the average salary separately.

Unit No.	**Self-Study Topics**
1	Extended Data types ,Symbolic constants
2	Evaluation of expressions, operator precedence and associativity
3	Need for user defined functions

Books	
	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.	Brian W. Kernighan and Dennis M. Ritchie, The 'C' Programming Language, Prentice Hall of India.
	E-resources (NPTEL/SWAYAM.. Any Other)- mention links
1.	elearning.vtu.ac.in/econtent/courses/video/BS/15PCD23.html
2.	https://nptel.ac.in/courses/106/105/106105171/ MOOC courses can be adopted for more clarity in understanding the topics and verities of problem solving methods.
3.	Courses can be adopted for more clarity in understanding the topics and verities of problem-solving methods. • https://www.tutorialspoint.com/what-is-an-algorithm-and-flowchart-in-c-language • https://www.tutorialspoint.com/cprogramming/c_data_types.htm • https://www.tutorialspoint.com/cprogramming/c_operators.htm • https://www.ccbp.in/blog/articles/decision-making-statements-in-c • https://www.tutorialspoint.com/cprogramming/c_arrays.htm • https://www.geeksforgeeks.org/variables-in-c/ • https://www.w3schools.com/c/c_arrays.php • https://www.programiz.com/c-programming/c-strings • https://www.programiz.com/c-programming/c-pointers • https://www.scaler.com/topics/c/structures-c/

Course delivery methods		**Assessment methods**	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Lab Test
3.	Flipped Classes	3.	Semester End Examination
4.	Practice session/Demonstrations in Labs	4.	
5.	Virtual Labs (if present)		

Course Outcome (COs) **Learning Levels:** Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create				
At the end of the course, the student will be able to (Highlight the **action verb** representing the learning level.)		**Learning Level**	**PO(s)**	**PSO(s)**
CO1	Elucidate the basic architecture and functionalities of a computer and also recognize the hardware parts.	L1	PO1	PSO1
CO2	Apply programming constructs of C language to solve the real world problem	L3	PO1,PO2	PSO1
CO3	Explore user-defined data structures like arrays in implementing solutions to problems like searching and sorting	L4	PO3,PO4,PO5	PSO1,PSO2
CO4	Explore the built in string functions and applications of strings.	L4	PO3,PO4,PO5	PSO1,PSO2
CO5	Design and Develop Solutions to problems using modular programming constructs using functions	L3	PO3,PO4,PO5,PO10,PO11	PSO1,PSO2,PSO3

Scheme of Continuous Internal Evaluation (CIE):

For integrated courses, a lab test also will be conducted at the end of the semester. The lab test **(COMPULSORY)** will be part of the CIE. **No SEE for Lab**.

THEORY (60 marks)		**LAB (40 marks)**		Total
IA test 1	IA test 2	Average of Lab Conduction & Assignment/Open ended Expt/CP	Lab test	
30 marks	30 marks	10 marks	30 marks	100 marks

IA Test:

1. 10 marks questions in Part A of IA question paper should also include an OBE related question (max 2 marks).
2. Remaining 20 marks questions in Part B & C should be descriptive.

Conduct of Lab:

1. a. Conducting the experiment and journal: 5 marks
   b. Calculations, results, graph, conclusion and Outcome: 5 marks
2. The Assignment (Certification), open ended experiment or a course project will be conducted for 10 marks & the Average of both components will be taken to award 10 marks.

Lab test: (Batchwise with 15 students/batch)

1. Test will be conducted at the end of the semester
2. Timetable, Batch details and examiners will be declared by Exam section
3. Conducting the experiment and writing report: 5 marks
4. Calculations, results, graph and conclusion: 15 marks
5. Viva voce: 10 marks

Eligibility for SEE:

1. **Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests. Lack of minimum score in IA test will make the student Not Eligible for SEE**

2. **Student should score minimum 40% of 30 marks (i.e. 12 marks) in Lab test & should score 40% of 40 marks (i.e. 16 marks) in Lab component.**
3. Lab test is COMPULSORY
4. **Minimum score in CIE to be eligible for SEE: 40 OUT OF 100.**
5. Not eligible in any one of the two components will make the student **Not Eligible** for SEE

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 100 marks of 3 hours duration.
2.	**Minimum marks required in SEE to pass:** Score should be ≥35 &, however overall score of CIE+SEE should be ≥40%.
3.	Question paper contains three parts **A,B and C**. Students have to answer 1. From Part A answer any 5 out of 7 questions, each Question Carries 6 Marks. 2. From Part B answer 5 out of 10 questions choosing any one full question from each unit, each Question Carries 10 Marks. 3. From Part C answer 1 out of 2 questions, each Question Carries 20 Marks.

Assignment (10 marks)				
Rubric/Level	**Exemplary=A (Far Exceeds Standard)**	**Above Average=B (Exceeds Standard)**	**Adequate= C (Meets Standard)**	**Inadequate= D (Below Standard)**
Technical Content (8 marks)	Comprehensive, accurate, in-depth understanding; shows original thinking and mastery of concepts. (7-8)	Mostly accurate, good understanding, minor gaps; shows good application of concepts. (5-6)	Basic coverage, some understanding, lacks depth or clarity. (3-4)	Incomplete, inaccurate, poor understanding; shows little effort. (1-2)
Results & learning Outcome (2 marks)	Clear, correct results with excellent insights and reflection on learning. (2)	Mostly correct results; good understanding of learning outcomes. (1.5)	Basic results; limited insights or superficial learning. (1)	Incorrect or missing results; no evident learning. (0.5)

Course Project (10 marks)				
Rubric/Level	**Exemplary=A (Far Exceeds Standard)**	**Above Average=B (Exceeds Standard)**	**Adequate= C (Meets Standard)**	**Inadequate =D (Below Standard)**
Innovative Idea (1 Marks)	Highly original, creative, and impactful idea (1)	Original idea with moderate creativity (0.75)	Common idea with minor innovation (0.5)	Unoriginal or poorly thought-out idea (0.25)
Work Plan/methodology (1 Mark)	Clear, logical, and detailed work plan with effective methodology (1)	Mostly clear and practical plan with some details (0.75)	Basic plan; lacks clarity or depth (0.5)	Poor or vague plan and methodology (0.25)
Work content/Use of Technology (5 Marks)	Comprehensive, technically sound; advanced and appropriate use of technology (5)	Good technical depth; reasonable use of technology (4)	Adequate work; technology used with limitations (3-2)	Superficial or minimal work; poor use of technology (1)
Project Presentation (1 Marks)	Clear, engaging, confident delivery; excellent visuals (1)	Clear and coherent; good use of visuals (0.75)	Understandable but lacks engagement or clarity (0.5)	Disorganized or hard to follow (0.25)
Individual Contribution (1 Marks)	Fully engaged and contributed significantly to all aspects (1)	Active contribution with few gaps (0.75)	Some participation; effort uneven (0.5)	Minimal or unclear contribution (0.25)

Report (1 Marks)	Well-structured, detailed, no errors; excellent formatting (1)	Mostly well-written with minor issues (0.75)	Adequate but with some errors (0.5)	Poorly written; lacks structure (0.25)

CO-PO Mapping (Planned)												CO-PSO Mapping (Planned)		
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PSO1**	**PSO2**	**PSO3**
1	✓											✓		
2	✓	✓										✓		
3			✓	✓	✓							✓	✓	
4			✓	✓	✓							✓	✓	
5			✓	✓	✓					✓	✓	✓	✓	✓
Tick mark the CO, PO and PSO mapping														

Name & Signature of Faculty members
involved in designing the syllabus
Prof.Pankaja Kadalagi
Prof.Poonam Siddarkar

Name & Signature of Faculty members
verifying/approving the syllabus

Python Programming (for CSE and allied programmes)

Course Code	1BPLC105F/B	**Course type**	PLC	**Credits L-T-P**	3 - 0 - 1
Hours/week: L - T- P	3-0-2			**Total credits**	4
Total Contact Hours	L = 40 Hrs; T = 0 Hrs; P = 20 Hrs Total = 60 Hrs			**CIE Marks**	100
Flipped Classes content	5 Hours			**SEE Marks**	100

Course learning objectives	
1.	Build computational thinking and structured problem-solving abilities.
2.	Develop strong fundamentals in Python programming constructs.
3.	Introduce structured, modular, and object-oriented programming principles.
4.	Apply Python to solve mathematical, logical, and engineering problems.

Pre-requisites: Basic knowledge of Computers, Basic Mathematical Foundation and Problem-solving skills

Unit – I	**Contact Hours = 8 Hours**

Introduction to Programming: The Python programming language, Definition of programming, Definition of Debugging, Syntax errors, Runtime errors, Semantic errors, Experimental debugging.

Algorithm and Flowchart: Definition, characteristics, building blocks of Algorithms, Pseudo-code, flowcharts, Simple strategies for developing algorithms, Examples.

Introduction to Python: History, Salient features, Installation of Python and Working with IDLE.

Variables, Expressions and Statements: Values and data types, Variables, Variable names and keywords, Statements, Evaluating expressions, Operators and operands, Type converter functions, Order of operations, Input and output statements in Python, Composition, The modulus operator.

Unit – II	**Contact Hours = 8 Hours**

Decision Making: if, if-else, if-elif-else, nested if, Short-hand (Ternary) if and match-case (Python 3.10+).

Iteration: Assignment, Updating variables, the for loop, the while statement, Loop control (break, continue, else) statements, the Collatz 3n + 1 sequence, Tables, and Two-dimensional tables.

Functions: Defining, Calling, Returning values, Recursion, Variable scope, default/keyword arguments.

Strings: String formatting options, Indexing, Slicing, Formatting, Regex basics and String handling and manipulation functions.

Unit – III	**Contact Hours = 8 Hours**

Lists: Creation, Indexing, Slicing, List operations, Aliasing, Cloning lists, Lists and for loops, List comprehensions, List handling methods and Applications

Tuples: Properties, Creation, Packing/Unpacking, and Applications.

Dictionaries: Key-value operations, Iteration, Dictionary comprehension, Dictionary methods and Applications.

Sets: Set creation, operations, and set comprehension.

Unit – IV	Contact Hours = 8 Hours
File Handling: About files, Writing our first file, Reading a file line-by-line, Turning a file into a list of lines, Reading the whole file at once, Working with binary files, Directories, Fetching something from the Web, File pointers, with statement. **Modules & Packages:** Importing the module, Three import statement variants, Creating custom modules, Standard libraries (os, sys, math, random, datetime), Attributes and the dot Operator **Exception Handling:** Definition, try, except, else, finally, Raising custom exceptions.	

Unit – V	Contact Hours = 8 Hours
Classes and Objects: Definition, Syntax, Attributes, Methods, self-variable, Constructors and Destructors **Object oriented programming:** Single/multiple inheritance, Generalization, Encapsulation and Modifiers, Operator Overloading, Polymorphism, Method overriding.	

Flipped Classroom Details

Unit No.	I	II	III	IV	V
No. for Flipped Classroom Sessions	1	1	1	1	1

Unit No.	Self-Study Topics
1.	Natural language v/s Formal language, Programming Paradigm, interpreted v/s compiled, typed v/s type-less programming language.
2.	Different types of functions
3.	List with in-line for loop
4.	Reading and working with CSV files
5.	Converting an instance to a string, Instances as return values.

List of Experiments

Unit No.	No. of Experiments	Topic(s) related to Experiment
1	1	a. Develop a python program to read 2 numbers from the keyboard and perform the basic arithmetic operations based on the choice. (1-Add, 2-Subtract, 3-Multiply, 4-Divide). b. Develop a program to read the name and year of birth of a person. Display whether the person is a senior citizen or not.
	2	Implement a program to accept marks for five subjects and calculate the percentage. Based on the percentage, display the grade as per the following criteria: • ≥90% → Grade A • 75–89% → Grade B • 60–74% → Grade C • 40–59% → Grade D

		• <40% → Fail
	3	Develop a menu-driven Python program to help a user track their daily expenses. The program should provide the following options: a. Add an expense (enter description and amount). b. View total expenses so far. c. Check if total expenses exceed a given budget. d. Exit. Use the match-case statement (Python 3.10+) to handle user choices and keep the program running until the user chooses to exit.
2	4	Write a Python program to generate a **monthly electricity bill** for one or more households: a. Ask the user how many households' bills need to be generated. b. For each household (using a loop), accept the number of units consumed as input. c. Apply the following tariff: a. First 100 units → ₹5/unit b. Next 100 units → ₹7/unit c. Above 200 units → ₹10/unit d. Display the total bill amount for each household with proper formatting. e. At the end, display the total of all households combined.
	5	Develop a Python program for a shopping cart system that: 1. Accepts the number of items purchased. 2. For each item, input the name, quantity, and price. 3. Stores the data in a list of tuples. 4. Uses a recursive function to calculate the total bill amount by processing the list of items. 5. Adds GST at 5% to the total and displays the formatted bill with item details, subtotal, tax, and final amount.
3	6	Write a Python program that: a. Accepts a paragraph of text from the user. b. Uses a dictionary to count and store the total number of: Vowels Consonants Digits Special characters (excluding spaces) c. Uses regular expressions to find and display all valid email addresses present in the paragraph. d. Displays the character count and the list of email addresses in a clear, formatted output.
	7	Write a program to: (a) Create a list of integers, remove duplicates, and sort it in ascending order. (b) Store student names and grades in a dictionary, then display all

		students scoring above 75%. (c) Demonstrate union, intersection, and difference operations on two sets of integers.
4	8	Develop a Python program to read a text file and display: • Number of lines. • Number of words. • Number of characters. Handle exceptions for file not found, permission denied, and other errors gracefully.
	9	Write a Python program to store and manage student records in a text file. The program should: 1. Accept details of multiple students (Name, Roll Number, Marks). 2. Store each student's record in a CSV file in a structured format. 3. Allow the user to read and display all records from the file.
5	10	Create a class BankAccount with attributes: account number, account holder name, and balance. Include methods to: • Deposit money. • Withdraw money (check for sufficient balance). • Display account details. Implement single inheritance to create a SavingsAccount class with an additional attribute for interest rate, and override a method to calculate interest.

Books	
	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.	Mark Lutz – *Learning Python*, 5th Edition, O'Reilly Media, 2013.
	Reference Books:
1.	S.A. Kulkarni, "Problem solving and Python programming", 1st edition, 2017
2.	Joel Murach, "Python Programming", Mike Murach & Associates Inc.,2016
	E-resources (NPTEL/SWAYAM.. Any Other)- mention links
1.	https://onlinecourses.nptel.ac.in/noc21_cs32/preview

Course delivery methods		**Assessment methods**	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Lab Test
3.	Flipped Classes	3.	Semester End Examination
4.	Practice session/Demonstrations in Labs		

Course Outcome (COs)

Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create

At the end of the course, the student will be able to (Highlight the **action verb** representing the learning level.)		**Learning Level**	**PO(s)**	**PSO(s)**
1.	**Apply** computational thinking to design algorithms and flowcharts for solving engineering problems.	Ap	PO1,2,3,5	1, 3
2.	**Develop** Python programs using control structures, functions, and modular programming concepts.	Ap	PO1,2,3,5,11	1, 2, 3
3.	**Examine** Python data structures, file handling, and exception handling for efficient data processing.	An	PO1,2,3,5,11	1, 3
4.	**Demonstrate** object-oriented programming concepts and advanced Python features in solving real-world problems.	Un	PO1,2,5,11	1, 2
5.	Apply the learnings inculcated throughout the course and develop a course project / present a seminar on that.	An	PO6,7,8	2,3

Scheme of Continuous Internal Evaluation (CIE):

For integrated courses, a lab test also will be conducted at the end of the semester. The lab test **(COMPULSORY)** will be part of the CIE. **No SEE for Lab**.

THEORY (60 marks)		**LAB (40 marks)**		Total
IA test 1	IA test 2	Average of Lab Conduction & Assignment/Open ended Expt/CP	Lab test	
30 marks	30 marks	10 marks	30 marks	100 marks

IA Test:

1. 10 marks questions in Part A of IA question paper should also include an OBE related question (max 2 marks).
2. Remaining 20 marks questions in Part B & C should be descriptive.

Conduct of Lab:

1. a. Conducting the experiment and journal: 5 marks
   b. Calculations, results, graph, conclusion and Outcome: 5 marks
2. The Assignment (Certification), open ended experiment or a course project will be conducted for 10 marks & the Average of both components will be taken to award 10 marks.

Lab test: (Batchwise with 15 students/batch)

1. Test will be conducted at the end of the semester
2. Timetable, Batch details and examiners will be declared by Exam section
3. Conducting the experiment and writing report: 5 marks
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Eligibility for SEE:

1. **Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests. Lack of minimum score in IA test will make the student Not Eligible for SEE**
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5. Not eligible in any one of the two components will make the student **Not Eligible** for SEE

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1.	It will be conducted for 100 marks of 3 hours duration.

2.	**Minimum marks required in SEE to pass:** Score should be ≥35 &, however overall score of CIE+SEE should be ≥40%.
3.	Question paper contains three parts **A,B and C**. Students have to answer 1. From Part A answer any 5 out of 7 questions, each Question Carries 6 Marks. 2. From Part B answer 5 out of 10 questions choosing any one full question from each unit, each Question Carries 10 Marks. 3. From Part C answer 1 out of 2 questions, each Question Carries 20 Marks.

Assignment (10 marks)				
Rubric/Level	**Exemplary=A (Far Exceeds Standard)**	**Above Average=B (Exceeds Standard)**	**Adequate= C (Meets Standard)**	**Inadequate= D (Below Standard)**
Technical Content (8 marks)	Comprehensive, accurate, in-depth understanding; shows original thinking and mastery of concepts. (7-8)	Mostly accurate, good understanding, minor gaps; shows good application of concepts. (5-6)	Basic coverage, some understanding, lacks depth or clarity. (3-4)	Incomplete, inaccurate, poor understanding; shows little effort. (1-2)
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Course Project (20 marks)				
Rubric/Level	**Exemplary=A (Far Exceeds Standard)**	**Above Average=B (Exceeds Standard)**	**Adequate= C (Meets Standard)**	**Inadequate =D (Below Standard)**
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Work content/Use of Technology (10 Marks)	Comprehensive, technically sound; advanced and appropriate use of technology (10-9)	Good technical depth; reasonable use of technology (8-7)	Adequate work; technology used with limitations (6-4)	Superficial or minimal work; poor use of technology (3-1)
Project Presentation (2 Marks)	Clear, engaging, confident delivery; excellent visuals (2)	Clear and coherent; good use of visuals (1.5)	Understandable but lacks engagement or clarity (1)	Disorganized or hard to follow (0.5)
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Report (2 Marks)	Well-structured, detailed, no errors; excellent formatting (2)	Mostly well-written with minor issues (1.5)	Adequate but with some errors (1)	Poorly written; lacks structure (0.5)

CO-PO Mapping (Planned)												CO-PSO Mapping (Planned)		
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PSO1**	**PSO2**	**PSO3**
1	√	√	√		√							√		√
2	√	√	√		√						√	√	√	√
3	√	√	√		√						√	√		√
4	√	√	√								√	√	√	
5						√	√	√					√	√
Tick mark the CO, PO and PSO mapping														

Name & Signature of Faculty members
involved in designing the syllabus

Name & Signature of Faculty members
verifying/approving the syllabus

Python Programming (for CSE and allied programmes)

Course Code	1BPLC105B/205B	**Course type**	PLC	**Credits L-T-P**	3 - 0 - 1
Hours/week: L - T- P	3-0-2			**Total credits**	4
Total Contact Hours	L = 40 Hrs; T = 0 Hrs; P = 20 Hrs Total = 60 Hrs			**CIE Marks**	100
Flipped Classes content	5 Hours			**SEE Marks**	100

Course learning objectives	
1.	Build computational thinking and structured problem-solving abilities.
2.	Develop strong fundamentals in Python programming constructs.
3.	Introduce structured, modular, and object-oriented programming principles.
4.	Apply Python to solve mathematical, logical, and engineering problems.

Pre-requisites: Basic knowledge of Computers, Basic Mathematical Foundation and Problem-solving skills

Unit – I	**Contact Hours = 8 Hours**

Introduction to Programming: The Python programming language, Definition of programming, Definition of Debugging, Syntax errors, Runtime errors, Semantic errors, Experimental debugging.
Algorithm and Flowchart: Definition, characteristics, building blocks of Algorithms, Pseudo-code, flowcharts, Simple strategies for developing algorithms, Examples.
Introduction to Python: History, Salient features, Installation of Python and Working with IDLE.
Variables, Expressions and Statements: Values and data types, Variables, Variable names and keywords, Statements, Evaluating expressions, Operators and operands, Type converter functions, Order of operations, Input and output statements in Python, Composition, The modulus operator.

Unit – II	**Contact Hours = 8 Hours**

Decision Making: if, if-else, if-elif-else, nested if, Short-hand (Ternary) if and match-case (Python 3.10+).
Iteration: Assignment, Updating variables, the for loop, the while statement, Loop control (break, continue, else) statements, the Collatz 3n + 1 sequence, Tables, and Two-dimensional tables.
Functions: Defining, Calling, Returning values, Recursion, Variable scope, default/keyword arguments.
Strings: String formatting options, Indexing, Slicing, Formatting, Regex basics and String handling and manipulation functions.

Unit – III	**Contact Hours = 8 Hours**

Lists: Creation, Indexing, Slicing, List operations, Aliasing, Cloning lists, Lists and for loops, List comprehensions, List handling methods and Applications
Tuples: Properties, Creation, Packing/Unpacking, and Applications.
Dictionaries: Key-value operations, Iteration, Dictionary comprehension, Dictionary methods and Applications.
Sets: Set creation, operations, and set comprehension.

Unit – IV	Contact Hours = 8 Hours
File Handling: About files, Writing our first file, Reading a file line-by-line, Turning a file into a list of lines, Reading the whole file at once, Working with binary files, Directories, Fetching something from the Web, File pointers, with statement. **Modules & Packages:** Importing the module, Three import statement variants, Creating custom modules, Standard libraries (os, sys, math, random, datetime), Attributes and the dot Operator **Exception Handling:** Definition, try, except, else, finally, Raising custom exceptions.	

Unit – V	Contact Hours = 8 Hours
Classes and Objects: Definition, Syntax, Attributes, Methods, self-variable, Constructors and Destructors **Object oriented programming:** Single/multiple inheritance, Generalization, Encapsulation and Modifiers, Operator Overloading, Polymorphism, Method overriding	

Flipped Classroom Details

Unit No.	I	II	III	IV	V
No. for Flipped Classroom Sessions	1	1	1	1	1

Unit No.	Self-Study Topics
1.	Natural language v/s Formal language, Programming Paradigm, interpreted v/s compiled, typed v/s type-less programming language.
2.	Different types of functions
3.	List with in-line for loop
4.	Reading and working with CSV files
5.	Converting an instance to a string, Instances as return values.

List of Experiments

Unit No.	No. of Experiments	Topic(s) related to Experiment
1	1	a. Develop a python program to read 2 numbers from the keyboard and perform the basic arithmetic operations based on the choice. (1-Add, 2-Subtract, 3-Multiply, 4-Divide). b. Develop a program to read the name and year of birth of a person. Display whether the person is a senior citizen or not.
	2	Implement a program to accept marks for five subjects and calculate the percentage. Based on the percentage, display the grade as per the following criteria: • ≥90% → Grade A • 75–89% → Grade B • 60–74% → Grade C • 40–59% → Grade D

		• <40% → Fail
	3	Develop a menu-driven Python program to help a user track their daily expenses. The program should provide the following options: a. Add an expense (enter description and amount). b. View total expenses so far. c. Check if total expenses exceed a given budget. d. Exit. Use the match-case statement (Python 3.10+) to handle user choices and keep the program running until the user chooses to exit.
2	4	Write a Python program to generate a **monthly electricity bill** for one or more households: a. Ask the user how many households' bills need to be generated. b. For each household (using a loop), accept the number of units consumed as input. c. Apply the following tariff: a. First 100 units → ₹5/unit b. Next 100 units → ₹7/unit c. Above 200 units → ₹10/unit d. Display the total bill amount for each household with proper formatting. e. At the end, display the total of all households combined.
	5	Develop a Python program for a shopping cart system that: 1. Accepts the number of items purchased. 2. For each item, input the name, quantity, and price. 3. Stores the data in a list of tuples. 4. Uses a recursive function to calculate the total bill amount by processing the list of items. 5. Adds GST at 5% to the total and displays the formatted bill with item details, subtotal, tax, and final amount.
3	6	Write a Python program that: a. Accepts a paragraph of text from the user. b. Uses a dictionary to count and store the total number of: Vowels Consonants Digits Special characters (excluding spaces) c. Uses regular expressions to find and display all valid email addresses present in the paragraph. d. Displays the character count and the list of email addresses in a clear, formatted output.
	7	Write a program to: (a) Create a list of integers, remove duplicates, and sort it in ascending order. (b) Store student names and grades in a dictionary, then display all

		students scoring above 75%. (c) Demonstrate union, intersection, and difference operations on two sets of integers.
4	8	Develop a Python program to read a text file and display: • Number of lines. • Number of words. • Number of characters. Handle exceptions for file not found, permission denied, and other errors gracefully.
	9	Write a Python program to store and manage student records in a text file. The program should: 1. Accept details of multiple students (Name, Roll Number, Marks). 2. Store each student's record in a CSV file in a structured format. 3. Allow the user to read and display all records from the file.
5	10	Create a class BankAccount with attributes: account number, account holder name, and balance. Include methods to: • Deposit money. • Withdraw money (check for sufficient balance). • Display account details. Implement single inheritance to create a SavingsAccount class with an additional attribute for interest rate, and override a method to calculate interest.

Books	
	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.	Mark Lutz – *Learning Python*, 5th Edition, O'Reilly Media, 2013.
	Reference Books:
1.	S.A. Kulkarni, "Problem solving and Python programming", 1st edition, 2017
2.	Joel Murach, "Python Programming", Mike Murach & Associates Inc.,2016
	E-resources (NPTEL/SWAYAM.. Any Other)- mention links
1.	https://onlinecourses.nptel.ac.in/noc21_cs32/preview

Course delivery methods		**Assessment methods**	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Lab Test
3.	Flipped Classes	3.	Semester End Examination
4.	Practice session/Demonstrations in Labs		

Course Outcome (COs)

Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create

At the end of the course, the student will be able to (Highlight the **action verb** representing the learning level.)		**Learning Level**	**PO(s)**	**PSO(s)**
1.	**Apply** computational thinking to design algorithms and flowcharts for solving engineering problems.	Ap	PO1,2,3,5	1, 3
2.	**Develop** Python programs using control structures, functions, and modular programming concepts.	Ap	PO1,2,3,5,11	1, 2, 3
3.	**Examine** Python data structures, file handling, and exception handling for efficient data processing.	An	PO1,2,3,5,11	1, 3
4.	**Demonstrate** object-oriented programming concepts and advanced Python features in solving real-world problems.	Un	PO1,2,5,11	1, 2
5.	Apply the learnings inculcated throughout the course and develop a course project / present a seminar on that.	An	PO6,7,8	2,3

Scheme of Continuous Internal Evaluation (CIE):

For integrated courses, a lab test also will be conducted at the end of the semester. The lab test **(COMPULSORY)** will be part of the CIE. **No SEE for Lab**.

THEORY (60 marks)		**LAB (40 marks)**		Total
IA test 1	IA test 2	Average of Lab Conduction & Assignment/Open ended Expt/CP	Lab test	
30 marks	30 marks	10 marks	30 marks	100 marks

IA Test:

1. 10 marks questions in Part A of IA question paper should also include an OBE related question (max 2 marks).
2. Remaining 20 marks questions in Part B & C should be descriptive.

Conduct of Lab:

1. a. Conducting the experiment and journal: 5 marks
   b. Calculations, results, graph, conclusion and Outcome: 5 marks
2. The Assignment (Certification), open ended experiment or a course project will be conducted for 10 marks & the Average of both components will be taken to award 10 marks.

Lab test: (Batchwise with 15 students/batch)

1. Test will be conducted at the end of the semester
2. Timetable, Batch details and examiners will be declared by Exam section
3. Conducting the experiment and writing report: 5 marks
4. Calculations, results, graph and conclusion: 15 marks
5. Viva voce: 10 marks

Eligibility for SEE:

1. **Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests. Lack of minimum score in IA test will make the student Not Eligible for SEE**
2. **Student should score minimum 40% of 30 marks (i.e. 12 marks) in Lab test & should score 40% of 40 marks (i.e. 16 marks) in Lab component.**
3. Lab test is COMPULSORY
4. **Minimum score in CIE to be eligible for SEE: 40 OUT OF 100.**
5. Not eligible in any one of the two components will make the student **Not Eligible** for SEE

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 100 marks of 3 hours duration.

2.	**Minimum marks required in SEE to pass:** Score should be ≥35 &, however overall score of CIE+SEE should be ≥40%.
3.	Question paper contains three parts **A,B and C**. Students have to answer 1. From Part A answer any 5 out of 7 questions, each Question Carries 6 Marks. 2. From Part B answer 5 out of 10 questions choosing any one full question from each unit, each Question Carries 10 Marks. 3. From Part C answer 1 out of 2 questions, each Question Carries 20 Marks.

Assignment (10 marks)				
Rubric/Level	**Exemplary=A (Far Exceeds Standard)**	**Above Average=B (Exceeds Standard)**	**Adequate= C (Meets Standard)**	**Inadequate= D (Below Standard)**
Technical Content (8 marks)	Comprehensive, accurate, in-depth understanding; shows original thinking and mastery of concepts. (7-8)	Mostly accurate, good understanding, minor gaps; shows good application of concepts. (5-6)	Basic coverage, some understanding, lacks depth or clarity. (3-4)	Incomplete, inaccurate, poor understanding; shows little effort. (1-2)
Results & learning Outcome (2 marks)	Clear, correct results with excellent insights and reflection on learning. (2)	Mostly correct results; good understanding of learning outcomes. (1.5)	Basic results; limited insights or superficial learning. (1)	Incorrect or missing results; no evident learning. (0.5)

Course Project (20 marks)				
Rubric/Level	**Exemplary=A (Far Exceeds Standard)**	**Above Average=B (Exceeds Standard)**	**Adequate= C (Meets Standard)**	**Inadequate =D (Below Standard)**
Innovative Idea (2 Marks)	Highly original, creative, and impactful idea (2)	Original idea with moderate creativity (1.5)	Common idea with minor innovation (1)	Unoriginal or poorly thought-out idea (0.5)
Work Plan/methodology (2 Marks)	Clear, logical, and detailed work plan with effective methodology (2)	Mostly clear and practical plan with some details (1.5)	Basic plan; lacks clarity or depth (1)	Poor or vague plan and methodology (0.5)
Work content/Use of Technology (10 Marks)	Comprehensive, technically sound; advanced and appropriate use of technology (10-9)	Good technical depth; reasonable use of technology (8-7)	Adequate work; technology used with limitations (6-4)	Superficial or minimal work; poor use of technology (3-1)
Project Presentation (2 Marks)	Clear, engaging, confident delivery; excellent visuals (2)	Clear and coherent; good use of visuals (1.5)	Understandable but lacks engagement or clarity (1)	Disorganized or hard to follow (0.5)
Individual Contribution (2 Marks)	Fully engaged and contributed significantly to all aspects (2)	Active contribution with few gaps (1.5)	Some participation; effort uneven (1)	Minimal or unclear contribution (0.5)
Report (2 Marks)	Well-structured, detailed, no errors; excellent formatting (2)	Mostly well-written with minor issues (1.5)	Adequate but with some errors (1)	Poorly written; lacks structure (0.5)

CO-PO Mapping (Planned)												CO-PSO Mapping (Planned)		
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PSO1**	**PSO2**	**PSO3**
1	√	√	√		√							√		√
2	√	√	√		√						√	√	√	√
3	√	√	√		√						√	√		√
4	√	√	√								√	√	√	
5						√	√	√					√	√
Tick mark the CO, PO and PSO mapping														

Name & Signature of Faculty members
involved in designing the syllabus

Name & Signature of Faculty members
verifying/approving the syllabus

Programme Specific Lab I & II semester

INDEX

Mechanics and Materials Laboratory

Course Code	1BMEML107/207	Course type	PSCL	Credits L-T-P	0 - 0 - 2
Hours/week: L - T- P	0 - 0 - 2			Total credits	1
Total Contact Hours	L = 0 Hrs; T = 0 Hrs; P = 20 Hrs Total = 20 Hrs			CIE Marks	50
Flipped Classes content	-00-			SEE Marks	50

Course learning objectives	
1.	To study the behavior of various engineering materials.
2.	Understand the impact behavior of different engineering materials.
3.	Understand the failure mechanism of different types of beams.

Required Knowledge of : Engineering Mechanics and Physics

Lab Experiment – I	**Contact Hours = 2 Hours**
Study on various engineering materials. e.g (brick, concrete cube, mild steel, tile, wood etc).	
Lab Experiment – 2	**Contact Hours = 2 Hours**
Study different components of Universal Testing Machine (UTM).	
Lab Experiment – 3	**Contact Hours = 2 Hours**
Study on physical properties of engineering materials.	
Lab Experiment – 4	**Contact Hours = 2 Hours**
Conduct Charpy Impact test on metals. e.g., mild steel/ brass/aluminium/ copper /cast iron.	
Lab Experiment – 5	**Contact Hours = 2 Hours**
Conduct Izod Impact test on metals. e.g., mild steel/ brass/aluminum/ copper /cast iron.	
Lab Experiment – 6	**Contact Hours = 2 Hours**
Study on different on types of loads and supports.	
Lab Experiment – 7	**Contact Hours = 2 Hours**
Study on different types of beams under various loadings.	
Lab Experiment – 8 Study on different bonds.	**Contact Hours = 2 Hours**
Lab Experiment – 9 (Open ended experiment)	**Contact Hours = 2 Hours**
Market study on different engineering materials.	
Lab Experiment – 10 (Open ended experiment)	**Contact Hours = 2 Hours**
Write a program to calculate the reactions for different types of beams and loadings using AI tool.	

Books	
	Text Books:
1.	Bansal R. K., Rakesh Ranjan Beohar and Ahmad Ali Khan, **"Basic Civil Engineering and Engineering Mechanics"**, Laxmi Publications, 2015.
2.	Bhavikatti S. S., **"Engineering Mechanics"**, New Age International, 2019.
3.	Basavarajaiah B. S., Mahadevappa P. **"Strength of Materials in SI Units",** University Press (India) Pvt. Ltd., 3rd Edition, 2010.
	E-resources (NPTEL/SWAYAM.. Any Other)- mention links
1.	https://nptel.ac.in/courses/112103109
2.	https://www.vlab.co.in/

Course delivery methods		Assessment methods	
1.	Practice session/Demonstrations in Labs	1.	Conduction of Experiments
2.	Virtual Labs (if present)	2.	Journal writing
3.	Chalk and Talk	3.	Lab project/ Open ended experiment
4.		4.	Lab Test
5.		5.	Semester End Examination

Course Outcome (COs)

Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create

At the end of the course, the student will be able to (Highlight the **action verb** representing the learning level.)		**Learning Level**	**PO(s)**	**PSO(s)**
1.	**Understand** the behavior of different engineering materials under various tests.	Un	1, 5, 8, 9	1
2.	**Apply** the concept of engineering mechanics to study the behaviour of different types of beams subjected to various loads.	Ap	1, 5, 8, 9	1

Scheme of Continuous Internal Evaluation (CIE):

Conduction of experiments (15) & viva-voce (5)	Journal	Open ended expt/Lab project	Lab Test	Total
20 marks	5 marks	10 marks	15	50 marks

Conduct of Lab:

1. Conduction of the experiment: 15 marks + Viva voce: 5 marks
2. Calculations, results, graph, conclusion and Outcome recorded in Journal: 5 marks
3. Open ended expt/Lab project: 10 marks
4. Open-ended experiments are a type of laboratory activity where the outcome is not predetermined, & students are given the freedom to explore, design & conduct the experiment based on the problem statements as per the concepts defined by the course coordinator.
5. Lab Test: 15 marks

Note:

1. The laboratory syllabus consists of 7-9 regular/conventional experiments and 3 open-ended experiments. The maximum marks for the laboratory course are 100.
2. All experiments are considered for CIE and SEE.

Eligibility for SEE:

1. 40% and above in CIE (20 marks and above)
2. **Lab test is COMPULSORY**

Scheme of Semester End Examination (SEE):			
1.	It will be conducted for 50 marks of 2/3 hours duration.		
2.	Minimum marks required in SEE to pass: **20 out of 50 marks**		
2.	One or Two experiments to be conducted.		
3.	**Minimum marks required in SEE to pass:** Score should be ≥35% , however overall score of CIE+SEE should be ≥40%.		
4.	Initial write up	10 marks	50 marks
	Conduct of experiments, results and conclusion	20 marks	
	One mark question	10 marks	
	Viva- voce	10 marks	
5.	Viva-voce shall be conducted for individual student and not in a group.		

Rubrics for Lab conduction (CIE 35 marks)				
Assessment Component	**Exemplary = A (Far Exceeds Standard)**	**Above Average = B (Exceeds Standard)**	**Adequate = C (Meets Standard)**	**Inadequate = D (Below Standard)**
1. Conduction of Experiments (15)	Performs all steps accurately with deep insight; excellent data analysis; no supervision required. (13–15)	Minor errors, good understanding; minimal supervision. (10–12)	Basic procedure followed; some errors; needs guidance. (7–9)	Incomplete or incorrect steps; poor understanding; needs constant help. (<7)
2. Viva-Voce (5)	Demonstrates excellent conceptual clarity and critical thinking. (5)	Good understanding with minor gaps in reasoning. (4)	Basic responses with limited understanding. (3)	Inaccurate or incomplete answers. (<3)
3. Journal (5)	Neatly presented, complete, error-free, and insightful observations. (5)	Mostly complete and neat with minor errors. (4)	Journal is basic with some incomplete entries. (3)	Poorly maintained, incomplete or illegible. (<3)
4. Lab Project (10)	Innovative, well-executed, clearly documented with good technical content (9–10)	Good effort with reasonable execution and documentation. (7–8)	Basic project; shows effort but lacks depth. (5–6)	Minimal or no meaningful effort. (<5)
5. Open-Ended Experiment (10)	Excellent initiative; deep exploration beyond standard procedures. (9–10)	Good attempt with moderate originality. (7–8)	Limited exploration; basic understanding shown. (5–6)	No significant effort or originality. (<5)

CO-PO Mapping (Planned)												CO-PSO Mapping (Planned)		
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PSO1**	**PSO2**	**PSO3**
1	√				√			√	√			√		
2	√				√			√	√			√		
Tick mark the CO, PO and PSO mapping														

Name & Signature of Faculty members involved in designing the syllabus

Prof. R. D. Deshpande

Dr. Sachin R. Kulkarni

Name & Signature of Faculty members verifying/approving the syllabus

BASIC ELECTRICAL ENGINEERING LAB

Course Code	**1BBEEL107/207**	**Course type**	**PSCL**	**Credits L-T-P**	0 - 0 - 1
Hours/week: L - T- P	0 - 0 - 2			**Total credits**	1
Total Contact Hours	L = 0 Hrs; T = 0 Hrs; P = 20-24 Hrs Total = 20 -24 Hrs			**CIE Marks**	50
Flipped Classes content	-			**SEE Marks**	50

Course learning objectives	
1.	To introduce the practical concepts and techniques in Electrical systems.
2.	To create awareness about domestic wiring, the functioning of various electrical apparatus and the safety measures.
3.	To impart basic knowledge of measurement of current, voltage, power, energy and power factor in Electrical systems.
4.	To provide the knowledge of determination of performance parameters of Electrical circuits.

Required Knowledge of: Basic Electrical Engineering

Lab Experiment – I	**Contact Hours = 2 Hours**
Measurement of voltage, current, power, power factor of single-phase load.	
Lab Experiment – 2	**Contact Hours = 2 Hours**
Verification of Kirchoff's laws.	
Lab Experiment – 3	**Contact Hours = 2 Hours**
Analysis of series RLC circuit.	
Lab Experiment – 4	**Contact Hours = 2 Hours**
Performance of Single-phase Electronic Energy Meter.	
Lab Experiment – 5	**Contact Hours = 2 Hours**
Measurement of three phase power using two wattmeter method.	
Lab Experiment – 6	**Contact Hours = 2 Hours**
Lumen efficacy of different types of lamps.	
Lab Experiment – 7	**Contact Hours = 2 Hours**
Demonstration of EV power train and subsystems.	
Lab Experiment – 8	**Contact Hours = 2 Hours**
One-way two-way control of lamp.	
Lab Experiment – 9	**Contact Hours = 2 Hours**
Residential wiring for lightning loads.	
Lab Experiment – 10	**Contact Hours = 2 Hours**
Open ended experiment: 1) Design/Implementation/Simulation of Electrical Circuits using suitable software/Hardware. 2) Protective Devices: Fuse/MCBs/Earthing etc.	

Books	
	Text Books:
1.	DC Kulshreshtha, Basic Electrical Engineering, Tata McGraw Hill, First Edition 2019.
2.	B.L.Theraja, A text book of Electrical Technology, S Chand and Company, reprint edition 2014.
	Reference Books:
1.	D.P.Kothari and I.J.Nagrath, Basic Electrical Engineering, Tata McGraw Hill 4th edition, 2019.
2.	V. K. Mehta, Rohit Mehta, Principles of Electrical Engineering & Electronics, S. Chand and Company Publications, 2nd edition,2015.
	E-resources:
1.	https://onlinecourses.nptel.ac.in/noc25_ee91/preview
2.	https://nptel.ac.in/courses/117106108

Course delivery methods		Assessment methods	
1.	Practice session/Demonstrations in Labs	1.	Conduction of Experiments
2.	Virtual Labs (if present)	2.	Journal writing
3.	Chalk and Talk	3.	Lab project/ Open ended experiment
4.		4.	Lab Test
5.		5.	Semester End Examination

Course Outcome (COs)

Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create

At the end of the course, the student will be able to (Highlight the **action verb** representing the learning level.)		**Learning Level**	**PO(s)**	**PSO(s)**
1.	**Demonstrate** an understanding of referring to the specifications of Electrical equipment.	Un	1,8,9,11	1
2.	**Demonstrate** an understanding of operation of Electrical appliances and assess their performance.	Ap	1,8,9,11	1
3.	**Demonstrate** an understanding of measurement Electrical quantities current, voltage, power, energy, power factor in Electrical systems.	Ap	1,8,9,11	1
4.	**Analyze** the performance of different electrical circuits.	An	1,8,9,11	1

Scheme of Continuous Internal Evaluation (CIE):

Conduction of experiments (15) & viva-voce (5)	Journal	Open ended expt/Lab project	Lab Test	Total
20 marks	5 marks	10 marks	15	50 marks

Conduct of Lab:

1. Conduction of the experiment: 15 marks + Viva voce: 5 marks
2. Calculations, results, graph, conclusion and Outcome recorded in Journal: 5 marks
3. Open ended expt/Lab project: 10 marks

4. Open-ended experiments are a type of laboratory activity where the outcome is not predetermined, & students are given the freedom to explore, design & conduct the experiment based on the problem statements as per the concepts defined by the course coordinator.
5. Lab Test: 15 marks

Note:

1. The laboratory syllabus consists of 7-9 regular/conventional experiments and 1 open-ended experiment. The maximum marks for the laboratory course are 100.
2. All experiments are considered for CIE and SEE.

Eligibility for SEE:

1. 40% and above in CIE (20 marks and above)
2. **Lab test is COMPULSORY**

Scheme of Semester End Examination (SEE):			
1.	It will be conducted for 50 marks of 2/3 hours duration.		
2.	Minimum marks required in SEE to pass: **20 out of 50 marks**		
2.	One or Two experiments to be conducted.		
3.	**Minimum marks required in SEE to pass:** Score should be ≥35% , however overall score of CIE+SEE should be ≥40%.		
4.	Initial write up	10 marks	50 marks
	Conduct of experiments, results and conclusion	20 marks	
	One mark question	10 marks	
	Viva- voce	10 marks	
5.	Viva-voce shall be conducted for individual student and not in a group.		

Rubrics for Lab conduction (CIE 35 marks)				
Assessment Component	**Exemplary = A (Far Exceeds Standard)**	**Above Average = B (Exceeds Standard)**	**Adequate = C (Meets Standard)**	**Inadequate = D (Below Standard)**
1. Conduction of Experiments (15)	Performs all steps accurately with deep insight; excellent data analysis; no supervision required. (13–15)	Minor errors, good understanding; minimal supervision. (10–12)	Basic procedure followed; some errors; needs guidance. (7–9)	Incomplete or incorrect steps; poor understanding; needs constant help. (<7)
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3. Journal (5)	Neatly presented, complete, error-free, and insightful observations. (5)	Mostly complete and neat with minor errors. (4)	Journal is basic with some incomplete entries. (3)	Poorly maintained, incomplete or illegible. (<3)
4. Lab Project (10)	Innovative, well-executed, clearly documented with good technical content (9–10)	Good effort with reasonable execution and documentation. (7–8)	Basic project; shows effort but lacks depth. (5–6)	Minimal or no meaningful effort. (<5)
5. Open-Ended Experiment (10)	Excellent initiative; deep exploration beyond standard procedures. (9–10)	Good attempt with moderate originality. (7–8)	Limited exploration; basic understanding shown. (5–6)	No significant effort or originality. (<5)

CO-PO Mapping (Planned)												CO-PSO Mapping (Planned)			
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO1	PSO2	PSO3	PSO 4
1	✓							✓	✓		✓	✓			
2	✓							✓	✓		✓	✓			
3	✓							✓	✓		✓	✓			
4	✓							✓	✓		✓	✓			
Tick mark the CO, PO and PSO mapping															

Name & Signature of Faculty members involved in designing the syllabus

S.No	Name	Signature
1.	Prof.P.V.Datar	
2.	Prof.A.V.Deshpande	
3.	Prof.S.N.Dodamani	

Name & Signature of Faculty members verifying/approving the syllabus

S.No	Name	Signature
1.	Dr.D.B.Kulkarni	
2.	Dr.R.B.Magadum	

Fundamentals of Electronics and Communication Engineering Lab

Course Code	1BBEEL107/207	**Course type**	**PSCL**	**Credits L-T-P**	0 – 0 – 2
Hours/week: L - T- P	0 - 0 - 2			**Total credits**	1
Total Contact Hours	L = 0 Hrs; T = 0 Hrs; P = 24 Hrs Total = 24 Hrs			**CIE Marks**	50
Flipped Classes content				**SEE Marks**	50

Course learning objectives	
1.	To understand how diodes, BJTs, and MOSFETs operate in analog circuits.
2.	To explore key op-amp configurations for signal processing tasks.
3.	To grasp the basics of digital logic and build simple combinational circuits.
4.	To introduce core concepts of analog communication through AM.
5.	To encourage hands-on problem solving in electronic circuit design.

Required Knowledge of: Basics of Physics and Mathematics

Lab Experiment – 0	**Contact Hours = 2 Hours**
Testing of electronic components and measuring instruments.	
Lab Experiment – I	**Contact Hours = 2 Hours**
Design and Testing of Half-Wave and Full-Wave Rectifiers with and Without Filter for Determining Ripple Factor, Voltage Regulation, and Efficiency.	
Lab Experiment – 2	**Contact Hours = 2 Hours**
Design and Testing of Bridge Rectifier with and Without Filter for Determining Ripple Factor, Voltage Regulation, and Efficiency.	
Lab Experiment – 3	**Contact Hours = 2 Hours**
Analysis of Input and Output Characteristics of a Bipolar Junction Transistor in Common Emitter Configuration.	
Lab Experiment – 4	**Contact Hours = 2 Hours**
Study of Transfer and Drain Characteristics of a MOSFET in Common Source Configuration	
Lab Experiment – 5	**Contact Hours = 2 Hours**
Investigation of Op-Amp in Inverting and Non-Inverting Modes with Gain Measurement	
Lab Experiment – 6	**Contact Hours = 2 Hours**
Study of Truth Tables for OR, AND, NOT, NAND, and NOR Gates Using Basic and Universal Gates	
Lab Experiment – 7(Open ended experiment)	**Contact Hours = 2 Hours**

Design and Testing of Clipping and Clamping Circuits to obtain desired Transfer Characteristics	
Lab Experiment – 8(Open ended experiment)	**Contact Hours = 2 Hours**
Design and test a single stage bipolar junction transistor amplifier to obtain desired gain and bandwidth requirements.	
Lab Experiment – 9(Open ended experiment)	**Contact Hours = 2 Hours**
Testing of Op-Amp as voltage follower and a weighted summer with waveform analysis.	
Lab Experiment – 10 (Open ended experiment)	**Contact Hours = 2 Hours**
Design and Testing of Integrator and Differentiator Circuits using Op-Amp with Waveform Analysis	
Lab Experiment – 11 (Open ended experiment)	**Contact Hours = 2 Hours**
Amplitude Modulation using Discrete Components for Given Specifications.	
Lab Experiment – 12 (Open ended experiment)	**Contact Hours = 2 Hours**
Simplification and realization of Boolean functions using Logic Gates/Universal Gates.	

Books	
	Text Books:
1.	David A Bell, Electronic Devices and Circuits, 5th Edition, Oxford University Press, 30th Impression, 2025.
2.	Ramakanth A Gayakwad, Op-amps and Linear Integrated Circuits, 4th Edition, Pearson Education, 2015.
3.	John G. Proakis, Masoud Saleh, Fundamentals of Communication Systems, Second Edition, Pearson Educations, Inc., 2014.
4.	D.P Kothari and I J Nagrath, Basic electronics, Second Edition, McGraw Hill Education Pvt ltd, 2018.
5.	M.Morris Mano and Michael D.Ciletti, Digital Design - With an Introduction to the Verilog HDL, VHDL and System Verilog 6th Edition, Pearson Education Inc, 2024.
6.	Robert L. Boylestad, Louis Nashelsky, “Electronic Devices and Circuit Theory", 11th Edition, PHI, 2016.
	E-resources (NPTEL/SWAYAM.. Any Other)- mention links
1.	Basic Electronics and Lab by Prof. T.S. Natarajan, IIT Madras **Link:** https://nptel.ac.in/courses/122106025
2.	Digital Electronic Circuits, by Prof. Goutam Saha, IIT Kharagpur **Link:** https://nptel.ac.in/courses/108105132

Course delivery methods		**Assessment methods**	
1.	Practice session/Demonstrations in Labs	1.	Conduction of Experiments
2.	Virtual Labs (if present)	2.	Journal writing
3.	Chalk and Talk	3.	Lab project/ Open ended experiment

4.		4.	Lab Test
5.		5.	Semester End Examination

Course Outcome (COs)				
Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create				
At the end of the course, the student will be able to (Highlight the **action verb** representing the learning level.)		**Learning Level**	**PO(s)**	**PSO(s)**
1.	***Apply*** the operating principles of diodes, transistors, and MOSFETs to construct and test basic analog circuits.	Ap	1,2,3,5,8,9,11	1,2
2.	***Implement*** operational amplifier configurations such as inverting, non-inverting, integrator, and differentiator for analog signal processing applications.	Ap	1,2,3,5,8,9,11	1,2
3.	***Develop*** solutions to open-ended electronic design problems by selecting appropriate components, constructing circuits, and interpreting results to meet defined objectives.	Ap	1,2,3,5,8,9,11	1,2
4.	***Analyze*** the functionality of logic gates and combinational circuits including adders, subtractors, and code converters using digital ICs.	An	1,2,3,5,8,9,11	1,2
5.	***Investigate*** amplitude modulation using electronic circuits.	An	1,2,3,5,8,9,11	1,2

Scheme of Continuous Internal Evaluation (CIE):

Conduction of experiments (15) & viva-voce (5)	**Journal**	**Open ended expt/Lab project**	**Lab Test**	**Total**
20 marks	5 marks	10 marks	15	50 marks

Conduct of Lab:

1. Conduction of the experiment: 15 marks + Viva voce: 5 marks
2. Calculations, results, graph, conclusion and Outcome recorded in Journal: 5 marks
3. Open ended expt/Lab project: 10 marks
4. Open-ended experiments are a type of laboratory activity where the outcome is not predetermined, & students are given the freedom to explore, design & conduct the experiment based on the problem statements as per the concepts defined by the course coordinator.
5. Lab Test: 15 marks

Note:

1. The laboratory syllabus consists of 7-9 regular/conventional experiments and 3 open-ended experiments. The maximum marks for the laboratory course are 100.
2. All experiments are considered for CIE and SEE.

Eligibility for SEE:

1. 40% and above in CIE (20 marks and above)
2. **Lab test is COMPULSORY**

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 50 marks of 2/3 hours duration.
2.	Minimum marks required in SEE to pass: **20 out of 50 marks**

2.	One or Two experiments to be conducted.		
3.	**Minimum marks required in SEE to pass:** Score should be ≥35% , however overall score of CIE+SEE should be ≥40%.		
4.	Initial write up	10 marks	50 marks
	Conduct of experiments, results and conclusion	20 marks	
	One mark question	10 marks	
	Viva- voce	10 marks	
5.	Viva-voce shall be conducted for individual student and not in a group.		

Rubrics for Lab conduction (CIE 35 marks)				
Assessment Component	**Exemplary = A (Far Exceeds Standard)**	**Above Average = B (Exceeds Standard)**	**Adequate = C (Meets Standard)**	**Inadequate = D (Below Standard)**
1. Conduction of Experiments (15)	Performs all steps accurately with deep insight; excellent data analysis; no supervision required. (13–15)	Minor errors, good understanding; minimal supervision. (10–12)	Basic procedure followed; some errors; needs guidance. (7–9)	Incomplete or incorrect steps; poor understanding; needs constant help. (<7)
2. Viva-Voce (5)	Demonstrates excellent conceptual clarity and critical thinking. (5)	Good understanding with minor gaps in reasoning. (4)	Basic responses with limited understanding. (3)	Inaccurate or incomplete answers. (<3)
3. Journal (5)	Neatly presented, complete, error-free, and insightful observations. (5)	Mostly complete and neat with minor errors. (4)	Journal is basic with some incomplete entries. (3)	Poorly maintained, incomplete or illegible. (<3)
4. Lab Project (10)	Innovative, well-executed, clearly documented with good technical content (9–10)	Good effort with reasonable execution and documentation. (7–8)	Basic project; shows effort but lacks depth. (5–6)	Minimal or no meaningful effort. (<5)
5. Open-Ended Experiment (10)	Excellent initiative; deep exploration beyond standard procedures. (9–10)	Good attempt with moderate originality. (7–8)	Limited exploration; basic understanding shown. (5–6)	No significant effort or originality. (<5)

CO-PO Mapping (Planned)												CO-PSO Mapping (Planned)		
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PSO1**	**PSO2**	**PSO3**
1	✓	✓	✓		✓			✓	✓		✓	✓	✓	
2	✓	✓	✓		✓			✓	✓		✓	✓	✓	
3	✓	✓	✓		✓			✓	✓		✓	✓	✓	
4	✓	✓	✓		✓			✓	✓		✓	✓	✓	
5	✓	✓	✓		✓			✓	✓		✓	✓	✓	
Tick (✓) mark the CO, PO and PSO mapping														

Name & Signature of Faculty members involved in designing the syllabus

Name & Signature of Faculty members verifying/approving the syllabus

Elements of Mechanical Engineering Lab

Course Code	1BEMEL107	Course type	PSC	Credits L-T-P	0 - 0 - 1
Hours/week: L - T- P	0 - 0 - 2			Total credits	1
Total Contact Hours	L = 0 Hrs; T = 0 Hrs; P = 20-24 Hrs Total = 24 Hrs			CIE Marks	50
Flipped Classes content				SEE Marks	50

Course learning objectives	
1.	Demonstrate and compare the mechanical properties of materials through standard tests (hardness, tensile, and joint strength).
2.	Perform basic manufacturing and machining operations such as welding, drilling, turning, and finishing, while following safety practices.
3.	Apply measurement techniques and error analysis of the components.
4.	Analyze and compare the performance of mechanical systems (power transmission elements, I.C. engines setups) to propose suitable applications.

Required Knowledge of: Basic Elements of Mechanical Engineering	
Lab Experiment – I	**Contact Hours = 2 Hours**
Hardness Test on Different Materials • Perform Brinell/Rockwell hardness test on mild steel, aluminum, and brass specimens.	
Lab Experiment – 2	**Contact Hours = 2 Hours**
Demonstration of Welding Processes • Compare arc welding, gas welding, and soldering by sample joints (Lap/Butt).	
Lab Experiment – 3	**Contact Hours = 2 Hours**
Lathe Machine Operations • Perform basic facing, step turning, Taper turning and knurling operations.	
Lab Experiment – 4	**Contact Hours = 2 Hours**
• Perform basic drilling and counter bore, counter sunk, Reaming, Tapping operations.	
Lab Experiment – 5	**Contact Hours = 2 Hours**
Study of Power Transmission Elements • Demonstrate belt drive and gear drive setups.	
Lab Experiment – 6	**Contact Hours = 2 Hours**
Experiment on Error Analysis • Measure the same dimension using Vernier Caliper, Micrometer, and Steel Scale.	
Lab Experiment – 7	**Contact Hours = 2 Hours**
Hydraulic Press Demonstration • Demonstration of Pascal's law using a hydraulic press or small hydraulic setup.	
Lab Experiment – 8	**Contact Hours = 2 Hours**
Performance Test on I.C. Engine (4-Stroke Petrol or Diesel Engine) • Calculate brake power, indicated power, and efficiency.	
Lab Experiment – 9	**Contact Hours = 2 Hours**
Performance Test on I.C. Engine • Comparative study of flash point and fire point of various fuels/oils using the open and closed cup method	

Lab Experiment – 10 (Open-ended experiment)	**Contact Hours = 2 Hours**
Determine the strength of welded joints (Lap and Butt) on the UTM	
Lab Experiment – 11 (Open-ended experiment)	**Contact Hours = 2 Hours**
Study of the Effect of Cutting Parameters on Surface Finish in Turning Operation of the given material	
Lab Experiment – 12 (Open-ended experiment)	**Contact Hours = 2 Hours**
Comparative Study of Belt Drive, Gear Drive, and Hydraulic for Power Transmission	

Books	
	Text Books:
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.
	E-resources (NPTEL/SWAYAM.. Any Other)- mention links
1.	https://onlinecourses.nptel.ac.in/noc24_me104
2.	https://onlinecourses.nptel.ac.in/noc25_me09

Course delivery methods		**Assessment methods**	
1.	Practice session/Demonstrations in Labs	1.	Conduction of Experiments
2.	Virtual Labs (if present)	2.	Journal writing
3.	Chalk and Talk	3.	Lab project/ Open ended experiment
4.		4.	Lab Test
5.		5.	Semester End Examination

Course Outcome (COs)

Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create

At the end of the course, the student will be able to (Highlight the **action verb** representing the learning level.)		**Learning Level**	**PO(s)**	**PSO(s)**
1.	**Classify and explain** engineering materials, their properties, and alloys, along with their practical applications.	Understand, Apply	PO1,	PSO3
2.	**Demonstrate knowledge of and compare** basic manufacturing and joining processes with emphasis on safety.	Understand, Analyze	PO1,	PSO2
3.	**Identify** errors in experimental data and apply fundamental design principles to **analyze** and select suitable power transmission elements such as flat belt drives and spur gears	Apply, Analyze,	PO1,	PSO1, PSO2
4.	**Integrate knowledge** from materials, production, design, thermal, and fluid power domains to **propose solutions to basic real-world mechanical problems**	Analyze, Evaluate,	PO1, PO3, PO8, PO11,	PSO1, PSO2, PSO3

Scheme of Continuous Internal Evaluation (CIE):

Conduction of experiments (15) & viva-voce (5)	Journal	Open-ended expt/Lab project	Lab Test	Total
20 marks	5 marks	10 marks	15	50 marks

Conduct of Lab:

1. Conduction of the experiment: 15 marks + Viva voce: 5 marks
2. Calculations, results, graph, conclusion and Outcome recorded in Journal: 5 marks
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4. Open-ended experiments are a type of laboratory activity where the outcome is not predetermined, & students are given the freedom to explore, design & conduct the experiment based on the problem statements as per the concepts defined by the course coordinator.
5. Lab Test: 15 marks

Note:

1. The laboratory syllabus consists of 7-9 regular/conventional experiments and 3 open-ended experiments. The maximum marks for the laboratory course are 100.
2. All experiments are considered for CIE and SEE.

Eligibility for SEE:

1. 40% and above in CIE (20 marks and above)
2. **Lab test is COMPULSORY**

Scheme of Semester End Examination (SEE):			
1.	It will be conducted for 50 marks of 2/3 hours duration.		
2.	Minimum marks required in SEE to pass: **20 out of 50 marks**		
2.	One or Two experiments to be conducted.		
3.	**Minimum marks required in SEE to pass:** Score should be ≥35% , however overall score of CIE+SEE should be ≥40%.		
4.	Initial write-up	10 marks	50 marks
	Conduct of experiments, results, and conclusion	20 marks	
	One mark question	10 marks	
	Viva- voce	10 marks	
5.	Viva-voce shall be conducted for each individual student and not in a group.		

Rubrics for Lab conduction (CIE 35 marks)				
Assessment Component	**Exemplary = A (Far Exceeds Standard)**	**Above Average = B (Exceeds Standard)**	**Adequate = C (Meets Standard)**	**Inadequate = D (Below Standard)**
1. Conduction of Experiments (15)	Performs all steps accurately with deep insight; excellent data analysis; no supervision required. (13–15)	Minor errors, good understanding; minimal supervision. (10–12)	Basic procedure followed; some errors; needs guidance. (7–9)	Incomplete or incorrect steps; poor understanding; needs constant help. (<7)
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CO-PO Mapping (Planned)												CO-PSO Mapping (Planned)		
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PSO1**	**PSO2**	**PSO3**
1	✓													✓
2	✓												✓	
3	✓											✓	✓	
4	✓		✓					✓			✓	✓	✓	✓
Tick mark the CO, PO, and PSO mapping														

Dr. Mahesh A Kori
Name & Signature of Faculty members involved in designing the syllabus

Prof. R. K. Tavildar
Name & Signature of Faculty members verifying/approving the syllabus

C Programming Lab

Course Code	1BPOPL107/207	Course type	PSCL	Credits L-T-P	0 - 0 - 2
Hours/week: L - T- P	0 - 0 - 2			Total credits	1
Total Contact Hours	L = 0 Hrs; T = 0 Hrs; P = 20-24 Hrs Total =24Hrs			CIE Marks	50
Flipped Classes content				SEE Marks	50

Course learning objectives	
1.	Apply programming constructs of C language to solve the real-world problems
2.	Explore user-defined data structures like arrays, structures and pointers in implementing solutions to problems
3.	Design and Develop Solutions to problems using structured programming constructs such as functions

Note:
1. The laboratory syllabus consists of PART-A and PART-B. While PART-A has 11 conventional experiments, PART-B has 8 typical open-ended experiments.
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 % weightage of the maximum 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 % weightage of the maximum 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.

Lab Experiment – I,2,3	**Contact Hours = 2 Hours**

UNIT – 2

1. A robot needs to find how far it must travel between two points on a 2D plane. Develop a C program to calculate the straight-line distance between the given coordinates.

2. Develop a C program that takes a student's marks as input and displays their grade based on the following
criteria:
90 and above: Grade A
75 to 89: Grade B
60 to 74: Grade C
50 to 59: Grade D
Below 50: Grade F
Choose a suitable control structure to implement this logic efficiently.

3. A bank ATM software implements a small transaction module that displays the following menu of options:

1. Deposit Cash
2. Withdraw Cash
3. Check Balance
4. Exit

Write a C program that reads a menu option as typed by the user and performs the required transaction until the user gives option 4 finally to exit from the program. Assume an opening balance of Rs. 10,000 in the account. The program should not allow withdrawal, if the balance is insufficient. The program can use any looping construct as well as switch statement to process menu option.

Lab Experiment – 4,5,6,7,8	Contact Hours = 2 Hours

UNIT – 3

4. Write a C Program to display Pyramid pattern by reading the number of rows as input.

1
2 3
4 5 6
7 8 9 10

5. 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.

6. 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.

7. A sensor in a robotic arm needs to calculate the angle of rotation in real-time, but the hardware doesn'tsupport built-in trigonometric functions. Develop a C program to approximate the value of sin(x) using aseries expansion method for improved performance.

8. 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."

Lab Experiment – 9,10	Contact Hours = 2 Hours

UNIT -4

9. 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.

10. 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.

Lab Experiment – 11	Contact Hours = 2 Hours

UNIT -5

11. Implement structures to read, write and compute average-marks of the students, list the students scoring above and below the average marks for a class of N students.

Open ended experiment

1.TOPIC : ARRAYS

A Social Networking site stores the names of registered users in one array. In another double dimension array it stores the user id (which is the index value of that name in the first array) and the birth year. Write a C program to search a given user name and print his birth year. If the user name is not found in the list then give appropriate message. The arrays required can be initialized as follows:

First Array

Rahul Sharma
Sanjay Gupta
Ashish Raina
Deepak Jadhav
Veena Joshi
Reena Deshpande

Second Array

0	1980
1	1982
2	1975
3	1985
4	1979
5	1970

If the user name to search is Deepak Jadhav then the output must be 1985.

2.TOPIC: FUNCTIONS

Write a *recursive* C function to find the factorial of a number,*n*!, defined by *fact*(*n*)=1, if *n*=0. Otherwise *fact*(*n*)=*n***fact*(*n*-1). Using this function,write a C program to compute the binomial coefficient nCr. Tabulate the results for different values of *n* and *r* with suitable messages.

3. 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.
4. 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.
5. 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.
6. 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.
7. 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.
8. 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.

Books	
	Text Books:
1.	E. Balaguruswamy , "Programming in ANSI C", Tata McGraw Hill, 5th edition,2010
2.	Kernighan, Dennis M. Ritchie, "The C Programming Language" (2nd ed.), Prentice Hall, 2005.
	E-resources (NPTEL/SWAYAM.. Any Other)- mention links
1.	elearning.vtu.ac.in/econtent/courses/video/BS/15PCD23.html
2.	https://nptel.ac.in/courses/106/105/106105171/ MOOC courses can be adopted for more clarity in understanding the topics and verities of problem solving methods.
3.	https://tinyurl.com/4xmrexre

Course delivery methods		Assessment methods	
1.	Practice session/Demonstrations in Labs	1.	Conduction of Experiments
2.	Virtual Labs (if present)	2.	Journal writing
3.	Chalk and Talk	3.	Lab project/ Open ended experiment
4.		4.	Lab Test
5.		5.	Semester End Examination

Course Outcome (COs)

Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create

At the end of the course, the student will be able to (Highlight the **action verb** representing the learning level.)		**Learning Level**	**PO(s)**	**PSO(s)**
1.	Design a computer program to solve simple and complex problems of different domains	L3	PO1,PO2	PSO1
2.	Apply programming constructs of C language to solve the real world problem.	L3	PO1,PO2	PSO1
3.	Explore user-defined data structures like arrays in implementing solutions to problems like searching and sorting.	L4	PO3,PO4,PO5	PSO1,PSO2
4.	Design and Develop Solutions to problems using modular programming constructs	L3	PO3,PO4,PO5,PO10,PO 11,PO12	PSO1,PSO2,PSO3
5.	Explore user-defined data structures like structures and pointers in implementing solutions	L4	PO3,PO4,PO5	PSO1,PSO2

Scheme of Continuous Internal Evaluation (CIE):

Conduction of experiments (15)& viva-voce (5)	Journal	Open ended expt/Lab project	Lab Test	Total
20 marks	5 marks	10 marks	15	50 marks

Conduct of Lab:

1. Conduction of the experiment:15 marks + Viva voce: 5 marks
2. Calculations, results, graph, conclusion and Outcome recorded in Journal: 5 marks
3. Open ended expt/Lab project: 10 marks
4. Open-ended experiments are a type of laboratory activity where the outcome is not predetermined, & students are given the freedom to explore, design& conduct the experiment based on the problem statements as per the concepts defined by the course coordinator.
5. Lab Test: 15 marks

Note:

1. The laboratory syllabus consists of 7-9regular/conventional experiments and 3 open-ended experiments. The maximum marks for the laboratory course are 100.
2. All experiments are considered for CIE and SEE.

Eligibility for SEE:

1. 40% and above in CIE (20 marks and above)
2. **Lab test is COMPULSORY**

Scheme of Semester End Examination (SEE):			
1.	It will be conducted for 50 marks of 2/3 hours duration.		
2.	Minimum marks required in SEE to pass: **20 out of 50 marks**		
2.	One or Two experiments to be conducted.		
3.	**Minimum marks required in SEE to pass:** Score should be ≥35% , however overall score of CIE+SEE should be ≥40%.		
4.	Initial write up	(5+5) marks	50 marks
	Conduct of experiments, results and conclusion	(15+5) marks	
	One mark question	10 marks	
	Viva- voce	10 marks	
5.	Viva-voce shall be conducted for individual student and not in a group.		

Rubrics for Lab conduction (CIE 35 marks)				
Assessment Component	**Exemplary = A (Far Exceeds Standard)**	**Above Average = B (Exceeds Standard)**	**Adequate = C (Meets Standard)**	**Inadequate = D (Below Standard)**
1. Conduction of Experiments (15)	Performs all steps accurately with deep insight; excellent data analysis; no supervision required. (13–15)	Minor errors, good understanding; minimal supervision. (10–12)	Basic procedure followed; some errors; needs guidance. (7–9)	Incomplete or incorrect steps; poor understanding; needs constant help. (<7)

2. Viva-Voce (5)	Demonstrates excellent conceptual clarity and critical thinking. (5)	Good understanding with minor gaps in reasoning. (4)	Basic responses with limited understanding. (3)	Inaccurate or incomplete answers. (<3)
3. Journal (5)	Neatly presented, complete, error-free, and insightful observations. (5)	Mostly complete and neat with minor errors. (4)	Journal is basic with some incomplete entries. (3)	Poorly maintained, incomplete or illegible. (<3)
4. Lab Project (10)	Innovative, well-executed, clearly documented with good technical content (9–10)	Good effort with reasonable execution and documentation. (7–8)	Basic project; shows effort but lacks depth. (5–6)	Minimal or no meaningful effort. (<5)
5. Open-Ended Experiment (10)	Excellent initiative; deep exploration beyond standard procedures. (9–10)	Good attempt with moderate originality. (7–8)	Limited exploration; basic understanding shown. (5–6)	No significant effort or originality. (<5)

CO-PO Mapping (Planned)												**CO-PSO Mapping (Planned)**		
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PSO1**	**PSO2**	**PSO3**
1	✓	✓										✓		
2	✓	✓										✓		
3			✓	✓	✓							✓	✓	
4			✓	✓	✓							✓	✓	
5			✓	✓	✓					✓	✓	✓	✓	✓
Tick mark the CO, PO and PSO mapping														

Name & Signature of Faculty members involved in designing the syllabus

1. Prof.Sudha v Salake
2. Prof.Jyoti A

Name & Signature of Faculty members verifying/approving the syllabus

Elements of Aeronautical Engineering Lab

Course Code	**25EAEL107/207**	**Course type**	**PSCL**	**Credits L-T-P**	0 - 0 - 1
Hours/week: L - T- P	0 - 0 - 2			**Total credits**	1
Total Contact Hours	L = 0 Hrs; T = 0 Hrs; P = 20 Hrs Total = 20 Hrs			**CIE Marks**	50
				SEE Marks	50

Course learning objectives	
1.	To Identify and understand the role of aircraft components.
2.	To design and test the performance of a basic glider, water rocket and balloon-powered rocket.
3.	To Demonstrate knowledge of jet engine operations and functions of flight instruments and control surfaces in aircraft motion.
4.	To explore and evaluate the capabilities of a 3D printer in creating accurate, functional prototypes from digital models.
5.	To design and fabricate aircraft components using biodegradable materials, focusing on the construction of airfoils and wing planforms for improved sustainability and performance.

Required Knowledge of : Basic physics and Mathematics

Lab Experiment – I	**Contact Hours = 2 Hours**
Introduction to Aircraft Components To identify and understand the function of the primary components of an aircraft using models.	
Lab Experiment – 2	**Contact Hours = 2 Hours**
Basic Glider or Paper Airplane Design and Performance Test Design, construct, and test a simple glider or paper airplane, and analyze the impact of design changes on flight characteristics such as lift, stability, and range.	
Lab Experiment – 3	**Contact Hours = 2 Hours**
Water - Powered Rocket Design, build and test water rockets to learn about thrust, drag, stability.	
Lab Experiment – 4	**Contact Hours = 2 Hours**
Air - Powered Rocket Design, Build and test balloon rockets to learn about aerodynamics, propulsion and performance.	
Lab Experiment – 5	**Contact Hours = 2 Hours**
Demonstration of Jet Engine Operation and Component Functionality To demonstrate the basic operation of a jet engine (typically a turbojet or turbofan model). To identify major components and understand their functions.	
Lab Experiment – 6	**Contact Hours = 2 Hours**
Demonstration of basic flight instruments and control surfaces using a flight simulator	

To visually demonstrate the basic flight instruments and the effect of primary control surfaces (aileron, elevator, rudder) on aircraft motion using a flight simulator. Hands on experience on flying: Take-off, Level flight, Landing.	
Lab Experiment – 7	**Contact Hours = 2 Hours**
Demonstration of UAV Components and Systems To familiarize students with the main components of a UAV including airframe, propulsion, control systems, sensors, and communication systems.	
Lab Experiment – 8	**Contact Hours = 2 Hours**
3D-Printer Demonstration of Design, Slicing, Printing and Post-Processing.	
Lab Experiment – 9 & 10 (Open ended experiment)	**Contact Hours = 4 Hours**
Fabrication of air craft components by using Bio-Degradable Materials. Exploring eco-friendly alternatives for reduced environmental impact and enhanced sustainability in aviation.	

Books	
	Text Books:
1.	John D. Anderson, "Introduction to Flight", McGraw-Hill Education, 2011. ISBN 9780071086059.
2.	Lalit Gupta and O P Sharma, "Fundamentals of Flight Vol-I to Vol-IV", Himalayan Books, 2006, ISBN-13: 978-8170020974
3.	Michael de Podesta, "A guide to building and understanding the physics of Water Rockets", 2007, National Physical Laboratory(NPL).
4.	Nelson R.C., "Flight stability and automatic control", McGraw-Hill International Editions, 1998. ISBN 9780071158381.
	E-resources (NPTEL/SWAYAM.. Any Other)- mention links
1.	NPTEL: Online Resources: Lecture by: Prof. Rajkumar S. Pant, IIT Bombay https://swayam.gov.in/nd1_noc19_ae05/preview
2.	NPTEL: (Unit III) Online Resources: Lecture by: Prof. Debi Prasad Mishra, IIT Kanpur https://swayam.gov.in/nd1_noc19_ae08/preview
3	NPTEL: Online Resources: Lecture by: Prof. Prof. Sajan Kapil. IIT Guwahati. https://onlinecourses.nptel.ac.in/noc21_me115/preview
4.	NPTEL: Online Resources: Lecture by: Prof. Rajkumar S.Pant.IIT Bombay https://nptel.ac.in/courses/101101083

Course delivery methods		**Assessment methods**	
1.	Practice session/Demonstrations in Labs	1.	Conduction of Experiments
2.	Virtual Labs (if present)	2.	Journal writing
3.	Chalk and Talk	3.	Lab project/ Open ended experiment
4.		4.	Lab Test
5.		5.	Semester End Examination

Course Outcome (COs)

Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create				
At the end of the course, the student will be able to (Highlight the **action verb** representing the learning level.)		**Learning Level**	**PO(s)**	**PSO(s)**
1.	**Identify** and **explain** the major components, systems, and instruments of aircraft, UAVs, and jet engines.	Un	1,2,9	1,2
2.	**Design** and **construct** simple flight models such as paper airplanes, gliders, water rockets, and balloon rockets to illustrate fundamental aerodynamic and propulsion principles.	Ap, Cr	3,4,5,8	1,2
3.	**Operate** flight simulation tools to **analyze** the effects of control surfaces and flight parameters on aircraft motion and stability.	Ap, An	1,4,5	1,2
4.	**Demonstrate** the process of 3D printing and **apply** it for fabricating aircraft components with conventional and biodegradable materials.	Ap	3,5,6,10	2,3
5.	**Evaluate** the performance, sustainability, and optimization of various aerospace components and experimental models through testing and analysis.	Ev	4,6,10,11	1,2,3

Scheme of Continuous Internal Evaluation (CIE):

Conduction of experiments (15) & viva-voce (5)	**Journal**	**Open ended expt/Lab project**	**Lab Test**	**Total**
20 marks	5 marks	10 marks	15	50 marks

Conduct of Lab:

1. Conduction of the experiment: 15 marks + Viva voce: 5 marks
2. Calculations, results, graph, conclusion and Outcome recorded in Journal: 5 marks
3. Open ended expt/Lab project: 10 marks
4. Open-ended experiments are a type of laboratory activity where the outcome is not predetermined, & students are given the freedom to explore, design & conduct the experiment based on the problem statements as per the concepts defined by the course coordinator.
5. Lab Test: 15 marks

Note:

1. The laboratory syllabus consists of 7-9 regular/conventional experiments and 3 open-ended experiments. The maximum marks for the laboratory course are 100.
2. All experiments are considered for CIE and SEE.

Eligibility for SEE:

1. 40% and above in CIE (20 marks and above)
2. **Lab test is COMPULSORY**

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 50 marks of 2/3 hours' duration.
2.	Minimum marks required in SEE to pass: **20 out of 50 marks**
2.	One or Two experiments to be conducted.

3.	**Minimum marks required in SEE to pass:** Score should be ≥35% , however overall score of CIE+SEE should be ≥40%.		
4.	Initial write up	10 marks	50 marks
	Conduct of experiments, results and conclusion	20 marks	
	One mark question	10 marks	
	Viva- voce	10 marks	
5.	Viva-voce shall be conducted for individual student and not in a group.		

Rubrics for Lab conduction (CIE 35 marks)				
Assessment Component	**Exemplary = A (Far Exceeds Standard)**	**Above Average = B (Exceeds Standard)**	**Adequate = C (Meets Standard)**	**Inadequate = D (Below Standard)**
1. Conduction of Experiments (15)	Performs all steps accurately with deep insight; excellent data analysis; no supervision required. (13–15)	Minor errors, good understanding; minimal supervision. (10–12)	Basic procedure followed; some errors; needs guidance. (7–9)	Incomplete or incorrect steps; poor understanding; needs constant help. (<7)
2. Viva-Voce (5)	Demonstrates excellent conceptual clarity and critical thinking. (5)	Good understanding with minor gaps in reasoning. (4)	Basic responses with limited understanding. (3)	Inaccurate or incomplete answers. (<3)
3. Journal (5)	Neatly presented, complete, error-free, and insightful observations. (5)	Mostly complete and neat with minor errors. (4)	Journal is basic with some incomplete entries. (3)	Poorly maintained, incomplete or illegible. (<3)
4. Lab Project (10)	Innovative, well-executed, clearly documented with good technical content (9–10)	Good effort with reasonable execution and documentation. (7–8)	Basic project; shows effort but lacks depth. (5–6)	Minimal or no meaningful effort. (<5)
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CO-PO Mapping (Planned)	**CO-PSO Mapping (Planned)**

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO1	PSO2	PSO3
1	√	√							√			√	√	
2			√	√	√			√				√	√	
3	√			√	√							√	√	
4			√		√	√				√			√	√
5				√		√				√	√	√	√	√
Tick mark the CO, PO and PSO mapping														

Prof. Mukta Magadum
Name & Signature of Faculty members
involved in designing the syllabus

Dr. R. Sundaramoorthy, Prof. I V Patil
Name & Signature of Faculty members
verifying/approving the syllabus

Humanities Courses I & II Semester

INDEX

SOFT SKILLS

Course Code	1BSKS106	**Course type**	NCMC	**Credits L-T-P**	1 – 0 - 0
Hours/week: L - T- P	1-0-0			**Total credits**	PP
Total Contact Hours	L = 15 Hrs; T = 0 Hrs; P = 0 Hrs Total = 15 Hrs			**CIE Marks**	100
Flipped Classes content	1 Hour			**SEE Marks**	--

Course learning objectives	
1.	To promote effective communication, collaboration and self-management.
2.	To develop essential life skills or soft skills for academic and professional success.
3.	Demonstrate discipline, time management, and structured problem-solving.
4.	Work in teams, negotiate, resolve conflicts, and think critically, adopt ethical decision-making.

Pre-requisites :

1. Conversant [familiar] with rudimentary of English Grammar.
2. Ability to understand spoken English or to speak, read, and write/frame simple and grammatically correct sentences in English.

Unit – I	Communication and Interpersonal Skills	**Contact Hours = 3 Hours**
Content of the Unit: Communication, Importance, Types: Verbal, non-verbal, and barriers to communication, Interpersonal skills and why they matter?. **Activities**: Listening games, group interaction.		

Unit – II	Self-Awareness and Empathy	**Contact Hours = 3 Hours**
Content of the Unit: Self-awareness: Importance in personal growth and career development, Types of self-awareness (internal vs. external), Self-concept, personality, strengths, values, learning styles, **Empathy**: What, types (cognitive, emotional), and its importance, tools for introspection and self-assessment. **Activities**: Self-assessment, peer-sharing, empathy mapping.		

Unit – III	Critical and Creative Thinking	**Contact Hours = 3 Hours**
Content of the Unit: What is thinking?, Importance and innovation, Types: Critical vs. creative thinking Elements of critical thinking: logic, reasoning, analysis, **Creative processes**: brainstorming, lateral thinking, design thinking, Advantages in innovation, conflict resolution, and decision-making, **Activities**: Group puzzles and idea generation tasks.		

Unit – IV	Decision Making and Problem Solving	**Contact Hours = 3 Hours**
Content of the Unit: Decision-making: The ability to analyze, evaluate, and synthesize information to make well-reasoned decisions. Types: Individual, group, ethical, impulsive, strategic Models: PMI, SWOT, Decision Trees, **Problem-solving**: Identifying root causes, analysing options, and implementing solutions, steps involved- using methods like 5 Whys and Fishbone Diagram. Strategies to resolve differences and reach win– win outcomes.**Activities**: Ethical dilemmas and decision games.		

Unit – V	Coping with Emotions and Stress	Contact Hours = 3 Hours
Content of the Unit: What are emotions and stress? **Stress Management:** Identifying stress triggers, relaxation techniques and work-life balance strategies, Types of emotions, stress (eustress, distress), **Emotional Intelligence (EI):** Recognizing and managing emotions, empathy, relationship management, and conflict resolution. **Activities**: Mindfulness practice, guided journaling and group support.		

Flipped Classroom Details

Unit No.	I	II	III	IV	V
No. for Flipped Classroom Sessions	**	**	**	**	1

Unit No.	Self-Study Topics
1	Principles of clear and effective exchange of ideas in professional and social contexts.
2	Advantages of empathy and self-awareness in workplace and personal life.
3	Advantages in innovation and conflict resolution. Applications in academic, personal, and social contexts.
4	Role in managing real-life and workplace challenges.
5	Time Management**:** Prioritization (Eisenhower Matrix), setting SMART goals, avoiding procrastination, and effective scheduling.

Books	
	Text Books:
1.	Soft Skills, 1e, By Soma Mahesh Kumar © 2024 | Published: June 8, 2023
2.	Effective Technical Communication, 3e, By Ashraf M. Rizvi, Priyadarshi Patnaik, © 2024 | Published: September 12, 2024
3..	**Communication Skills** by Sanjay Kumar & Pushpa Lata, Oxford University Press India Pvt Ltd - 2019.
	Reference Books:
1.	WHO Life Skills Education – Training Modules
2.	Emotional Intelligence by Daniel Goleman
3.	The seven Habits of Highly Effective People by Stephen R. Covey
	E-resources (NPTEL/SWAYAM..)
1.	Curated TED Talks and case material
2.	AI Tools: ChatGPT, Orai, Pymetrics, Woebot, Grammarly, Miro, Lucidchart,
3.	British Council Apps : **bbcLearnEnglishonline** Grammar LearnEnglish Podcasts, IELTS Word Power Bbclearningenglishgrammer online Sounds Right (Phonemic Chart)
4.	Google Docs + Voice Typing - https://docs.google.com LearnEnglish – https://learnenglish.britishcouncil.org/ TakeIELTS - https://www.britishcouncil.in/exam/ielts

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Assignment/ OBA
3.	Flipped Classes	3.	Course Project
4.	Online classes/ Language Lab	4.	Learnenglish.british Council/ Quicklrn.com

Course Outcome (COs) **Learning Levels:** Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create				
At the end of the course, the student will be able to (Highlight the **action verb** representing the learning level.)		**Learning Level**	**PO(s)**	**PSO(s)**
1.	Express themselves effectively using verbal and non-verbal communication skills and develop healthy interpersonal relationships.	L1 (Re)	10	
2.	Understand and Reflect on their values, emotions, and strengths through increased self-awareness	L2 (Un)	10	
3.	Apply critically and creatively thinking skills, while engaged in problem-solving situations	L3 (AP)	10	
4.	Analyze and make responsible decisions applying decision making models, evaluate ethnically and practically in all settings.	L3(AL)	10	
5.	Identify and Manage stressors and regulate emotions, apply time and stress management techniques and effective strategies.	L3 (Ap)	10	

Scheme of Continuous Internal Evaluation (CIE):

Components	**Addition of two IA tests**	**Two Assignments – (Open OBA, etc)**	**Course project (CP)/ Case study etc**	**Total Marks**
Marks	30+30 = 60	10 + 10 = 20	20 marks (with report or/and presentation)	100

IA Test:

1. Two IAs , 30 marks MCQs questions paper, each question carries one mark.
2. Remaining 40 marks CIE includes two assignments and Project or/and Case study [20+20=40]

-Certification earned by passing the standard Online MOOCs course /exams with beining and finishing reports can be considered as a Course activity and awarded maximum of 10 marks.

Eligibility for PP:

-Lack of minimum score in IA test will make the student Not Eligible/ NP.

-Minimum score in CIE to be pass/PP is 40 OUT OF 100 in CIE tests.

Scheme of Semester End Examination (SEE): NOT APPLICABLE

Assignment (10 marks)				
Rubric/Level	**Exemplary=A (Far Exceeds Standard)**	**Above Average=B (Exceeds Standard)**	**Adequate= C (Meets Standard)**	**Inadequate= D (Below Standard)**
Technical Content (8 marks)	Comprehensive, accurate, in-depth understanding; shows original thinking and mastery of concepts. (7-8)	Mostly accurate, good understanding, minor gaps; shows good application of concepts. (5-6)	Basic coverage, some understanding, lacks depth or clarity. (3-4)	Incomplete, inaccurate, poor understanding; shows little effort. (1-2)
Results & learning Outcome (2 marks)	Clear, correct results with excellent insights and reflection on learning. (2)	Mostly correct results; good understanding of learning outcomes. (1.5)	Basic results; limited insights or superficial learning. (1)	Incorrect or missing results; no evident learning. (0.5)

Course Project (20 marks)				
Rubric/Level	**Exemplary=A (Far Exceeds Standard)**	**Above Average=B (Exceeds Standard)**	**Adequate= C (Meets Standard)**	**Inadequate =D (Below Standard)**
Innovative Idea (2 Marks)	Highly original, creative, and impactful idea (2)	Original idea with moderate creativity (1.5)	Common idea with minor innovation (1)	Unoriginal or poorly thought-out idea (0.5)
Work Plan/methodology (2 Marks)	Clear, logical, and detailed work plan with effective methodology (2)	Mostly clear and practical plan with some details (1.5)	Basic plan; lacks clarity or depth (1)	Poor or vague plan and methodology (0.5)
Work content/Use of Technology (10 Marks)	Comprehensive, technically sound; advanced and appropriate use of technology (10-9)	Good technical depth; reasonable use of technology (8-7)	Adequate work; technology used with limitations (6-4)	Superficial or minimal work; poor use of technology (3-1)
Project Presentation (2 Marks)	Clear, engaging, confident delivery; excellent visuals (2)	Clear and coherent; good use of visuals (1.5)	Understandable but lacks engagement or clarity (1)	Disorganized or hard to follow (0.5)
Individual Contribution (2 Marks)	Fully engaged and contributed significantly to all aspects (2)	Active contribution with few gaps (1.5)	Some participation; effort uneven (1)	Minimal or unclear contribution (0.5)
Report (2 Marks)	Well-structured, detailed, no errors; excellent formatting (2)	Mostly well-written with minor issues (1.5)	Adequate but with some errors (1)	Poorly written; lacks structure (0.5)

CO-PO Mapping (Planned)												**CO-PSO Mapping (Planned)**		
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PSO1**	**PSO2**	**PSO3**
1							**√**	**√**	**√**					
2							**√**	**√**	**√**					
3							**√**	**√**	**√**					
4							**√**	**√**	**√**					
5							**√**	**√**	**√**					

Tick mark the CO, PO and PSO mapping			

Name & Signature of Faculty members involved in designing the syllabus

Name & Signature of Faculty members Verifying/approving the syllabus

Communication Skills

Course Code	1BENG206	**Course type**	Theory	**Credits L-T-P**	1– 0 - 1
Hours/week: L - T- P	1 – 0 – 1			**Total credits**	1
Total Contact Hours	L = 15 Hrs; T = 0 Hrs P = 1 Hrs Total = 15+1=16 Hrs/ per week			**CIE Marks**	50
Flipped Classes content	1 Hour			**SEE Marks**	50

Course learning objectives	
1.	Understand Core Communication Principles and build essential verbal communication skills for clarity and effectiveness.
2.	Achieve Phonetic and Pronunciation Accuracy
3.	Apply formal writing, email etiquette, and creative content development for employability.
4.	Enhance Professional Listening, Reading, and Grammar Use
5.	Apply Non-Verbal Communication Techniques

Pre-requisites :

1. Conversant [familiar] with rudimentary of English Grammar.
2. Ability to understand spoken English or to speak, read, and write/frame simple and grammatically correct sentences in English.

Unit – I	**Introduction to Communicative Skills**	**Contact Hours = 3 Hours**
Content of the Unit: Process of Communication, Barriers to Effective Communication, Different styles and levels in Communication. Interpersonal and Intrapersonal Communication. **AI Tools: Peerup App, Orai, Chatgpt and** Quillbot to analyze and classify parts of speech. AI-based pronunciation tools (Google Speech-to-Text) for real-time feedback		

Unit – II	**Introduction to Phonetics**	**Contact Hours = 3 Hours**
Content of the Unit: Basic pronunciation Guidelines to consonants & vowels, Syllables structure, Phonetic Transcription, syllables types, Stress types. **AI Tools: Speak and Improve.com and Loora.**		

Unit – III	**Nature and Style of sensible writing and Grammar**	**Contact Hours = 3 Hours**
Content of the Unit: Parts of paragraph, Transitional words/phrases, Cohesion and Coherence in writing. Grammar: Word Classification and Vocabulary. **AI Tools: Chatgpt and** Google Meet / Zoom + AI Transcription- Practice group discussions with live transcription. **Grammarly** - Highlights grammar issues with explanations. **Oxford Learner's Dictionaries :** https://www.oxfordlearnersdictionaries.com/) - Includes etymology, pronunciation, antonyms.		

Unit – IV	**Professional Communication for Employment & Grammar**	**Contact Hours = 3 Hours**
Content of the Unit: Types of Listening, Listening Barriers. Reading Comprehension, techniques, barriers and strategies. one Word substitute, Question tags, Articles and tenses. **AI Tools: Grammarly and Chatgpt**		

Unit – V	Non Verbal Communication	Contact Hours = 3 Hours
Content of the Unit: NVC Types- Kinesics, eye contact, personal appearance, gesture, posture, facial expressions, Haptics, Proxemics, chronomics, Paralanguage. Mock Interview, Telephone Interviews. **AI Tools: Empathic app.** Listening to professional talks, analyzing tone and structure - https://www.ted.com/talks Non-verbal cues in professional reading - https://www.youtube.com/c/Mindsight Grammar AI practice - https://quillbot.com/grammar-check		

Flipped Classroom Details

Unit No.	I	II	III	IV	V
No. for Flipped Classroom Sessions	**	**	**	**	1

Unit No.	Self-Study Topics
1	Communicative English fundamentals and Importance.
2	Intonation and Silent Letters
3	Principles of Paragraphs in Documents
4	Improving Listening Skills.
5	**NVC** role in personal and professional life

Books	
	Text Books:
1.	**Communication Skills** by Sanjay Kumar & Pushpa Lata, Oxford University Press India Pvt Ltd - 2019.
2.	**A Textbook of English Language Communication Skills** (ISBN-978-81-955465-2-7), Published by InfiniteLearning Solutions, Bengaluru - 2022.
3.	Yadav, D. P. (2022). *A course in English pronunciation*. Notion Publications.
	Reference Books:
1.	**Technical Communication** by Gajendra Singh Chauhan Et al (ISBN-978-93-5350-050-4), Cengage Learning India Pvt Limited [Latest Revised Edition] - 2019.
2.	**English for Engineers** by N.P. Sudarshan and C. Savitha, Cambridge University Press – 2018.
	E-resources (NPTEL/SWAYAM.. Any Other)- mention links
1.	ALL 44 sounds of English in 75 minutes https://www.youtube.com/watch?v=QxQUapA-2w4&t=51s.
2.	Google Docs + Voice Typing - https://docs.google.com LearnEnglish – https://learnenglish.britishcouncil.org/ TakeIELTS - https://www.britishcouncil.in/exam/ielts British Council Apps -bbcLearnEnglishonline Grammar, LearnEnglish Podcasts IELTS Word Power Bbclearningenglishgrammer online Sounds Right (Phonemic Chart)
3.	**SpeakEasy** – conversational AI chatbot that provides spoken interaction and metrics-based feedback on fluency, pacing, and naturalness arXiv. **Poised** – AI-powered coach for online communication with real-time feedback on clarity and delivery

4.	**Yoodli** – AI speech coach offering analysis of eye contact, speech pace, repetition, and delivery in video presentations Axios. **Virti** – immersive, AI-powered role-play simulations to practice non-verbal responses and scenarios

Course delivery methods		**Assessment methods**	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Assignment- Open/Industry/Certification
3.	Flipped Classes	3.	Course Project
4.	Online classes	4.	Semester End Examination

Course Outcome (COs)

Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create

At the end of the course, the student will be able to (Highlight the **action verb** representing the learning level.)		**Learning Level**	**PO(s)**	**PSO(s)**
1.	Understand and articulate the fundamentals of communicative English	L1 (Re)	10	
2.	Accurately transcribe and pronounce English words	L2 (Un)	10	
3.	Construct coherent written documents using principles of effective paragraph structure	L3 (Ap)	10	
4.	Develop strategies for effective listening and reading Skills	L3 (Ap)	10	
5.	Recognize the significance of non-verbal communication in both personal and professional interactions.	L3 (Ap)	10	

Scheme of Continuous Internal Evaluation (CIE):

Components	**Addition of two IA tests**	**Two Assignments – (Open /Industry/Certification**	**Course project (CP)/ Case study**	**Total Marks**
Marks	30+30 = 60	10 + 10 = 20	10+10=20 marks (with report & presentation **using AI Tools**)	100

IA Test:

1. Two IAs, 30 marks MCQs questions paper, each question carries one mark.
2. Remaining 40 marks CIE includes two assignments and Project or/and Case study [20+20=40]

-Certification earned by passing the standard Online MOOCs course can be considered as a Course activity and awarded maximum of 10 marks.

Eligibility for SEE:

-Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests.

-Lack of minimum score in IA test will make the student Not Eligible for SEE.

-Minimum score in CIE to be eligible for SEE: 40 OUT OF 100.

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 50 marks of 1 hours duration.

2.	**Minimum marks required in SEE to pass:** Score should be ≥ 35%, however overall score of CIE + SEE should be ≥ 40%.
3.	Question paper contains 50 MCQs questions paper, each question carries one mark.

Assignment (10 marks)				
Rubric/Level	**Exemplary=A (Far Exceeds Standard)**	**Above Average=B (Exceeds Standard)**	**Adequate= C (Meets Standard)**	**Inadequate= D (Below Standard)**
Technical Content (8 marks)	Comprehensive, accurate, in-depth understanding; shows original thinking and mastery of concepts. (7-8)	Mostly accurate, good understanding, minor gaps; shows good application of concepts. (5-6)	Basic coverage, some understanding, lacks depth or clarity. (3-4)	Incomplete, inaccurate, poor understanding; shows little effort. (1-2)
Results & learning Outcome (2 marks)	Clear, correct results with excellent insights and reflection on learning. (2)	Mostly correct results; good understanding of learning outcomes. (1.5)	Basic results; limited insights or superficial learning. (1)	Incorrect or missing results; no evident learning. (0.5)

Course Project (20 marks)				
Rubric/Level	**Exemplary=A (Far Exceeds Standard)**	**Above Average=B (Exceeds Standard)**	**Adequate= C (Meets Standard)**	**Inadequate =D (Below Standard)**
Innovative Idea (2 Marks)	Highly original, creative, and impactful idea (2)	Original idea with moderate creativity (1.5)	Common idea with minor innovation (1)	Unoriginal or poorly thought-out idea (0.5)
Work Plan/methodology (2 Marks)	Clear, logical, and detailed work plan with effective methodology (2)	Mostly clear and practical plan with some details (1.5)	Basic plan; lacks clarity or depth (1)	Poor or vague plan and methodology (0.5)
Work content/Use of Technology (10 Marks)	Comprehensive, technically sound; advanced and appropriate use of technology (10-9)	Good technical depth; reasonable use of technology (8-7)	Adequate work; technology used with limitations (6-4)	Superficial or minimal work; poor use of technology (3-1)
Project Presentation (2 Marks)	Clear, engaging, confident delivery; excellent visuals (2)	Clear and coherent; good use of visuals (1.5)	Understandable but lacks engagement or clarity (1)	Disorganized or hard to follow (0.5)
Individual Contribution (2 Marks)	Fully engaged and contributed significantly to all aspects (2)	Active contribution with few gaps (1.5)	Some participation; effort uneven (1)	Minimal or unclear contribution (0.5)
Report (2 Marks)	Well-structured, detailed, no errors; excellent formatting (2)	Mostly well-written with minor issues (1.5)	Adequate but with some errors (1)	Poorly written; lacks structure (0.5)

CO-PO Mapping (Planned)												**CO-PSO Mapping (Planned)**		
CO	**PO**	**PO**	**PO**	**PO**	**PO**	**PO**	**PO**	**PO**	**PO**	**PO**	**PO**	**PSO1**	**PSO2**	**PSO3**

	1	2	3	4	5	6	7	8	9	10	11			
1										**√**				
2										**√**				
3										**√**				
4										**√**				
5										**√**				
Tick mark the CO, PO and PSO mapping														

Signature of Faculty members involved in designing the syllabus

Name & Signature of Faculty members verifying/approving the syllabus

Indian Constitution & Engineering Ethics

Course Code	**1B ICO107/207**	**Course type**	**NCMC**	**Credits L-T-P**	**0-0-0**
Hours/week: L - T- P	**1-0-0**			**Total credits**	**--**
Total Contact Hours	**L = 15 Hrs; T = 0 Hrs; P = 0 Hrs Total = 15 Hrs.**			**CIE Marks**	**100**
Flipped Classes content	**(3) - Hours**			**SEE Marks**	**--**

Course Learning Objectives	
1.	**To understand the evolution and foundational philosophy of the Indian Constitution.**
2.	**To explore the relevance of the Constitution in contemporary Indian society**
3.	**To study the structure of Indian governance: legislative, executive, and judiciary**
4.	**To understand the rights and duties of citizens in a constitutional democracy.**
5.	**To understand professional responsibilities and ethics that are part of constitutional duties**

Pre-requisites: English language & domain terminologies, Basic knowledge of social studies

Unit – I : Constitutional Foundations	**Contact Hours = 3 Hours**
• **Why Constitution is necessary in modern nation-states** • **Indian society before and after Constitution** • **Making of the Constitution: Constituent Assembly, historical context** • **Preamble: Keywords and their interpretation** • **Indian Constitution Document Structure: Parts, Chapters, Articles and Schedules**	

Unit – II : Rights, Duties & Values in the Constitution	**Contact Hours = 3 Hours**
• **Fundamental Rights: Scope, Restrictions, Landmark Judgments (e.g., Right to Privacy)** • **Directive Principles of State Policy (DPSP): Relevance today** • **Fundamental Duties: Scope, need, and modern challenges** • **Interrelation between FRs, DPSPs, and Duties**	

Unit – III : Govt. Structure, Electoral Democracy & Executive	**Contact Hours = 3 Hours**
• **Parliament: Lok Sabha, Rajya Sabha, Committees, and procedures** • **Election Commission, Electoral Process, EVMs and use of technology in elections** • **Union Executive: President, Prime Minister, Council of Ministers** • **State Executive: Governor, Chief Minister, State Cabinet** • **Role of civil services in constitutional governance**	

Unit – IV : Legislature, Judiciary	**Contact Hours = 3 Hours**
• **Union & State Legislatures: Composition, powers, procedures** • **Judicial Structure: Supreme Court, High Courts, Tribunals** • **Judicial Review, Judicial Activism, Public Interest Litigation (PIL)** • **Rule of Law, Separation of Powers** • **Recent Court Judgments impacting Indian society**	

Unit – V : Professional & Engineering Ethics	Contact Hours = 3 Hours
• Engineering as a profession & Professional ethics (Indian Constitution: Part III FRs, IV DPSP & IVA FDs) • Data privacy, Risks, Safety, Reliability in engineering practice. • Formal ethical guidelines by professional engineering bodies IEEE, ASME and IEI India • Ethical dilemmas: Conflicts of interests & Engineers responsibility	

Flipped Class Sessions

Unit No.	Details
I	Discussion on Constituent Assembly / related videos display/ Preamble: Major aspects, important terms in constitution formation
II	Key objectives of DPSP as defined in Indian Constitution
III	A talk on Electoral Process, EVMs and use of technology in elections
IV	Recent / popular Court Judgments in the interest social community / impacting Indian society
V	Discussion on specific Constitution Amendment / Case Study on Emergency / Election Reforms.

Unit No.	Self-Study Topics
Unit II	Comparative study of Fundamental Rights & Fundamental Duties
Unit III	Structure & functions of Parliamentary Committees & major constitutional amendments
Unit IV	Meaning & procedures of Public Interest Litigation (PIL) in India
Unit V	Contemporary ethical issues towards Data privacy, AI & sustainable development.

Books & Other Resources:	
TEXT BOOKS:	
1.	'Introduction to the Constitution of India' Durga Das Basu, LexisNexis 25th Edition 2023
2.	'Engineering Ethics & Human Values' M.Govindarajan, S.Natarajan, V.S.Senthilkumar, PHI 2004
REFERENCE BOOKS:	
1.	'Our Constitution' Subhash Kashyap, National Book Trust (NBT) India, 5th Edition 2024
2.	'We, the People' Nani Palkhivala, Rupa Publications India Pvt. Ltd.1984
3.	'Samvidhana Odu' - for Students & Youths, Justice H N Nagamohan Das, Jana Prakashana 2019
E-RESOURCES (NPTEL/SWAYAM/Any Other)	
1.	https://legislative.gov.in/constitution-of-india/
2.	https://indiankanoon.org/
3.	https://archive.nptel.ac.in/courses/129/106/129106002/

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	2 IA tests-each on specific syllabus units
2.	PPTs & Interactive Videos	2.	Assignments /Case Study & Analysis, reports
3.	Flipped Classes	3.	Course Project on any key Constitution topic
4.	Group Discussion	4.	Online Quizzes (Surprise and Scheduled)
			**No Semester End Examination

Course Outcome (COs) Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create				
At the end of the course, the student will be able to (Highlight the action verb representing the learning level.)		Learning Level	PO(s)	PSO(s)
1.	Explain the historical background and structure of the Constitution.	Un	6,8,9	3
2.	Apply constitutional principles to real-life civic or technological scenarios	Ap	6,8	3
3.	Apply key concepts like Fundamental Rights, Duties, and DPSPs.	Un, Ap	6,8	3
4.	Understand government functioning as per constitutional provisions.	Un	6,8,9	3
5.	Apply ethical principles to engineering practice and professional responsibilities.	Ap	7	3

Scheme of Continuous Internal Evaluation (CIE):				
Components	Addition of two IA Tests	2-Assignments (open book/ Industry /Certification etc.)	Course project (CP) / Case study etc.	Total Marks
Marks	30+30 = 60	10 + 10 = 20	20 marks (with Report & Presentation)	100

1. Each IA Test consists of thirty objective type (MCQ) questions, which are compulsory and carry 1 mark each for the total 30 marks.
2. Students must use the OMR sheet to answer the questions by clearly marking or shading the circle corresponding to the correct option from the given choices.
3. Question papers should also include an OBE related question (max 2 marks).
4. MOOCs Certification earned by passing the standard Online course (1 course of at least 8 hours defined by BOS) can be considered as a Course activity and awarded maximum of 10 marks.

Semester End Course Evaluation:	
1.	As an Ability Enhancement Course (AEC) offered in the 1st semester, this is a No-Credit Mandatory Course (NCMC). There will be no Semester End Examination (SEE); the performance of students will be assessed solely on the basis of TOTAL marks obtained in the Continuous Internal Evaluation (CIE).
2.	Minimum marks required to pass: Score should be $\geq$ 24 in IA Tests and overall score of CIE / SEE should be $\geq$ 40%.

Assignment (10 marks)				
Rubric/Level	Exemplary=A (Far Exceeds Standard)	Above Average=B (Exceeds Standard)	Adequate= (Meets Standard)	Inadequate= D (Below Standard)
Technical Content (8 marks)	Comprehensive, accurate, in-depth understanding; shows original thinking and mastery of concepts. (7-8)	Mostly accurate, good understanding, minor gaps; shows good application of concepts. (5-6)	Basic coverage, some understanding, lacks depth or clarity. (3-4)	Incomplete, inaccurate, poor understanding; shows little effort. (1-2)
Results & learning Outcome (2 marks)	Clear, correct results with excellent insights and reflection on learning. (2)	Mostly correct results; good understanding of learning outcomes. (1.5)	Basic results; limited insights/ superficial learning. (1)	Incorrect or missing results; no evident learning. (0.5)

Course Project (20 marks)				
Rubric/Level	**Exemplary=A (Far Exceeds Standard)**	**Above Average=B (Exceeds Standard)**	**Adequate=C (Meets Standard)**	**Inadequate =D (Below Standard)**
Innovative Idea (2 Marks)	**Highly original, creative, and impactful idea (2)**	**Original idea with moderate creativity (1.5)**	**Common idea with minor innovation (1)**	**Unoriginal or poorly thought-out idea (0.5)**
Work Plan/methodology (2 Marks)	**Clear, logical, and detailed work plan with effective methodology (2)**	**Mostly clear and practical plan with some details (1.5)**	**Basic plan; lacks clarity or depth (1)**	**Poor or vague plan and methodology (0.5)**
Work content/Use of Technology (10 Marks)	**Comprehensive, technically sound; advanced and appropriate use of technology (10-9)**	**Good technical depth; reasonable use of technology (8-7)**	**Adequate work; technology used with limitations (6-4)**	**Superficial or minimal work; poor use of technology (3-1)**
Project Presentation (2 Marks)	**Clear, engaging, confident delivery; excellent visuals (2)**	**Clear and coherent; good use of visuals (1.5)**	**Understandable but lacks engagement or clarity (1)**	**Disorganized or hard to follow (0.5)**
Individual Contribution (2 Marks)	**Fully engaged and contributed significantly to all aspects (2)**	**Active contribution with few gaps (1.5)**	**Some participation; effort uneven (1)**	**Minimal or unclear contribution (0.5)**
Report (2 Marks)	**Well-structured, detailed, no errors; excellent formatting (2)**	**Mostly well-written with minor issues (1.5)**	**Adequate but with some errors (1)**	**Poorly written; lacks structure (0.5)**

CO-PO Mapping (Planned)												CO-PSO Mapping (Planned)		
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO 10**	**PO 11**	**PSO1**	**PSO2**	**PSO3**
1						✓		✓	✓					✓
2						✓		✓						✓
3						✓		✓						✓
4						✓		✓	✓					✓
5							✓							✓
****Tick mark the CO, PO and PSO mapping**														

Sudhindra K Madi
Name & Signature of Faculty members involved in designing the syllabus

S K Madi P.S.Upparamani
Name & Signature of Faculty members verifying/approving the syllabus

Samskrutika Kannada
ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ

Course Code	1BKSK109(BKSK107)	Course type	Theory	**Credits L-T-P**	1-0-0
Hours/week: L - T- P	1-0-0			**Total credits**	1
Total Contact Hours	L = 15 Hrs			**CIE Marks**	50
				SEE Marks	50

Course learning objectives : : ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ ಪಠ್ಯ ಕಲಿಕೆಯ ಉದ್ದೇಶಗಳು :	
1.	ಪದವಿ ವಿದ್ಯಾರ್ಥಿಗಳಾಗಿರುವುದರಿಂದ ಕನ್ನಡ ಭಾಷೆ, ಸಾಹಿತ್ಯ ಮತ್ತು ಸಂಸ್ಕೃತಿಯ ಪರಿಚಯ ಮಾಡಿಕೊಳ್ಳುವುದು.
2.	ಕನ್ನಡ ಸಾಹಿತ್ಯದ ಪ್ರಧಾನ ಭಾಗವಾದ ಆಧುನಿಕಪೂರ್ವ ಮತ್ತು ಆಧುನಿಕ ಕಾವ್ಯಗಳನ್ನು ಪರಿಚಯಿಸುವುದು.
3.	ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ಸಾಹಿತ್ಯ, ಮತ್ತು ಸಂಸ್ಕೃತಿಯ ಬಗ್ಗೆ ಅರಿವು ಹಾಗೂ ಆಸಕ್ತಿಯನ್ನು ಮೂಡಿಸುವುದು.
4.	ತಾಂತ್ರಿಕ ವ್ಯಕ್ತಿಗಳ ಪರಿಚಯವನ್ನು ಹಾಗೂ ಅವರುಗಳ ಸಾಧಿಸಿದ ವಿಷಯಗಳನ್ನು ಪರಿಚಯಿಸುವುದು.
5.	ಸಾಂಸ್ಕೃತಿಕ, ಜನಪದ ಹಾಗೂ ಪ್ರವಾಸ ಕಥನಗಳ ಪರಿಚಯ ಮಾಡಿಕೊಳ್ಳುವುದು.

Pre-requisites : Good understanding of Kannada, Fluency in Kannada language

Unit – I ಘಟಕ-1 ಕನ್ನಡ ಸಂಸ್ಕೃತಿ ಮತ್ತು ಭಾಷೆ ಕುರಿತಾದ ಲೇಖನಗಳು	**Contact Hours = 3 Hours**
1. ಕರ್ನಾಟಕ ಸಂಸ್ಕೃತಿ : ಪಂಪ ನಾಗರಾಜಯ್ಯ	
2. ಕರ್ನಾಟಕದ ಏಕೀಕರಣ: ಒಂದು ಅಪೂರ್ವ ಚರಿತ್ರೆ – ಜೆ. ವೆಂಕಟಸುಬ್ಬಯ್ಯ	
3. ಆಡಳಿತ ಭಾಷೆಯಾಗಿ ಕನ್ನಡ – ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ ಮತ್ತು ಪ್ರೋ. ವಿ. ಕೇಶವಮೂರ್ತಿ	

Unit – II ಆಧುನಿಕ ಪೂರ್ವದ ಕಾವ್ಯಭಾಗ	**Contact Hours = 3 Hours**
1. ವಚನಗಳು : ಬಸವಣ್ಣ, ಅಕ್ಕಮಹಾದೇವಿ, ಅಲ್ಲಮಪ್ರಭು, ಆಯ್ದಕ್ಕಿ ಮಾರಯ್ಯ, ಜೇಡರದಾಸಿಮಯ್ಯ , ಆಯ್ದಕ್ಕಿ ಲಕ್ಕಮ್ಮ	
2. ಜನಪದ ಗೀತೆ : ಜಾಲಿಯ ಮರದಂತೆ	
3. ತಲ್ಲಣಿಸದಿರು ಕಂಡ್ಯ ತಾಳು ಮನವೇ – ಕನಕದಾಸರು	
4. ನಾಬರಿ ಭ್ರೂಣವಲ್ಲ: ಮಾಲತಿ ಪಟ್ಟಣಶೆಟ್ಟಿ	

Unit – III ಆಧುನಿಕ ಕಾವ್ಯಭಾಗ	**Contact Hours = 3 Hours**
1. ಡಿವಿಜಿ ರವರ ಮಂಕುತಿಮ್ಮನ ಕಗ್ಗದಿಂದ ಆಯ್ದ ಕೆಲವು ಭಾಗಗಳು	
2. ಕುರುಡು ಕಾಂಚಾಣ : ದ. ರಾ. ಬೇಂದ್ರೆ	
3. ಹೊಸಬಾಳಿನ ಗೀತೆ : ಕುವೆಂಪು	

Unit – IV ತಾಂತ್ರಿಕ ವ್ಯಕ್ತಿಗಳ ಪರಿಚಯ	**Contact Hours = 3 Hours**
1. ಡಾ. ಸರ್. ಎಂ. ವಿಶ್ವೇಶ್ವರಯ್ಯ : ವ್ಯಕ್ತಿ ಮತ್ತು ಐತಿಹ್ಯ – ಎ. ಎನ್. ಮೂರ್ತಿರಾವ್	
2. ಬದುಕನ್ನು ಪ್ರೀತಿಸಿದ ಸಂತ: ಎಚ್. ಆರ್. ರಾಮಕೃಷ್ಣ ರಾವ	

Unit – V ಸಾಂಸ್ಕೃತಿಕ , ಜನಪದ ಕಥೆ ಮತ್ತು ಪ್ರವಾಸ ಕಥನ	**Contact Hours = 3 Hours**
1.ಯುಗಾದಿ : ವಸುಧೇಂದ್ರ	
2. ಮೆಗಾನೆ ಎಂಬ ಗಿರಿಜನ ಪರ್ವತ : ಹಿ. ಚಿ. ಬೋರಲಿಂಗಯ್ಯ	

Books	
	Text Books:
1.	**ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ,** ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ್, Visvesvaraya Technological University, Belagavi. 2020
	Reference Books:
1.	ಸಾಹಿತ್ಯ ಸಂಚಲನ, ಕನ್ನಡ ಪಠ್ಯ ಪುಸ್ತಕ, Karnataka Text Book Society (R), 2017-18

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Assignment
		3.	Semester End Examination

Course Outcome (COs)

Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create

At the end of the course, the student will be able to (Highlight the **action verb** representing the learning level.)

ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ ಪಠ್ಯ ಕಲಿಕೆಯ ನಂತರ ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ :

Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create		**Learning Level**	**PO(s)**	**PSO(s)**
1.	ಕನ್ನಡ ಭಾಷೆ, ಸಾಹಿತ್ಯ ಮತ್ತು ಕನ್ನಡದ ಸಂಸ್ಕೃತಿಯ ಕುರಿತು ಅರಿವು ಮೂಡಿರುತ್ತದೆ.	Re / Un	9	--
2.	ಕನ್ನಡ ಸಾಹಿತ್ಯದ ಆಧುನಿಕಪೂರ್ವ ಮತ್ತು ಆಧುನಿಕ ಕಾವ್ಯಗಳನ್ನು ಸಾಂಕೇತಿಕವಾಗಿ ಕಲಿತು ಹೆಚ್ಚಿನ ಓದಿಗೆ ಮತ್ತು ಜ್ಞಾನಕ್ಕೆಸ್ಫೂರ್ತಿ ಮೂಡುತ್ತದೆ	Re / Un	9	--
3.	ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ಸಾಹಿತ್ಯ, ಮತ್ತು ಸಂಸ್ಕೃತಿಯ ಬಗ್ಗೆ ಅರಿವು ಹಾಗೂ ಆಸಕ್ತಿ ಹೆಚ್ಚಾಗುತ್ತದೆ.	Re / Un	9	--
4.	ತಾಂತ್ರಿಕ ವ್ಯಕ್ತಿಗಳ ಪರಿಚಯವನ್ನು ಹಾಗೂ ಅವರುಗಳ ಸಾಧಿಸಿದ ವಿಷಯಗಳನ್ನು ತಿಳಿದುಕೊಂಡು ನಾಡಿನ ಇನ್ನಿತರ ವ್ಯಕ್ತಿಗಳ ಬಗ್ಗೆ ತಿಳಿದುಕೊಳ್ಳಲು ಕೌತುಕತೆ ಹೆಚ್ಚಾಗುತ್ತದೆ.	Re / Un	9	--
5.	ಸಾಂಸ್ಕೃತಿಕ, ಜನಪದ ಹಾಗೂ ಪ್ರವಾಸ ಕಥನಗಳ ಪರಿಚಯ ಮಾಡಿಕೊಡುವುದು.	Re / Un	9	--

Scheme of Continuous Internal Evaluation (CIE): Theory Course

Components	Addition of two IA tests	Online Quiz	Addition of two Assignments	Course Seminar	Total Marks
Marks	15 + 15 = 30	-	10+10 =20	-	50
Minimum score to be eligible for SEE: 20 OUT OF 50					

Scheme of Semester End Examination (SEE):
It will be conducted for 50 marks of 01 hours duration. **-Student should score minimum 40% of 30 marks (i.e. 12 marks) in IA tests.** **-Lack of minimum score in IA test will make the student Not Eligible for SEE.**
SEE Score should be $\geq$ 35% ,however overall score of CIE + SEE should be $\geq$ 40%
Question paper will be of MCQ type and will cover the entire unit of course. It will contain 50 questions, each of the 01 mark.

Assignment (10 marks)				
Rubric/Level	**Exemplary=A (Far Exceeds Standard)**	**Above Average=B (Exceeds Standard)**	**Adequate= C (Meets Standard)**	**Inadequate= D (Below Standard)**
Listening & Comprehension (2.5)	Comprehends spoken Kannada in daily conversations with ease and responds appropriately. (2-2.5)	Understands short sentences and conversations on familiar topics with few errors. (1.5 - 2)	Understands simple greetings, questions, and instructions with difficulty. (1-1.5)	Recognizes only a few isolated Kannada words; struggles to understand sentences. (0-1)
Speaking & Pronunciation (2.5 marks)	Speaks fluently and politely in complete sentences, with clear pronunciation and correct usage. (2-2.5)	Speaks in simple conversations (greetings, gratitude, asking/answering questions) with mostly correct pronunciation. (1.5 - 2)	Can produce short, simple sentences with errors; pronunciation partly correct. (1-1.5)	Produces very few Kannada words; unclear pronunciation; unable to form sentences. (0-1)
Writing (2.5 marks)	Writes short paragraphs or dialogues accurately with correct grammar, vocabulary, and sentence structure. (2-2.5)	Writes short meaningful sentences using correct pronouns, verbs, and tenses. (1.5 - 2)	Can write simple words, phrases, and very short sentences. (1-1.5)	Can write only a few Kannada alphabets/words with errors. (0-1)
Reading (2.5 marks)	Reads fluently with good pronunciation, intonation, and comprehension of meaning. (2-2.5)	Reads simple sentences and short passages with correct pronunciation. (1.5 - 2)	Can read familiar words and short phrases with help.(1-1.5)	Struggles to recognize Kannada script; cannot read words. (0-1)

CO-PO Mapping (Planned)												**CO-PSO Mapping (Planned)**		
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PSO 1**	**PSO 2**	**PSO 3**
1									✓					
2									✓					
3									✓					
4									✓					
5									✓					
Tick mark the CO, PO and PSO mapping														

Dr. Bharatesh P Makannavar

Name & Signature of Faculty members involved in designing the syllabus

Name & Signature of Faculty members verifying/approving the syllabus

Balake Kannada

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Course Code	1BKBK109(BKBK107)	**Course type**	Theory	**Credits L-T-P**	1 – 0 - 0
Hours/week: L - T- P	1-0-0			**Total credits**	01
Total Contact Hours	L = 15 Hrs			**CIE Marks**	50
				SEE Marks	50

Course learning objectives	
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, literature and General information about this state.

Pre-requisites : Fluency in English, Basic of Kannada language

Unit – I	**Contact Hours = 3 Hours**
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 conversion, Listening and Speaking Activities, Key to Transcription. 3. Personal pronouns, Possessive Forms, Interrogative words	

Unit – II	**Contact Hours = 3 Hours**
1.Possessive forms of nouns, dubitive question and Relative nouns. 2.Qualitative, Quantitative and Colour Adjectives, Numerals adjectives. 3. Predictive Forms, Locative Case	

Unit – III	**Contact Hours = 3 Hours**
1. Language functions. 2. starting conversion with stranger. 3. Expressing gratitude.	

Unit – IV	**Contact Hours = 3 Hours**
1.Permission, Commands, encouraging and Urging words (Imperative words and sentences) 2. Accusative Cases and Potential Forms used in General Communication 3. Helping Verbs “iru and iralla”, Corresponding Future and Negation Verbs 4. Comparative, Relationship, Identification and Negation Words	

Unit – V	Contact Hours = 3 Hours
1.Different types of Tense, Time and Verbs 2. Formation of Past, Future and Present Tense Sentences with Verb Forms 3. Kannada vocabulary list, Kannada Words in Conversation	

Books	
	Text Books:
1.	**BALAKE KANNADA**, ಡಾ. ಎಲ್ . ತಿಮ್ಮೇಶ್, VTU, 2020
	Reference Books:
1.	"Learn Kannada Through English" by Manisha S, Pragyath Technologies Private Limited, 2023
2.	Articulation English Workbook, Karnataka Text Book Society (R), 2024

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Assignment
3.	Practice session	4.	Semester End Examination

Course Outcome (COs)

At the end of the course, the student will be able to (Highlight the **action verb** representing the learning level.)

	Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create	**Learning Level**	**PO(s)**	**PSO(s)**
1.	To understand the necessity of learning of local language for comfortable life.	Re / Un	9	
2.	To speak, read and write Kannada language as per requirement.	Re / Un	9	
3.	To communicate (converse) in Kannada language in their daily life with kannada speakers.	Re / Un	9	
4.	To Listen and understand the Kannada language properly.	Re / Un	9	
5.	To speak in polite conservation.	Re / Un	9	

Scheme of Continuous Internal Evaluation (CIE):

Components	Addition of two IA tests	Two Assignments – (Open /Industry/Certification	Course project (CP)/ Case study etc	Total Marks
Marks	15+15 = 30	10 + 10 = 20	--	50

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 50 marks of 1-hour duration. **-Student should score minimum 40% of 30 marks (i.e. 12 marks) in IA tests.** **-Lack of minimum score in IA test will make the student Not Eligible for SEE.**
2.	SEE Score should be $\geq$ 35% ,however overall score of CIE + SEE should be $\geq$ 40%
3.	Question paper will be of MCQ type and will cover the entire unit of course. It will contain 50 questions, each of the 01 mark.

Assignment (10 marks)				
Rubric/Level	**Exemplary=A (Far Exceeds Standard)**	**Above Average=B (Exceeds Standard)**	**Adequate= C (Meets Standard)**	**Inadequate= D (Below Standard)**
Listening & Comprehension (2.5)	Comprehends spoken Kannada in daily conversations with ease and responds appropriately. (2-2.5)	Understands short sentences and conversations on familiar topics with few errors. (1.5 - 2)	Understands simple greetings, questions, and instructions with difficulty. (1-1.5)	Recognizes only a few isolated Kannada words; struggles to understand sentences. (0-1)
Speaking & Pronunciation (2.5 marks)	Speaks fluently and politely in complete sentences, with clear pronunciation and correct usage. (2-2.5)	Speaks in simple conversations (greetings, gratitude, asking/answering questions) with mostly correct pronunciation. (1.5 - 2)	Can produce short, simple sentences with errors; pronunciation partly correct. (1-1.5)	Produces very few Kannada words; unclear pronunciation; unable to form sentences. (0-1)
Writing (2.5 marks)	Writes short paragraphs or dialogues accurately with correct grammar, vocabulary, and sentence structure. (2-2.5)	Writes short meaningful sentences using correct pronouns, verbs, and tenses. (1.5 - 2)	Can write simple words, phrases, and very short sentences. (1-1.5)	Can write only a few Kannada alphabets/words with errors. (0-1)
Reading (2.5 marks)	Reads fluently with good pronunciation, intonation, and comprehension of meaning. (2-2.5)	Reads simple sentences and short passages with correct pronunciation. (1.5 - 2)	Can read familiar words and short phrases with help.(1-1.5)	Struggles to recognize Kannada script; cannot read words. (0-1)

CO-PO Mapping (Planned)												CO-PSO Mapping (Planned)		
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PSO 1**	**PSO 2**	**PSO 3**
1									✓					
2									✓					
3									✓					
4									✓					
5									✓					
Tick mark the CO, PO and PSO mapping														

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Project Based learning

INDEX

Code	Title
1BIDTL158	Innovation and Design Thinking Lab
1BPRJ258	Interdisciplinary Project-Based Learning

Innovation and Design thinking Lab
(Project based learning)

Course Code	1BIDTL158	**Course type**	AEC/SDC	**Credits L-T-P**	0 - 0 - 1
Hours/week: L - T- P	0 - 0 - 2			**Total credits**	1
Total Contact Hours	L = 0 Hrs; T = 0 Hrs; P = 24 Hrs			**CIE Marks**	50
Flipped Classes content				**SEE Marks**	50

Course learning objectives	
1.	Understand and apply design thinking principles to identify and solve real-world problems through ideation and brainstorming techniques.
2.	Develop foundational knowledge in entrepreneurship, including innovation processes and multidisciplinary team collaboration.
3.	Acquire hands-on skills in electronics and programming, such as operating Arduino-based circuits, sensor tracking, and motor control using MATLAB/SIMULINK.
4.	Build practical engineering abilities, including designing electrical systems, developing Android apps with MIT App Inventor, and performing mechanical tasks like tyre repair.
5.	Identify societal, practical, engineering, or lifestyle challenges and propose innovative solutions using methods like 6 thinking hats and root cause analysis in open-ended experiments.

Required Knowledge of :Working principle of everyday use items

Lab Experiment – 1	**Contact Hours = 2 Hours**
Design Thinking : concepts, Key Characteristics, The 5 Stages of Design Thinking, Use of Design Thinking, Applications	
Lab Experiment – 2	**Contact Hours = 2 Hours**
Entrepreneurship : Introduction, Key Elements of Entrepreneurship, Types of Entrepreneurship, The Entrepreneurial Process, Traits of Successful Entrepreneurs, Importance of Entrepreneurship	
Lab Experiment – 3	**Contact Hours = 2 Hours**
Innovation and Ideation : The Role of Ideation in Innovation, Key Stages in Innovation Through Ideation, Popular Ideation Techniques, Principles for Successful Ideation and Applications	
Lab Experiment – 4	**Contact Hours = 2 Hours**
Introduction to sensors, tracking its data, Arduino based circuit operations	
Lab Experiment – 5	**Contact Hours = 2 Hours**
Introduction to Motor Control by SIMULINK and Introduction to MATLAB and hands on experiment	
Lab Experiment – 6	**Contact Hours = 2 Hours**

Development of android app using MIT app	
Lab Experiment – 7	**Contact Hours = 2 Hours**
Design of an Electrical Extension box, Introductory concepts of LCD interfacing using I2C module	
Lab Experiment – 8	**Contact Hours = 2 Hours**
Introduction to 3D printing process and hands on Experiment using 3D printing	
Lab Experiment – 9	**Contact Hours = 2 Hours**
Introduction to Laser cutting for acrylic materials	
Lab Experiment – 10 (Open ended experiment)	**Contact Hours = 2 Hours**
Formation of Multidisciplinary teams and brainstorming. Identification of societal/practical/engineering/lifestyle problem and propose solutions through techniques like brainstorming, 6 thinking hats, root cause analysis	
Lab Experiment – 11 (Open ended experiment)	**Contact Hours = 2 Hours**
Identification of societal/practical/engineering/lifestyle problem and propose solutions through techniques like brainstorming, 6 thinking hats, root cause analysis	
Lab Experiment – 12 (Open ended experiment)	**Contact Hours = 2 Hours**
Identification of societal/practical/engineering/lifestyle problem and propose solutions through techniques like brainstorming, 6 thinking hats, root cause analysis	

Formation of Batches

Books	
	Text Books:
1.	C. Starkey, “Basic Engineering Design”, Butterworth-Heinemann Publisher 1988.
2.	Ken Hurst, “Engineering Design Principles”, Elsevier publication, Swan Press, 2010
3.	Richard G Budynas and J Keith Nisbett, Shigley’s “ Mechanical Engineering Design”, Mc Graw Hill, 9th Edition, 2011
4.	Kenneth Ayala, “The 8051 Microcontroller, Architecture, Programming, and Applications”, West publishing Company.
5.	K. K. Chitkara, “Construction Project Management”, 4th Edition, Tata McGraw-Hill, 2019.
6.	B. L. Theraja, “A textbook of Electrical Technology”, S. Chand Publication.
	Reference Books:
1.	Rattan, S.S. “Theory of Machines”, 3rd Edition, Tata McGraw-Hill, 2009.
2.	Yousef Haik, SangarappillaiSivaloganathan, Tamer M. Shahin, “Engineering Design Process”, Cengage learning, 2011.
3.	Hugh Jack, “Engineering Design, Planning, and Management”, Academic press 2013.
4.	Boylsted, “Electronic Devices and Circuits”, Person publication, 2013.
5.	R. P. Jain, “Modern Digital Electronics” 2/e, TMH publication

6.	Jeremy Blum, "Exploring Arduino: Tools and Techniques for Engineering Wizardry 1st Edition, Wiley publication, 2015.
7.	Simon Monk, "Programming Arduino Next Steps: Going Further with Sketches", McGraw Hill / Tab Electronics.
8.	Massimo Banzi, "Make: Getting Started with Arduino, 3rd Edition", Shroff Publications, 2014.
9.	Stuart Yarnold "Arduino in Easy Steps", In Easy Steps Publications, 2015.
10.	Blum, "Arduino Programming in 24 Hours, Sams Teach Yourself", 1st Edition, Pearson Publications, 2015
11.	V. K. Mehta, "Principles of Electronics", S. Chand Publication, 2014
12.	A guide to the Project Management Body of Knowledge (PMBOK) 6th Edition
	E-resources (NPTEL/SWAYAM. Any Other)- mention links
	http://epics.ieee.org/

Course delivery methods		**Assessment methods**	
1.	Practice session/Demonstrations in Labs	1.	Conduction of Experiments
2.	Virtual Labs (if present)	2.	Journal writing
3.	Chalk and Talk	3.	Lab project/ Open ended experiment
4.		4.	Lab Test
5.		5.	Semester End Examination

Course Outcome (COs)

Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create

At the end of the course, the student will be able to (Highlight the **action verb** representing the learning level.)		**Learning Level**	**PO(s)**	**PSO(s)**
1.	**Explain** the fundamental principles of design thinking, entrepreneurship, and innovation.	Un	1	1
2.	**Illustrate** the basic operation of sensor tracking using Arduino circuits and motor control with MATLAB/SIMULINK.	Un	1	1
3.	**Demonstrate** the process of developing an Android app with MIT App Inventor and designing an electrical extension box.	Ap	1	1
4.	**Analyze** societal and engineering problems to determine their root causes and evaluate potential solutions using problem-solving techniques.	Ap	1	1

Scheme of Continuous Internal Evaluation (CIE):

Conduction of experiments (30)	**Journal & Attendance**	**viva-voce (5)**	**Lab Project**	**Open Ended Experiment**	**Total(CIE)**
30 marks	5 marks	5 marks	5 marks	5 marks	50 marks

Rubrics for Lab conduction (CIE 50 marks)				
Assessment Component	**Exemplary = A (Far Exceeds Standard)**	**Above Average = B (Exceeds Standard)**	**Adequate = C (Meets Standard)**	**Inadequate = D (Below Standard)**
1. Conduction of Experiments (30)	Performs all steps accurately with deep insight; excellent data analysis; no supervision required. (6-7)	Minor errors, good understanding; minimal supervision. (5-6)	Basic procedure followed; some errors; needs guidance. (4-5)	Incomplete or incorrect steps; poor understanding; needs constant help. (<4)
2. Viva-Voce (5)	Demonstrates excellent conceptual clarity and critical thinking. (5)	Good understanding with minor gaps in reasoning. (4)	Basic responses with limited understanding. (3)	Inaccurate or incomplete answers. (<3)
3. Journal (5)	Neatly presented, complete, error-free, and insightful observations. (5)	Mostly complete and neat with minor errors. (4)	Journal is basic with some incomplete entries. (3)	Poorly maintained, incomplete or illegible. (<3)
4. Lab Project (5)	Innovative, well-executed, clearly documented with good technical content (4-5)	Good effort with reasonable execution and documentation. (3-4)	Basic project; shows effort but lacks depth. (2-3)	Minimal or no meaningful effort. (<2)
5. Open-Ended Experiment (5)	Excellent initiative; deep exploration beyond standard procedures. (4-5)	Good attempt with moderate originality. (3-4)	Limited exploration; basic understanding shown. (2-3)	No significant effort or originality. (<2)

SEE : 50 marks

1. Writeup : 10 marks
2. Conduction of Experiment 1 and Viva voce : 20 marks
3. Conduction of Experiment 1 and Viva voce : 20 marks

Total : 50 marks

CO-PO Mapping (Planned)												CO-PSO Mapping (Planned)		
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PSO1**	**PSO2**	**PSO3**
1	✓					✓		✓	✓		✓	✓		
2	✓		✓		✓	✓		✓		✓		✓		
3	✓		✓		✓			✓				✓		
4		✓	✓			✓		✓		✓		✓		
5														
Tick mark the CO, PO and PSO mapping														

Prof. Mahesh M Sattigeri, Prof. Pradnya Kulkarni,Prof. Gourav V Kulkarni

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Name & Signature of Faculty members verifying/approving the syllabus

Interdisciplinary Project based learning

Course Code	1BPRJ258	**Course type**	AEC/SDC	**Credits L-T-P**	0 - 0 - 1
Hours/week: L - T- P - S	0 - 0 -0- 2			**Total credits**	1
Total Contact Hours	L = 0 Hrs; T = 0 Hrs; P = 0 Hrs; S = 24 hrs			**CIE Marks**	100
Flipped Classes content				**SEE Marks**	

Course learning objectives	
1.	Develop skills in **design thinking**, **innovation**, and **entrepreneurship**.
2.	Apply **interdisciplinary engineering concepts** to solve real-world problems
3.	Gain hands-on exposure to **tools and technologies** such as Arduino, MATLAB/Simulink, Android App Development, and 3D printing
4.	Work in **multidisciplinary teams** to ideate, design, and prototype solutions

Required Knowledge of Ideation and application of design thinking

WEEK 1 -2
Team Meeting : Set the agenda, Present the current situation, Brainstorm observation, Identify the root problem, Agree on the problem statement. Defining the Objective : Link Objectives to the problem, Smart Frame work., Assign the responsibility.
WEEK 3-4
Visit the site : Pre site visit preparation, conducting the site visit. Feasibility study : Define the scope , Market, Technical, Operational , Financial, Legal (if any) and Environmental , Risk assessment. Review compliance with local/national statutory / regulatory requirements
WEEK 5-6
Define the prototype objective , Use site visit insights, select materials and tools, build in iterations , test and evaluate and prepare for scale up. Apply concepts like 6 thinking hats during prototype evaluation.
WEEK 7-10
Finalize the design, resource planning , step by step construction process, testing and calibration , documentation , handover and implementation.
WEEK 11-12
Testing , validation, feedback collection, interaction and improvement. To check feasibility of implementation of feedback points and prepare revision plan.
WEEK 13-15
Preparation , Exhibition set up , final presentation, structure delivery, Reporting/Publication/possibility of patents or design registration for eligible and innovative projects

Books	
	Text Books / hardware/Software
1.	C. Starkey, "Basic Engineering Design", Butterworth-Heinemann Publisher 1988. **Hardware:** Arduino boards, sensors, DC motors, 3D printer, laser cutter
2.	Richard G Budynas and J Keith Nisbett, Shigley's " Mechanical Engineering Design", Mc Graw Hill, 9th Edition, 2011 **Software:** MATLAB/Simulink, MIT App Inventor, TinkerCAD, SolidWorks/Fusion360
3.	Kenneth Ayala, "The 8051 Microcontroller, Architecture, Programming, and Applications", West publishing Company.
4.	Jeremy Blum, "Exploring Arduino: Tools and Techniques for Engineering Wizardry 1st Edition, Wiley publication, 2015.
5.	Boylsted, "Electronic Devices and Circuits", Person publication, 2013.
	E-resources (NPTEL/SWAYAM.. Any Other)- mention links
1.	http://epics.ieee.org/
2.	

Course delivery methods		Assessment methods	
1.	Practice session/Demonstrations in Labs	1.	Conduction of Experiments
2.	Virtual Labs (if present)	2.	Journal writing
3.	Chalk and Talk	3.	Lab project/ Open ended experiment
4.		4.	Lab Test
5.		5.	Semester End Examination

Course Outcome (COs)

Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create

At the end of the course, the student will be able to (Highlight the **action verb** representing the learning level.)		**Learning Level**	**PO(s)**	**PSO(s)**
1.	**Describe** the key principles of design thinking, entrepreneurship, and innovation through ideation, as demonstrated in lab reports.	Un	1	1
2.	**Explain** the basic operation of sensor tracking with Arduino circuits and motor control using MATLAB/SIMULINK	Ap	1	1
3.	**Identify** the steps for developing an Android app using MIT App Inventor and designing an electrical extension box	Re	1	1
4.	**List** societal or engineering problems and their root causes using techniques like brainstorming and 6 thinking hats, evaluated through probable solutions to the same	Re	1	1

Scheme of Continuous Internal Evaluation (CIE):

Phase-1	**Review of Problem definition and Resource planning**
Phase-2	**Mid-semester review for project progress and prototype development**
Phase-3	**Exhibition and Final Presentation**

Phase -1	PHASE-2	PHASE-3	Total
30 marks	30 marks	40 marks	100 marks

Note:

1. **Students need to maintain Project diaries from Week 1 to Week 15 and record the discussions/deliberations with the respective faculty allotted to the group**
2. **One Project Diary to be maintained per group. The diary shall be signed by the allotted faculty weekly. Duly signed Project Diary needs to be shown during Phase wise reviews**
3. **Group needs to be formed in such a way that there are students from different branches as a multidisciplinary appraoch**

CO-PO Mapping (Planned)												CO-PSO Mapping (Planned)		
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PSO1**	**PSO2**	**PSO3**
1	✓					✓		✓	✓		✓	✓		
2	✓		✓		✓	✓		✓		✓		✓		
3	✓		✓		✓			✓				✓		
4		✓	✓			✓		✓		✓		✓		
5														
Tick mark the CO, PO and PSO mapping														

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