Siddaganga Institute of Technology

An autonomous institution affiliated to VTU, Belagavi,
Approved by AICTE, New Delhi, Accredited by NAAC with 'A++' grade
Awarded Diamond College Rating by QS I-GAUGE and ISO 9001:2015 Certified

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Scheme and Syllabus under NEP 2025 Scheme for the AY 2025-26

Siddaganga Institute of Technology, Tumakuru.

Courses under NEP 2025 scheme

Sl.	Code	Title	Dept.
01	AMC1	Applied Mathematics-I for CV stream	Maths
02	AMS1	Applied Mathematics-I for CSE stream	Maths
03	AMM1	Applied Mathematics-I for ME stream	Maths
04	AME1	Applied Mathematics-I for EEE stream	Maths
05	AMC2	Applied Mathematics-II for CV stream	Maths
06	AMS2	Applied Mathematics-II for CSE stream	Maths
07	AMM2	Applied Mathematics-II for ME stream	Maths
08	AME2	Applied Mathematics-II for EEE stream	Maths
09	APC	Physics for Sustainable Structural System (CV stream)	Physics
10	APS	Quantum Physics and Applications (CSE stream)	Physics
11	APM	Physics of Materials (Mech. stream)	Physics
12	APEE	Electrical Engineering Materials (EEE)	Physics
13	APEC	Quantum Physics and Electronics Sensors (ECE stream)	Physics
14	ACC	Applied Chemistry for Sustainable Structures and Material Design (CV)	Chemistry
15	ACS	Applied Chemistry for Smart Systems (CSE)	Chemistry
16	ACM	Applied Chemistry for Advanced Metal Protection and Sustainable Energy Systems (ME)	Chemistry
17	ACE	Applied Chemistry for Emerging Electronics and Futuristic Devices (EEE & ECE stream)	Chemistry
18	PSC1	Building Materials and Concrete Technology	CV
19	PSC2	Elements of Mechanical Engineering	ME
20	PSC3	Basics of Electrical Engineering	EEE
21	PSC4	Fundamentals of ECE	ECE
22	PSC5	Structured Programming in C	CSE
23	PSC6	Elements of Biotechnology and Biomimetics	BT
25	PSCL1	Building Materials Lab	CV
26	PSCL2	Elements of Mechanical Engineering Lab	ME
27	PSCL3	Basic Electrical Laboratory	EEE
28	PSCL4	Fundamentals of Electronics & Communication Engineering Lab	ECE
29	PSCL5	C Programming Lab	CSE
30	PSCL6	Elements of Biotechnology Laboratory	BT
32	ESCO6	Introduction to Electrical Engineering	EEE
33	ESCO7	Introduction to Electronics & Communication Engineering	ECE
34	ESCO8	Introduction to Mechanical Engineering	ME
35	ESCO9	Essentials of Information Technology	ISE
36	ESCO10	Introduction to Building Sciences	CV
37	ESCO11	Applied Mechanics	ME
38	PLC5	Introduction to C Programming (for Non- IT programmes)	CSE
39	PLC6	Python Programming (For CSE and allied programmes)	ISE
40	ETC13	Introduction to AI and Applications	CSE
41	CC03	Balake Kannada	Humanities
42	CC04	Samkrutika Kannada	Humanities
43	CC08	Communication Skills	T&P
44	CC09	Soft Skills	T&P
45	CC10	Indian Constitution and Engineering Ethics	Humanities
46	CAEDC	Computer Aided Engineering Drawing for CV Stream	ME
47	CAEDS	Computer Aided Engineering Drawing for CSE Stream	ME
48	CAEDM	Computer Aided Engineering Drawing for ME Stream	ME
49	CAEDEE	Computer Aided Engineering Drawing for EEE Stream	ME
50	CAEDEC	Computer Aided Engineering Drawing for ECE Stream	ME
51	SDCxx1 (xx – BRANCH)	Innovation and Design Thinking Lab (**Project-based learning-** IDEA Lab Workshop/Maker's space)	Dean
52	SDC2 (Common to all)	Interdisciplinary Project-Based Learning	Dean

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CIVIL ENGINEERING STREAM (CV)

SCHEME OF TEACHING AND EXAMINATIONS (2025)

(EFFECTIVE FROM THE ACADEMIC YEAR 2025-26)

I Semester (Physics Cycle)

Sl. No.	Course Category and Course Code		Course Title	Teaching Dept.	Teaching hrs./week				Examination				Credits
					Lecture	Tutorial	Practical/ Drawing	SAAE	Duration in hrs.	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	ASC	AMC1	Applied Mathematics-I (CV Stream)	Maths	3	2	0		03	50	50	100	04
2	ASC(IC)	APC	Physics for Sustainable Structural System	Phy	3	0	2		03	50	50	100	04
3	PSC	PSC1	Building Materials and Concrete Technology	CV	3	0	0		03	50	50	100	03
4	ESC-I	ESCO6	Introduction to Electrical Engineering	EE	3	0	0		03	50	50	100	03
5	ETC	ETC13	Introduction to AI and Applications	CS & Allied Dept.	3	0	0		03	50	50	100	03
6	AEC	CC09	Soft Skills	Humanities (T&P)	1	0	0		01	100	---	100	PP
7	PSCL	PSCL1	Building Materials Lab	CV	0	0	2		02	50	50	100	01
8	AEC/SDC	SDCCV1	Innovation and Design Thinking Lab (**Project-based learning**- IDEA Lab Workshop/Maker's space)	Respective /Any Dept.	0	0	2		02	50	50	100	01
9	HSMS	CC04/ CC03	Samkrutika Kannada / Balake Kannada	Humanities	1	0	0		01	50	50	100	01
	Total									**500**	**400**	**900**	**20**
10	**AICTE Activity Points** (students have to earn 100 activity points from I to VI semester)				Compulsory requirement for the award of a degree								

S- (SAAE) Students Academic Activity Engagement Hours, **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, **AEC/SDC**- Ability Enhancement Course/Skill Development course, **ETC**- Emerging Technology Course, **TD/PSB**- Teaching Department / Paper Setting Board, **HSMC**-Humanity, Social Science and management Course, **CIE** –Continuous Internal Evaluation, **SEE**- Semester End Examination, **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

Credit Definition:	04-Credits courses are to be designed for 50 hours of Teaching-Learning Session
1-hour Lecture **(L)** per week=**1Credit**	04-Credits (IC) are to be designed for 40 hours' theory and 10-12 hours of practical sessions 03-Credits courses are to be designed for 40 hours of Teaching-Learning Session
2-hoursTutorial**(T)** per week=**1Credit**	
3-2-hours Practical / Drawing (**P**) per week=**1Credit**	02- Credits courses are to be designed for 25 hours of Teaching-Learning Session

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

AMC1 and APC are integrated courses (IC), combining theory with practical components.

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

- The theory component will be evaluated through both Continuous Internal Evaluation (CIE) and Semester End Examination (SEE).
- The practical component will be assessed only through CIE. However, questions related to the practical content will be included in the SEE question paper as part of the final examination.

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. The first year of Engineering programmes is composed of I semester and 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. Activities under SIP may include Physical Activities, Creative Arts, Universal Human Values, Literary Events, Proficiency Modules, Lectures by Eminent Personalities, Local Area Visits, Department/Branch Familiarization, and Innovation-related sessions. The specific programmes to be conducted will be notified separately by the University, with the academic calendar or separately.

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 on 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.

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CIVIL ENGINEERING STREAM (CV)

Code	Program Specific Course (PSC)	L	T	P	Cr		Code	Program Specific Course Lab (PSCL)	L	T	P	Cr
PSC1	Building Materials and Concrete Technology	3	0	0	3		PSCL1	Building Materials Lab	0	0	2	1
PSC2	Elements of Mechanical Engineering	3	0	0	3		PSCL2	Elements of Mechanical Engineering Lab	0	0	2	1
PSC3	Basics of Electrical Engineering	3	0	0	3		PSCL3	Basic Electrical Laboratory	0	0	2	1
PSC4	Fundamentals of ECE	3	0	0	3		PSCL4	Fundamentals of Electronics & Communication Engg. Lab	0	0	2	1
PSC5	Structured Programming in C	3	0	0	3		PSCL5	C Programming Lab	0	0	2	1
PSC6	Elements of Biotechnology and Biomimetics	3	0	0	3		PSCL6	Elements of Biotechnology Laboratory	0	0	2	1
PSC7	Principles of Soil Science and Agronomy	3	0	0	3		PSCL7	Soil Science and Agronomy Field Lab	0	0	2	1
	Engineering Science Courses-I (ESC-I)											
ESCO6	Introduction to Electrical Engineering	3	0	0	3							
ESCO7	Introduction to Electronics & Communication Engineering	3	0	0	3							
ESCO8	Introduction to Mechanical Engineering	3	0	0	3							
ESCO9	Essentials of Information Technology	3	0	0	3							
ESCO10	Introduction to Building Sciences	3	0	0	3							
ESCO11	Applied Mechanics	3	0	0	3							

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 the Laboratory environment using **MATLAB 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 with their program stream. These courses are intended to reinforce the academic foundations and develop the professional competencies relevant to their chosen engineering discipline.

Programme Specific Courses (PSC): Programme Specific Courses (PSC) are a set of core courses tailored to the 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 their chosen field. Students must select and complete the courses from this group that **correspond 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): Courses 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 the courses that do not belong to their admitted program stream. For example, a student admitted to the Civil Engineering program must choose a course such as Introduction to Mechanical Engineering or Introduction to Electrical Engineering, rather than Civil Engineering-related subjects. The course selected under Engineering Science Courses – II (ESC-II) must be different from the course chosen under ESC-I and must also not belong to the student's admitted engineering stream.

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CIVIL ENGINEERING STREAM (CV)

SCHEME OF TEACHING AND EXAMINATION (2025)

(EFFECTIVE FROM THE ACADEMIC YEAR 2025-26)

II Semester (Chemistry Cycle)

Sl. No.	Course Category and Course Code		Course Title	Teaching Dept.	Teaching hrs/week				Examination				Credits
					Lecture	Tutorial	Practical/ Drawing	SAAE	Duration in hrs.	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	ASC	AMC2	Applied Mathematics-II (CV Stream)	Maths	3	2	0		3	50	50	100	**04**
2	ASC(IC)	ACC	Applied Chemistry for Sustainable Structures and Material Design	Che	3	0	2		3	50	50	100	**04**
3	ESC	CAEDC	Computer-Aided Engineering Drawing for CV Stream	ME	2	0	2		3	50	50	100	**03**
4	ESC-II	ESCO11	Applied Mechanics	CV	3	0	0		3	50	50	100	**03**
5	PLC(IC)	PLC5	Introduction to C Programming	CS & Allied Dept.	3	0	2		3	50	50	100	**04**
6	AEC	CC08	Communication Skills	Humanities (T&P)	1	0	1		2	50	50	100	**01**
7	NCMC	CC10	Indian Constitution and Engineering Ethics	Humanities	1	0	0		1	100	0	100	**PP**
8	AEC/SDC	SDC2	Interdisciplinary Project-Based Learning	Res. Dept. (Multiple Dept.)	0	0	0	2	2	50	50	100	**01**
	Total									**450**	**350**	**800**	**20**
9	**AICTE Activity Points** (students have to earn 100 activity points from I to VI semester)				Compulsory requirement for the award of a degree								

S- (SAAE) Students Academic Activity Engagement Hours, **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, **AEC/SDC**- Ability Enhancement Course/Skill Development course, **ETC**- Emerging Technology Course, **TD/PSB**- Teaching Department / Paper Setting Board, **HSMC**-Humanity, Social Science and management Course, **CIE** –Continuous Internal Evaluation, **SEE**- Semester End Examination, **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

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CIVIL ENGINEERING STREAM (CV)

MAT, CHE and PLC are integrated courses (IC), combining theory with practical components.

The theory sessions shall be conducted for 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).
- The practical component will be assessed only through CIE. However, questions related to the practical content will be included in the SEE question paper as part of the final examination.

Code	Engineering Sciences Courses - II (ESC-II)	L	T	P	Cr			Programming Language Courses (PLC)	L	T	P	Cr
ESCO6	Introduction to Electrical Engineering	3	0	0	3		PLC5	Introduction to C Programming (for Non- IT programmes)	3	0	2	4
ESCO7	Introduction to Electronics & Communication Engineering	3	0	0	3		PLC6	Python Programming (For CSE and allied programmes)	3	0	2	4
ESCO8	Introduction to Mechanical Engineering	3	0	0	3							
ESCO9	Essentials of Information Technology	3	0	0	3							
ESCO10	Introduction to Building Sciences	3	0	0	3							
ESCO11	Applied Mechanics	3	0	0	3							

The Mathematics/Chemistry 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 the Laboratory environment using **MATLAB 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 with their program stream. These courses are intended to reinforce the academic foundations and develop the professional competencies relevant to their chosen engineering discipline.

Engineering Sciences Courses-II (ESC-II): Courses 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 the courses that do not belong to their admitted program stream. For example, a student admitted to the Civil Engineering program must choose a course such as Introduction to Mechanical Engineering or Introduction to Electrical Engineering, rather than Civil Engineering-related subjects. The course selected under Engineering Science Courses – II (ESC-II) must be different from the course chosen under ESC-I and must also not belong to the student's admitted engineering stream.

For the course ***Interdisciplinary Project***, 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.

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

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COMPUTER SCIENCE AND ENGINEERING STREAM (CS, IS, CI, BT)

SCHEME OF TEACHING AND EXAMINATIONS (2025)

(EFFECTIVE FROM THE ACADEMIC YEAR 2025-26)

I Semester (Physics Cycle)

Sl. No.	Course Category and Course Code		Course Title	Teaching Dept.	Teaching hrs./week				Examination				Credits
					Lecture	Tutorial	Practical/ Drawing	SAAE	Duration in hrs.	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	ASC	AMS1	Applied Mathematics-I (CSE Stream)	Maths	3	2	0		03	50	50	100	04
2	ASC(IC)	APS	Quantum Physics and Applications	Phy	3	0	2		03	50	50	100	04
3	PSC	PSC5 PSC6	**CS, CI, IS** - Structured Programming in C **BT** - Elements of Biotechnology and Biomimetics	CS/IS/BT	3	0	0		03	50	50	100	03
4	ESC	ESCO6 ESCO7 ESCO9	**CS** - Introduction to Electrical Engg. **CI, IS** - Introduction to Electronics & Communication Engg. **BT** - Essentials of Information Technology	EEE/ME Stream Dept.	3	0	0		03	50	50	100	03
5	ETC	ETC13	Introduction to AI and Applications	CS & Allied Dept.	3	0	0		03	50	50	100	03
6	AEC	CC09	Soft Skills	Humanities (T&P)	1	0	0		01	100	---	100	PP
7	PSCL	PSCL5 PSCL6	**CS, CI, IS** - C Programming Lab **BT** - Elements of Biotechnology Lab	CS/IS/BT	0	0	2		02	50	50	100	01
8	AEC/SDC	SDCxx1	Innovation and Design Thinking Lab (**Project-based learning**- IDEA Lab Workshop/Maker's space)	Respective (Any) Dept.	0	0	2		02	50	50	100	01
9	HSMS	CC04/CC03	Samkrutika Kannada / Balake Kannada	Humanities	1	0	0		01	50	50	100	01
	Total									**500**	**400**	**900**	**20**
10	**AICTE Activity Points** (students have to earn 100 activity points from I to VI semester)				Compulsory requirement for the award of a degree								

S- (SAAE) Students Academic Activity Engagement Hours, **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, **AEC/SDC**- Ability Enhancement Course/Skill Development course, **ETC**- Emerging Technology Course, **TD/PSB**- Teaching Department / Paper Setting Board, **HSMC**-Humanity, Social Science and management Course, **CIE** –Continuous Internal Evaluation, **SEE**- Semester End Examination, **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

Credit Definition: 1-hour Lecture **(L)** per week=**1Credit** 2-hoursTutorial**(T)** per week=**1Credit**	04-Credits courses are to be designed for 50 hours of Teaching-Learning Session 04-Credits (IC) are to be designed for 40 hours' theory and 10-12 hours of practical sessions 03-Credits courses are to be designed for 40 hours of Teaching-Learning Session

3- 2-hours Practical / Drawing (**P**) per week=**1Credit**	02- Credits courses are to be designed for 25 hours of Teaching-Learning Session 01-Credit courses are to be designed for 12 hours of Teaching-Learning sessions

MAT and PHY are integrated courses (IC), combining theory with practical components.

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

- The theory component will be evaluated through both Continuous Internal Evaluation (CIE) and Semester End Examination (SEE).
- The practical component will be assessed only through CIE. However, questions related to the practical content will be included in the SEE question paper as part of the final examination.

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. The first year of Engineering programmes is composed of I semester and 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. Activities under SIP may include Physical Activities, Creative Arts, Universal Human Values, Literary Events, Proficiency Modules, Lectures by Eminent Personalities, Local Area Visits, Department/Branch Familiarization, and Innovation-related sessions. The specific programmes to be conducted will be notified separately by the University, with the academic calendar or separately.

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 on 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.

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COMPUTER SCIENCE AND ENGINEERING STREAM (CS, IS, CI, BT)

Code	Program Specific Course (PSC)	L	T	P	Cr		Code	Program Specific Course Lab (PSCL)	L	T	P	Cr
PSC1	Building Materials and Concrete Technology	3	0	0	3		PSCL1	Building Materials Lab	0	0	2	1
PSC2	Elements of Mechanical Engineering	3	0	0	3		PSCL2	Elements of Mechanical Engineering Lab	0	0	2	1
PSC3	Basics of Electrical Engineering	3	0	0	3		PSCL3	Basic Electrical Laboratory	0	0	2	1
PSC4	Fundamentals of ECE	3	0	0	3		PSCL4	Fundamentals of Electronics & Communication Engg. Lab	0	0	2	1
PSC5	Structured Programming in C	3	0	0	3		PSCL5	C Programming Lab	0	0	2	1
PSC6	Elements of Biotechnology and Biomimetics	3	0	0	3		PSCL6	Elements of Biotechnology Laboratory	0	0	2	1
PSC7	Principles of Soil Science and Agronomy	3	0	0	3		PSCL7	Soil Science and Agronomy Field Lab	0	0	2	1
	Engineering Science Courses (ESC)											
ESCO6	Introduction to Electrical Engineering	3	0	0	3							
ESCO7	Introduction to Electronics & Communication Engineering	3	0	0	3							
ESCO8	Introduction to Mechanical Engineering	3	0	0	3							
ESCO9	Essentials of Information Technology	3	0	0	3							
ESCO10	Introduction to Building Sciences	3	0	0	3							

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 the Laboratory environment using **MATLAB 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 with their program stream. These courses are intended to reinforce the academic foundations and develop the professional competencies relevant to their chosen engineering discipline.

Programme Specific Courses (PSC): Programme Specific Courses (PSC) are a set of core courses tailored to the 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 their chosen field. Students must select and complete the courses from this group that **correspond 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): Courses 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 the courses that do not belong to their admitted program stream. For example, a student admitted to the Civil Engineering program must choose a course such as Introduction to Mechanical Engineering or Introduction to Electrical Engineering, rather than Civil Engineering-related subjects. The course selected under Engineering Science Courses – II (ESC-II) must be different from the course chosen under ESC-I and must also not belong to the student's admitted engineering stream.

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COMPUTER SCIENCE AND ENGINEERING STREAM (CS, IS, CI, BT)

SCHEME OF TEACHING AND EXAMINATION (2025)

(EFFECTIVE FROM THE ACADEMIC YEAR 2025-26)

II Semester (Chemistry Cycle)

Sl. No.	Course Category and Course Code		Course Title	Teaching Dept.	Teaching hrs/week				Examination				Credits
					Lecture	Tutorial	Practical/ Drawing	SAAE	Duration in hrs.	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	ASC	AMS2	Applied Mathematics-II (CSE Stream)	Maths	3	2	0		3	50	50	100	**04**
2	ASC(IC)	ACS	Applied Chemistry for Smart Systems	Che	3	0	2		3	50	50	100	**04**
3	ESC	CAEDS	Computer-Aided Engineering Drawing CSE Stream	ME	2	0	2		3	50	50	100	**03**
4	ESC	ESCO7 ESCO6	**CS, BT**- Introduction to Electronics & Communication Engg. **CI, IS** - Introduction to Electrical Engg.	EEE/ME Stream Dept.	3	0	0		3	50	50	100	**03**
5	PLC(IC)	PLC6	Python Programming	CS & Allied Dept.	3	0	2		3	50	50	100	**04**
6	AEC	CC08	Communication Skills	Humanities (T&P)	1	0	1		2	50	50	100	**01**
7	NCMC	CC10	Indian Constitution and Engineering Ethics	Humanities	1	0	0		1	100	0	100	**PP**
8	AEC/SDC	SDC2	Interdisciplinary Project-Based Learning	Res. Dept. (Multiple Dept.)	0	0	0	2	2	50	50	100	**01**
	Total									450	350	800	**20**
	AICTE Activity Points (students have to earn 100 activity points from I to VI semester)				Compulsory requirement for the award of a degree								

S- (SAAE) Students Academic Activity Engagement Hours, **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, **AEC/SDC**- Ability Enhancement Course/Skill Development course, **ETC**- Emerging Technology Course, **TD/PSB**- Teaching Department / Paper Setting Board, **HSMC**-Humanity, Social Science and management Course, **CIE** –Continuous Internal Evaluation, **SEE**- Semester End Examination, **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

SIDDAGANGA INSTITUTE OF TECHNOLOGY, TUMAKURU

(An autonomous institution affiliated to VTU, Belagavi, Approved by AICTE, New Delhi, Accredited by NAAC with 'A++' grade & ISO 9001:2015 Certified)

COMPUTER SCIENCE AND ENGINEERING STREAM (CS, IS, CI, BT)

MAT, CHE and PLC are integrated courses (IC), combining theory with practical components.

The theory sessions shall be conducted for 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).
- The practical component will be assessed only through CIE. However, questions related to the practical content will be included in the SEE question paper as part of the final examination.

Code	Engineering Sciences Courses (ESC)	L	T	P	Cr			Programming Language Courses (PLC)	L	T	P	Cr
ESCO6	Introduction to Electrical Engineering	3	0	0	3		PLC5	Introduction to C Programming (for Non- IT programmes)	3	0	2	4
ESCO7	Introduction to Electronics & Communication Engineering	3	0	0	3		PLC6	Python Programming (For CSE and allied programmes)	3	0	2	4
ESCO8	Introduction to Mechanical Engineering	3	0	0	3							
ESCO9	Essentials of Information Technology	3	0	0	3							
ESCO10	Introduction to Building Sciences	3	0	0	3							
ESCO11	Applied Mechanics	3	0	0	3							

The Mathematics/Chemistry 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 the Laboratory environment using **MATLAB 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 with their program stream. These courses are intended to reinforce the academic foundations and develop the professional competencies relevant to their chosen engineering discipline.

Engineering Sciences Courses-II (ESC-II): Courses 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 the courses that do not belong to their admitted program stream. For example, a student admitted to the Civil Engineering program must choose a course such as Introduction to Mechanical Engineering or Introduction to Electrical Engineering, rather than Civil Engineering-related subjects. The course selected under Engineering Science Courses – II (ESC-II) must be different from the course chosen under ESC-I and must also not belong to the student's admitted engineering stream.

For the course ***Interdisciplinary Project***, 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.

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

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MECHANICAL ENGINEERING STREAM (ME, IM, CH)

SCHEME OF TEACHING AND EXAMINATION (2025)

(EFFECTIVE FROM THE ACADEMIC YEAR 2025-26)

I Semester (Chemistry Cycle)

Sl. No.	Course Category and Course Code		Course Title	Teaching Dept.	Teaching hrs./week				Examination				Credits
					Lecture	Tutorial	Practical/ Drawing	SAAE	Duration in hrs.	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	ASC	AMM1	Applied Mathematics-I (ME Stream)	Maths	3	2	0		3	50	50	100	**04**
2	ASC(IC)	ACM	Applied Chemistry for Advanced Metal Protection and Sustainable Energy Systems	Che	3	0	2		3	50	50	100	**04**
3	ESC	CAEDM	Computer-Aided Engineering Drawing for ME Stream	ME	2	0	2		3	50	50	100	**03**
4	ESC-I	ESCO7	Introduction to Electronics & Communication Engineering	Res.Dept.	3	0	0		3	50	50	100	**03**
5	PLC(IC)	PLC5	Introduction to C Programming	CS & Allied Dept.	3	0	2		3	50	50	100	**04**
6	AEC	CC08	Communication Skills	Humanities (T&P)	1	0	1		2	50	50	100	**01**
7	NCMC	CC10	Indian Constitution and Engineering Ethics	Humanities	1	0	0		1	100	0	100	**PP**
8	AEC/SDC	SDCxx1	Innovation and Design Thinking Lab (**Project-based learning-** IDEA Lab Workshop/Maker's space)	Respective (Any) Dept.	0	0	2		02	50	50	100	01
	Total									**450**	**450**	**900**	**20**
	AICTE Activity Points (students have to earn 100 activity points from I to VI semester)				Compulsory requirement for the award of a degree								

S- (SAAE) Students Academic Activity Engagement Hours, **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, **AEC/SDC**- Ability Enhancement Course/Skill Development course, **ETC**- Emerging Technology Course, **TD/PSB**- Teaching Department / Paper Setting Board, **HSMC**-Humanity, Social Science and management Course, **CIE** –Continuous Internal Evaluation, **SEE**- Semester End Examination, **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

Credit Definition: 1-hour Lecture **(L)** per week=**1Credit** 2-hoursTutorial**(T)** per week=**1Credit** 3-2-hours Practical / Drawing (**P**) per week=**1Credit**	04-Credits courses are to be designed for 50 hours of Teaching-Learning Session 04-Credits (IC) are to be designed for 40 hours' theory and 10-12 hours of practical sessions 03-Credits courses are to be designed for 40 hours of Teaching-Learning Session 02- Credits courses are to be designed for 25 hours of Teaching-Learning Session 01-Credit courses are to be designed for 12 hours of Teaching-Learning sessions

MAT, CHE and PLC are integrated courses (IC), combining theory with practical components.

The theory sessions shall be conducted for 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).
- The practical component will be assessed only through CIE. However, questions related to the practical content will be included in the SEE question paper as part of the final examination.

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. The first year of Engineering programmes is composed of I semester and 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. Activities under SIP may include Physical Activities, Creative Arts, Universal Human Values, Literary Events, Proficiency Modules, Lectures by Eminent Personalities, Local Area Visits, Department/Branch Familiarization, and Innovation-related sessions. The specific programmes to be conducted will be notified separately by the University, with the academic calendar or separately.

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 on 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.

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MECHANICAL ENGINEERING STREAM (ME, IM, CH)

Code	Engineering Sciences Courses - II (ESC-II)	L	T	P	Cr			Programming Language Courses (PLC)	L	T	P	Cr
ESCO6	Introduction to Electrical Engineering	3	0	0	3		PLC5	Introduction to C Programming (for Non- IT programmes)	3	0	2	4
ESCO7	Introduction to Electronics & Communication Engg.	3	0	0	3		PLC6	Python Programming (For CSE and allied programmes)	3	0	2	4
ESCO8	Introduction to Mechanical Engineering	3	0	0	3							
ESCO9	Essentials of Information Technology	3	0	0	3							
ESCO10	Introduction to Building Sciences	3	0	0	3							
ESCO11	Applied Mechanics	3	0	0	3							

The Mathematics/Chemistry 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 the Laboratory environment using **MATLAB 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 with their program stream. These courses are intended to reinforce the academic foundations and develop the professional competencies relevant to their chosen engineering discipline.

Engineering Sciences Courses-II (ESC-II): Courses 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 the courses that do not belong to their admitted program stream. For example, a student admitted to the Civil Engineering program must choose a course such as Introduction to Mechanical Engineering or Introduction to Electrical Engineering, rather than Civil Engineering-related subjects. The course selected under Engineering Science Courses – II (ESC-II) must be different from the course chosen under ESC-I and must also not belong to the student's admitted engineering stream.

For the course ***Interdisciplinary Project***, 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.

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

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MECHANICAL ENGINEERING STREAM (ME, IM, CH)

SCHEME OF TEACHING AND EXAMINATIONS (2025)

(EFFECTIVE FROM THE ACADEMIC YEAR 2025-26)

II Semester (Physics Cycle)

Sl. No.	Course Category and Course Code		Course Title	Teaching Dept.	Teaching hrs./week				Examination				Credits
					Lecture	Tutorial	Practical/ Drawing	SAAE	Duration in hrs.	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	ASC	AMM2	Applied Mathematics-II (ME Stream)	Maths	3	2	0		03	50	50	100	04
2	ASC(IC)	APM	Physics of Materials	Phy	3	0	2		03	50	50	100	04
3	PSC	PSC2	Elements of Mechanical Engg.	Res.Dept.	3	0	0		03	50	50	100	03
4	ESC-II	ESCO11 ESCO9 ESCO6	**ME-** Applied Mechanics **IM-** Essentials of Information Technology **CH-** Introduction to Electrical Engineering	Res.Dept.	3N	0	0		03	50	50	100	03
5	ETC	ETC13	Introduction to AI and Applications	CS & Allied Dept.	3	0	0		03	50	50	100	03
6	AEC	CC09	Soft Skills	Humanities (T&P)	1	0	0		01	100	---	100	PP
7	PSCL	PSCL2	Elements of Mechanical Engg. Lab	Res.Dept.	0	0	2		02	50	50	100	01
8	HSMS	CC04/CC03	Samkrutika Kannada / Balake Kannada	Humanities	1	0	0		01	50	50	100	01
9	AEC/SDC	SDC2	Interdisciplinary Project-Based Learning	Res. Dept. (Multiple Dept.)	0	0	0	2	02	50	50	100	**01**
	Total									**500**	**400**	**900**	**20**
	AICTE Activity Points (students have to earn 100 activity points from I to VI semester)				Compulsory requirement for the award of a degree								

S- (SAAE) Students Academic Activity Engagement Hours, **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, **AEC/SDC**- Ability Enhancement Course/Skill Development course, **ETC**- Emerging Technology Course, **TD/PSB**- Teaching Department / Paper Setting Board, **HSMC**-Humanity, Social Science and management Course, **CIE** –Continuous Internal Evaluation, **SEE**- Semester End Examination, **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

MAT and PHY are integrated courses (IC), combining theory with practical components.

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

- The theory component will be evaluated through both Continuous Internal Evaluation (CIE) and Semester End Examination (SEE).
- The practical component will be assessed only through CIE. However, questions related to the practical content will be included in the SEE question paper as part of the final examination.

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MECHANICAL ENGINEERING STREAM (ME, IM, CH)

Code	Program Specific Course (PSC)	L	T	P	Cr		Code	Program Specific Course Lab (PSCL)	L	T	P	Cr
PSC1	Building Materials and Concrete Technology	3	0	0	3		PSCL1	Building Materials Lab	0	0	2	1
PSC2	Elements of Mechanical Engineering	3	0	0	3		PSCL2	Elements of Mechanical Engineering Lab	0	0	2	1
PSC3	Basics of Electrical Engineering	3	0	0	3		PSCL3	Basic Electrical Laboratory	0	0	2	1
PSC4	Fundamentals of ECE	3	0	0	3		PSCL4	Fundamentals of Electronics & Communication Engg. Lab	0	0	2	1
PSC5	Structured Programming in C	3	0	0	3		PSCL5	C Programming Lab	0	0	2	1
PSC6	Elements of Biotechnology and Biomimetics	3	0	0	3		PSCL6	Elements of Biotechnology Laboratory	0	0	2	1
PSC7	Principles of Soil Science and Agronomy	3	0	0	3		PSCL7	Soil Science and Agronomy Field Lab	0	0	2	1
	Engineering Science Courses (ESC)											
ESCO6	Introduction to Electrical Engineering	3	0	0	3							
ESCO7	Introduction to Electronics & Communication Engineering	3	0	0	3							
ESCO8	Introduction to Mechanical Engineering	3	0	0	3							
ESCO9	Essentials of Information Technology	3	0	0	3							
ESCO10	Introduction to Building Sciences	3	0	0	3							

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 the Laboratory environment using **MATLAB 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 with their program stream. These courses are intended to reinforce the academic foundations and develop the professional competencies relevant to their chosen engineering discipline.

Programme Specific Courses (PSC): Programme Specific Courses (PSC) are a set of core courses tailored to the 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 their chosen field. Students must select and complete the courses from this group that **correspond 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): Courses 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 the courses that do not belong to their admitted program stream. For example, a student admitted to the Civil Engineering program must choose a course such as Introduction to Mechanical Engineering or Introduction to Electrical Engineering, rather than Civil Engineering-related subjects. The course selected under Engineering Science Courses – II (ESC-II) must be different from the course chosen under ESC-I and must also not belong to the student's admitted engineering stream.

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ELECTRICAL AND ELECTRONICS ENGINEERING STREAM (EE, EC, EI, ET)

SCHEME OF TEACHING AND EXAMINATION (2025)

(EFFECTIVE FROM THE ACADEMIC YEAR 2025-26)

I Semester (Chemistry Cycle)

Sl. No.	Course Category and Course Code		Course Title	Teaching Dept.	Teaching hrs/week				Examination				Credits
					Lecture	Tutorial	Practical/ Drawing	SAAE	Duration in hrs.	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	ASC	AME1	Applied Mathematics-I (EEE Stream)	Maths	3	2	0		3	50	50	100	**04**
2	ASC(IC)	ACE	Applied Chemistry for Emerging Electronics and Futuristic Devices	Che	3	0	2		3	50	50	100	**04**
3	ESC	CAEDEE CAEDEC	Computer-Aided Engineering Drawing for EEE Stream (EE) Computer-Aided Engineering Drawing for ECE Stream (EC, EI, ET)	ME	2	0	2		3	50	50	100	**03**
4	ESC	ESCO7 ESCO6	**EE-** Introduction to Electronics and Communication Engg. **EC, EI, ET-** Introduction to Electrical Engg.	Resp. Dept.	3	0	0		3	50	50	100	**03**
5	PLC(IC)	PLC5	Introduction to C Programming	CS & Allied Dept.	3	0	2		3	50	50	100	**04**
6	AEC	CC08	Communication Skills	Humanities (T&P)	1	0	1		2	50	50	100	**01**
7	NCMC	CC10	Indian Constitution and Engineering Ethics	Humanities	1	0	0		1	100	0	100	**PP**
8	AEC/SDC	SDCxx1	Innovation and Design Thinking Lab (**Project-based learning-** IDEA Lab Workshop/Maker's space)	Respective (Any) Dept.	0	0	2		02	50	50	100	01
	Total									**450**	**450**	**900**	**20**
	AICTE Activity Points (students have to earn 100 activity points from I to VI semester)				Compulsory requirement for the award of a degree								

S- (SAAE) Students Academic Activity Engagement Hours, **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, **AEC/SDC**- Ability Enhancement Course/Skill Development course, **ETC**- Emerging Technology Course, **TD/PSB**- Teaching Department / Paper Setting Board, **HSMC**-Humanity, Social Science and management Course, **CIE** –Continuous Internal Evaluation, **SEE**- Semester End Examination, **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

Credit Definition:	
1-hour Lecture **(L)** per week=**1Credit** 2-hoursTutorial**(T)** per week=**1Credit** 3-2-hours Practical / Drawing (**P**) per week=**1Credit**	04-Credits courses are to be designed for 50 hours of Teaching-Learning Session 04-Credits (IC) are to be designed for 40 hours' theory and 10-12 hours of practical sessions 03-Credits courses are to be designed for 40 hours of Teaching-Learning Session 02- Credits courses are to be designed for 25 hours of Teaching-Learning Session 01-Credit courses are to be designed for 12 hours of Teaching-Learning sessions

MAT, CHE and PLC are integrated courses (IC), combining theory with practical components.

The theory sessions shall be conducted for 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).
- The practical component will be assessed only through CIE. However, questions related to the practical content will be included in the SEE question paper as part of the final examination.

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. The first year of Engineering programmes is composed of I semester and 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. Activities under SIP may include Physical Activities, Creative Arts, Universal Human Values, Literary Events, Proficiency Modules, Lectures by Eminent Personalities, Local Area Visits, Department/Branch Familiarization, and Innovation-related sessions. The specific programmes to be conducted will be notified separately by the University, with the academic calendar or separately.

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 on 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.

Code	Engineering Sciences Courses (ESC)	L	T	P	Cr			Programming Language Courses (PLC)	L	T	P	Cr
ESCO6	Introduction to Electrical Engineering	3	0	0	3		PLC5	Introduction to C Programming (for Non- IT programmes)	3	0	2	4
ESCO7	Introduction to Electronics & Communication Engg.	3	0	0	3		PLC6	Python Programming (For CSE and allied programmes)	3	0	2	4
ESCO8	Introduction to Mechanical Engineering	3	0	0	3							
ESCO9	Essentials of Information Technology	3	0	0	3							
ESCO10	Introduction to Building Sciences	3	0	0	3							
ESCO11	Applied Mechanics	3	0	0	3							

The Mathematics/Chemistry 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 the Laboratory environment using **MATLAB 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 with their program stream. These courses are intended to reinforce the academic foundations and develop the professional competencies relevant to their chosen engineering discipline.

Engineering Sciences Courses-II (ESC-II): Courses 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 the courses that do not belong to their admitted program stream. For example, a student admitted to the Civil Engineering program must choose a course such as Introduction to Mechanical Engineering or Introduction to Electrical Engineering, rather than Civil Engineering-related subjects. The course selected under Engineering Science Courses – II (ESC-II) must be different from the course chosen under ESC-I and must also not belong to the student's admitted engineering stream.

For the course ***Interdisciplinary Project***, 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.

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

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ELECTRICAL AND ELECTRONICS ENGINEERING STREAM (EE, EC, EI, ET)

SCHEME OF TEACHING AND EXAMINATIONS (2025)

(EFFECTIVE FROM THE ACADEMIC YEAR 2025-26)

II Semester (Physics Cycle)

Sl. No.	Course Category and Course Code		Course Title	Teaching Dept.	Teaching hrs./week				Examination				Credits
					Lecture	Tutorial	Practical/ Drawing	SAAE	Duration in hrs.	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	ASC	AME2	Applied Mathematics-II (EEE Stream)	Maths	3	2	0		03	50	50	100	04
2	ASC(IC)	APEE APEC	**EE -** Electrical Engineering Materials **EC, ET, EI -** Quantum Physics and Electronics Sensors	Phy	3	0	2		03	50	50	100	04
3	PSC	PSC3 PSC4	**EE-** Basics of Electrical Engineering **EC, ET, EI -** Fundamentals of Electronics and Communication Engg.	Resp. Dept.	3	0	0		03	50	50	100	03
4	ESC	ESCO9	Essentials of Information Technology	Resp. Dept.	3	0	0		03	50	50	100	03
5	ETC	ETC13	Introduction to AI and Applications	CS & Allied Dept.	3	0	0		03	50	50	100	03
6	AEC	CC09	Soft Skills	Humanities (T&P)	1	0	0		01	100	---	100	PP
7	PSCL	PSCL3 PSCL4	Basic Electrical Laboratory (EE) Fundamentals of Electronics & Communication Engg Lab (EC, ET, EI)	Resp. Dept.	0	0	2		02	50	50	100	01
8	HSMS	CC04/CC03	Samkrutika Kannada / Balake Kannada	Humanities	1	0	0		01	50	50	100	01
9	AEC/SDC	SDC2	Interdisciplinary Project-Based Learning	Resp. Dept. (Multiple Dept.)	0	0	0	2	02	50	50	100	**01**
	Total									**500**	**400**	**900**	**20**
	AICTE Activity Points (students have to earn 100 activity points from I to VI semester)				Compulsory requirement for the award of a degree								

S- (SAAE) Students Academic Activity Engagement Hours, **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, **AEC/SDC**- Ability Enhancement Course/Skill Development course, **ETC**- Emerging Technology Course, **TD/PSB**- Teaching Department / Paper Setting Board, **HSMC**-Humanity, Social Science and management Course, **CIE** –Continuous Internal Evaluation, **SEE**- Semester End Examination, **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

MAT and PHY are integrated courses (IC), combining theory with practical components.

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

- The theory component will be evaluated through both Continuous Internal Evaluation (CIE) and Semester End Examination (SEE).
- The practical component will be assessed only through CIE. However, questions related to the practical content will be included in the SEE question paper as part of

the final examination.

Code	Program Specific Course (PSC)	L	T	P	Cr		Code	Program Specific Course Lab (PSCL)	L	T	P	Cr
PSC1	Building Materials and Concrete Technology	3	0	0	3		PSCL1	Building Materials Lab	0	0	2	1
PSC2	Elements of Mechanical Engineering	3	0	0	3		PSCL2	Elements of Mechanical Engineering Lab	0	0	2	1
PSC3	Basics of Electrical Engineering	3	0	0	3		PSCL3	Basic Electrical Laboratory	0	0	2	1
PSC4	Fundamentals of ECE	3	0	0	3		PSCL4	Fundamentals of Electronics & Communication Engg. Lab	0	0	2	1
PSC5	Structured Programming in C	3	0	0	3		PSCL5	C Programming Lab	0	0	2	1
PSC6	Elements of Biotechnology and Biomimetics	3	0	0	3		PSCL6	Elements of Biotechnology Laboratory	0	0	2	1
PSC7	Principles of Soil Science and Agronomy	3	0	0	3		PSCL7	Soil Science and Agronomy Field Lab	0	0	2	1
	Engineering Science Courses (ESC)											
ESCO6	Introduction to Electrical Engineering	3	0	0	3							
ESCO7	Introduction to Electronics & Communication Engineering	3	0	0	3							
ESCO8	Introduction to Mechanical Engineering	3	0	0	3							
ESCO9	Essentials of Information Technology	3	0	0	3							
ESCO10	Introduction to Building Sciences	3	0	0	3							

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 the Laboratory environment using **MATLAB 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 with their program stream. These courses are intended to reinforce the academic foundations and develop the professional competencies relevant to their chosen engineering discipline.

Programme Specific Courses (PSC): Programme Specific Courses (PSC) are a set of core courses tailored to the 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 their chosen field. Students must select and complete the courses from this group that **correspond 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): Courses 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 the courses that do not belong to their admitted program stream. For example, a student admitted to the Civil Engineering program must choose a course such as Introduction to Mechanical Engineering or Introduction to Electrical Engineering, rather than Civil Engineering-related subjects. The course selected under Engineering Science Courses – II (ESC-II) must be different from the course chosen under ESC-I and must also not belong to the student's admitted engineering stream.

Applied Mathematics – I
(Civil Engineering)

Contact Hours/ Week:	3:2:0:0	Credits:	4 Credits
Total Lecture Hours:	40 Hours Theory + 20 Hours Tutorials	CIE Marks:	50
Course Code:	AMC1	SEE Marks:	50

Course objectives: This course will enable students to:	
1.	**Familiarize** the importance of calculus associated with one variable and multivariable arising in engineering.
2.	**Analyze and solve** engineering problems by applying Ordinary Differential Equations.
3.	**Demonstrate** the use of analytical and numerical methods to solve the system of linear equations.
4.	**Utilize** a modern tool MATLAB for computation and visualization.

Module I : Polar Curves and Curvature
Polar coordinates, Polar curves, angle between the radius vector and the tangent, angle between two curves. Pedal equations. Curvature and radius of curvature - Cartesian, parametric, polar and pedal forms.
8 Hours Theory + 4 Hours Tutorial

Module II: Series Expansion, Indeterminate Forms and Multivariable Calculus
Statement and problems on Taylor's and Maclaurin's series expansion for one variable. Indeterminate forms - L'Hospital's rule. Partial differentiation, total derivative - differentiation of composite functions, Jacobian, Maxima and minima for the function of two variables.
8 Hours Theory + 4 Hours Tutorial

Module III : Ordinary Differential Equations of First Order
Linear and Bernoulli's differential equation. Exact and reducible to exact differential equations with integrating factors - $\frac{1}{N}\left(\frac{\partial M}{\partial y}-\frac{\partial N}{\partial x}\right)$ and $\frac{1}{M}\left(\frac{\partial N}{\partial x}-\frac{\partial M}{\partial y}\right)$**.** Orthogonal trajectories**,** Law of natural growth and decay**.**
8 Hours Theory + 4 Hours Tutorial

Module IV: Ordinary Differential Equations of Higher Order
Higher-order linear ordinary differential equations with constant coefficients, homogeneous and non-homogeneous equations (e^{ax}, $sin(ax+b), cos(ax+b)$, x^n only), Method of variation of parameters, Cauchy's and Legendre's homogeneous differential equations. Applications: Solving governing differential equations of Mass Spring.
8 Hours Theory + 4 Hours Tutorial

Module V : Linear Algebra

Elementary row transformation of a matrix, Rank of a matrix. Echelon form, Consistency and Solution of system of linear equations - Gauss-elimination method and approximate solution by Gauss-Seidel method. Eigen values and Eigen vectors, Rayleigh's power method to find the dominant Eigenvalue and Eigenvector. Applications: Traffic flow.
8 Hours Theory + 4 Hours Tutorial

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.

Course Outcomes:
Upon completion of this course the student will be able to:

CO1	**Apply** the knowledge of calculus to solve problems related to polar curves and implementation using MATLAB.
CO2	**Apply** the concept of partial differentiation to compute rate of change of multivariate functions and implementation using MATLAB.
CO3	**Apply** the analytical methods to solve first order and first-degree differential equations and implementation using MATLAB.
CO4	**Apply** the analytical methods to solve higher order differential equations and implementation using MATLAB.
CO5	**Apply** matrix theory for solving the system of linear equations, compute eigenvalues and eigenvectors and implementation using MATLAB.

Course Articulation Matrix

		POs											**PSOs**	
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**
CO	**CO1**	3	1			1								

	CO2	3	1			1								
	CO3	3	1			1								
	CO4	3	1			1								
	CO5	3	1			1								

Applied Mathematics – I
(CSE allied branches)

Contact Hours/ Week:	3:2:0:0	Credits:	04
Total Lecture Hours:	40Hours Theory + 20Hours Tutorial	CIE Marks:	50
Course Code:	AMS1	SEE Marks:	50

Course objectives:
This course will enable students to:

1.	**Familiarize** the importance of calculus of scalars and vectors associated with one variable and multivariable arising in engineering.
2.	**Demonstrate** the use of Linear Algebra to solve the system of equations.
3.	**Utilize** vector spaces and linear transformations to model and solve problems in Computer Science and Engineering.
4.	**Utilize** a modern tool MATLAB for computation and visualization.

Module I: Calculus

Partial differentiation, total derivative, differentiation of composite functions, Jacobian, Statement of Taylor's and Maclaurin's series expansion for two variables. Maxima and minima for the function of two variables.

(8 Hours Theory+4 Hours Tutorial)

Module II: Vector Calculus

Scalar and vector fields, Gradient, directional derivatives, divergence and curl - physical interpretation, solenoidal vector fields, irrotational vector fields and scalar potential.
Introduction to polar coordinates and polar curves.
Curvilinear coordinates: Scale factors, base vectors, Cylindrical polar coordinates, Spherical polar coordinates, transformation between cartesian and curvilinear systems, orthogonality.

(8 Hours Theory+4 Hours Tutorial)

Module III: System of Linear Equations, Eigen Values and Eigen Vectors

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, diagonalization of the matrix, modal matrix.

(8 Hours Theory+4 Hours Tutorial)

Module IV: Vector Space

Vector spaces: definition and examples, subspace: definition and examples. Linear Combinations, linear span, linearly independent and dependent sets, basis and dimension, row space and column space of a matrix, Coordinates vector, inner products and orthogonality.

(8 Hours Theory+4 Hours Tutorial)

Module V: Linear Transformation

Definition and examples, algebra of linear transformations, matrix of a linear transformation. Singular, non-singular linear transformations and invertible linear transformations. Rank and nullity of linear transformations, Rank-Nullity theorem.

(8 Hours Theory+4 Hours Tutorial)

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	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, 7th Ed., 2019.
4	David Poole	Linear Algebra, a modern introduction, Cengage publishers, 4th 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.

Course Outcomes: Upon completion of this course the student will be able to:	
CO1	**Apply** the concepts of multivariable calculus in applications of computer science engineering and implementation using MATLAB.
CO2	**Apply** the concept of vector calculus to verify the vector as solenoidal or irrotational. Demonstrate the use of curvilinear coordinates. Implementation using MATLAB.
CO3	**Apply** matrix theory for solving the system of linear equations, compute eigenvalues and eigenvectors and implementation using MATLAB.
CO4	**Identify** the characteristic parameters of the vector spaces.
CO5	**Demonstrate** the use of linear transformation in the computer science and engineering stream.

Course Articulation Matrix

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

Applied Mathematics-I
(Mechanical Engg.)

Contact Hours/ Week:	3+2	Credits:	04
Total Lecture Hours:	40+20	CIE Marks:	50
Course Code:	AMM1	SEE Marks:	50

Course objectives:
This course will enable students to:

1.	**Familiarize** the importance of calculus associated with one variable and multivariable arising in engineering.
2.	**Analyze and solve** engineering problems by applying Ordinary Differential Equations.
3.	**Demonstrate** the use of analytical and numerical methods to solve the system of linear equations.
4.	**Utilize** a modern tool MATLAB for computation and visualization.

Module I - Polar Curves and Curvature

Polar coordinates, Polar curves, angle between the radius vector and the tangent, angle between two curves. Pedal equations. Curvature and radius of curvature - Cartesian, parametric, polar and pedal forms.

8 Hours

Module II - Series Expansion, Indeterminate Forms and Multivariable Calculus

Statement and problems on Taylor's and Maclaurin's series expansion for one variable. Indeterminate forms-L'Hospital's rule. Partial differentiation, total derivative – differentiation of composite functions. Jacobian. Maxima and minima for the function of two variables.

8 Hours

Module III - Ordinary Differential Equations of First Order

Linear and Bernoulli's differential equation. Exact and reducible to exact differential equations with integrating factor: $\frac{1}{N}\left(\frac{\partial M}{\partial y}-\frac{\partial N}{\partial x}\right)$ and $\frac{1}{M}\left(\frac{\partial N}{\partial x}-\frac{\partial M}{\partial y}\right)$. Orthogonal trajectories, Law of natural growth and decay.

8 Hours

Module IV - Ordinary Differential Equations of Higher Order

Higher-order linear ordinary differential equations with constant coefficients, homogeneous and non- homogeneous equations(e^{ax}, sin(ax+b), cos(ax+b), x^nonly), Method of variation of parameters, Cauchy's and Legendre's homogeneous differential equations. Applications: Solving governing differential equations of Mass Spring.

8 Hours

Module V - Linear Algebra

Elementary row transformation of a matrix, Echelon form, 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.

8 Hours

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.	Ray Wylie, Louis C. Barrett	Advanced Engineering Mathematics, Mc Graw Hill Book Co., New York, 6th Ed., 2017.
6.	David C Lay	Linear Algebra and its Applications, Pears on Publishers, 4th Ed., 2018.
7.	Gareth Williams	Linear Algebra with Applications "Jones Bartlett Publishers Inc., 6th Ed., 2017.

Course Outcomes:
Upon completion of this course the student will be able to:

CO1	**Apply** the knowledge of calculus to solve problems related to polar curves and implementation using MATLAB.
CO2	**Apply** the concept of partial differentiation to compute rate of change of multivariate functions and implementation using MATLAB.
CO3	**Apply** the analytical methods to solve first order and first-degree differential equations and implementation using MATLAB.
CO4	**Apply** the analytical methods to solve higher order differential equations and implementation using MATLAB.
CO5	**Apply** matrix theory for solving the system of linear equations, compute eigenvalues and eigenvectors and implementation using MATLAB.

Course Articulation Matrix

		POs											PSOs	
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**
COs	**CO1**	3	1			1								
	CO2	3	1			1								
	CO3	3	1			1								

	CO4	3	1			1								
	CO5	3	1			1								

Applied Mathematics-I

(EEE Stream)

Contact Hours/ Week:	3+2	Credits:	4
Total Lecture Hours:	40 + 20	CIE Marks:	50
Course Code:	AME1	SEE Marks:	50

Course objectives: This course will enable students to:	
1.	**Familiarize** the importance of calculus associated with one variable and multivariable arising in engineering.
2.	**Analyze** and solve engineering problems by applying Ordinary Differential Equations.
3.	**Demonstrate** the use of analytical and numerical methods to solve the system of linear equations.
4.	**Utilize** a modern tool MATLAB for computation and visualization.

Module I: Differential Calculus
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.
8 Hours Theory + 4 Hours Tutorial

Module II: Power Series Expansions, Indeterminate Forms and Multivariable Calculus
Statement and problems on Taylor's and Maclaurin's series expansion for one variable. Indeterminate forms - L'Hospital's rule. Partial Differentiation: Partial differentiation, total derivative - differentiation of composite functions. Jacobian. Maxima and minima for a function of two variables.
8 Hours Theory + 4 Hours Tutorial

Module III: Ordinary Differential Equations (ODE) of First Order and First Degree and Nonlinear ODE
Exact and reducible to exact differential equations. Integrating factors on $\frac{1}{N}\left(\frac{\partial M}{\partial y}-\frac{\partial N}{\partial x}\right)$ and $\frac{-1}{M}\left(\frac{\partial M}{\partial y}-\frac{\partial N}{\partial x}\right)$ only. Linear and Bernoulli's differential equations. Orthogonal trajectories, L-R and C-R circuits. Non-linear differential equations: Introduction to general and singular solutions, solvable for p only, Clairaut's equations, reducible to Clairaut's equations.
8 Hours Theory + 4 Hours Tutorial

Module IV: Ordinary Differential Equations of Higher Order
Higher-order linear ODEs with constant coefficients, homogeneous and non-homogeneous equations - e^{ax}, sin(ax+b), cos(ax+b), x^n only. Method of variation of parameters, Cauchy's and Legendre's homogeneous differential equations. L-C-R circuits.

8 Hours Theory + 4 Hours Tutorial

Module V: Linear Algebra
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.
8 Hours Theory + 4 Hours Tutorial

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 and 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.

Course Outcomes:
Upon completion of this course the student will be able to:

CO1	Apply the knowledge of calculus to solve problems related to polar curves and implementation using MATLAB.
CO2	Apply the concept of partial differentiation to compute rate of change of multivariate functions and implementation using MATLAB.
CO3	Apply the analytical methods to solve first order and first-degree differential equations and implementation using MATLAB.
CO4	Apply the analytical methods to solve higher order differential equations and implementation using MATLAB.
CO5	Apply matrix theory for solving the system of linear equations, compute eigenvalues and eigenvectors and implementation using MATLAB.

Course Articulation Matrix

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

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

Applied Mathematics – II
(Civil Engineering)

Contact Hours/ Week:	3:2:0:0	Credits:	4 Credits
Total Lecture Hours:	40 Hours Theory + 20 Hours Tutorials	CIE Marks:	50
Course Code:	AMC2	SEE Marks:	50

Course objectives: This course will enable students to:	
1.	**Familiarize** the importance of Integral calculus and Vector calculus.
2.	**Analyze** the engineering problems applying Partial Differential Equations
3.	**Develop** the numerical schemes to solve algebraic, transcendental and differential Equations
4.	**Utilize** a modern tool MATLAB for computation and visualization.

Module I : Integral Calculus
Multiple Integrals: 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. Beta and Gamma functions: Definitions, properties, relation between Beta and Gamma functions.
8 Hours Theory + 4 Hours Tutorial

Module II : Partial Differential Equations
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.
8 Hours Theory + 4 Hours Tutorial

Module III : Vector Calculus
Scalar and vector fields. Gradient, directional derivative, divergence and curl - physical interpretation, solenoidal vector fields, irrotational vector fields and scalar potential. Vector Integration: Line integrals, work done by a force and flux, Statements of Green's theorem and Stoke's theorem, problems without verification.
8 Hours Theory + 4 Hours Tutorial

Module IV : Numerical Methods - 1
Solution of algebraic and transcendental equations: Regula-Falsi and Newton-Raphson methods, problems. 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 $1/3^{rd}$ and $3/8^{th}$ rules.
8 Hours Theory + 4 Hours Tutorial

Module V: Numerical Methods – 2

Numerical solution of ordinary differential equations of first order and first degree: Taylor's series method, Modified Euler's method, Runge-Kutta method of fourth order, Milne's predictor-corrector method and Adams-Bashforth predictor-corrector method.
8 Hours Theory + 4 Hours Tutorial

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	M.K. Jain, S.R.K. Iyengar and R.K. Jain	Numerical Methods for Scientific and Engineering Computation, New Age International Publishers, 8th 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	Steven V. Chapra and Raymond P. Canale	Applied Numerical Methods with Matlab for Engineers and Scientists, McGraw-Hill, 3rd Ed., 2011.
6	Richard L. Burden, Douglas J. Faires and A. M. Burden	Numerical Analysis, 10th Ed.,2010, Cengage Publishers.
7	S.S. Sastry	Introductory Methods of Numerical Analysis, PHI Learning Private Limited, 5th Ed., 2012.

Course Outcomes:
Upon completion of this course the student will be able to:

CO1	Apply the concepts of integral calculus to model and solve problems in civil engineering applications using MATLAB.
CO2	Apply the concept of partial differentiation to compute rate of change of multivariate functions and implementation using MATLAB.
CO3	Apply the concept of vector calculus to verify the vector as solenoidal or irrotational. Demonstrate the use of curvilinear coordinates. Implementation using MATLAB.
CO4	Apply numerical techniques to solve algebraic and transcendental equations and to perform interpolation and numerical integration. Implementation using MATLAB.
CO5	Apply appropriate numerical methods to find approximate solutions of ordinary differential equations and implementation using MATLAB.

Course Articulation Matrix

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

Applied Mathematics–II
(CSE Stream)

Contact Hours/ Week:	3:2:0:0	Credits:	04
Total Lecture Hours:	40 Hours Theory + 20 Hours Tutorial	CIE Marks:	50
Course Code:	AMS2	SEE Marks:	50

Course objectives: This course will enable students to:	
1.	**Understand** and quantify the errors.
2.	**Develop** the numerical schemes to solve transcendental and differential equations.
3.	**Demonstrate** the application of interpolation.
4.	**Utilize** a modern tool MATLAB for computation and visualization.

Module I: Introduction to Numerical Methods
Errors and their computation: Round off error, Truncation error, Absolute error, Relative error and Percentage error. Solution of algebraic and transcendental equations: Bisection, Regula-Falsi, Secant and Newton-Raphson methods.
(8 Hours Theory+4 Hours Tutorial)

Module II: Numerical Solutions for System of Linear Equations
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.
(8 Hours Theory+4 Hours Tutorial)

Module III: Interpolation
Finite differences, interpolation using Newton Gregary forward and Newton Gregary backward difference formulae, Newton's divided difference. Lagrange interpolation formulae, piecewise interpolation-linear and quadratic.
(8 Hours Theory+4 Hours Tutorial)

Module IV: Differential Equations of First and Higher Order
Linear and Bernoulli`s differential equations. Exact and reducible to exact differential equations with integrating factors on $\frac{1}{N}\left(\frac{\partial M}{\partial y}-\frac{\partial N}{\partial x}\right)$ and $-\frac{1}{M}\left(\frac{\partial M}{\partial y}-\frac{\partial N}{\partial x}\right)$. Homogeneous and non-homogeneous differential equations of higher order with constant coefficients. Inverse differential operators – e^{ax}, sin(ax+b), cos(ax+b) and x^n.
(8 Hours Theory+4 Hours Tutorial)

Module V: Numerical Integration and Numerical Solution of Differential Equations
Numerical integration: Trapezoidal, Simpson's 1/3 rd, Simpson's 3/8th rule and Weddle's rule. Numerical solution of ordinary differential equations of first order and first degree - Taylor's series method, Modified Euler's method, Runge-Kutta method of fourth order and Milne's predictor-corrector method.
(8 Hours Theory+4 Hours Tutorial)

TEXT BOOKS		
1	M.K. Jain, S.R.K. Iyengar and R.K. Jain	Numerical Methods for Scientific and Engineering Computation, New Age International Publishers, 8th Ed., 2022.
2	David C Lay	Linear Algebra and its Applications, Pearson Publishers, 5th Ed., 2023.
3	B. S. Grewal	Higher Engineering Mathematics, Khanna Publishers, 44th Ed., 2021.

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	S. S. Sastry	Introductory Methods of Numerical Analysis, PHI Learning Private Limited, 5th Ed. 2012.
4	Steven V. Chapra and Raymond P. Canale	Applied Numerical Methods with Matlab for Engineers and Scientists, McGraw-Hill, 3rd Ed., 2011.
5	Richard L. Burden, Douglas J. Faires, A. M. Burden	Numerical Analysis, 10th Edition., 2010, Cengage Publishers.

Course Outcomes:
Upon completion of this course the student will be able to:

CO1	**Apply** numerical techniques to solve algebraic and transcendental equations and implementation using MATLAB.
CO2	**Apply** analytical and numerical techniques to solve system of linear equations and implementation using MATLAB.
CO3	**Apply** numerical techniques to perform interpolation and implementation using MATLAB.
CO4	**Apply** analytical techniques to solve ordinary differential equations and implementation using MATLAB.
CO5	**Apply** numerical technique for integration and IVP and implementation using MATLAB.

Course Articulation Matrix

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

Applied Mathematics – II
(Mechanical Engg. Stream)

Contact Hours/ Week:	3+2	Credits:	04
Total Lecture Hours:	40+20	CIE Marks:	50
Course Code:	AMM2	SEE Marks:	50

Course objectives:
This course will enable students to:

1.	**Familiarize** the importance of Integral calculus and Vector calculus.
2.	**Develop** the numerical schemes to solve algebraic, transcendental and differential Equations.
3.	**Analyze** and solve engineering problems by applying Ordinary Differential Equations.
4.	**Utilize** a modern tool MATLAB for computation and visualization.

Module I - Integral Calculus

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.

Beta and Gamma functions: Definitions, properties, relation between Beta and Gamma functions.

8 Hours

Module II - Partial Differential Equations (PDE)

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.

8 Hours

Module III – Vector Calculus

Scalar and vector fields. Gradient, directional derivative, divergence and curl-physical interpretation, solenoidal vector fields, irrotational vector fields and scalar potential.

Vector Integration: Line integrals, work done by a force and flux. Statement of Green's theorem and stoke's theorem and problems without verifications.

8 Hours

Module IV – Numerical Methods-1

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 $1/3^{rd}$ and $3/8^{th}$ rules.

8 Hours

Module V - Numerical Methods–2

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

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.	M. K. Jain, S. R. K. Iyengar and R. K. Jain	Numerical Methods for Scientific and Engineering Computation, New Age International Publishers, 8th Ed., 2022.

REFERENCE BOOKS		
1.	B. V. Ramana	Higher Engineering Mathematics, McGraw-Hill Education, 11thEd., 2017.
2.	Srimanta Pal & Subodh C. Bhunia	Engineering Mathematics, Oxford University Press, 3rdEd., 2016.
3.	N. P. Bali and Manish Goyal	A Textbook of Engineering Mathematics, Laxmi Publications, 10thEd., 2022.
4.	H. K. Dass and Er. Rajnish Verma	Higher Engineering Mathematics, S. Chand Publication, 3rdEd., 2014.
5.	Ray Wylie, Louis C. Barrett	Advanced Engineering Mathematics, Mc Graw Hill Book Co., New York, 6th Ed., 2017.
6.	Steven V. Chapra and Raymond P. Canale	Applied Numerical Methods with Matlab for Engineers and Scientists, McGraw-Hill, 3rd Ed., 2011.
7.	Richard L. Burden, Douglas J. Faires and A. M. Burden	Numerical Analysis, 10th Ed., 2010, Cengage Publishers.
8.	S. S. Sastry	Introductory Methods of Numerical Analysis", PHI Learning Private Limited, 5th Ed., 2012.

Course Outcomes:
Upon completion of this course the student will be able to:

CO1	**Apply** the concepts of integral calculus to model and solve problems in engineering applications using MATLAB.
CO2	**Apply** the analytical methods to solve partial differential equations.
CO3	**Apply** the concept of vector calculus to verify the vector as solenoidal or irrotational. Demonstrate the use of line integral, Greens and stokes theorem. Implementation using MATLAB.
CO4	**Apply** numerical techniques to solve algebraic and transcendental equations and to perform interpolation and numerical integration. Implementation using MATLAB.
CO5	**Apply** appropriate numerical methods to find approximate solutions of ordinary differential equations and implementation using MATLAB.

Course Articulation Matrix

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

APPLIED MATHEMATICS-II
(EEE Stream)

Contact Hours/ Week:	3+2	Credits:	4
Total Lecture Hours:	40 +20	CIE Marks:	50
Course Code:	AME2	SEE Marks:	50

Course objectives: This course will enable students to:	
1.	**Familiarize** the importance of Integral calculus and Vector calculus.
2.	**Develop** the numerical schemes to solve algebraic, transcendental and differential Equations
3.	**Demonstrate** the use of Laplace Transform to solve initial value problems
4.	**Utilize** a modern tool MATLAB for computation and visualization.

Module I: Integral Calculus and its Applications
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. Beta and Gamma functions: Definitions, properties, relation between Beta and Gamma functions.
8 Hours Theory + 4 Hours Tutorial

Module II: Vector Calculus and its Applications
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. Vector Integration**:** Line integrals, Statement of Green's and Stokes' theorem without verification problems.
8 Hours Theory + 4 Hours Tutorial

Module III: Numerical Methods-1
Solution of algebraic and transcendental equations: Regula-Falsi method and Newton-Raphson method. Finite Differences and Interpolation: Forward and backward differences, Interpolation, Newton forward and backward interpolation formulae, Newton's divided difference interpolation formula and Lagrange's interpolation formula. Numerical Integration: Trapezoidal rule, Simpson's $1/3^{rd}$ rule and Simpson's $3/8^{th}$ rule.
8 Hours Theory + 4 Hours Tutorial

Module IV: Numerical Methods-2
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-Bashforth predictor-corrector method.
8 Hours Theory + 4 Hours Tutorial

Module V: Laplace Transform
Laplace transform (LT): Definition and Formulae of Laplace Transform, LT of elementary functions. Properties–linearity, scaling, shifting property, differentiation in the s domain, division by t. LT of periodic functions, square wave, saw-tooth wave, triangular wave, full and half wave rectifier, Heaviside Unit step function. Inverse Laplace Transforms: Definition, properties, evaluation using different methods, and applications to solve ordinary differential equations.
8 Hours Theory + 4 Hours Tutorial

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.	M.K. Jain, S.R.K. Iyengar and R.K. Jain	Numerical Methods for Scientific and Engineering Computation, New Age International Publishers, 8th 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.	Steven V. Chapra and Raymond P. Canale	Applied Numerical Methods with Matlab for Engineers and Scientists, McGraw-Hill, 3rd Ed., 2011.
6.	Richard L. Burden, Douglas J. Faires and A. M. Burden	Numerical Analysis, 10th Ed.,2010, Cengage Publishers.
7.	S.S. Sastry	Introductory Methods of Numerical Analysis, PHI Learning Private Limited, 5th Ed., 2012.

Course Outcomes: Upon completion of this course the student will be able to:	
CO1	Apply the concepts of integral calculus to model and solve problems in engineering applications using MATLAB.
CO2	Apply the concept of vector calculus to verify the vector as solenoidal or irrotational. Demonstrate the use of line integral, Greens and stokes theorem. Implementation using MATLAB.
CO3	Apply numerical techniques to solve algebraic and transcendental equations and to perform interpolation and numerical integration. Implementation using MATLAB.

CO4	Apply appropriate numerical methods to find approximate solutions of ordinary differential equations and implementation using MATLAB.
CO5	Apply the Laplace transform method to solve initial value problem and implement using MATLAB

Course Articulation Matrix

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

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

PHYSICS FOR SUSTAINABLE STRUCTURAL SYSTEMS (for CV)

Contact Hours/ Week:	3(L) + 2(P)	Credits:	4
Total Lecture Hours:	40 + 28	CIE Marks:	50
Course Code:	APC	SEE Marks:	50

Course objectives:
This course will enable students to:

1.	Study the principles of elasticity for designing structures with a solid understanding of their mechanical behavior under stress.
2.	Comprehend different oscillatory systems and to acquire knowledge about interaction between waves and structures.
3.	Study the acoustics of buildings and the essentials of radiometry and photometry.
4.	Understand the principles and techniques used in various non-destructive testing (NDT) methods and to understand shock waves, generation, and applications.
5.	Understand the various relevant material characterization techniques.

UNIT I

ELASTICITY

Introduction, Elastic materials (qualitative), Hooke's law, Stress-strain curve, Strain hardening and softening. Elastic Moduli, Poisson's ratio and its limiting values. Relation between Young's modulus (Y), rigidity modulus (n), bulk modulus (K) and Poisson's ratio (σ) (with derivation), Beams, Bending moment and expression for bending moment (qualitative). Cantilever, Derivation of expression of Young's modulus of a beam, I section girder and their engineering Applications, Failures of engineering materials – Ductile fracture, Brittle fracture, Stress concentration, Fatigue and factors affecting fatigue (only qualitative explanation). Numerical problems.

Prerequisites: Basics of Elasticity.

Self-learning: Stress-Strain Curve, Elastic moduli

8 Hours

UNIT II

OSCILLATIONS & WAVES

Oscillations: Simple Harmonic motion (SHM), Characteristics of 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, Numerical Problems.

Waves and their role in structural behavior: Types of waves, Wave propagation in beams, rods, and slabs, Boundary effects, Wave dispersion, Damping in structures, Energy dissipation techniques in structures.

Pre-requisites: Basics of oscillations
Self-learning: Differences between harmonic and un-harmonic oscillations

8 Hours

UNIT III

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, Impact of noise in multi-storied buildings, Numerical Problems.

Radiometry and Photometry: Radiation quantities, Spectral Quantities, Relation between luminescence and Radiant quantities, Reflectance and Transmittance, Photometry (cosine law and inverse square law - Qualitative), Numerical Problems

Prerequisites: Basics of Sound, Waves & light properties
Self-learning: Types of acoustics

8 Hours

UNIT IV

NON-DESTRUCTIVE TESTING AND SHOCK WAVES

Introduction to NDT, Needs for inspection, Methods of NDT, Benefits of NDT. Visual inspection, Liquid penetration test: Principle, Basic processing steps of inspection, materials used, advantages and limitations, Eddy current testing: Inspection probes, Display methods, Ultrasonic testing- Ultrasonic flaw detector, - Normal beam pulse-echo, normal beam through transmission, Numerical Problems.

Shock waves: Mach number and Mach Angle, Mach Regimes, definition and Characteristics of Shock waves, Construction and working of Reddy shock tube, Role of Shock waves in NDT methods. Numerical problems.

Prerequisites: Basics of Ultrasonic.
Self-learning: Fundamentals of NDT. Common examination methods.

8 Hours

UNIT V

MATERIAL CHARACTERISATION AND INSTRUMENTATION TECHNIQUES
Introduction to nanomaterials and nanocomposites, surface area to volume ratio, quantum confinement, Optical properties due to quantum confinement, characteristics of composites, metal matrix, ceramic matrix, polymer matrix nanocomposites. Bragg's law, principle, construction and working of X-ray Diffractometer, crystallite size determination by Scherrer equation, Principle, construction, working and applications of Atomic Force Microscope (AFM) and Scanning electron microscope (SEM), Numerical Problems **Prerequisites:** Fundamental principles of Quantum Mechanics, **Self-learning:** Nanomaterials, Principles of XRD, AFM, and SEM
8 Hours

TEXT BOOKS		
1	H M Agarwal and R M Agarwal	Physics, Oscillations and Waves, Optics and Quantum Mechanics, Pearson, 2025
2	Satyendra Sharma and Jyotsna Sharma	Engineering Physics, Pearson, 2018.

REFERENCE BOOKS		
1	S L Kakani, Shubra Kakani	Engineering Physics, 3rd Edition, CBS Publishers Pvt. Ltd. 2020
2	R K Gaur and S L Gupta	Engineering Physics, edition, Dhanpat Rai Publications Ltd., New Delhi, 2016
3	Chintoo S Kumar, K. Takayama and K P J Reddy	Shockwaves Made Simple, Wiley India Pvt. Ltd. New Delhi, 2014.
4	Sam Zhang, Lin Li, Ashok Kumar	Material Characterization Techniques, CRC Press, First Edition, 2008

LIST OF EXPERIMENTS

1. Rigidity modulus by Torsional Pendulum
2. Determination of Young's modulus using Single Cantilever
3. Series & Parallel Resonance using LCR circuit
4. Spring Constant
5. Wavelength of laser using grating,
6. Verification of Stefan's law
7. Frequency of AC source using Sonometer
8. Moment of Inertia of the given irregular body by setting Torsional Oscillations
9. Reddy shock tube
10. Resistivity of a wire by four probe method
11. Verification on Inverse Square Law of Intensity of Light
12. Determination of wavelength of Ultrasonic using Ultrasonic Interferometer

13. Simulation Experiment

14. Data Analysis using Spread Sheets

Note: Any ten experiments to be conducted from the above list by covering one a) Demonstration and b) Open Ended/ simulation/spreadsheet activity.

Manual/Observation book:

1.	Engineering Physics Lab Manual prepared by Faculty, Department of Physics, SIT.

Course Outcomes: Upon completion of this course the student will be able to:	
CO1	Apply the theory of elasticity to design and evaluate elastic moduli and bending moments of structural beams.
CO2	Analyze the behavior of simple harmonic, damped, and forced oscillatory systems in mechanical contexts and be able to find effective spring constant, frequency of oscillations, damping coefficient and amplitude of oscillation.
CO3	Apply the principles of acoustics, radiometry and photometry to design and evaluate systems of sound, light and radiation measurements.
CO4	Demonstrate knowledge of non-destructive testing (NDT) techniques and select suitable methods for assessing material and structural integrity.
CO5	Elucidate the importance of XRD, AFM and SEM in the area of engineering for structural characterizations of nanomaterials and be able to evaluate surface-to-volume ratio, crystallite size and interplanar spacing of crystal.

Course Articulation Matrix

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

QUANTUM PHYSICS AND APPLICATIONS

(For CSE, ISE, CI & BT Branches)

Contact Hours/ Week:	3(L) + 2(P)	Credits:	4
Total Lecture Hours:	40 + 28	CIE Marks:	50
Course Code:	APS	SEE Marks:	50

Course objectives: This course will enable students to:	
1	Understand principles of quantum mechanics and its applications in quantum computing.
2	Analyze the electrical properties of metals/semiconductors using classical and quantum models.
3	Explore superconductivity principles, phenomena, and applications in quantum systems.
4	Explain light-matter interaction and the working of photonic devices like lasers & optical fibers.
5	Comprehend basic quantum computing concepts and predict simple quantum circuit outcomes.

UNIT I

Quantum Mechanics

de Broglie hypothesis of Matter Waves, de Broglie wavelength and derivation of expression by analogy, Phase velocity and Group velocity (only concept), Heisenberg's Uncertainty Principle and its application (Nonexistence of electron inside the nucleus-Non Relativistic), Time independent Schrodinger wave equation, Wave Function, Physical Significance of a wave function and Born Interpretation, Eigen functions and Eigen Values, Motion of a particle in a one dimensional potential well of infinite depth, Waveforms and Probabilities, Numerical Problems.

Prerequisites: Dual nature of matter.
Self-learning: deBroglie Hypothesis

8 Hours

UNIT II

Electrical Properties of Metals and Semiconductors

Assumptions of classical free electron theory, Failures of classical free electron theory, Mechanisms of electron scattering in solids, Matheissen's rule, Assumptions of Quantum Free Electron Theory, Density of States (qualitative), Fermi Dirac statistics, Fermi Energy, Variation of Fermi Factor with Temperature and Energy, Expression for carrier concentration, Derivation of electron concentration in an intrinsic semiconductor, Expression for electron and hole concentration in extrinsic semiconductor (qualitative), Fermi level for intrinsic and extrinsic

semiconductor (qualitative), Hall effect in semiconductor, Expression for Hall coefficient and Hall voltage, Applications of Hall effect, Numerical problems, Numerical Problems.

Prerequisites: Basics of electrical conductivity.

Self-learning: Resistivity and Mobility

8 Hours

UNIT III

Superconductivity

Introduction to superconductors, Temperature dependence of resistivity, Critical temperature, Critical field, Meissner effect, Critical current, Types of super conductors, Temperature dependence of critical field, BCS theory (qualitative), Limitations of BCS theory, High temperature superconductivity, Quantum tunneling (qualitative), Josephson Junction, Flux quantization, DC and AC SQUIDs (qualitative), Applications in quantum computing. Numerical Problems.

Prerequisites: Basics of electrical conductivity

Self-learning: Tunneling Effect

8 Hours

UNIT IV

Photonics

Basic properties of a LASER beam, Interaction of Radiation with Matter, Einstein's A and B Coefficients, Requisites of a laser system, Condition for Laser Action, Semiconductor diode Laser, Applications - Bar code scanner, Laser Printer. Numerical Problems.

Optical fiber - Principle and construction, Derivation of Numerical aperture, V-number, Number of modes, Attenuation and its mechanisms (qualitative). Application - Optical fiber communication, Numerical problems.

Prerequisites: Properties of light

Self-learning: Propagation Mechanism &TIR in optical fiber

8 Hours

UNIT V

Quantum Computing

Matrices - Row and Column matrices and their multiplication (Inner product), Conjugate and transpose of a matrix, Unitary matrix (*U*). Concepts of Hilbert's space, Dirac (Ket and Bra) notation, and Matrix form of wave function. Identity Operator, Determination of I|0> and I|1>. Pauli Matrices and its operations on |0> and |1> states.

Introduction to Quantum Computing, Concept of Qubit - Bloch Sphere, properties, Difference between bit and qubit. Differences between classical & quantum computing. Moore's law - limitation of VLSI. Single Qubit Gates: Quantum Not Gate, Pauli - Z Gate, Hadamard Gate, Two Qubit Gate: Controlled NOT Gate. Predicting the outputs of various combinations of single and two-qubit gates. Numerical Problems. **Prerequisites:** Basics of Matrices, Classical computing, Concept of bit, **Self-learning:** Moore's law
8 Hours

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

REFERENCE BOOKS		
1	H M Agarwal and R M Agarwal	Physics, Oscillations and Waves, Optics and Quantum Mechanics, Pearson, 2025
2	M. N. Avadhanulu, P. G. Kshirsagar and TVS Arun Murthy	A Text book of Engineering Physics, 11th revised Ed, S. Chand & Company Ltd, New Delhi, 2022
3	Mishra, P. K.	Superconductivity – Basics and Applications. Ane Books, 2009.
4	Parag K Lala	Quantum Computing, McGraw Hill, 2020.

LIST OF EXPERIMENTS

1. Determination of wavelength of LASER using Diffraction Grating.
2. Determination of acceptance angle and numerical aperture of the given Optical Fiber.
3. Study the Characteristics of a Photo-Diode and to determine the power responsivity
4. Determination of Planck's Constant using LEDs.
5. Determination of Fermi Energy of Copper.
6. Determination of Energy gap of the given Semiconductor.
7. Black-Box Experiment (Identification of basic Electronic Components)
8. Resonance in LCR circuit.
9. Characteristics of a Bipolar Junction Transistor.
10. Determination of resistivity of a semiconductor by Four Probe Method.

11. Predicting the outputs of various combinations of single and two-qubit gates using QUIRK Quantum Simulator.
12. Predicting the outputs of various combinations of single and two-qubit gates using QUISKIT.
13. Air-wedge / Newtons to study the interference by the division of amplitude.
14. Data Analysis using Spread Sheet.

Note: Any TEN experiments to be conducted from the above list by covering one a) Demonstration and b) Open Ended/ simulation/spreadsheet activity.

Manual/Observation book:

1.	Engineering Physics Lab Manual prepared by Faculty, Department of Physics, SIT.

Course Outcomes: Upon completion of this course the student will be able to:	
CO1	Apply the basics of quantum mechanics to show nonexistence of electrons in the nucleus and to solve the problems on de Broglie wavelength, uncertainty in position, energy, and particle in a potential well.
CO2	Apply the concepts of classical and quantum free electron theory to find Fermi factor , concentration of charge carriers, as well as Hall coefficient, Hall voltage for the semiconductor.
CO3	Apply the theory of superconductivity to find the critical temperature and critical field for superconducting state of the materials
CO4	Apply the theory of LASERs and optical fiber to solve the problems on condition of laser action, power of laser, numerical aperture and attenuation coefficient of optical fiber.
CO5	Apply the knowledge of quantum theory in quantum computation and able to find the output of quantum circuits having single and multiple qubit gates.

Course Articulation Matrix

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

PHYSICS OF MATERIALS

(For ME, IEM & CH Branches)

Contact Hours/ Week:	3(L) + 2(P)	Credits:	4
Total Lecture Hours:	40 + 28	CIE Marks:	50
Course Code:	APM	SEE Marks:	50

Course objectives: This course will enable students to:	
1	Understand the principles of elasticity for designing structures with a solid materials and their mechanical behavior under stress.
2	Comprehend the theoretical background of lasers, the working of He-Ne laser and the applications of laser. Also, study the nature of light propagation in optical fiber, reasons for the fiber loss and applications of optical fiber.
3	Elucidate the types of oscillation, shock waves & its generation, and applications.
4	Understand the principles, materials, design and operation of thermoelectric devices for energy conversion and temperature control.
5	Comprehensive understanding of materials characterization techniques, analyze and interpret properties and structure of materials.

UNIT I

ELASTICITY

Introduction, Hooke's law, Review of Stress-Strain curve, Stress hardening and softening, Elastic Moduli, Poisson's ratio, Relation between Young's modulus (Y), rigidity modulus (n), and Poisson's ratio (σ) (with derivation), Mention relation between Y, K and σ, Limiting values of Poisson's ratio, Static and dynamic loading, Beams, Bending moment and derivation of expression, Cantilever, Torsion and Expression for couple per unit twist, Elastic materials (qualitative). Failures of engineering materials - Ductile fracture, Brittle fracture, Stress concentration, Fatigue and factors affecting fatigue (only qualitative explanation), S-N Curve, Numerical problems.

Prerequisites: Basics of Elasticity.

Self-learning: Stress-Strain Curve, Elastic moduli

8 Hours

UNIT II

Laser and Optical Fiber

Lasers: Introduction, characteristics of LASER, and difference between laser light and ordinary light. Concept of induced absorption, spontaneous emission and stimulated emission. Expression for energy density in terms of Einstein's coefficients and discussion of results.

Requisites of lasers. Condition for laser action. Construction and working of He-Ne laser, Material processing with laser beam: Surface modification, surface hardening, drilling, welding, cutting. Numerical Problems.

Optical fibers: Structure of optical fiber, working principle, Light propagation mechanism - angle of acceptance, numerical aperture, Expression for numerical aperture, Attenuation, and mechanisms for fiber loss (qualitative). Applications of Optical Fibers - Fiber Optic displacement sensor and Pressure sensor, Numerical Problems.

Prerequisite: Properties of light,

Self-learning: Difference between laser and ordinary light, Principle of optical fiber

8 Hours

UNIT III

OSCILLATIONS and SHOCK WAVES

Simple Harmonic motion (SHM), Characteristics of 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 with derivation, Resonance, Sharpness of resonance, Numerical Problems.

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

Pre-requisites: Basics of oscillations

Self-learning: Differences between harmonic and un-harmonic oscillations, Basics of SHM

8 Hours

UNIT IV

THERMOELECTRIC MATERIALS AND DEVICES

Thermo emf and thermo current, Seebeck effect, Peltier effect, Seebeck and Peltier coefficients, Figure of merit (Mention Expression), Laws of thermoelectricity. Expression for thermo emf in terms of T_1 and T_2, Thermo couples, Thermopile, Construction and Working of Thermoelectric generators (TEG) and Thermoelectric coolers (TEC), Low, Mid and High temperature thermoelectric materials, Applications: Exhaust of Automobiles, Refrigerator, Space Program (Radioisotope Thermoelectric Generator (RTG), Numerical Problems

Prerequisites: Basics of thermoelectricity **Self-learning:** Seebeck effect, Peltier effect
8 Hours

UNIT V
MATERIAL CHARACTERISATION AND INSTRUMENTATION TECHNIQUES Introduction to nanomaterials and nanocomposites, surface area to volume ratio, quantum confinement, Optical properties due to quantum confinement, characteristics of composites, metal matrix, ceramic matrix, polymer matrix nanocomposites. Bragg's law, principle, construction and working of X-ray Diffractometer, crystallite size determination by Scherrer equation, Principle, construction, working and applications of Atomic Force Microscope (AFM) and Scanning electron microscope (SEM), Numerical Problems **Prerequisites:** Fundamental principles of Quantum Mechanics, **Self-learning:** Nanomaterials, Principles of XRD, AFM, XPS and SEM.
8 Hours

TEXT BOOKS		
1	H M Agarwal and R M Agarwal	Physics, Oscillations and Waves, Optics and Quantum Mechanics, Pearson, 2025
2	Satyendra Sharma and Jyotsna Sharma	Engineering Physics, Pearson, 2018.

REFERENCE BOOKS		
1	S L Kakani, Shubra Kakani	Engineering Physics, 3rd Edition, CBS Publishers Pvt. Ltd. 2020
2	Chintoo S Kumar, K. Takayama and K P J Reddy	Shockwaves Made Simple, Wiley India Pvt. Ltd. New Delhi, 2014.
3	Sam Zhang, Lin Li, Ashok Kumar	Material Characterization Techniques, CRC Press, First Edition, 2008
4	Hitendra K. Singh and A. K. Singh,	Engineering Physics, Tata McGraw Hill, New Delhi, 2010

LIST OF EXPERIMENTS

1. Rigidity modulus of the material of the wire using Torsional Pendulum
2. Young's modulus of the material of the given bar using Single Cantilever
3. Series & Parallel Resonance using LCR circuit
4. Spring Constant
5. Wavelength of laser using grating,
6. Numerical aperture and fiber loss
7. Study the working of Peltier Modules
8. Verification of Stefan's law

9. Simulation Experiment
10. Data Analysis using Spread Sheets
11. Frequency of AC source using Sonometer
12. Moment of Inertia of the given irregular body by setting Torsional Oscillations
13. Reddy shock tube
14. Resistivity of a wire by four probe method

Note: Any ten experiments to be conducted from the above list by covering one a) Demonstration and b) Open Ended/ simulation/spreadsheet activity.

Manual/Observation book:

1	Engineering Physics Lab Manual prepared by Faculty, Department of Physics, SIT.

Course Outcomes: Upon completion of this course the student will be able to:	
CO1	Apply the theory of elasticity to design and evaluate elastic moduli and bending moments of structural beams.
CO2	Apply the theory of LASERs and optical fiber to solve the problems on condition of laser action, power of laser, numerical aperture and attenuation coefficient of optical fiber
CO3	Analyze the behavior of simple harmonic, damped, and forced oscillatory systems in mechanical and electrical contexts.
CO4	Evaluate the principles of thermoelectric effects and assess the performance of thermoelectric materials and devices for energy conservation and thermal management.
CO5	Elucidate the importance of XRD, AFM and SEM in the area of engineering for structural characterizations of nanomaterials and be able to evaluate surface-to-volume ratio, crystallite size and interplanar spacing of crystal.

Course Articulation Matrix

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

ELECTRICAL ENGINEERING MATERIALS

(For EE Branch)

Contact Hours/ Week:	3(L) + 2(P)	Credits:	4
Total Lecture Hours:	40 + 28	CIE Marks:	50
Course Code:	APEE	SEE Marks:	50

Course objectives:
This course will enable students to:

1	Understand the properties of dielectrics and magnetic materials.
2	Know the thermal properties of materials and their applications relevant to engineering.
3	Elucidate the properties of metals and superconductors.
4	Study the concept of band formation in solids and Hall Effect

UNIT I

Dielectric and Magnetic Materials:

Dielectrics: Introduction – Dielectrics, Solid, Liquid and Gaseous dielectrics, Polar and non-polar dielectrics, Electrical Polarization Mechanisms, Internal fields in solids (qualitative), Clausius-Mossotti relation, (Derivation) and its implications, Frequency dependence of Dielectric constant, Dielectric loss. Applications of dielectrics in Capacitors, Transformers, Numerical Problems.

Magnetic material: Classification of magnetic materials, Hysteresis curve and explanation using Domain theory, Hard and soft magnetic materials, Applications - Transformer Cores, magnetic data storage, Numerical Problems.

Pre-requisites: Basics of dielectrics and magnetic materials.

Self-learning: Electric dipolemoment, Bohr magneton.

8 Hours

UNIT II

Thermoelectric materials and devices:

Thermo emf and thermo current, Seebeck effect, Peltier effect, Seebeck and Peltier coefficients, figure of merit (Mention Expression), laws of thermoelectricity. Expression for thermo emf in terms of T1 and T2, Thermo couples, thermopile, Construction and Working of Thermoelectric generators (TEG) and Thermoelectric coolers (TEC), low, mid and high temperature thermoelectric materials, Applications: Exhaust of Automobiles, Refrigerator, Space Program (Radioisotope Thermoelectric Generator), Numerical Problems

Prerequisites: Basics of thermal conductivity

Self-learning: Seebeck effect, Thermo emf

8 Hours

UNIT III

Electrical Properties of Metals

Assumptions of classical free electron theory, drift velocity, relaxation time, collision time, Mechanisms of electron scattering in solids, Matheissen's rule, Expression for electrical conductivity, mobility of electrons, Failures of classical free electron theory. Assumptions of Quantum Free Electron Theory, Density of States (qualitative), Fermi Energy (qualitative), Expression of Fermi energy in terms of resistivity of a wire, significance of Fermi energy, Fermi Dirac statistics, Variation of Fermi Factor with Temperature, Fermi velocity, Fermi mean free path, Fermi temperature, Success of quantum free electron theory, concept of perfect conductor, Failures of QFE theory, Numerical Problems.

Prerequisites: Basics of electrical properties
Self-learning: Electrical conductivity

8 Hours

UNIT IV

Semiconductors

Classification of solids based on the formation of bands due to splitting of energy levels at equilibrium inter-nuclear distance: metal (Na & Mg), insulator (diamond) and semiconductor (Si). Types of semiconductors – Intrinsic and extrinsic semiconductor. Expression for carrier concentration, Derivation of electron concentration in an intrinsic semiconductor, Expression for electron and hole concentration in extrinsic semiconductor (qualitative), Fermi level for intrinsic and extrinsic semiconductor (qualitative), Expression for electrical conductivity of a semiconductor. Hall effect in semiconductor, Expression for Hall coefficient and Hall voltage, Applications of Hall effect, Numerical Problems.

Prerequisites: Basics of semiconductor
Self-learning: Effective mass

8 Hours

UNIT V

Superconductivity

Introduction to superconductors, Temperature dependence of resistivity, Critical temperature, Critical magnetic field, Meissner effect, Critical current, Types of super conductors, Temperature dependence of critical field, BCS theory (qualitative), Limitations of BCS theory, High temperature superconductivity, Quantum tunneling (qualitative), Josephson Junction, Flux quantization, DC SQUIDs (qualitative), Applications - superconducting magnet, Maglev Vehicle, Numerical Problems.

Prerequisites: Basics of electrical conductivity **Self-learning:** Tunnelling Effect	
	8 Hours

TEXT BOOKS		
1	M. N. Avadhanulu, P. G. Kshirsagar and TVS Arun Murthy	A Textbook of Engineering Physics, 11th revised Ed, S. Chand & Company Ltd, New Delhi, Reprint 2022
2	S L Kakani, Shubra Kakani	Engineering Physics, 3rd Edition, CBS Publishers and Distributers Pvt. Ltd, 2020
3	Satyendra Sharma and Jyotsna Sharma	Engineering Physics, Pearson, 2018.

REFERENCE BOOKS		
1	S Mani Naidu	Engineering Physics , Pearson, Fourteenth Impression, 2024.
2	S. O. Pillai	Solid State Physics, 8th Ed- New Age International Publishers-2018
3	Mishra, P. K.	Superconductivity – Basics and Applications. Ane Books, 2009.
4	Gaur and Gupta	Engineering Physics, Dhanpat Rai Publications, 2017
5	R. K. Shukla,	Electrical Engineering Materials, Tata Mcgraw-Hill Education, India, 2017 Reprint Edition.

LIST OF EXPERIMENTS

1. Determination of Magnetic Flux Density at any point along the axis of a circular coil.
2. Determination of the dielectric constant of the material of a capacitor by Charging and Discharging Method.
3. Study the characteristics of a Photo-Diode and determine the power responsivity
4. Study the frequency response of Series & Parallel LCR circuits.
5. Determination of the Fermi Energy of Copper.
6. Determination of resistivity of a semiconductor by Four Probe Method.
7. B-H Curve
8. Thermo-emf or Peltier Module
9. Identification of Electronic and Electrical Components and Determination of Value – Black Box
10. Energy Gap of a Semiconductor
11. I-V Characteristics of a Bipolar Junction Transistor.
12. I-V Characteristics of a Zener diode.
13. Construction and Analysing Electronic circuits (Expeyes Simulator / circuit lab)
14. Light Emitting Diode
15. Data Analysis using Spreadsheets

Note: Any ten experiments to be conducted from the above list by covering one a) Demonstration and b) Open Ended/ simulation/spreadsheet activity.

Manual/Observation book:

1	Engineering Physics Lab Manual prepared by Faculty, Department of Physics, SIT.

Course Outcomes: Upon completion of this course the student will be able to:	
CO1	Apply the theory of dielectrics to find dielectric constant, polarizability of the materials and be able to elucidate the applications of hard and soft magnetic materials for engineering applications.
CO2	Analyse thermoelectric phenomena, device construction, and identify suitable materials and applications for energy conversion.
CO3	Evaluate electrical transport mechanisms in metals using classical and quantum models and perform relevant calculations.
CO4	Apply the concepts of semiconductors to find mobility of charge carriers, conductivity of the materials, type and concentration of charge carriers in the semiconductor, Hall coefficient and Hall voltage.
CO5	Apply the theory of superconductivity to find critical temperature and critical field for superconducting state of the materials.

Course Articulation Matrix

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

QUANTUM PHYSICS AND ELECTRONICS SENSORS

(For EC, EI and ET Branches)

Contact Hours/ Week:	3(L) + 2(P)	Credits:	4
Total Lecture Hours:	40 + 28	CIE Marks:	50
Course Code:	APEC	SEE Marks:	50

Course objectives:
This course will enable students to:

1	Study the principles of quantum mechanics.
2	Understand the properties of metals, semiconductors and superconductors.
3	Explain light-matter interaction and the working of photonic devices like lasers & optical fibers.
4	Demonstrate the principles, characteristics, and applications of semiconductor devices.

UNIT I

Quantum Mechanics

de Broglie hypothesis of Matter Waves, de Broglie wavelength and derivation of expression by analogy, Phase velocity and Group velocity (only concept), Heisenberg's Uncertainty Principle and its application (Nonexistence of electron inside the nucleus-Non Relativistic), Wave Function, Time independent Schrodinger wave equation, Physical Significance of a wave function and Born Interpretation, Eigen functions and Eigen Values, Motion of a particle in a one dimensional potential well of infinite depth, Waveforms and Probabilities. Numerical Problems

Prerequisites: Dual nature of matter.
Self-learning: deBroglie Hypothesis

8 Hours

UNIT II

Electrical Properties of Metals and Semiconductors

Assumptions of classical free electron theory, Failures of classical free electron theory, Mechanisms of electron scattering in solids, Matheissen's rule, Assumptions of Quantum Free Electron Theory, Density of States (qualitative), Fermi Dirac statistics, Fermi Energy, Variation of Fermi Factor with Temperature and Energy, Expression for carrier concentration, Derivation of electron concentration in an intrinsic semiconductor, Expression for electron and hole concentration in extrinsic semiconductor (qualitative), Fermi level for intrinsic and extrinsic semiconductor (qualitative), Hall effect in semiconductor, Expression for Hall coefficient and Hall voltage, Applications of Hall effect, Numerical Problems.

Prerequisites: Basics of electrical conductivity.
Self-learning: Resistivity and Mobility

8 Hours

UNIT III

Superconductivity

Introduction to superconductors, Temperature dependence of resistivity, Critical temperature, Critical field, Meissner effect, Critical current, Types of superconductors, Temperature dependence of critical field, BCS theory (qualitative), Limitations of BCS theory, High temperature superconductivity, Quantum tunnelling (qualitative), Josephson Junction, Flux quantization, DC SQUIDs (qualitative), Applications - superconducting magnet, Maglev Vehicle, Numerical Problems.

Prerequisites: Basics of electrical conductivity
Self-learning: Tunneling Effect

8 Hours

UNIT IV

Photonics

Basic properties of a LASER beam, Interaction of Radiation with Matter, Einstein's A and B Coefficients, Requisites of a laser system, Condition for Laser Action, Semiconductor diode Laser, Applications - Bar code scanner, Laser Printer. Numerical Problems.

Optical fiber - Principle and construction, Derivation of Numerical aperture, V-number, Number of modes, Attenuation and its mechanisms (qualitative). Application - Optical fiber communication, Numerical problems.

Prerequisites: Properties of light
Self-learning: Propagation Mechanism &TIR in optical fiber

8 Hours

UNIT V

Semiconductor devices and Sensors

Formation of bands due to splitting of energy levels at equilibrium inter-nuclear distance - silicon/germanium, Direct and indirect band gap, LED, PhotoDiode, Photo Transistor, Light dependent resistor, Sensing mechanisms, Piezoelectric Sensors, Metal Oxide Semiconductor (MOS) sensors, Hall sensor, Superconducting Nanowire Single Photon Detector, Numerical Problems.

Prerequisites: I-V characteristics of p-n junction diode
Self-learning: Band formation in solids

8 Hours

TEXT BOOKS

1	M. N. Avadhanulu, P. G. Kshirsagar and TVS Arun Murthy	A Text book of Engineering Physics, 11th Ed, S. Chand & Company Ltd, New Delhi, 2022
2	S L Kakani, Shubra Kakani	Engineering Physics, 3rd Edition, CBS Publishers and Distributers Pvt. Ltd., 2020.
3	Satyendra Sharma and Jyotsna Sharma	Engineering Physics, Pearson, 2018.

REFERENCE BOOKS		
1	H M Agarwal and R M Agarwal	Physics, Oscillations and Waves, Optics and Quantum Mechanics, Pearson, 2025
2	S Mani Naidu	Engineering Physics, Pearson, Fourteenth Impression, 2024.
3	Mishra, P. K.	Superconductivity – Basics and Applications. Ane Books, 2009.
4	S. O. Pillai	Solid State Physics, 8th Ed- New Age International Publishers-2018.
5	B L Theraja	Basic Electronics, Multi-Colour Edition, S Chand, 2006

LIST OF EXPERIMENTS

1. Determination of the wavelength of LASER using Diffraction Grating.
2. Determination of acceptance angle and numerical aperture of the given Optical Fiber.
3. Determination of dielectric constant of the material of capacitor by charging and discharging method.
4. Study the Characteristics of a Photo-Diode and to determine the power responsivity
5. Determination of Plank's Constant using LEDs.
6. Determination of Fermi Energy of Copper.
7. Interference by the division of amplitude (Air-wedge/Newton's Rings)
8. Black-Box Experiment
9. Construction and Analysing of Electronic circuits (Expeyes Simulator / circuit lab)
10. Verification of the Inverse Square Law of Intensity of Light.
11. I-V Characteristics of a Bipolar Junction Transistor.
12. I-V Characteristics of a Zener diode.
13. Resonance in LCR circuit
14. Energy Gap of a Semiconductor

Note: Any ten experiments to be conducted from the above list by covering one a) Demonstration and b) Open Ended/ simulation/spreadsheet activity.

Manual/Observation book:

1	Engineering Physics Lab Manual prepared by Faculty, Department of Physics, SIT.

Course Outcomes: Upon completion of this course the student will be able to:	
CO1	Apply the basics of quantum mechanics to show the nonexistence of electrons in the nucleus and to solve the problems on de Broglie wavelength, uncertainty in position, energy, and particle in a potential well.
CO2	Apply the concepts of quantum free electron theory to find Fermi factor and concentration of charge carriers, Hall coefficient, Hall voltage for the semiconductor.
CO3	Apply the theory of superconductivity to find the critical temperature and critical field for the superconducting state of the materials.
CO4	Apply the theory of LASERs and optical fiber to solve the problems on the condition of laser action, power of laser, numerical aperture and attenuation coefficient of optical fiber.
CO5	Analyze the various semiconductor devices for electronic and photonic applications.

Course Articulation Matrix

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

Applied Chemistry for Sustainable Structures and Material Design

(CV Stream)

Contact Hours/ Week:	3+2	Credits:	4
Total Lecture Hours:	40+26	CIE Marks:	50
Course Code:	ACC	SEE Marks:	50

Course objectives:

This course will enable students to:

1.	Utilize the principles of water quality assessment and analytical techniques to evaluate and interpret water characteristics.
2.	Apply the understanding of cement quality parameters and implement the concepts of artificial concrete in the context of green building practices.
3.	Demonstrate proficiency in the synthesis of polymers, polymer composites, nanomaterials and apply their applications in civil engineering structures.
4.	Understand the properties of metals, alloys and analyze the corrosion phenomena relevant to building construction.
5.	Employ the construction, working principles, advancements in batteries and emerging energy storage technologies.

UNIT I

WATER CHEMISTRY AND ANALYTICAL TECHNIQUES

Water quality parameters: Introduction: Types of water and impurities in water. Water quality parameters: pH, turbidity, dissolved oxygen, chlorides and alkalinity for environmental and construction applications.

Waste water analysis: Chemical Oxygen Demand (COD): Definition, determination and numerical problems. Hardness of water: Definition, types and its determination by rapid EDTA method.

Analytical Techniques: Potentiometric Sensors: Principle, instrumentation and application in the estimation of iron in industrial effluents (FAS against $K_2Cr_2O_7$). Conductometric Sensors: Principle, instrumentation and applications of conductometric titrations in industrial effluents: Strong acid against strong base and mixture of strong acid and weak acid against a strong base. Optical Sensors: Colorimetry – Principle, instrumentation and numerical problems. Application of colorimetry in the estimation of copper in brass alloy.

8 Hours

UNIT II

CONVENTIONAL AND SUSTAINABLE CONSTRUCTION MATERIALS
Cement: Introduction, chemical composition and types. Manufacturing of cement by Kiln process, Setting and hardening of cement. **Sustainability issues in cement manufacturing**: Environmental impact of cement – CO_2 emissions and energy consumption. Concept of carbon footprint and greenhouse gas mitigation. **Supplementary Cementitious Materials**: Fly ash and Ground Granulated Blast-furnace Slag (GGBS) - Origin, Chemistry and its applications. **Green cements and alternatives**: Geopolymer Concrete: Introduction, mechanism of geopolymerization and manufacturing process of geopolymer concrete. Advantages over Ordinary Portland Cement (OPC) concrete. **Piezoelectric cement composites**: Piezoelectric materials in cement composites and its applications in civil engineering. **Bioconcrete:** Introduction, self-healing property and advantages.
8 Hours

UNIT III MATERIALS FOR STRUCTURAL INTEGRITY
Polymers: Introduction: Definition and types of polymerization. Molecular weight of polymers: Number and weight average molecular weight of polymers. Numerical problems. Synthesis, properties and engineering applications of PVC, PMMA, Kevlar and Epoxy Resins. **Biopolymers:** Polylactic acid: Synthesis, properties and its applications. **Nanomaterials**: Introduction: Definition and classification based on composition. Size dependent properties: Surface area, water absorption and permeability, thermal properties and antimicrobial activity. Synthesis of TiO_2 by hydrothermal process. Concrete as composite material and composition of nano-concrete. Industrial applications of carbon-based reinforced composites graphene/carbon nano tube as fillers.
8 Hours

UNIT IV CORROSION SCIENCE AND SURFACE PROTECTION
Metals and Alloys: Introduction, classification of metals: ferrous and non-ferrous. Iron and its alloys: Wrought Iron, Cast Iron, Pig iron and Steel - composition, properties and applications. Aluminum and its alloys: Duralumin and Magnalium - composition, properties,

and applications.

Corrosion: Introduction, electrochemical corrosion of steel. Types of corrosion - Differential metal corrosion, Differential aeration corrosion – waterline corrosion and pitting corrosion, and Stress corrosion in civil structures. Corrosion control by coatings: Galvanization and anodization. Corrosion control by cathodic protection: Impressed voltage method and sacrificial anode method. Introduction to corrosion penetration rate. Numerical problems.

Metal finishing: Introduction, technological importance of metal finishing, Electroplating of Chromium - Decorative and hard coating.

8 Hours

UNIT V

ENERGY SYSTEMS AND GREEN FUELS

Electrochemistry: Introduction, Electrode potential, Nernst equation (basic overview), Construction and working of concentration cell. Numerical problems on Nernst equation and concentration cell.

Energy systems: Introduction: Definition, classification of batteries. Battery characteristics: capacity, power density, cell balancing and cycle life. Construction and working of Lithium-ion battery and its applications.

Fuel cells: Definition, difference between battery and fuel cell. Construction, working, and applications of solid-oxide fuel cell.

Solar Energy: Construction and working of silicon solar cell. Advantages, applications and limitations.

Green Fuels: Introduction, green hydrogen production by TiO_2-photocatalytical method and applications.

8 Hours

TEXT BOOK

Sl. No.	Author/s	Title, Publisher, Edition, Year
1	Suba Ramesh and S. Vairam	Engineering Chemistry - A text book of Chemistry for Engineers. Wiley India 2020.

REFERENCE BOOKS

Sl. No.	Author/s	Title, Publisher, Edition, Year
1	S. S. Dara	A text book of Environmental Chemistry and pollution and pollution control, 2004.

2	N. Subramanian	Building Materials. Oxford Higher Education, 2019. ISBN: 9780199497218, 9780199497218
3	Bharath Bhushan	Hand book of nanotechnology, Spinger-Verlag Berlin Heidelberg, New York, 2010.
4	S.K. Dhawan and Hema Bhandari	Corrosion Preventive Materials and Corrosion Testing, CRC Press, 2020.
5	Vladimir S. Bagotsky, Alexander M. Skundin, Yurij M. Volfkovich	Electrochemical Power Sources Batteries, Fuel Cells, And Supercapacitors. Wiley Publishing Inc. 2015.

Course Outcomes:	
Upon completion of this course the student will be able to:	
CO1	Analyze water quality parameters and metal ion concentration through wet and instrumental methods and modify the quality of water quality by RO.
CO2	Apply the knowledge of chemistry principles to improve the quality of cement, concrete and eco-friendly concrete.
CO3	Identify differences in traditional and advanced polymer/nanocomposites and their influence on engineering applications.
CO4	Implement suitable techniques to control corrosion of ferrous, nonferrous metals, alloys and protect metals through metal finishing process.
CO5	Illustrate the functioning of electrodes, energy storage and conversion systems, such as Li-ion battery, solid-oxide fuel cell and silicon solar cell.

Course Articulation Matrix

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

PRACTICAL MODULE

Course objectives: This course will enable students to:	
1.	The use of pH sensor for the determination of pK_a of given soft drinks.
2.	The construction and use of electrochemical cell as sensor for the determination of emf/concentration of redox species.
3.	The usage of optical sensors (colorimeter) for the estimation of metals in various matrices.
4.	The use of conductivity meter for the determination of conductance in electrolytic solutions.
5.	The application of volumetry in the analysis of water quality parameters.

A – Instrumental Methods of Analysis:

A1. Determination of pKa of given sample of soft drink using pH sensor and its graphical interpretation using origin software.

A2. Estimation of iron present in stainless steel using electrochemical sensor and its graphical interpretation using origin software.

A3. Optical sensor for copper determination from e - waste sample (printed circuit board) and its graphical interpretation using origin software.

A4. Estimation of HCl using standard NaOH conductometrically and its graphical interpretation using origin software.

B – Volumetric Methods of Analysis:

B1. Determination of total hardness of water for drinking purpose.

B2. Determination of Chemical Oxygen Demand (COD) of the given industrial waste water sample.

B3. Redox titration – Determination of iron in the given TMT by bars external indicator method.

B4. Determination of CaO in cement by rapid EDTA method.

C – Demonstration Experiments (Any two):

C1. Synthesis of nano SiO_2 by combustion method.

C2. Determination of alkalinity of water using standard NaOH solution.

C3. Preparation of urea formaldehydye resin.

C4. Determination of viscosity coefficient of a lubricant using Ostwald's viscometer.

D – Open Ended Experiments (Any two):

TEXT BOOK:

Sl. No.	Author/s	Title, Publisher, Edition, Year
1.	Arthur I. Vogel	Quantitative Inorganic Analysis and Elementary Instrumental Analysis: ELBS, Longmann Group, 5th Edition, 1989.

Course Outcomes: Upon completion of this course the student will be able to:	
CO1	Determine the electrode potential of newly constructed electrodes; calculate the voltage of galvanic cell and batteries and determination of pH of water and other liquid samples.
CO2	Estimate the amount of metal(s) in effluents by potentiometer.
CO3	Determine the metals/pollutants in water and alloys using colorimeter.
CO4	Measure the conductance of solutions/electrolytes which in turn can be used for the determination of its characteristics.
CO5	Use the knowledge of volumetric analysis for estimation of metals and water samples.

Mapping of Course Outcomes with Program outcomes

1. Ability to apply knowledge of science to the engineering problems.
2. Ability to analyze the problems using the principles of science.

Course Articulation Matrix

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

APPLIED CHEMISTRY FOR SMART SYSTEMS

(CSE Stream)

Contact Hours/ Week:	03+ 02	Credits:	04
Total Lecture Hours:	40+ 26	CIE Marks:	50
Course Code:	ACS	SEE Marks:	100

Course objectives: This course will enable students to:	
1.	Implement the knowledge of battery and fuel cell construction, operation and applications in the production of hydrogen as a clean energy fuel.
2.	Learn the art of sensor technology, mechanism of corrosion and its control.
3.	Master the knowledge of principles of green chemistry, biomaterials, e-waste and their applications, along with the role of chemistry in forensic science.
4.	Gain knowledge on quantum dots, polymers, photovoltaic cells and its applications in real time sensor technologies.
5.	To impart foundational knowledge on the structure, mechanistic perspectives of electronic memory and display systems.

UNIT I
SUSTAINABLE CHEMISTRY FOR ENERGY DEVICES

Advanced Battery Chemistry: Introduction, Electrochemical cell and classification. Nernst equation (overview), Concentration cell - Definition, construction & working and numerical problems on Nernst equation and concentration cell. Batteries: Basic concepts, classification of batteries (primary, secondary and reserve batteries).

Next – Generation Energy Systems: Introduction, construction and working of commercial batteries like Lithium - ion and Sodium - ion batteries.

Clean Energy Chemistry: Introduction, Fuel cell, difference between fuel cell and battery, construction and working of methanol - oxygen fuel cell and Solid-oxide Fuel Cell (SOFCs).

Clean Fuel: Hydrogen as a clean Fuel, hydrogen production by photocatalytic water splitting using TiO_2 and its advantages.

8 Hours

UNIT II
CHEMISTRY OF CHEMICAL SENSORS AND CORROSION TECHNOLOGY

Chemical Sensors: Colorimetry - Principle, instrumentation and application in the estimation of copper and numerical problems.

Biosensors: Principle and working mechanism for the detection of glucose in biofluids.

Electrochemical Sensors: Potentiometry - Principle, instrumentation and application in redox titration (FAS v/s $K_2Cr_2O_7$). Conductometric Sensors - Principle, instrumentation and application in titrations of strong acid against a strong base, and mixture of acids (strong acid + weak acid) against a strong base.

Corrosion: Metallic corrosion, electrochemical theory of corrosion, types of corrosion - differential metal and differential aeration corrosion (waterline and pitting corrosion). Corrosion penetration rate (CPR) - numerical problems. Corrosion control: Metal coatings - Galvanization, Inorganic coatings - Anodization of Alumina. Cathodic protection - Impressed voltage method and Sacrificial anode method.

8 Hours

UNIT III
GREEN MATERIALS AND E-WASTE MANAGEMENT

Green Chemistry: Introduction, principles of green chemistry, atom economy - definition and numerical problems. Green synthesis of nano ZnO for magnetic radio frequency identification (RFID) and internet of nanothings (IONT) applications.

Biomaterials: Introduction, synthesis, properties and applications of polylactic acid (PLA) and polyethylene glycol (PEG) for touch screen and brain computer interfaces.

Chemistry in forensic Science: Definition and its applications (relevant to computer science & engineering).

E-waste: Introduction, sources (E - waste items), toxic materials used in the manufacturing electronic and electrical products, problem of E - waste on environment and human health, solution for E - waste, methods of disposal, advantages of recycling. Extraction of gold from E – waste via hydrometallurgy.

8 Hours

UNIT IV
ADVANCED CHEMISTRY: QUANTUM MATERIALS AND POLYMERS

Quantum dots: Introduction, size dependent properties (Quantum confinement effect, Surface-to-volume ratio & Band gap). Solar Cells: Definition with principle, construction, working and applications of Quantum Dot Sensitized Solar Cells (QDSSC's).

Polymers: Definition, classification - based on occurrence, structure and effect of heat on polymers (thermoplastic and thermosetting polymers). Number average and weight average molecular weight - Definition and numerical problems. Synthesis, properties and applications of PVC & PMMA for device applications.

Conducting polymers: Definition, mechanism of conduction in polyacetylene (oxidative doping). Synthesis and applications of Polyaniline.

8 Hours

UNIT V **FUNCTIONAL MATERIALS IN MEMORY AND DISPLAY SYSTEMS**
Memory Devices: Introduction, basic structure (concept) of electronic memory devices, classification of electronic memory devices: based on principle of electronic material used (transistor type, capacitor type, resistor type, charge transfer complex type). Based on the type of material used (organic and inorganic memory devices). **Resistive Ram (ReRAM) materials:** Introduction, synthesis of nano ZnO by combustion method and nano TiO_2 by hydrothermal method. **Display Systems:** Introduction, Liquid crystals: Definition, types (Thermotropic & lyotropic liquid crystals). Properties of liquid crystals: Electric effect & Optic effect. Applications of liquid crystals in Liquid crystal display (LCD). Light emitting diode (LED): Definition, working principle. Types of LED: Organic light emitting diodes (OLED's), Quantum Light emitting diodes (QLED's) and Light emitting electrochemical cells (LEEC's).
8 Hours

TEXT BOOK		
Sl. No.	**Author/s**	**Title, Publisher, Edition, Year**
1	Suba Ramesh and S. Vairam.	Engineering Chemistry - A text book of Chemistry for Engineers, Wiley India, 2020.

REFERENCE BOOKS		
Sl. No.	**Author/s**	**Title, Publisher, Edition, Year**
1	Sankar P. Dey, Nayim Sepay	A Textbook of Green Chemistry, First Edition, Techno World Publisher, 2021.
2	S.K. Dhawan and Hema Bhandari	Corrosion Preventive Materials and Corrosion Testing, CRC Press, 2020, ISBN-13: 978-1351588430.
3	Kavita Shakya Chahal & Twinkle Solanki	Green Chemistry & E-Waste Management IGI Global (2022**),** ISBN-13: 978-1799898511.
4	Poushali Das, Sayan Ganguly	Quantum Dots and Polymer Nanocomposites: Synthesis, Chemistry and Applications: CRC Press, 2022.
5	Sabar D. Hutagalung	Materials science and technology, InTech Publishers, 2012.

Course Outcomes: Upon completion of this course the student will be able to:	
CO1	Explore the use of electrode materials for the construction of batteries and green chemistry for environmental sustainability.
CO2	Apply the knowledge of sensors in chemical analysis, also to apply the electrochemical theory of corrosion and its control.
CO3	Apply the concepts of green materials and its application in forensic science and E - Waste management.
CO4	Describe the concepts of quantum materials, polymers and applications in the development of solar and fuel cells.
CO5	Explain the importance of functional materials in the development of memory and display systems.

Course Articulation Matrix

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

PRACTICAL MODULE

COURSE OBJECTIVES:

Course objectives: This course will enable students to:	
1.	The use of pH sensor for the determination of pK_a of given soft drinks.

2.	The construction and use of electrochemical cell as sensor for the determination of emf /concentration of redox species.
3.	The usage of optical sensor (colorimeter) for the estimation of metals in various matrices.
4.	The use of conductivity meter for the determination of conductance in electrolytic solutions.
5.	The application of volumetry in the analysis of water quality parameters.

A - INSTRUMENTAL METHODS OF ANALYSIS:

A1. Determination of pKa of given sample of soft drink using pH sensor and its graphical interpretation using origin software.

A2. Estimation of iron present in stainless steel solution using electrochemical sensor and its graphical interpretation using origin software.

A3. Optical sensor for copper determination from E - waste sample (printed circuit board) And its graphical interpretation using origin software.

A4. Conductometric sensor for the estimation of HCl and its graphical interpretation using origin software.

B -VOLUMETRIC METHODS OF ANALYSIS:

B1. Determination of total hardness of water for drinking purpose.

B2: Determination of Chemical Oxygen Demand (COD) of the given industrial waste water sample.

B3. Redox titration - Determination of iron in the given TMT bars by external indicator method.

B4. Determination of alkalinity of given water sample.

C - DEMONSTRATION EXPERIMENTS: (ANY TWO)

C1. Synthesis of nano ZnO by combustion method.

C2. Green synthesis of conductive inks for flexible electronic applications.

C3: Evaluation of acid content in beverages using pH sensors.

C4. Detection of sugar in a blood sample using Fehling's solution.

D - OPEN ENDED EXPERIMENTS (ANY TWO):

TEXT BOOK:

Sl. No.	Author/s	Title, Publisher, Edition, Year

1.	Arthur I. Vogel	Quantitative Inorganic Analysis and Elementary Instrumental Analysis: ELBS, Longmann Group, 5th Edition, 1989.

Course Outcomes: Upon completion of this course the student will be able to:	
CO1	Determine the electrode potential of newly constructed electrodes; calculate the voltage of galvanic cell and batteries and determination of pH of water and other liquid samples.
CO2	Estimate the amount of metal(s) in effluents by potentiometer.
CO3	Determine the metals/pollutants in water and alloys using colorimeter.
CO4	Measure the conductance of solutions/electrolytes which in turn can be used for the determination of its characteristics.
CO5	Use the knowledge of volumetric analysis for estimation of metals and water samples.

Mapping of Course Outcomes with Program outcomes

1. Ability to apply knowledge of science to engineering problems.
2. Ability to analyze problems using the principles of science.

Course Articulation Matrix

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

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

Contact Hours/ Week:	03+ 02	Credits:	04
Total Lecture Hours:	40+ 26	CIE Marks:	50
Course Code:	ACM	SEE Marks:	50

Course objectives: This course will enable students to:	
1.	Master the knowledge of lubricants, coolants, and application of instrumentation techniques for the determination of different types of analyses present in effluents.
2.	Gain the knowledge on the battery concept, construction and working of batteries, fuel cells, nanomaterials preparation, graphene and applications in energy storage.
3.	Master the knowledge on the importance of polymers, preparation of engineering polymeric materials, carbon fiber and 3-D printing materials.
4.	Learn the corrosion mechanism, corrosion control and coating technologies.
5.	Learn the basic concepts of artificial fuels, biofuels and green fuels used for combustion engines.

UNIT I

SENSOR TECHNOLOGIES AND ADVANCED FLUIDS

Sensing Technologies: Introduction, Optical sensors: Colorimetry - Principle and statement of Beer-Lambert's law, Numerical problems. Electrochemical sensors: Potentiometry - Principle, instrumentation and application in the estimation of iron in steel industry effluents (ex. redox titration of FAS against $K_2Cr_2O_7$). pH sensor- principle and its application in the estimation of pKa of acid electrolyte. Conductometric sensors: Principle, instrumentation and applications of conductometric titrations in industrial effluents - strong acid against strong base, mixture of acids (strong acid + weak acid) against a strong base.

Lubricants: Introduction, classification, properties and industrial applications of lubricants. Lubricant testing - experimental determination of viscosity.

Industrial coolants: Introduction, types - water and oil based coolants, properties and industrial applications.

Industrial effluents: Introduction, determination of chemical oxygen demand (COD) and numerical problems.

8 Hours

UNIT II

ADVANCED ENERGY AND NANOMATERIALS

Energy storage devices: Introduction, classification of batteries, characteristics (capacity, power density, cell balancing and cycle life). Construction, working and applications of Lead acid battery and Lithium-ion battery.

Fuel cells and renewable energy: Introduction, construction and working of solid oxide fuel cells (SOFCs) for Auxiliary Power Units (APUs) applications. Difference between fuel cell and battery, Photovoltaic cells-construction, working, advantages, limitations and applications.

Nanochemistry: Introduction, size dependent properties of nanomaterials (surface area, catalytic and electrical), types of nanomaterials - based on composition (carbon based, metal based, composite and dendrimers). Production of nanomaterials – top down and bottom up approaches. Synthesis of nanometal oxides-semiconducting nano ZnO by solution combustion method and nano TiO_2 by hydrothermal method.

Graphene: Synthesis by chemical vapor deposition (CVD) method, properties and engineering applications. Role of carbon nanotubes (CNT) in energy devices.

8 Hours

UNIT III

ADVANCED MATERAILS FOR ENGINEERING PPLICATIONS

Engineering Polymers: Introduction, classification - based on occurrence, structure and effect of heat on polymer. Number average and weight average molecular weight - definition and numerical problems. Synthesis, properties and applications of PVC and PMMA. Glass transition temperature-Definition and factors affecting Tg (flexibility, molecular weight, inter molecular force).

Polymer composites: Introduction, fiber-reinforced polymer (FRPS) Kevlar-synthesis, properties and industrial applications.

Carbon fiber: Preparation from poly acrylonitrile (PAN), properties and applications. **3-D printing materials:** Introduction, synthesis, properties and applications of poly lactic acid (PLA) resin.

8 Hours

UNIT IV

CORROSION SCIENCE AND COATING TECHNOLOGY
Corrosion Chemistry: Introduction, electrochemical theory of corrosion, types of corrosion- differential metal and differential aeration corrosion (waterline and pitting corrosion). Corrosion Penetration Rate (CPR)- numerical problems. Corrosion control: Metal coatings – galvanization. Surface conversion coating: Inorganic coatings- anodization of Aluminium, Cathodic protection - Impressed voltage method and Sacrificial anode method. **Coating Technology:** Introduction, technological importance, Electroplating of chromium (hard and decorative). Electroless plating - electroless plating of nickel. Difference between electroplating and electroless plating.
8 Hours

UNIT V ADVANCED SYNTHETIC AND GREEN FUELS
Fuels: Introduction, calorific value, determination of calorific value using bomb calorimeter, numerical problems on GCV and NCV. Knocking in internal combustion engines, knocking mechanism and anti-knocking agnets, Methyl tertiary butyl ether (PTBE) and Ethyl tertiary bytyl ether (ETBE), importance of octane and cetane rating of fuel. **Bio fuels:** Introduction, power alcohol-advantages and disadvantages, synthesis of biodiesel by Trans-esterification method, advantages and its applications. **Green Fuels:** Introduction, examples, Water splitting-Definition, Production of green hydrogen by photocatalytic water splitting (TiO_2) method and its advantages. **Hydrogen storage:** Introduction, advantages, limitations of metal hydride and ammonia as chemical hydrogen carriers.
8 Hours

TEXT BOOK		
1	Suba Ramesh and S. Vairam.	Engineering Chemistry - A text book of Chemistry for Engineers, Wiley India, 2020.

REFERENCE BOOKS		
1	D. A Skoog, F. J. Holler and Stanley R. Crouch	Instrumental Analysis, Cengage Learning India Pvt. Ltd., 2010.
2	Colin Tong	Introduction to Materials for Advanced Energy Systems, Springer Nature Publication, 2019.

3	Charles C Hermant	Polymer Chemistry, Oxford Book Company, 2018.
4	Pietro Pedeferri	Corrosion Science and Engineering, Springer Nature Publication, 2018.
5	A. Pratap Singh, DhananjayKumar, Avinash Kumar Agarwal	Alternative Fuels and Advanced Combustion Techniques as Sustainable Solutions for Internal Combustion Engines, Springer Nature Publication, 2021

Course Outcomes:	
Upon completion of this course the student will be able to:	
CO1	Extend the concept of lubricants and coolants to combustion engine, application of sensor technology to the detection of trance concentration and also the conductivity of the solution using conductometric sensor.
CO2	Apply the knowledge of electrochemistry for the construction of batteries, fuel cells and also preparation of nanomaterials by different methods.
CO3	Apply the knowledge on the preparation of advanced polymers, carbon fiber, 3-D printing materials
CO4	Apply the electrochemical theory of corrosion of metals/alloys, corrosion control methods and coating technology.
CO5	Explain the importance of fuel includes synthetic fuels, bio fuels and green fuels

Course Articulation Matrix

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

PRACTICAL MODULE

Course objectives:
This course will enable students to:

1.	The use of pH sensor for the determination of pK_a of given soft drinks.
2.	The construction and use of electrochemical cell as sensor for the determination of emf /concentration of redox species.
3.	The usage of optical sensor (colorimeter) for the estimation of metals in various matrices.
4.	The use of conductivity meter for the determination of conductance in electrolytic solutions.
5.	The application of volumetry in the analysis of water quality parameters.

A – Instrumental Methods of Analysis

A1. Determination of pKa of given sample of soft drink using pH sensor and its graphical interpretation using origin software.

A2. Estimation of iron present in stainless steel solution using electrochemical sensor and its graphical interpretation using origin software.

A3. Optical sensor for copper determination from e - waste sample (printed circuit board) and its graphical interpretation using origin software.

A4. Estimation of HCl using standard NaOH conductometrically and its graphical interpretation using origin software.

B - Volumetric Methods of Analysis

B1. Determination of total hardness of water for drinking purpose.

B2: Determination of Chemical Oxygen Demand (COD) of the given industrial waste water sample.

B3. Redox titration - Determination of iron in the given TMT bars by external indicator method.

B4. Determination of alkalinity of given water sample.

C – Demonstration Experiments: (Any two)

C1. Synthesis of semiconducting nano ZnO by combustion method.

C2. Green synthesis of conductive inks for flexible electronic applications

C3: Doping of electronic material (ZnO) with dopants (Cu/Ni) to increase the conductivity of material.

C4. Synthesis of polyaniline as a conducting polymer.

D - Open Ended Experiments (any two):

TEXT BOOK:

Vogel : Quantitative Inorganic Analysis and Elementary Instrumental Analysis: ELBS, Longmann Group, 5th Edition, 1989.

Course Outcomes: Upon completion of this course the student will be able to:	
CO1	Determine the electrode potential of newly constructed electrodes; calculate the voltage of galvanic cell and batteries and determination of pH of water and other liquid samples.
CO2	Estimate the amount of metal(s) in effluents by potentiometer.
CO3	Determine the metals/pollutants in water and alloys using colorimeter.
CO4	Measure the conductance of solutions/electrolytes which in turn can be used for the determination of its characteristics.
CO5	Use the knowledge of volumetric analysis for estimation of metals and water samples.

Mapping of Course Outcomes with Program outcomes

1. Ability to apply knowledge of science to engineering problems.
2. Ability to analyze problems using the principles of science.

Program Articulation Matrix:

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

APPLIED CHEMISTRY FOR EMERGING ELECTRONICS AND FUTURISTIC DEVICES

(EEE Stream)

Contact Hours/ Week:	03+ 02	Credits:	04
Total Lecture Hours:	40+ 26	CIE Marks:	50
Course Code:	ACE	SEE Marks:	50

Course objectives: This course will enable students to:	
1.	Learn the basic concepts of electrochemistry, electrode potentials that are essential to determine the battery voltage and the working principle, applications of analytical instruments.
2.	Learn the corrosion mechanism, corrosion control techniques and problems associated with E-waste.
3.	Explain the concepts of batteries, semiconductors and photovoltaic cells.
4.	Master the knowledge of synthesis, applications of nanomaterials and quantum dots for smart materials.
5.	Convey the necessity of advanced polymeric materials as conducting polymers, composites and stretchable devices.

UNIT I
ELECTRODE SYSTEM AND ELECTROCHEMICAL SENSORS

Electrochemical cells: Classification - galvanic cells and electrolytic cells with examples. Construction and working of a galvanic cell (e.g. Daniel cell). Single electrode potential, standard electrode potential and E.M.F of a cell – definition and Nernst equation (basic overview). Concentration cells – definition, construction, working and equation for E.M.F of a concentration cell. Numerical problems on Nernst equation and concentration cell. Electrodes: Reference electrodes – construction, working and applications of Calomel electrode. Ion-selective electrodes – construction, working and application of glass electrode for the determination of pH of a solution.

Sensing Techniques: Optical sensors: Colorimetry - principle, instrumentation and application in the estimation of copper in PCB's. Numerical problems. Electrochemical sensors: Potentiometry- Principle, instrumentation, and application in redox titration (e.g. FAS against $K_2Cr_2O_7$). Conductometric sensors: Principle, instrumentation and application in titrations of strong acid against a strong base and mixture of acids (strong acid + weak acid) against a strong base.

8 Hours

UNIT II
CORROSION SCIENCE AND E-WASTE MANAGEMENT

Corrosion Chemistry: Metallic corrosion, electrochemical theory of corrosion, types of corrosion- differential metal and differential aeration corrosion (waterline and pitting corrosion). Corrosion penetration rate (CPR)- numerical problems. Corrosion control- Metal coatings- galvanization, Inorganic coatings- anodization, Cathodic protection - Impressed voltage method and Sacrificial anode method.

Metal finishing: Introduction, difference between Electroplating and Electroless plating, Electroplating of chromium (hard and decorative). Electroless plating of copper on PCBs.

E-waste Management: Introduction, sources, effects of E-waste on environment and human health, methods of disposal, advantages of recycling. Extraction of gold from E-waste by hydrometallurgy.

8 Hours

UNIT III
MATERIALS FOR ENERGY DEVICES

Semiconductors: Introduction, n-type and p-type semiconductor materials, difference between organic and inorganic semiconductors, organic photovoltaics – Poly (3-hexylthiophene) (P3HT) as a donor and Phenyl-C61-butyric acid methyl ester (PCBM) as an acceptor, construction, working and applications.

Energy Storage Devices: Introduction, classification of batteries-primary, secondary and reserve battery, characteristics (capacity, power density, cell balancing & cycle life), construction and working of lithium-ion battery advantages in EV applications, construction and working of ultra-small asymmetric super capacitor and its applications in IoT/wearable devices.

Energy Conversion Devices: Introduction, construction, working principle, advantages and applications of photovoltaic cell (PV cell), Introduction to MEMS-Based Energy Harvesters, working principle and applications.

8 Hours

UNIT IV
NANO AND QUANTUM DOT MATERIALS

Nanomaterials: Introduction, size dependent properties of nanomaterials (surface area, catalytic and electrical), types of nano materials – based on materials (carbon based, metal based, composites and dendrimers). Production of nanomaterials – definition of top down and

bottom up process. Synthesis of nanometal oxides – semiconducting nano ZnO by solution-combustion method and nano TiO_2 by hydrothermal method. Carbon nanotubes – definition and synthesis by arc discharge method.

Quantum Dot Materials: Introduction to quantum dots, Types-inorganic and organic quantum dots. Optical and electronic properties of quantum dots (QDs).

Inorganic Quantum Dot Materials (IQDMs): Introduction, synthesis and properties of silicon based QDs by Sol-Gel method, CdSe quantum dots by hot injection method and applications in optoelectronic devices, quantum dot-based copper conductive ink by wet chemical reduction method, properties and applications.

Organic Quantum Dot Materials (OQDMs): Introduction, synthesis and properties of chitosan-carbon quantum dots hydrogel applications in next-generation flexible and wearable electronics, synthesis and properties of graphene quantum dots using citric acid method its applications in emerging electronics.

8 Hours

UNIT V
FUNCTIONAL POLYMERS AND HYBRID COMPOSITES IN FLEXIBLE ELECTRONICS

Polymers: Introduction, classification - based on occurrence, structure and effect of heat on polymer. Number average and weight average molecular weight - definition and numerical problems. Conducting polymers - mechanism of conduction in polyacetylene (oxidative doping). Synthesis and applications of Polyaniline.

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.

Stretchable and Wearable Microelectronics: Introduction, basic principle and working of Lithography for micro-patterned copper deposition, synthesis, properties and applications of PDMS (Polydimethylsiloxane) in e-skin (electronic skin) and RFID (Radio Frequency Identification), synthesis and properties of Polyvinylidene Fluoride (PVDF) applications in E-nose devices.

8 Hours

TEXT BOOK		
Sl. No.	**Author/s**	**Title, Publisher, Edition, Year**
1	Suba Ramesh and S. Vairam	Engineering Chemistry - A text book of Chemistry for Engineers, Wiley India, 2020.

REFERENCE BOOKS		
Sl. No.	**Author/s**	**Title, Publisher, Edition, Year**
1	Subhendu Bhandari and Arti Rushi	Materials for Chemical Sensors, CRC Press, 2023.
2	S.K. Dhawan and Hema Bhandari	Corrosion Preventive Materials and Corrosion Testing, CRC Press, 2020.
3	Anurag Gaur, A.L. Sharma, Anil Arya	Supercapacitors, batteries and hydroelectric Cells, CRC Press, 2021.
4	B. Viswanathan	Structure and properties of solid state materials, Narosa Publications, 2009.
5	Sabar D. Hutagalung	Materials science and technology, InTech Publishers, 2012.

Course Outcomes: Upon completion of this course the student will be able to:	
CO1	Explain the electrode potential of newly constructed electrodes and evaluate the voltage of electrochemical cells; colorimetric, potentiometric and conductometric sensors in chemical analysis.
CO2	Apply the concept of electrochemical theory of corrosion of metals, corrosion control methods and E-wastes disposal.
CO3	Apply the knowledge of semiconductors, batteries and photovoltaic cells as energy devices.
CO4	Describe the ideas of nanomaterials and applications of quantum dots for smart materials.
CO5	Apply the concepts of different polymers as conducting polymers, composites and stretchable devices.

Course Articulation Matrix

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

PRACTICAL MODULE

Course objectives: This course will enable students to:	
1.	The use of pH sensor for the determination of pK_a of given soft drinks.
2.	The construction and use of electrochemical cell as sensor for the determination of emf /concentration of redox species.
3.	The usage of optical sensor (colorimeter) for the estimation of metals in various matrices.
4.	The use of conductivity meter for the determination of conductance in electrolytic solutions.
5.	The application of volumetry in the analysis of water quality parameters.

A - Instrumental Methods of Analysis

A1. Determination of pKa of given sample of soft drink using pH sensor and its graphical interpretation using origin software.

A2. Estimation of iron present in stainless steel solution using electrochemical sensor and its graphical interpretation using origin software.

A3. Optical sensor for copper determination from e - waste sample (printed circuit board) and its graphical interpretation using origin software.

A4. Estimation of HCl using standard NaOH conductometrically and its graphical interpretation using origin software.

B - Volumetric Methods of Analysis

B1. Determination of total hardness of water for drinking purpose.

B2: Determination of Chemical Oxygen Demand (COD) of the given industrial waste water sample.

B3. Redox titration - Determination of iron in the given TMT bars by external indicator method.

B4. Determination of alkalinity of given water sample.

C – Demonstration Experiments: (Any two)

C1. Synthesis of semiconducting nano ZnO by combustion method.

C2. Green synthesis of conductive inks for flexible electronic applications

C3: Doping of electronic material (ZnO) with dopants (Cu/Ni) to increase the conductivity of material.

C4. Synthesis of polyaniline as a conducting polymer.

D - Open Ended Experiments (any two):

TEXT BOOK:

Sl. No.	Author/s	Title, Publisher, Edition, Year
1.	Arthur I. Vogel	Quantitative Inorganic Analysis and Elementary Instrumental Analysis: ELBS, Longmann Group, 5th Edition, 1989.

Course Outcomes: Upon completion of this course the student will be able to:	
CO1	Determine the electrode potential of newly constructed electrodes; calculate the voltage of galvanic cell and batteries and determination of pH of water and other liquid samples.
CO2	Estimate the amount of metal(s) in effluents by potentiometer.
CO3	Determine the metals/pollutants in water and alloys using colorimeter.
CO4	Measure the conductance of solutions/electrolytes which in turn can be used for the determination of its characteristics.
CO5	Use the knowledge of volumetric analysis for estimation of metals and water samples.

Mapping of Course Outcomes with Program outcomes

1. Ability to apply knowledge of science to engineering problems.
2. Ability to analyze problems using the principles of science.

Course Articulation Matrix

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

Building Materials and Concrete Technology

Contact Hours/ week: (L-T-P-S)	3-0-0-3	**Credits:**	3.0
Total Lecture Hours:	90 = 42 (L)+0(T)+0(P)+48(S)	**CIE Marks:**	50
Sub. Code:	PSC1	**SEE Marks:**	50

CIE- Continuous Internal Evaluation, SEE-Semester End Examination

COURSE OBJECTIVES:
This course will enable students to:

1	Understand the properties, classification, and applications of conventional, modern, sustainable and innovative building materials
2	Understand the composition, properties, and hydration process of cement and the behavior of fresh and hardened concrete.
3	Apply mix design principles to proportion concrete mixes as per IS 10262:2019.

UNIT I

9 Hours

Basic building materials-I: Bricks, Stones, Aggregates, Mortar • Bricks: Composition, qualities, classification, manufacturing (traditional and modern methods), clamp vs kiln burning, brick bonds (English & Flemish). • Stones: Properties, classification, quarrying, and types of stone masonry (random rubble, coursed rubble, ashlar). • Aggregates: Classification, properties (mechanical, physical, thermal), manufactured sand, importance of grading, bulking of sand, quality of water for construction • Mortar: Types (lime mortar, cement mortar, mud mortar), properties, and applications •

UNIT II

9 Hours

Basic building materials-II: Timber, Metals, and Miscellaneous Materials • Timber: Structure, defects, seasoning, preservation, fire-resisting treatment • Wood products: Veneers, plywood, fibreboard, particle board, block board, laminated wood. • Metals: Properties and uses of steel (mild, high-carbon, high-strength deformed steel), aluminum, copper • Miscellaneous materials: Glass (types, properties, uses), plastics (types, applications), paints & varnishes, distempers, adhesives, gypsum • Bitumen and asphalt: Properties, classification, uses in building & road construction •

UNIT III

8 Hours

Cement and Fresh Concrete • Cement: Composition, hydration process, structure of hydrated cement, blended cements (fly ash, GGBS, silica fume, metakaolin). • Types of cement, manufacturing process (dry & wet). • Fresh Concrete: Manufacture of concrete (batching, mixing, transporting, placing, compaction, curing). • Workability: Factors affecting, measurement (slump cone, compaction factor, Vee-Bee test). •

UNIT IV

8 Hours

Concrete Mix Design and Hardened Concrete • Mix Design: Concept with and without admixtures, factors influencing mix proportioning, exposure conditions • Procedure of mix proportioning (as per IS 10262:2019). • Numerical examples on mix design. • Hardened Concrete: Properties – compressive strength, tensile strength, flexural strength, durability aspects (shrinkage, creep, permeability). •

UNIT V

8 Hours

Sustainable and Innovative Materials • Sustainable materials: Locally available, recycled, industrial waste, alternative materials • Innovative materials: Stabilized soil blocks, hollow & solid concrete blocks, AAC blocks, ferrocement panels, marble slurry bricks, innovative tiles, porcelain, earthenware, glazing • Advanced concepts: Self-healing concrete, fiber-reinforced concrete, Green concrete, geopolymer concrete, high-performance concrete, smart/3D printing materials •

TEXT BOOKS:

1	S.K. Duggal	Building Materials, New Age International Publishers, 5th Edition, 2017.
2	M.S. Shetty	Concrete Technology: Theory and Practice, S. Chand Publishing, Revised Edition, 2019
3	S.C. Rangwala	Engineering Materials, Charotar Publishing House, 42nd Edition, 2016

REFERENCES:

1	A.M. Neville	Properties of Concrete, Pearson Education Limited, 5th Edition, 2012
2	P.K. Mehta & Paulo J.M. Monteiro	Concrete: Microstructure, Properties, and Materials, McGraw Hill Education, 4th Edition, 2014
3	Haimei Zhang	Building Materials in Civil Engineering, Woodhead Publishing, 1st Edition, 2011

COURSE OUTCOMES: Upon completion of this course the student will be able to:

CO1	Explain the properties and classification of Bricks, Stones, Aggregates, Sand, Mortar.
CO2	Explain the properties and classification of timber, metals, and miscellaneous building materials
CO3	Describe the manufacturing process and properties of cement and concrete in fresh state.
CO4	Apply IS guidelines to design concrete mixes and analyse factors that affect strength and durability.
CO5	Evaluate sustainable and innovative building materials for practical applications.

CO-PO Mapping: 1=> Low, 2=> Medium, 3 => Strong mapping

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

ELEMENTS OF MECHANICAL ENGINEERING

Contact Hours/ Week:	3+0+0 (L+P+T)	Credits:	3.0
Total Lecture Hours:	40	CIE Marks:	50
Sub. Code:	PSC2	SEE Marks:	50

Course objectives: This course will enable students to:	
1.	Acquiring a basic understanding about steam and Steam, Gas and Water Turbines
2.	Students will be introduced to fundamentals of IC engines & refrigeration concepts.
3.	Students will be exposed to power transmission.
4.	Acquire a basic knowledge about conventional and advanced manufacturing processes.
5.	Acquiring a basic insight into future mobility such as Mechatronics, CNC and Additive Manufacturing

UNIT I

Formation of steam, Turbines

Formation of steam: Formation of steam, Types of steam, Steam properties - specific volume, enthalpy and internal energy, Simple numerical problems **(PO1)**

Steam turbines –Classification, Principle of operation of De Laval impulse and Parsan's reaction steam turbine **(PO2)**

Gas turbines- Classification, Principle of operation of open cycle gas turbine & closed cycle gas turbine. **(PO2)**

Water turbines - Classification, principle of operation of Pelton wheel **(PO2)**

8 Hours

UNIT II

I C Engines & Refrigeration

Internal Combustion Engines: Construction of IC engine parts, 4 stroke Diesel engine. Numerical problems on IP, BP, FP, Mechanical & Thermal efficiency**. (PO2)**

Refrigeration: Principle of refrigeration, Unit of refrigeration, working principle of Vapour compression refrigeration and vapour absorption refrigeration, List of commonly used refrigerants **(PO1)**

8 Hours

UNIT III

Power Transmission

Belt drives: Types of belt drives, stepped cone pulley, Velocity ratio in belt drives, Slip and Creep in belts drives. **(PO2)**

Gear Drives: Types of gears- Spur, Helical, Spiral, Bevel, Worm gears, Rack and Pinion, and Velocity ratio in Gears. Spur Gear Nomenclature. **(PO2)**

Gear Trains: Types of Gear trains, Working of Simple gear train, Compound gear train, Simple numerical problems on gear trains. **(PO2)**

8 Hours

UNIT IV

Machine Tools

Lathe: Principle of Working, Construction of Centre Lathe, classification of lathe, Specification of lathe, Lathe operations – Turning, Facing, Knurling, Thread cutting, Taper Turning by Tailstock offset Method. **(PO1)**

Drilling: Principle of working, classification of drilling machine, Construction and Working of Bench drilling machine and its operations, Drilling, Boring, Reaming, Tapping, Countersinking, Counter-boring and Spot facing. **(PO1)**

Milling: Principle of working, classification of milling machines, Construction and working of horizontal milling machine. Milling operations - Slot milling, Form milling, Angular milling, Gang milling **(PO1)**

8 Hours

UNIT V

Joining Process, Mechatronics, CNC and Additive Manufacturing

Joining Processes: Soldering, Brazing, and welding definitions only, working of Oxy-Acetylene Gas welding and Arc Welding. **(PO1)**

Introduction to Mechatronics: Systems of Mechatronics, advantages & disadvantages, Measurement Systems and Control Systems - Open loop control system and close loop control system (with simple block diagrams). **(PO1)**

Introduction to Additive Manufacturing: classification and any one concept of Additive Manufacturing (3D printing by Stereo lithography process) **(PO1)**

8 Hours

TEXT BOOKS

1	K R Gopala Krishna	Elements of Mechanical Engineering, Subhash Publications, 2008
2	Hazra Choudhry and Nirzar Roy	Elements of Workshop Technology (Vol. 1 and 2), Media Promoters and Publishers Pvt. Ltd., 2010.

REFERENCE BOOKS

1	Jonathan Wickert and Kemper Lewis,	An Introduction to Mechanical Engineering, Third Edition 2012
2	P.N.Rao	Manufacturing Technology- Foundry, Forming and Welding, Tata McGraw Hill 3rdEd., 2003.

3	P.N.Rao	CAD/CAM principles and applications, , Tata McGraw Hill 2nd Edition.

ONLNINE RESOURCES	
1	https://www.khanacademy.org/science/ap-chemistry-beta/x2eef969c74e0d802:thermodynamics
2	https://www.tlv.com/global/TI/steam-theory/principal-applications-for-steam.html.
3	https://www.forbesmarshall.com/Knowledge/SteamPedia/AboutSteam/Fundamentl-Applications-of-Steam.
4	https://rakhoh.com/en/applications-and-advantages-of-steam-in-manufacturing – and process-industry/.
5	Videos Makino (For Machine Tool Operation).

Course Outcomes: Upon completion of this course the student will be able to:	
CO1	Explain the basic principles of formation of steam and its application such as Steam Turbine, Gas Turbine and water turbines.
CO2	Describe the performance parameters of IC engines and working principles of VAR and VCR refrigeration system.
CO3	Describe the working of various mechanical power transmission for engineering applications.
CO4	Describe different conventional and advanced machining tools such as Lathe, drilling and milling machines.
CO5	Enumerate various aspects of future mobility, such as Mechatronics, CNC, and 3D printing technology.

Course Articulation Matrix

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

BASICS OF ELECTRICAL ENGINEERING

Contact Hours/ Week:	3(L) + (T) +0(P)	Credits:	3
Total Lecture Hours:	40	CIE Marks:	50
Course Code:	PSC3	SEE Marks:	50

Course objectives: This course will enable students to:	
1.	To introduce fundamental concepts of electric circuits and electromagnetism.
2.	Voltage-current relation & power equations in R L C circuits and analysis of series and parallel A.C. circuits.
3.	Generation of three phase voltages, relation between phase & line values in star and delta connected circuits.
4.	Construction and principle of operation of D.C. motor, types of motors, speed control of separately excited D.C. motor.
5.	To study the domestic wiring and electrical safety practices.

UNIT I
DC circuits: Ohm's law and Kirchhoff's laws, analysis of series, parallel and series-parallel circuits. Power and energy. Numericals **Electromagnetism:** Faraday's Laws of Electromagnetic Induction, Lenz's Law, Fleming's rules, statically and dynamically induced EMF; concepts of self and mutual inductance. Coefficient of Coupling. Energy stored in magnetic field. Numericals
8 Hours

UNIT II
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. Series, Parallel and Series-Parallel circuits. Numericals.
8 Hours

UNIT III
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. **Transformers:** Necessity of transformer, principle of operation, Types and construction of single- phase transformers, EMF equation, losses, variation of losses with respect to load. Efficiency. Rating, cost, size and applications. Numerical.
8 Hours

UNIT IV
DC Machines: **DC Generator:** Principle of operation, constructional details, induced emf expression, types of Generators. Relation between induced emf and terminal voltage. Numericals. **DC Motor:** Principle of operation, back emf and its significance. Torque equation, types of motors, characteristics and speed control (armature & field)of DC motors(series & shunt only). Applications of DC motors. Numericals.
8 Hours

UNIT V
Three-phase induction Motors: Concept of rotating magnetic field, Principle of operation, constructional features of motor, types – squirrel cage and wound rotor. Slip and its significance Rating, cost, size and applications. Numerical. Domestic Wiring: Requirements, Types of wiring: conduit wiring and casing & capping. Two way and three-way control of lamp load. **Safety measures:** Domestic electric circuit including protective devices, working principle of Fuse and Miniature circuit breaker (MCB), merits and demerits. Electric Shock, Earthing, types (Plate and pipe earthing), Safety Precautions to avoid shock
8 Hours

TEXT BOOKS		
1	D C Kulshreshtha,	Basic Electrical Engineering, Tata McGraw Hill, 1st Ed., 2019, ISBN-13: 9789353167219
2	D. P. Kothari and I. J. Nagrath,	Basic Electrical Engineering, Tata McGraw Hill, 4th Ed., 2019, ISBN-13**:** 9789353165727

REFERENCE BOOKS		
1	V. K. Mehta, Rohit Mehta	Principles of Electrical Engineering & Electronics, S. Chand and Company Publications, 2nd Ed., 2015, **ISBN-13:** 9788121927291
2	E. Hughes	Electrical Technology, Pearson, 12th Ed., 2016., **ISBN-13:** 978-1-292-09304-8

Course Outcomes: Upon completion of this course the student will be able to:	
CO1	Apply the concepts of basic laws to solve electric circuits and Faraday's laws to solve electromagnetic circuits
CO2	Analyze R, L, C, R-L, R-C and R-L-C Series and Parallel AC circuits
CO3	Determine the relation between phase and line values of voltage and current in three phase circuits. Illustrate Construction and operation of various Electrical Machines.
CO4	Analyze the working principle of D.C. machine and speed control of separately excited D.C. motor.
CO5	Illustrate working of A.C. Machines and concepts of domestic wiring, protective devices, solar photo voltaic system and safety measures.

Course Articulation Matrix

		POs											**PSOs**	
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**
COs	**CO1**	3	2	0	0	1	0	0	0	0	0	1		
	CO2	3	2	0	0	1	0	0	0	0	0	1		
	CO3	3	2	0	0	0	0	0	0	0	0	1		
	CO4	3	2	0	0	0	0	0	0	0	0	1		
	CO5	3	2	0	0	0	0	0	0	0	0	1		

Fundamentals of Electronics & Communication Engineering

Contact Hours/ Week:	3(L) – 0(T) – 0(P)	Credits:	03
Total Lecture Hours:	42	CIE Marks:	50
Course Code:	PSC4	SEE Marks:	50

Course objectives: This course will enable students to:	
1.	Analyze & design different stages of DC power supply
2.	Get knowledge of the working and application of transistors
3.	Build the analog computational circuits using OPAMP and generate AC signal of required frequency using Oscillator circuits
4.	Understand different analog modulation techniques
5.	Understand basics of digital electronics

UNIT I
Semiconductor Diode and its Applications Review of PN–junction, diode equation, VI characteristics, effect of temperature, diode approximation, DC load line analysis, Zener diode: Working, VI characteristics. Basic building blocks of a regulated DC power supply: Half wave rectifier, Full wave rectifier, Capacitor filter (qualitative analysis). Zener regulator (includes numericals on diode equation, rectifier, filter and Zener regulator). Clipping circuits (Shunt single ended) and clamping circuits.
9 Hours

UNIT II
Transistors and their Applications Bipolar junction transistor, CB and CE configuration and characteristics, BJT as switch and amplifier, Fixed bias and voltage divider bias, DC load line and operating point, Single stage RC coupled amplifier and its frequency response, Field Effect Transistor: Junction field effect transistor (N-channel), JFET characteristics, Enhancement MOSFETs (N-channel): Classification, Construction and drain characteristics Case study: MOSFET as a switch
8 Hours

UNIT III
Operational Amplifier and Oscillators Block diagram of an Operational amplifier, Schematic symbol, differential amplifier, Characteristics of an ideal operational amplifier, Op-Amp parameters: gain, input resistance, output resistance, CMRR, slew rate, bandwidth, input offset voltage, input bias current and input offset current. Equivalent circuit of Op-Amp, concept of virtual ground, Op-amp applications: Inverting and non-inverting amplifier, Voltage follower, Adder, Subtractor, Integrator and differentiator. Concept of positive feedback, Barkhausen criteria for oscillations, RC phase-shift oscillator and Wein bridge oscillator.
9 Hours

UNIT IV
Communication System Block diagram of communication system, communication channels and their characteristics: wire line, fiber optic, wireless electromagnetic channels. Need for modulation, Analog Modulation: AM, FM, PM (Definition, waveforms, expressions and comparisons excluding derivations and spectral diagrams) Applications: AM radio broadcasting, super heterodyne FM receiver, mobile wireless telephone systems Case study of converting analog signal to digital signal using PCM**.**
8 Hours

UNIT V
Fundamentals of Digital Systems and Binary Numbers Digital Systems, introduction to number systems (Binary, Octal, decimal, Hexadecimal). Number base conversion: (binary to decimal, hexa decimal and vice versa), Binary addition, binary subtraction using 1's and 2's complement method. Review of logic gates, Universal gates. Boolean Algebra: De Morgan's theorems, Simplification and realization of Boolean expressions using basic gates and NAND gates, Half adder, Full adder and Parallel adder. Case study with four bit adder simulation.
8 Hours

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, Pearson Education, 4th Edition, 2015.

REFERENCE BOOKS		
1	John G. Proakis, Masoud Saleh	Fundamentals of Communication Systems, Second Edition, Pearson Educations, Inc., 2014.
2	D.P Kothari and I J Nagrath	Basic electronics, Second Edition, McGraw Hill Education Pvt ltd, 2018.
3	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

Course Outcomes: Upon completion of this course the student will be able to:	
CO1	Analyze PN junction diodes & different stages of DC power supply.
CO2	Analyze transistor characteristics and its application.
CO3	Design OPAMP application circuits.
CO4	Analyze the fundamental concepts of communication system.
CO5	Apply Boolean laws to simplify logic expressions and circuits.

Course Articulation Matrix

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

STRUCTURED PROGRAMMING IN C			
Contact Hours/ Week:	3	Credits:	3
Total Lecture Hours (L:T:P:S):	3:0:0:0	CIE Marks:	50
Course Code:	PSC5	SEE Marks:	50

Course objectives:
This course will enable students to:

1.	Elucidate the basic architecture and functionalities of a computer.
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 and procedures.

UNIT I

Introduction to Computing: Computer languages, Creating and Running Programs, System Development.

Overview of C: A Brief History of C, C Is a Middle-Level Language, C Is a Structured Language, C Is a Programmer's Language, Compilers Vs. Interpreters, The Form of a C Program, The Library and Linking, Separate Compilation, Compiling a C Program, C's Memory Map.

Expressions: The Basic Data Types, Modifying the Basic Types, Identifier Names, Variables, The Four C Scopes, Type Qualifiers, Storage Class Specifiers, Variable Initializations, Constants, Operators, Expressions.

Textbook 2: Chapter 1: 1.3, 1.4, 1.5; Textbook 1: Chapter 1, 2

6 Hours

UNIT II

Console I/O: Reading and Writing Characters, Reading and Writing Strings, Formatted Console I/O, printf(), scanf().

Statements: True and False in C, Selection Statements, Iteration Statements, Jump Statements, Expression Statements, Block Statements.

Textbook 1: Chapter 8, 3

8 Hours

UNIT III

Arrays and Strings: Single-Dimension Arrays, Generating a Pointer to an Array, Passing Single-Dimension Arrays to Functions, Strings, Two-Dimensional Arrays, Multidimensional Arrays, Array Initialization, Variable - Length Arrays.

Pointers: What Are Pointers?, Pointer Variables, The Pointer Operators, Pointer

Expressions, Pointers and Arrays, Multiple Indirection, Initializing Pointers. **Textbook 1: Chapter 4, 5**
8 Hours

UNIT IV
Functions: The General Form of a Function, Understanding the Scope of a Function, Function Arguments, argc and argv—Arguments to main(), The return Statement, What Does main() Return?, Recursion, Function Prototypes, Declaring Variable Length Parameter Declarations, The inline Keyword. **Pointers (Contd...):** Pointers to Functions, C's Dynamic Allocation Functions. **Textbook 1: Chapter 5, Chapter 6**
8 Hours

UNIT V
Structures, Unions, Enumerations, and typedef: Structures, Arrays of Structures, Passing Structure to Functions, Structure Pointers, Arrays and Structures within Structures, Unions, Bit-Fields, Enumerations, Using sizeof to Ensure Portability, typedef. **Textbook: Chapter 11.1 to 11.6, 11.8, 11.19, Chapter 12.1 to 12.6**
10 Hours

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

REFERENCE 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.

Course Outcomes: Upon completion of this course the student will be able to:	
CO1	Elucidate the basic architecture and functionalities of a computer and also recognize the hardware parts.
CO2	Apply programming constructs of C language to solve the real world problem
CO3	Explore user-defined data structures like arrays in implementing solutions to problems like searching and sorting.

CO4	Explore user-defined data structures like structures, unions and pointers in implementing solutions.
CO5	Design and Develop Solutions to problems using modular programming constructs using functions.

Course Articulation Matrix

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

ELEMENTS OF BIOTECHNOLOGY AND BIOMIMETICS

Contact Hours/ Week:	L:T:P::3:0:0	**Credits:**	3.0
Total Lecture Hours:	42	**CIE Marks:**	50
Course Code:	PSC6	**SEE Marks:**	50

UNIT I
Fundamentals of Biochemistry: **Carbohydrates**: Introduction to carbohydrates, sources of carbohydrates, three major size classes of carbohydrates (mono, di, and polysaccharides), and classification of monosaccharides based on number of C-atoms (classification based on functional groups: aldoses and Ketoses). **Nucleic Acids:** Introduction to Nucleic Acids, purine & pyrimidines, nucleosides, nucleotides of DNA & RNA, base pairing, structure of DNA, Structure of RNA, and types of RNA. Properties of Nucleic Acids. **Proteins:** Introduction to Proteins: Amino acids (Structure, classification, and properties of amino acids). Structural organization: Primary structure, Secondary structure, Tertiary structure, and quaternary structure of proteins.
10 Hours

UNIT II
Fundamentals of Cell, Molecular, and Genetics: Introduction to Genetics, Mendelian Genetics and laws, Monohybrid and dihybrid cross, back cross and test cross, Conceptual numerical. Linkage and crossing over in Drosophila Melanogaster (C is and Trans arrangement of genes, types of linkage, crossing-over types and mechanism of crossing-over), Cell and Cell Structure (Prokaryotes and Eukaryotes), Cell Division and Cell Cycle. Central dogma of Molecular biology. Cell growth, senescence, and cell death
8 Hours

UNIT III
Fundamentals of Bioprocess Engineering: Introduction to bioprocess engineering, Biotechnology and Bioprocess engineering, the biologists and biotechnology engineers, research approaches, the story of penicillin, synergy between biologists and engineers, bioprocesses and regulatory constraints.
8 Hours

UNIT IV
Fundamentals of Bioinformatics: Introduction to Biological Databases (Definition of Bioinformatics, Goals, Scope, Application, Limitations, and New Themes). Database: (Definition of database, Types), Biological database: Databases (Primary, Secondary and Specialized), Interconnection between the databases, Pit falls of biological databases. Nucleotide and Protein sequence and structure databases (NCBI, EMBL, DDBJ, Uniprot, and PDB). Other Important Databases: KEGG, PubMed, PubChem, ZINC
8 Hours

UNIT V
Biomimetics and its applications: Introduction to Biomimetics (definition and its evolution), Biomimicry problem definition and solution (Lotus leaves, Kingfisher beak, and Bird fly), tools and techniques: Discovery tools, Biomimicry software and database, Biomimicry and the future of innovation (material science, energy and sustainability, medicine and water purification).
8 Hours

TEXT BOOKS		
1	Nelson, D.L., & Cox, M. M	Lehninger principles of biochemistry 7th ed. ISBN-9781319108243, W.H. Freeman, 2017
2	Xiong,Jin	EssentialBioinformatics.ISBN-10.0521706106, Cambridge University Press, 2006
3	DeLisa,Matthew,etal., Micheal L Shuler and FikertKargi	Bioprocessengineering:basicconcepts,ISBN-13:978-0137062706.Pearson,2017.

REFERENCE BOOKS		
1	David Freifelder	MolecularBiology, 2nd ed, 834p, ISBN-8185198349, 1987
2	Lewin, Benjamin and GabbyDover.	Genesv.ISBN-9780198542889, Vol. 1110. Oxford: Oxford University Press,1994.

Course Outcomes: Upon completion of this course the student will be able to:	
CO1	Apply the basic concepts of Biomolecules to analyze the various properties.
CO2	Outline the fundamental concepts of cell, molecular and genetics to assess the roles.
CO3	Use the fundamentals of Bioprocess Engineering to create a synergy between biologists and engineers.
CO4	Illustrate the various uses and applications of biological databases
CO5	Apply the fundamental concepts of Biomimetics to analyze biomimicry and the future of innovation.

Course Articulation Matrix

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

1:Low, 2:Medium, 3: High

Building Materials Lab

Contact Hours/ week: (L-T-P-S)	0-0-2-0	**Credits:**	1.0
Total Lecture Hours:	30 = 0 (L)+0(T)+28(P)+2(S)	**CIE Marks:**	0
Sub. Code:	PSCL1	**SEE Marks:**	0

CIE- Continuous Internal Evaluation, SEE-Semester End Examination

COURSE OBJECTIVES:
This course will enable students to:

1	Perform testing on various ingredients used in concreting as per Indian Standards
2	Perform lab tests on hardened concrete, tiles, bricks and Reinforcement bars

UNIT I

28 Hours

- Determination of bulking of sand and grain size distribution
- Determination of flakiness index and elongation index
- Determination of fineness and normal consistency of cement
- Determination of initial and final setting time
- Casting concrete cubes and cylinder for nominal/design mix
- Determination of workability by Slump test
- Determination of compressive, split tensile and flexural strength of concrete specimens
- Determination of flexural strength and compressive strength of floor tiles
- Determination of compressive strength of solid blocks and bricks
- Determination of tensile strength of HYSD/TMT bars

TEXT BOOKS:

1	Duggal S.K	"Building materials", New Age International publishers , second edition.4835/24, Ansari Road, Daryaganj, New Delhi-110 002 , 2003. ISBN 81-224-1435-4.
2	Shetty M.S	"Concrete Technology", S. Chand & Company Ltd., 2006.
3	M. L.Gambhir	Concrete Manual, Dhanpat Rai and Co.,

REFERENCES:

COURSE OUTCOMES: Upon completion of this course the student will be able to:

CO1	Evaluate the quality of materials used for building construction
CO2	Prepare a detailed report of the material testing carried out
CO3	Relate the experimental procedure and results to the quality of the tested materials

CO-PO Mapping: 1=> Low, 2=> Medium, 3 => Strong mapping

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

ELEMENTS OF MECHANICAL ENGINEERING LAB

Contact Hours/ Week:	0+0+2(L+T+P)	Credits:	1.0
Total Practical Hours	26	CIE Marks:	50
Sub. Code:	PSCL2	SEE Marks:	50

Course objectives: This course will enable students to:	
1.	provide hands-on experience in fabricating simple sheet metal components from surface development and joining them using soldering techniques.
2.	train students in basic turning operations using a lathe to achieve specified dimensions on work pieces.
3.	develop skills for conducting standard laboratory tests on fuels to determine properties such as flash point, fire point, viscosity, and density.
4.	fabricate standard welded joints using electric arc welding with proper safety.
5.	foster the ability to analyze experimental results and relate the findings to real-world applications in engineering manufacturing and thermal systems.

PART – A
CONVENTIONAL EXPERIMENTS

1. **Sheet metal and Soldering:** Development of lateral surfaces of square prism, Rectangular tray, cylinder, funnel. Minimum 3 models involving development and soldering.
2. **Turning Practice:** Machining of a model involving the turning operations like facing, counter sinking, plain turning, step turning and knurling operations.

16 Hours

PART – B
TYPICAL OPEN-ENDED EXPERIMENTS

1. Comparative study of flash point and fire point of various liquid fuels / oils using the open cup method
2. Comparative study of flash point and fire point of various liquid fuels / oils using the closed cup method
3. Comparative study on viscosity of different liquid fuels.
4. Comparative study on density of different liquids.
5. **Welding shop:** Study of electric arc welding tools & equipment. Fabricate the at least two types of joints using electric arc welding.

10 Hours

TEXT BOOKS:

Along with Lab Manual provided by Mechanical Engineering Department, students are advised to follow text book.

Choudhury S.K.H. and others	Elements of Workshop Technology – Vol.1&2. Edition II, Media Promoters and Publishers, Mumbai, 2001.

REFERENCE BOOKS:

1	P.N. Rao	Manufacturing Technology: Vol. 1 (McGraw Hill), 5th edition, 2018. Manufacturing Technology: Vol. 2 (McGraw Hill), 4th edition, 2019
2	R.K. Rajput	Thermal Engineering, Laxmi Publications (New Delhi) 9th edition 2024

Course Outcomes: Upon completion of this course the student will be able to:	
CO1 :	Prepare sheet metal components by developing lateral surfaces and perform soldering to assemble models with accuracy
CO2 :	Carry out basic turning operations on a lathe such as facing, countersinking, plain turning, step turning, and knurling to achieve required dimensions and finish.
CO3 :	Determine and compare important fuel properties such as flash point, fire point, viscosity, and density using standard laboratory methods.
CO4 :	Fabricate different types of welding joints such as butt, lap, and T/L joints using electric arc welding tools while following safety procedures.

Course Articulation Matrix

		POs												PSOs		
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
COs	**Co-1**	**2**	**2**	**2**		**2**				**1**	**1**		1	**3**		
	Co-2	**2**	**1**	2	**1**	**2**			**1**	1	**1**		1	**3**		
	Co-3	**2**	**2**		**3**	**2**		**1**			**2**		**1**			**3**
	Co-4	**2**	**1**	**2**		**2**	**2**	**1**	1	2	**1**		2	**3**		

BASIC ELECTRICAL LABORATORY

Contact Hours/ Week:	0(L) +0 (T) +2(P)	Credits:	1
Total Lecture Hours:		CIE Marks:	50
Course Code:	PSCL3	SEE Marks:	50

Course objectives: This course will enable students to:	
1.	Understand and Verify Fundamental Electrical Laws.
2.	Measure Electrical Parameters Accurately.
3.	Design and Implement Practical Electrical Circuits.
4.	Evaluate and Interpret Experimental Data.

Sl. No.	**Name of Experiment**
	Part A (Conventional Experiments)
1	Verification of Ohm's law and Kirchhoff's laws for DC circuits.
2	Speed-torque characteristics of DC shunt motor.
3	Measurement of resistance, inductance, impedance and power factor using voltmeter, ammeter and wattmeter in single-phase AC circuits.
4	Load test on single phase transformer.
5	Measurement of three-phase power of an inductive load by 2-wattmeter method, when the load is (a) star connected and (b) delta connected. Calculation of resistance, reactance, impedance and power factor.
6	Wiring an appropriate electric circuit, understanding the basic principle used for 2-way and 3-way control of load.
	Part B (Open-Ended Experiments)
7	Creation of short circuit to determine the time taken by a fuse of different length. Documenting the test data and the conclusions.
8	Trouble shooting experiments in simple DC circuits. The trouble may be due to improper connection, faulty component leading to open circuits or short circuits. Detection of fault and the reasons for that and conclusion.
9	Measurement of voltage between line and neutral, ground and line, ground and neutral in respect of heathy an unhealthy 3-pin socket. Conclusions arrived for the faulty wiring. Allowable ground voltage.
10	A 12 V battery is available. It is required to obtain 3 V from the battery to charge a mobile. Create a circuit to obtain the required voltage. Specify all the ratings of the components used.
11	Only three ammeters and standard resistance are available in the laboratory. Using the same measure the single-phase power consumed by an inductive load.
12	Only three voltmeters and standard resistance are available in the laboratory. Using the same measure the single-phase power consumed by a capacitive load.
	Note: (i) The laboratory syllabus consists of PART-A and PART-B. While PART-A has 6 conventional experiments, PART-B has 6 typical open-ended experiments. The maximum mark for laboratory course is 100.

	(ii)	Both PART-A and PART-B are considered for CIE and SEE.
	(iii)	Students have to answer 1(one) question from PART-A and 1(one) question from PART-B.
	(iv)	a) The questions set for SEE shall be from amongst the experiments under PART-A. It is evaluated for 70 marks out of the maximum 100 marks. b) The open-ended question set for SEE shall be any other open-ended question and not selected from the experiments under PART-A. It shall be evaluated for 30 marks.
	(v)	For continuous internal evaluation, during the semester classwork, the typical open-ended questions may be selected from PART-B or there may be any other similar question to enhance the skill of the students.

Course Outcomes:

The students will be able to:

	Course Outcome	Level
CO1	Conduct standard electrical experiments to verify theoretical principles.	**L_3**
CO2	Measure key electrical parameters such as resistance, inductance, impedance, power, and power factor with standard methods.	**L_3**
CO3	Design and perform experiments to solve practical open-ended electrical problems.	**L_3**
CO4	Analyse experimental data from non-routine method to arrive at a solution.	**L_3**

COs mapping with Pos (3-high, 2-medium, 1-low)

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	**2**	**1**							**2**	**2**			**1**	**-**
CO2	**2**	**1**							**2**	**2**			**1**	**-**
CO3	**2**	**1**							**2**	**2**			**1**	**-**
CO4	**2**	**1**							**2**	**2**			**1**	**-**

Fundamentals of Electronics and Communication Engineering Lab

Contact Hours/ Week:	0(L) – 0(T) – 2(P)	Credits:	01
Total Lecture Hours:	28	CIE Marks:	50
Course Code:	PSCL4	SEE Marks:	50

Course objectives: This course will enable students to:	
1.	Understand the characteristics and applications of semiconductor devices
2.	Analyze various applications of Operational Amplifier.
3.	Learn the truth table of digital ICs and design combinational circuits.
4.	Understand the concept of amplitude modulation.

PART – A
CORE/BASIC HARDWARE EXPERIMENTS

1. Design and Testing of Half-Wave Rectifier with and without Filter for determining Ripple Factor, Voltage Regulation, and Efficiency.
2. Design and Testing of Full-Wave Rectifier with and without Filter for determining Ripple Factor, Voltage Regulation, and Efficiency.
3. Analysis of Input and Output Characteristics of a Bipolar Junction Transistor in a Common Emitter Configuration.
4. Study of Transfer and Drain Characteristics of a MOSFET in Common Source Configuration.
5. Investigation of Op-Amp in Inverting and Non-Inverting Modes with Gain Measurement.
6. Study of Truth Tables for OR, AND, NOT, NAND, and NOR Gates using Basic and Universal Gates.

PART – B
OPEN ENDED HARDWARE EXPERIMENTS

1. Design and Testing of Clipping and Clamping Circuits to obtain desired Transfer Characteristics
2. Design and testing of a single stage bipolar junction transistor amplifier to obtain desired gain and bandwidth requirements.
3. Testing of Op-Amp as voltage follower and a weighted summer with waveform analysis.
4. Design and Testing of Integrator and Differentiator Circuits using Op-Amp with Waveform Analysis
5. Amplitude Modulation using Discrete Components for given Specifications.
6. Realization of Half/ Full Adder and Subtractor using Logic Gates.

Course Outcomes: Upon completion of this course the student will be able to:	
CO1	Demonstrate the characteristics and applications of semiconductor devices.
CO2	Design various applications of Operational Amplifier.
CO3	Analyze the functionality of logic gates and their applications.
CO4	Investigate amplitude modulation to explore fundamental analog communication technique.

Course Articulation Matrix

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

C PROGRAMMING LAB			
Contact Hours/ Week:	3	Credits:	1
Total Lecture Hours (L:T:P:S):	0:0:2:0	CIE Marks:	50
Course Code:	PSCL5	SEE Marks:	50

Course objectives: This course will enable students to:	
1.	Elucidate the basic architecture and functionalities of a computer.
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 and procedures.

Note:

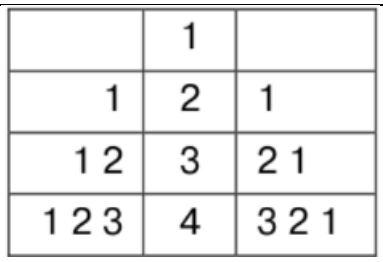
1. The laboratory syllabus consists of PART-A and PART-B. While PART-A has 6 conventional experiments, PART-B has 6 typical open-ended experiments. The maximum marks for the laboratory course are 100.
2. Both PART-A and PART-B are considered for CIE and SEE.
3. Students have answer 1(one) question from PART-A and 1(one) question from PART-B.

a. The questions set for SEE shall be from among the experiments under PART-A. It is evaluated for 70 marks out of the maximum 100 marks.

b. The open-ended question set for SEE shall be any other open-ended question and not selected from the experiments under PART-A. It shall be evaluated for 30 marks.

4. For continuous internal evaluation, during the semester, classwork, the typical open-ended questions shall be from PART-B, and any other similar questions to enhance the skill of the students

	PART - A
1	Simulation of a Simple Calculator.
2	Compute the roots of a quadratic equation by accepting the coefficients. Print appropriate messages.
3	An electricity board charges the following rates for the use of electricity: for the first 200 units 80 paise per unit: for the next 100 units 90 paise per unit: beyond 300 units Rs 1 per unit. All users are charged a minimum of Rs. 100 as meter charge. If the total amount is more than Rs 400, then an additional surcharge of 15% of total amount is charged. Write a program to read the name of the user, number of units consumed and print out the charges.
4	Write a C Program to display the following by reading the number of rows as input.

	
5	Implement Binary Search on Integers.
6	Implement Matrix multiplication and validate the rules of multiplication.
7	Compute sin(x) / cos(x) using Taylor series approximation. Compare your result with the built-in library function. Print both the results with appropriate inferences.
8	Sort the given set of N numbers using Bubble sort.
9	Write functions to implement string operations such as compare, concatenate, and find string length. Use the parameter passing techniques.
10	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.
11	Develop a program using pointers to compute the sum, mean and standard deviation of all elements stored in an array of N real numbers.
12	Write a C program to copy a text file to another, read both the input file name and target file name.

	PART - B
1	A college library has a digital bookshelf system where each book is assigned a unique Book ID. The bookshelf is organized in ascending order of Book IDs. Develop a C Program to quickly find whether a book with a specific Book ID is available in the shelf.
2	A sports teacher has recorded the scores of students in a 100-meter race. To prepare the result sheet, the teacher wants the scores arranged in descending order (from highest to lowest). Develop a C program to sort the scores.
3	A small warehouse tracks how many units of different products are shipped from multiple branches. Another dataset shows how much revenue each product generates per unit. Develop a C program which combines these datasets to calculate the total revenue generated by each branch.
4	A basic mobile contact manager stores first and last names separately. For displaying full names in the contact list, you need to join them manually. Additionally, the system must check the length of each full name to ensure it fits the screen. Perform these operations by developing a C program without using built-in string functions.
5	A currency exchange booth allows users to convert between two currencies. Before confirming the exchange, the system simulates a swap of the values to preview the result without changing the original data. In other cases, it updates the actual values. Develop a C program that implements both behaviors using

	Call by Value and Call by reference.
6	A local library needs to store and display details of its books, including title, author, and year of publication. Design a structure that can hold these details and develop a C program to display a list of all books entered.

Course Outcomes: Upon completion of this course the student will be able to:	
CO1	Elucidate the basic architecture and functionalities of a computer and also recognize the hardware parts.
CO2	Apply programming constructs of C language to solve the real world problem
CO3	Explore user-defined data structures like arrays in implementing solutions to problems like searching and sorting.
CO4	Explore user-defined data structures like structures, unions and pointers in implementing solutions.
CO5	Design and Develop Solutions to problems using modular programming constructs using functions.

Course Articulation Matrix

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

ELEMENTS OF BIOTECHNOLOGY LABORATORY

Contact Hours/ Week:	L:T:P::1:0:0	**Credits:**	3
Total Lecture Hours:	28	**CIE Marks:**	50
Course Code:	PSCL6	**SEE Marks:**	50

LIST OF EXPERIMETS	
1	Instrumentation and working principles of Microscopes, calorimeters and pH meters
2	Sterilization techniques: Hotairoven, Autoclave and Laminar Air flow unit
3	Concentration of solutions: Normality, Molarity and buffer solutions
4	Study of different stages of mitosis(onion root tip experiment)and meiosis
5	Study of mutations in *Drosophila Melanogaster*
6	Study of cross section of different parts of a plant
7	Identification of bacterial and fungal organisms by staining
8	Qualitative test to identify types of biomolecules: Carbohydrates and proteins
9	Scientific article retrieval using biological databases
10	Sequence retrieval using biological databases
11	Biomolecular structure visualization and analysis using PyMOL and VMS
12	Determination of bacterial cell growth using turbidometry method

TEXT BOOKS		
1	Nelson, D.L., & Cox, M. M	Lehninger principles of biochemistry 7th ed. W.H.Freeman, ISBN-9781319108243, 2017
2	Xiong, Jin	Essential bioinformatics, Cambridge University Press, ISBN-10.0521706106,2006
3	David Freifelder	Molecular Biology,ISBN-978-9350781210, 2nd ed,834p,

REFERENCE BOOKS		
1	Lewin, Benjamin and GabbyDover.	Genesv.ISBN-9780198542889, Vol. 1110. Oxford: OxfordUniversityPress,1994.

Course Outcomes:
Upon completion of this course the student will be able to:

CO1	Describe the various instrumentation and sterilization principles
CO2	Explain the basic concepts of preparation of the solutions
CO3	Analyze the microscopic use for the study of cells like plants, bacteria etc.
CO4	Apply the knowledge of carbohydrates and proteins to analyze the biological samples
CO5	Demonstrate the basics of biological databases for Biomolecular visualization

Course Articulation Matrix

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

1:Low, 2:Medium, 3: High

INTRODUCTION TO ELECTRICAL ENGINEERING

Contact Hours/ Week:	3(L) + (T) +0(P)	Credits:	3
Total Lecture Hours:	40	CIE Marks:	50
Course Code:	ESCO06	SEE Marks:	50

Course objectives:
This course will enable students to:

1.	Introduce different types of electric power systems
1.	Interpret the fundamental concepts of electric circuits.
2.	Impart knowledge of construction and operation of DC machines
3.	Impart knowledge of construction and operation of AC machines
4.	Study the domestic wiring, tariff and electrical safety practices.

UNIT I

Introduction: Conventional and non-conventional energy resources; General structure of electrical power systems using single line diagram approach.
Power Generation: Hydel, thermal, nuclear, Solar & wind power generation (Block Diagram approach).
DC Circuits: Ohm's Law and its limitations. KCL & KVL, series, parallel, series-parallel circuits. Numerical.

8 Hours

UNIT II

A.C. Fundamentals: Equation of AC Voltage and current, waveform, time period, frequency, amplitude, phase, phase difference, average value, RMS value, form factor, peak factor. (only definitions)
Voltage and current relationship with phasor diagrams in R, L, and C circuits. Concept of Impedance. Analysis of R-L, R-C, R-L-C Series circuits. Active power, reactive power and apparent power. Concept of power factor. Numerical.
Three Phase Circuits: Generation of Three phase AC quantity, advantages and limitations; star and delta connection, relationship between line and phase quantities. Numerical.

8 Hours

UNIT III

DC Machines: DC Generator: Principle of operation, constructional details, induced emf expression, types of generators. Relation between induced emf and terminal voltage. Numerical.
DC Motor: Principle of operation, back emf and its significance. Torque equation, types of motors, characteristics and speed control (armature & field) of DC motors (series & shunt only). Rating, cost, size and applications of DC motors. Numerical.

8 Hours

UNIT IV

Transformers: Necessity of transformer, principle of operation, Types and construction of single- phase transformers, EMF equation, losses, variation of losses with respect to load. Efficiency. Rating, cost, size and applications. Numerical.
Three-phase induction Motors: Concept of rotating magnetic field, Principle of operation, constructional features of motor, types – squirrel cage and wound rotor. Slip and its significance Rating, cost, size and applications. Numerical.

8 Hours

UNIT V
Domestic Wiring: Requirements, Types of wiring: conduit, casing & capping. Two way and three-way control of load. **Electrical energy consumption and Tariff:** Power rating of household appliances including air conditioners, PCs, laptops, printers, etc. Definition of "unit" used for consumption of electrical energy, two-part electricity tariff, calculation of electrical energy consumption for domestic applications. **Safety measures:** Working principle of Fuse and Miniature circuit breaker (MCB), merits and demerits. Electric Shock, Earthing and its types, Safety Precautions to avoid shock.
8 Hours

TEXT BOOKS		
1	D C Kulshreshtha,	Basic Electrical Engineering, Tata McGraw Hill, 1st Ed., 2019, ISBN-13: 9789353167219
2	D. P. Kothari and I. J. Nagrath,	Basic Electrical Engineering, Tata McGraw Hill, 4th Ed., 2019, ISBN-13**:** 9789353165727

REFERENCE BOOKS		
1	V. K. Mehta, Rohit Mehta	Principles of Electrical Engineering & Electronics, S. Chand and Company Publications, 2nd Ed., 2015, ISBN-13: 9788121927291
2	E. Hughes	Electrical Technology, Pearson, 12th Ed., 2016., ISBN-13: 978-1-292-09304-8

Course Outcomes:

Upon completion of this course the student will be able to:

CO1	Explain the concepts of various energy sources and Electric circuits.
CO2	Apply the basic Electrical laws to solve circuits.
CO3	Explain the construction and operation of various Electrical Machines.
CO4	Determine the performance parameters of different Electrical Machines.
CO5	Explain the concepts of domestic wiring, circuit protective devices and safety measures.

Course Articulation Matrix

		POs											**PSOs**	
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**
COs	**CO1**	3	2	1	0	0	0	0	0	0	0	0		
	CO2	3	3	0	0	0	0	0	0	0	0	0		
	CO3	3	2	0	0	0	0	0	0	0	0	0		
	CO4	3	2	0	0	0	0	0	0	0	0	0		
	CO5	3	1	0	0	0	0	0	0	0	0	0		

Introduction to Electronics & Communication Engineering

Contact Hours/ Week:	3(L) – 0(T) – 0(P)	Credits:	03
Total Lecture Hours:	42	CIE Marks:	50
Course Code:	ESCO7	SEE Marks:	50

Course objectives: This course will enable students to:	
1.	Analyze various stages of DC power supply.
2.	Understand the working of amplifiers and oscillators.
3.	Build the analog computational circuits using OP-AMP
4.	To equip students with basic foundations of embedded systems.
5.	Understand basics of digital electronics.
6.	Understand basics of analog and digital modulation techniques.

UNIT I

Power Supplies

Block diagram, Half-wave rectifier, Full-wave rectifiers (Bi phase and Bridge), C- filter (Qualitative analysis), Zener voltage regulator, Line and load regulation, Voltage doubler, switched mode power supply

Amplifiers

Review of BJT, BJT as a switch; Cut-off and saturation modes; RC coupled CE amplifier, frequency response, gain, input and output resistance, bandwidth, phase shift, negative feedback.

9 Hours

UNIT II

Operational Amplifiers

Ideal op-amp; parameters and characteristics of ideal and practical op-amp; Practical op-amp circuits: Inverting and non-inverting amplifiers, voltage follower, summer, subtractor.

Oscillators

Concept of positive feedback, Barkhausen criterion, sinusoidal and non-sinusoidal oscillators, RC phase shift oscillator, Wein bridge oscillator, Multivibrators, Single-stage astable oscillator, Crystal controlled oscillators (using Op-amp, qualitative analysis).

8 Hours

UNIT III

Boolean Algebra and Logic Circuits

Binary numbers, Number Base Conversion, Binary, octal, decimal & 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.

9 Hours

UNIT IV

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, Microprocessor vs Microcontroller, RISC vs CISC, Memory-

ROM **Sensors and Interfacing** Sensors, Actuators, LED, 7-Segment LED Display.
8 Hours

UNIT V
Analog Communication Schemes Introduction, Modern communication system scheme: Information source, input transducer, Transmitter, Channel or Medium, Noise, Receiver, Multiplexing, Concept of modulation, Types of communication systems. Types of modulation (only concepts) – AM, FM, Concept of Radio wave propagation (Ground, space, sky) **Digital Modulation Schemes** Advantages of digital communication over analog communication, ASK, FSK, PSK (explanation with waveform).
8 Hours

TEXT BOOKS		
1	Mike Tooley	Electronic Circuits, Fundamentals & Applications, 4th Edition, Elsevier, 2015
2	M. Morris Mano	Digital Logic and Computer Design, PHI Learning, 2017

REFERENCE BOOKS		
1	D P Kothari, I J Nagrath	Basic Electronics, 2nd edition, McGraw Hill Education (India), Private Limited, 2018.
2	Shibu K. V	Introduction to Embedded Systems, 2nd edition, Tata Mc Graw Hill Education Pvt. Ltd., 2017
3	S L Kakani and Priyanka Punglia	Communication Systems, Ist Edition, New Age International Publisher, 2017

Course Outcomes: Upon completion of this course the student will be able to:	
CO1	Analyse basic electronic circuits using the principles of rectifiers, voltage regulators, and amplifiers.
CO2	Analyse the behaviour of analog circuits including oscillators and operational amplifiers in signal generation and conditioning applications.
CO3	Apply number system conversions and Boolean algebra to design and implement basic combinational logic circuits.
CO4	Interpret the structure and functionality of embedded systems and digital logic components such as microcontrollers, sensors, and logic gates.
CO5	Illustrate the fundamental concepts of analog and digital modulation techniques based on their characteristics and suitability for communication systems.

Course Articulation Matrix

		POs											**PSOs**	
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**
COs	**CO1**	2	2			1							1	
	CO2	2	2			1							1	
	CO3	2	2										1	

	CO4	**2**	**1**										**1**	
	CO5	**2**	**1**										**1**	

INTRODUCTION TO MECHANICAL ENGINEERING

Contact Hours/ Week:	3 Hrs	Credits:	3.0
Total Lecture Hours:	39	CIE Marks:	50
Sub. Code:	ESCO8	SEE Marks:	50

Course objectives: This course will enable students :	
1.	To develop basic knowledge on mechanical engineering, fundamentals and energy sources.
2.	Understand the concept of different types of machine tool operations and modern manufacturing processes like CNC, 3D printing.
3.	To know the concept of IC engines and future mobility vehicles.
4.	To give exposure in the field of engineering materials and manufacturing processes technology and its applications.
5.	To acquire a basic understanding role of mechanical engineering in the robotics and automation in industry.

UNIT I
Introduction: Role of Mechanical Engineering in Industries and Society, Emerging Trends and Technologies in different sectors such as Energy, Manufacturing, Automotive and Aerospace. **(PO1)** **Energy:** Introduction to various Energy Sources, Basic working principles of Thermal power plant, nuclear power plant, Solar power plant and Wind power plant. Environmental issues like Global warming and Ozone depletion. **(PO1, PO7)**
7 Hours

UNIT II
Machine Tool Operations: Working Principle of lathe, Lathe operations: Turning, facing, knurling. Working principles of Bench Type Drilling Machine, drilling operations: drilling, boring, reaming. Working of Horizontal Milling Machine, Milling operations: plane milling and slot milling. **(PO1)** **Introduction to Advanced Manufacturing Systems:** Introduction, components of CNC, advantages and applications of CNC, Introduction to 3D printing and 3D printing by stereolithography process**. (PO1)**
8 Hours

UNIT III
Introduction to IC Engines: Components and Working Principles, 4-Strokes Petrol and Diesel Engines, comparison of 4-stroke Petrol and Diesel engine, Application of IC Engines. **(PO1)** **Insight into Future Mobility;** Electric and Hybrid Vehicles, Components of Electric and HybridVehicles. Advantages and disadvantages of EVs and Hybrid vehicles. **(PO1)**
8 Hours

UNIT IV

Engineering Materials: Properties and applications of Ferrous & Nonferrous Metals, silica, ceramics, glass, graphite, diamond and polymer, Shape Memory Alloys. **(PO1)** **Joining Processes**: Soldering, Brazing and Welding, Definitions, classification of welding process, Arc welding, Gas welding and types of flames. **(PO1)**
8 Hours

UNIT V
Introduction to Mechatronics and Robotics(Modified): open-loop and closed-loop mechatronic systems, Classification of Robots: Robot Anatomy, Application, Advantages and Disadvantages. **(PO1)** **Automation in industry**: Definition, types – Fixed, programmable and flexible automation, basic elements with block diagrams, advantages. **(PO1)** **Introduction to IOT**: Definition and Characteristics, Physical design, protocols, Logical design of IoT, Functional blocks, and communication models**. (PO1)**
8 Hours

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

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

ONLNINE RESOURCES	
1	Videos Makino (For Machine Tool Operation).
2	https://www.youtube.com/watch?v=vIJ50aUiBgM

Course Outcomes: Upon completion of this course the student will be able to:	
CO1	Explain the role of mechanical engineering in industries and society, various energy sources and its impact on environment.
CO2	Describe the machine tool operations and advanced manufacturing process.
CO3	Explain the working principle of IC engines, electric and hybrid vehicles.
CO4	Discuss the properties of common engineering materials and various metal joining processes.
CO5	Explain the concepts of mechatronics, robotics and automation in IoT.

Course Articulation Matrix

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

ESSENTIALS OF INFORMATION TECHNOLOGY

Contact Hours/ Week:	3:0:0:0	Credits:	3.0
Total Lecture Hours:	42	CIE Marks:	50
Course Code:	ESCO9	SEE Marks:	50

Course objectives: This course will enable students to:	
1.	Provide fundamental knowledge of computer systems, software, and networks.
2.	Develop skills in using productivity tools for academic and professional tasks.
3.	Enable effective use of internet and communication technologies.
4.	Introduce emerging trends and applications in IT.
5.	Create awareness of ethical, legal, and security issues in IT.
6.	Impart practical skills for digital literacy and employability.

UNIT I
Data Storage: Bits and Their Storage, Main Memory, Mass Storage, Representing Information as Bit Patterns, The Binary System, Storing Integers, Storing Fractions. **Data Manipulation:** Computer Architecture, Machine Language, Program Execution, Arithmetic/Logic Instructions, Communicating with Other Devices. **Textbook 1: Chapter-1 (1.1-1.7), Chapter-2 (2.1-2.5)**
8 Hours

UNIT II
Operating Systems: The History of Operating Systems, Operating System Architecture, Coordinating the Machine's Activities, Handling Competition Among Processes, Security. **Algorithms:** The Concept of an Algorithm, Algorithm Representation, Algorithm Discovery. **Textbook 1: Chapter-3, Chapter-5 (5.1-5.3)**
8 Hours

UNIT III
Networking and the Internet: Network Fundamentals, The Internet, The World Wide Web, Internet Protocols, Security. **Cybersecurity:** Overview—What is Cybersecurity?, Brief History of Cybersecurity Events, The Basic Information Security Model, Cyber Hygiene, Teams in Cybersecurity. **Ethical Issues in Information Technology:** Overview, Ownership Rules, Ethics and Online Content. **Textbook 1: Chapter-4** **Textbook 2: Chapter-16, Chapter-17**
8 Hours

UNIT IV
Software Engineering: The Software Engineering Discipline, The Software Life Cycle, Software Engineering Methodologies, Modularity, Tools of the Trade. **Database Systems:** Database Fundamentals, The Relational Model.

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

UNIT V
Introduction to HTML and Website Development: What is HTML?, Cascading Style Sheets (CSS), Website Design and Storyboarding, Structure of a Website. **Computer Graphics:** The Scope of Computer Graphics, Overview of 3D Graphics, Modeling, Rendering. **Textbook 2: Chapter-12.** **Textbook 1: Chapter-10 (10.1-10.4)**
8 Hours

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.

Course Outcomes: Upon completion of this course the student will be able to:	
CO1	Illustrate different information representation and manipulation schemes.
CO2	Use Information Technology (IT) infrastructure for information exchange.
CO3	Apply basic software engineering concepts for Website and application development.
CO4	Develop queries for quick insert, access and updating of structured information.
CO5	Identify the role of cybersecurity and ethical issues in Information Technology (IT).

Course Articulation Matrix

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

Web links and Video Lectures (e-Resources):

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

Teaching-Learning Process (Innovative Delivery Methods):

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

1. Flipped Classroom
2. Problem-Based Learning (PBL)
3. Case-Based Teaching
4. Simulation and Virtual Labs
5. ICT-Enabled Teaching

Assessment Structure:

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

- To qualify and become eligible to appear for SEE, in the **CIE**, a student must score at least **40% of 50 marks**, i.e., **20 marks**.
- To pass the **SEE**, a student must score at least **35% of 50 marks**, i.e., **18 marks**.
- Notwithstanding the above, a student is considered to have **passed the course,** provided the combined total of **CIE and SEE is at least 40 out of 100 marks**.

Continuous Comprehensive Assessments (CCA):

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

Self-study (for Learning Activity, Not for SEE):

File Management, Word Processors, Introduction to Spreadsheets, Introduction to Presentation Applications.

Refer Textbook 2: Chapter-6, Chapter-8, Chapter-9, Chapter-10.

Learning Activity -1: (Marks- 25) 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.

Problem Description:

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, 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 [CO1-5] [PO9]	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 [CO2-5] [PO1, PO3]	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 /output for various cases. [CO2-4] [PO2, PO4, PO5]	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 [CO2-4] [PO3, PO11]	Demonstrates outstanding creativity and innovation in developing solution, especially for design tasks.	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/adequate solution is evident.
Documentation & Analysis [CO1-5] [PO8/PO9/PO11]	Documentation is complete, well-organized, and includes deep reflection on improvements across iterations.	Documentation is complete with some reflection on program refinement.	Documentation is present but lacks detail or depth in reflection.	Incomplete documentation; reflection is minimal.	No documentation or reflection provided as per schedule.

Introduction to Building Sciences

Contact Hours/ Week:	3-0-0	Credits:	3.0
Total Lecture Hours:	42 Hours	CIE Marks:	50
Course Code:	ESCO10	SEE Marks:	50

Course objectives:
This course will enable students to:

1.	Understand the scope of various Civil Engineering domains, materials and terminologies
2.	Understand the laws governing mechanics, and the apply them to concurrent forces
3.	Analyse the coplanar non-concurrent force system
4.	Analyse the parallel force system, determine centroids and moment of inertia of laminae
5.	Determine CG, surface areas, volumes and moment of inertia of 1D, 2D and 3D bodies

UNIT I

Scope of various fields of Civil Engineering: Surveying, Structural Engineering, Geotechnical Engineering, Water Resources Engineering, Transportation Engineering, Environmental Engineering, Construction Planning and Project Management. (**1 Hour**)

Basic and Emerging Materials of Construction: Types and Uses of Bricks, Stones, Cement, Structural Steel, Wood and Concrete. Types and Uses of Autoclaved Aerated Concrete (AAC) blocks, Bamboo, Recycled plastics, Material selection criteria, Durability, Sustainability (**4 Hours**)

Structural Elements of a Building: Concept of Foundation, Plinth, Lintel, Chejja, Masonry wall, Column, Beam, Slab, Flooring and Staircase, Green building rating systems IGBC, LEED, GRIHA (Green Rating for Integrated Habitat Assessment) for new buildings. (**3 hours**)

8 Hours

UNIT II

Fundamentals of Mechanics: Introduction to Mechanics, Classification of Engineering Mechanics, Basic terminologies in Mechanics-time, mass, space, length, force, momentum, Continuum, Rigid body, Particle, Characteristics of a force, Scalar and Vector quantities, Fundamentals Laws of Mechanics. (**3 Hours**)

Coplanar Concurrent Forces: Composition of forces, Resolution of forces, General method of composition of forces, Equilibrium of bodies and connected bodies. (**5 Hours**)

8 Hours

UNIT III

Coplanar non-concurrent forces: Moment of a force, Varignon's theorem, Couple, resolution of force and a couple, resultant of force systems, equilibrium of coplanar non-concurrent system of forces, application to beam problems- Determination of support reaction for beams subjected to different types of loads (Concentrated loads, UDL, UVL, pure moment and their combinations), introduction to the concepts of determinacy and indeterminacy in components subjected to forces/loads.

8 Hours

UNIT IV

Centroid and Moment of Inertia of plane sections: Importance of centroid and centre of gravity, methods of determining the centroid, locating the centroid of plane lamina from first principles, centroid of composite sections.

Importance of Moment of Inertia, parallel axis theorem and perpendicular axis theorem, section modulus, radius of gyration, polar moment of inertia, second moment of area (moment of inertia) of plane sections from first principles -rectangle, triangle, circle, moment of inertia of composite sections, Numerical Problems.

8 Hours

UNIT V
Centre of gravity and Mass moment of inertia: Centre of gravity concept, centre of gravity from first principles of simple sections, Theorems of Pappus-Guldinus. Mass moment of inertia-determination of mass moment of inertia of rod, rectangular and circular plate from first principles. (**4 Hours)** **Friction:** Frictional force, Laws of friction, angle of friction, angle of repose and cone of friction, Concept of wedges. (**4 Hours**)
8 Hours

TEXT BOOKS		
1	A.Nelson	Engineering Mechanics, Statics and Dynamics, Tata McGraw Hill Publications, 2009. ISBN:978-07-014614-3
2	Bansal R. K., Rakesh Ranjan Beohar and Ahmad Ali Khan	Basic Civil Engineering and Engineering Mechanics, Laxmi Publications, 3rd Edition, 2015, ISBN: 9789380856674.

REFERENCE BOOKS		
1	Beer F.P. and Johnston E.R.	Mechanics for Engineers: Statics and Dynamics, McGraw Hill, 4th Edition, 1987, ISBN: 9780070045842
2	Hibbler R. C.	Engineering Mechanics: Principles of Statics and Dynamics, Pearson Press, 2017
3	Timoshenko S, Young D. H., Rao J. V., Sukumar Patil	Engineering Mechanics, McGraw Hill Publisher,5th Edition, 2017, ISBN: 9781259062667
4	Bhavikatti S S	Engineering Mechanics, New Age International Publications, 4th Edition, 2018.

Course Outcomes: Upon completion of this course the student will be able to:	
CO1	Comprehend various civil engineering domains, materials & terminologies of buildings
CO2	Solve engineering problems involving concurrent force systems using laws of statics
CO3	Apply equations of statics to evaluate unknown forces in non-concurrent force systems
CO4	Locate centroids of plane figures and evaluate its moment of inertia about any axis
CO5	Determine the location of CG, surface areas, volumes and MI of 1D, 2D and 3D bodies

Course Articulation Matrix

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

APPLIED MECHANICS

Contact Hours/ Week:	: 3+0+0 (T+L+P)	Credits:	3
Total Lecture Hours:	: 40 hours	CIE Marks:	50
Total Tutorial Hours	: 0	SEE Marks:	50
Sub. Code:	: ESCO11		

Course Objectives
• To develop students' ability to analyze the problems involving forces, moments with their applications. • To make students learn the effect of friction on different planes • To develop the student's ability to find out the center of gravity and moment of inertia and their applications. • To make the students learn about kinematics and kinetics and their applications.

UNIT I
Fundamentals of Mechanics: Introduction to Mechanics, Classification of Engineering Mechanics, Basic terminologies in Mechanics-time, mass, space, length, force, momentum, Continuum, Rigid body, Particle, Characteristics of a force, Scalar and Vector quantities, Fundamentals Laws of Mechanics. (**3 Hours)** **Coplanar Concurrent Forces:** Composition of forces, Resolution of forces, General method of composition of forces, Equilibrium of bodies and connected bodies. (**5 Hours)**
8 Hours
UNIT II
Coplanar non-concurrent forces: Moment of a force, Varignon's theorem, Couple, resolution of force and a couple, resultant of force systems, equilibrium of coplanar non-concurrent system of forces, application to beam problems- Determination of support reaction for beams subjected to different types of loads (Concentrated loads, UDL, UVL, pure moment and their combinations), introduction to the concepts of determinacy and indeterminacy in components subjected to forces/loads.
8 Hours
UNIT III
Centroid and Moment of Inertia of plane sections: Importance of centroid and centre of gravity, methods of determining the centroid, locating the centroid of plane lamina from first principles, centroid of composite sections – symmetrical sections -T and I section. Importance of Moment of Inertia, parallel axis theorem and perpendicular axis theorem, section modulus, radius of gyration, polar moment of inertia, second moment of area (moment of inertia) of plane sections from first principles -rectangle, triangle, circle, moment of inertia of composite sections, Numerical Problems (Only symmetrical sections- T and I section).
8 Hours
UNIT IV
Centre of gravity and Mass moment of inertia: Centre of gravity concept, centre of gravity from first principles of simple sections, Theorems of Pappus-Guldinus. Mass moment of inertia-determination of mass moment of inertia of rod, rectangular and circular plate from first principles. (**4 Hours)** **Friction:** Frictional force, Laws of friction, angle of friction, angle of repose and cone of friction, Concept of wedges. (**4 Hours)**

	8 Hours
UNIT V	
Dynamics: Basic terms, principles of dynamics, types of motion. **Kinematics:** Introduction, Displacement, speed, velocity, acceleration, acceleration due to gravity, Numerical examples on linear motion. **Projectiles:** Introduction, important definitions, motion of body projected horizontally- derivation and numerical examples. **Kinetics:** Introduction, approaches- D 'Alembert's principle and work-energy method.	
	8 Hours

TEXTBOOKS		
1.	S.S.Bhavikatti	Engineering Mechanics, Eighth Edition, 2021, NEW AGE International Publishers, ISBN 9388818474

REFERENCE BOOKS		
1.	Bansal R. K., Rakesh Ranjan Beohar and Ahmad Ali Khan	Basic Civil Engineering and Engineering Mechanics, third edition, 2015, Laxmi Publications, ISBN: 9789380856674.
2.	Beer F.P. and Johnston E. R	Mechanics for Engineers: Statics and Dynamics, Fourth edition, 1987, McGraw Hill, ISBN: 9780070045842
3.	Hibbler R. C.	Engineering Mechanics: Principles of Statics and Dynamics, fourteenth edition, 2017, Pearson Press, New Delhi.ISBN:9789332584747.

ONLINE RESOURCES		
1.	NPTEL course on "Engineering Mechanics"	By Prof. K. Ramesh, IIT Madras

Course Outcomes	
Upon completion of this course the student will be able to:	
CO1	Identify system of forces and to solve complex engineering problems by applying principles of engineering, science, and mathematics.
CO2	Apply equations of statics to analyze non concurrent force system and to determine support reactions of beams subjected to various loading types.
CO3	Locate the centroid of laminas and compute the moment of inertia of plane sections using first principles.
CO4	Compute the centroid and the moment of inertia of solids from first principles and apply the concept of friction for a given real world problem.
CO5	Apply the Principles of Kinematics and Kinetics to solve plane motion and connected bodies for the solution of engineering problems.

Course Articulation Matrix

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

INTRODUCTION TO C PROGRAMMING			
Contact Hours/ Week:	3	Credits:	4
Total Lecture Hours (L:T:P:S):	3:0:2:0	CIE Marks:	50
Course Code:	PLC5	SEE Marks:	50

Course objectives: This course will enable students to:	
1.	Elucidate the basic architecture and functionalities of a computer.
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 and procedures.

UNIT I
INTRODUCTION TO C: Introduction to computers, input and output devices, designing efficient programs. Introduction to C, Structure of C program, Files used in a C program, Compilers, Compiling and executing C programs, variables, constants, Input/output statements in C. **Textbook: Chapter 1.1 - 1.9, 2.1 - 2.2, 8.1 - 8.6, 9.1 - 9.14**
8 Hours

UNIT II
DECISION CONTROL AND LOOPING STATEMENTS: Operators in C, Type conversion and typecasting. Introduction to decision control, Conditional branching statements, iterative statements, nested loops, break and continue statements, goto statement. **Textbook: Chapter 9.15 - 9.16, 10.1 - 10.6**
8 Hours

UNIT III
FUNCTIONS & ARRAY **Functions:** Introduction using functions, Function definition, function declaration, function call, return statement, passing parameters to functions, scope of variables, storage classes, recursive functions. **Arrays**: Declaration of arrays, accessing the elements of an array, storing values in arrays, Operations on arrays, Passing arrays to functions. **Textbook: Chapter 11.1 - 11.13, 12.1 - 12.6**
8 Hours

UNIT IV
Two dimensional arrays, operations on two-dimensional arrays, two-dimensional arrays to functions, multidimensional arrays

APPLICATIONS OF ARRAYS AND INTRODUCTION TO STRINGS : Applications of arrays, case study with sorting techniques.
INTRODUCTION TO STRINGS: Reading strings, writing strings, summary of functions used to read and write characters.Suppressing input using a Scanset.

Textbook: Chapter 12.7 - 12.12

8 Hours

UNIT V

STRINGS: String taxonomy, operations on strings, Miscellaneous string and character functions, arrays of strings.

POINTERS: Understanding the Computers Memory, Introduction to Pointers, Declaring Pointer Variables.

STRUCTURES: Introduction to structures.

Textbook: Chapter 13.1 - 13.6, 14.1 - 14.3, 15.1

8 Hours

Lab Assignments

1	C Program to find Mechanical Energy of a particle using E = mgh+1/2 mv2.
2	C Program to convert Kilometers into Meters and Centimeters.
3	C Program To Check the Given Character is Lowercase or Uppercase or Special Character.
4	Program to balance the given Chemical Equation values x, y, p, q of a simple chemical equation of the type: The task is to find the values of constants b1, b2, b3 such that the equation is balanced on both sides and it must be the reduced form.
5	Implement Matrix multiplication and validate the rules of multiplication
6	Compute sin(x)/cos(x) using Taylor series approximation. Compare you result with the built-in library function. Print both the results with appropriate inferences.
7	Sort the given set of N numbers using Bubblesort.
8	Write functions to implement string operations such as compare, concatenate,string length Convince the parameter passing techniques.
9	Implement structures to read, write and compute average-marks and the students scoring above and below the average marks for a class of N students.
10	Develop a program using pointers to compute the sum, mean and standard deviation of all elements stored in an array of N real numbers.

TEXT BOOKS

1	Reema Thareja	PROGRAMMING IN C, Third Edition, Oxford University, 2023.

REFERENCE BOOKS		
1	E Balaguruswamy	Programming in ANSI C, 9e, Tata McGraw Hill Education.
2	Brian W. Kernighan and Dennis M. Ritchie	The 'C' Programming Language, Second Edition, Prentice Hall of India, 2015.

Course Outcomes: Upon completion of this course the student will be able to:	
CO1	Elucidate the basic architecture and functionalities of a computer and also recognize the hardware parts.
CO2	Apply programming constructs of C language to solve the real world problem
CO3	Explore user-defined data structures like arrays in implementing solutions to problems like searching and sorting.
CO4	Explore user-defined data structures like structures, unions and pointers in implementing solutions.
CO5	Design and Develop Solutions to problems using modular programming constructs using functions.

Course Articulation Matrix

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

PYTHON PROGRAMMING

Contact Hours/ Week:	28+28	Credits:	3
Total Lecture Hours:	2L + 2P	CIE Marks:	50
Course Code:	PLC2	SEE Marks:	50

Course objectives: This course will enable students to:	
1.	Learn the syntax and semantics of the Python programming language.
2.	Illustrate the process of structuring the data using lists, tuples
3.	Demonstrate the use of built-in functions to navigate the file system.
4.	Implement the Object-Oriented Programming concepts in Python.

UNIT I
Python Basics: Entering Expressions into the Interactive Shell, The Integer, Floating-Point, and String Data Types, String Concatenation and Replication, Storing Values in Variables, Your First Program, Dissecting Your Program. **Flow Control:** Boolean Values, Comparison Operators, Boolean Operators, Mixing Boolean and Comparison Operators, Elements of Flow Control, Program Execution, Flow Control Statements, Importing Modules, Ending a Program Early with sys.exit(). Example Programs. Textbook 1
8+6P Hours

UNIT II
Functions: def Statements with Parameters, Return Values and return Statements, The None Value, Keyword Arguments and print(), Local and Global Scope, The global Statement, Exception Handling, A Short Program: Guess the Number. Example Programs. **Lists:** The List Data Type, Working with Lists, Augmented Assignment Operators, Methods, Example Program: Magic 8 Ball with a List, List-like Types: Strings and Tuples, References. Example Programs. Textbook 1
5+6P Hours

UNIT III
Dictionaries and Structuring Data: The Dictionary Data Type, Pretty Printing, Using Data Structures to Model Real-World Things. Example Programs. **Manipulating Strings:** Working with Strings, Useful String Methods, Project: Password Locker. Example Programs. Textbook 1
5+6P Hours

UNIT IV
Object-Oriented Programming: Classes and Objects, Creating Classes in Python, Creating Objects in Python, The Constructor Method, Classes with Multiple Objects, Using Objects as

Arguments, Objects as Return Values, Class Attributes versus Data Attributes, Encapsulation, Using Private Instance Variables and Methods. **Inheritance**: Accessing the Inherited Variables and Methods, Using super() Function and Overriding Base Class Methods, Multiple Inheritances, Method Resolution Order (MRO), The Polymorphism, Operator Overloading and Magic Methods. Example Programs. Textbook 2
6+6P Hours

UNIT V
Reading and Writing Files: Files and File Paths, The os.path Module, The File Reading/Writing Process, Saving Variables with the shelve Module, Saving Variables with the pprint.pformat() Function. Example Programs. **Organizing Files:** The shutil Module, Walking a Directory Tree, Compressing Files with the zipfile Module, Example Programs. Textbook 1
6+4P Hours

Laboratory Experiments or Programs	
Aim: Introduce the Python fundamentals, data types, operators and flow control.	
1.	Develop a Python program to compute the distance between two given points. (Euclidean distance formula).
2.	Develop a Python program to find the largest of three given numbers using if-elif statements.
3.	Develop a Python program to check whether a given number is palindrome or not and also count the number of occurrences of each digit in the input number.
Aim: Demonstration of manipulation of list and functions.	
4.	Defined as a function F as Fn = Fn-1 + Fn-2. Write a Python program which accepts a value for N (where N >0) as input and pass this value to the function. Display suitable error message if the condition for input value is not followed. **The first two terms are 0 and 1** **A Fibonacci sequence is the integer sequence of 0, 1, 1, 2, 3, 5, 8....**
5.	Develop a python program to compute the gcd of two given numbers using function with argument and return value.
6.	Develop a python program to sort the given list using selection sort.
7.	Develop a python program to find the key elements in a given list using binary search technique.
Aim: Demonstration of Dictionary and strings using string methods.	
7.	Develop a Python program that accepts a sentence and find the number of words, digits, uppercase letters and lowercase letters.(without using built-in functions)
8.	Develop a program to convert roman numbers into integer values using dictionaries.
9.	Develop a python program to Check if a given string is binary string or not. [Hint: Input: str = "01010101010" Output: Yes

	Input: str = "geeks101" Output: No]
10.	Develop a python program to check if a string contains only alphanumeric characters or even special character. [Hint: Input : GeeksForGeeks Output : String contains special characters. Input : Geeks For Geeks Output : String contains only alphanumeric characters]
Aim: Demonstration of the concepts of classes, methods, objects and inheritance.	
11.	Develop a python program by creating a class called Employee to store the details of Name, Employee_ID, Department and Salary, and implement a method to update salary of employees belonging to a given department.
12.	Develop a Python Program to Create a Class Called as Complex and Implement __add__() Method to Add Two Complex Numbers. Display the Result by Overloading the + Operator.
13.	Develop a python program utilizing inheritance to calculate the area of a triangle, circle, and rectangle as defined below. The Shape class serves as the base class, defining a common interface for calculating the area. Derived classes (Triangle, Circle, and Rectangle) inherit from Shape and implement their specific area calculation methods.
Aim: Demonstration of working with Reading and Writing Files.	
14.	Write a python program to accept a file name from the user and perform the following operations 1. Display the first N lines of the file 2. Copy the content of one file to another file. 3. Display the contents of copied file in reversed order.
15.	Develop a python program for generating random quiz files along with key_answer file. (Each set must have 10 questions and five different quiz patterns).

TEXT BOOKS		
1	Al Sweigart	Automate the Boring Stuff with Python, 1st Edition, 2015
2	Gowrishankar S, Veena	Introduction to Python Programming, CRC Press/Taylor & Francis, 1st Edition, 2018

REFERENCE BOOKS		
1	Charles Dierbach	Introduction to Computer Science Using Python, Wiley India Pvt Ltd, 1st Edition, 2015

Course Outcomes: Upon completion of this course the student will be able to:	
CO1	Discuss the fundamentals of python programming elements like variables, operators, if conditional, loops etc.
CO2	Identify the methods to create and manipulate lists, tuples, strings and dictionaries.

CO3	Interpret the concepts of Object-Oriented Programming used in Python to solve problems.
CO4	Develop programs to organize the files.

Course Articulation Matrix

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

INTRODUCTION TO AI AND APPLICATIONS

Contact Hours/ Week:	3(L) + 0(T) + 0(P)	Credits:	3.0
Total Lecture Hours:	3 Hrs.	CIE Marks:	50
Course Code:	ETC13	SEE Marks:	50

Course objectives: This course will enable students to:	
1.	Introduce basic concepts and techniques of Artificial Intelligence (AI) and Artificial Super Intelligence (ASI).
2.	Apply informed search techniques for different applications.
3.	Introduce basic concepts and techniques of Machine Learning (ML).
4.	Learn knowledge representation mechanism, prompt engineering techniques and writing prompts for creative thinking and creative writing
5.	Introduce tends in AI and super intelligence.
6.	Learn the basics of Robotics and its Engineering applications.

UNIT I
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, Narrow AI, Artificial General Intelligence, Artificial Super Intelligence, Reactive Machines, Limited Memory, Theory of Mind, Self-Awareness, Machine Learning and Deep Learning, Preparing for Super Intelligence: Major Breakthroughs of Narrow AI. Artificial intelligence technologies: Techniques in AI, Machine Learning Model, Types of Machine Learning Algorithms. Artificially Intelligent Machine: Defining Intelligence, Components of Intelligence, Differences Between Human and Machine Intelligence, Agent and Environment. Textbook 1: Chapter 1 (1.1-1.3), Chapter 2 (2.1-2.2), Chapter 3 (3.1-3.4). Textbook 3: Chapter 1(1.1-1.9, 1.11, 1.12), 2, 3(3.1-3.4),
8 Hours

UNIT II
Machine Learning: Techniques in AI, Machine Learning Model, Model Based and Model Less Learning, Regression Analysis in Machine Learning, Classification Techniques, Clustering Techniques, Naïve Bayes Classification, Deep Learning, Neural Network. Textbook 1: Chapter 2 (2.1-2.8) Textbook 3: Chapter 5(5.1-5.6), 6 (6.1, 6.2)
8 Hours

UNIT III
Knowledge Representation: Introduction, Knowledge Representation, Knowledge-Based Agent, Types of Knowledge. Introduction to Prompt Engineering, Introduction to Prompt Engineering, The Evolution of Prompt Engineering, Types of Prompts, How Does Prompt Engineering Work? Prompt Engineering Techniques for ChatGPT, Introduction to Prompt Engineering Techniques, Instructions Prompt Technique, Zero, One, and Few Shot Prompting, Self-Consistency Prompt. Textbook 1: Chapter 4 (4.1-4.4)

Textbook 2: Chapters 1 (1.1-1.4), 3 (3.1 -3.4) Textbook 3: Chapter 8, 9(9.1-9.5), 10
8 Hours

UNIT IV
Current Trends in Artificial Intelligence: AI and Ethical Concerns, AI as a Service (AIaaS), Recent trends in AI. Control and Alignment Concerns in Superintelligence, Scheming in Narrow AI. Textbook 1: Chapter 8 (8.1, 8.2, 8.4) Textbook 3: Chapter 11, 12, 13
8 Hours

UNIT V
Robotics, Robotics-an Application of AI, Drones Using AI, No Code AI, Low Code AI. Applications of AI: Application of AI in Computer Science, Application of AI in Civil Engineering, Application of AI in Electronics and Telecommunications, Application of AI in Electronics and Electrical Engineering, Application of AI in Electronics and Instrumentation, Application of AI in Mechanical Engineering, Application of AI in Biotechnology, Application of AI in Industrial Engineering and Management. Textbook 1: Chapter 8 (8.3), Chapter 1 (1.7, 1.8, 1.10, 1.11) Textbook 3: Chapter 15, 16, 17, 18
8 Hours

TEXT BOOKS		
1	Reema Thareja	Artificial Intelligence: Beyond Classical AI, Pearson Education, 2023.
2	Ajantha Devi Vairamani and Anand Nayyar	Prompt Engineering: Empowering Communication, 1st Edition, CRC Press, Taylor & Francis Group, 2024.
3	SASI	"Engineering Intelligence – A VTU Abridged Series", Chiac ASI, 2025

REFERENCE BOOKS		
1	Stuart Russell and Peter Norvig	Artificial Intelligence: A Modern Approach (4th Edition), Pearson Education, 2023.
2	Elaine Rich, Kevin Knight, and Shivashankar B. Nair	Artificial Intelligence, McGraw Hill Education.
3	Tom Taulli	Prompt Engineering for Generative AI: ChatGPT, LLMs, and Beyond, Apress, Springer Nature.
4	Nilakshi Jain	Artificial Intelligence: Making A System Intelligent, First Edition, Wiley.

Course Outcomes: Upon completion of this course the student will be able to:	
CO1	Explain the concepts and types of artificial intelligence and artificial super intelligence.

CO2	Illustrate basic machine learning methods for regression, classification and clustering.
CO3	Make use of prompt engineering techniques to interact with generative AI tools.
CO4	Outline recent trends in artificial intelligence and machine learning.
CO5	Identify real-world applications of AI across different Engineering disciplines.

Course Articulation Matrix

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

ಬಳಕೆ ಕನ್ನಡ Balake Kannada (Kannada for Usage)

Contact Hours/Week	:	1(L) + 0(T) + 0(P)	Credits	:	1.0
Total Lecture Hours	:	15	CIE Marks	:	50
Total Tutorial Hours	:	00	SEE Marks	:	50
Total Practical Hours	:	00	Exam Hours	:	1:30
Course Type	:	Theory	Course Code	:	**CC03**

Course Objectives: This course will enable students:

- To create the awareness regarding the necessity of learning local language for comfortable and healthy life.
- To enable learners to Listen and understand the Kannada language properly.
- To speak, read and write Kannada language as per requirement.
- To train the learners for correct and polite conservation.
- To know about Karnataka state and its language, literature and General information about this state.

Unit I

1. Introduction, Necessity of learning a local language, Methods to learn the Kannada language.
2. Easy learning of a Kannada Language: A few tips, Hints for correct and polite conservation, Listening and Speaking Activities, Key to Transcription.
3. ವೈಯಕ್ತಿಕ, ಸ್ವಾಮ್ಯಸೂಚಕ/ಸಂಬಂಧಿತ ಸರ್ವನಾಮಗಳು ಮತ್ತು ಪ್ರಶ್ನಾರ್ಥಕ ಪದಗಳು- Personal Pronouns, Possessive Forms, Interrogative words.

03 Hrs

Unit II

1. ನಾಮಪದಗಳ ಸಂಬಂಧಾರ್ಥಕ ರೂಪಗಳು, ಸಂದೇಹಾಸ್ಪದ ಪ್ರಶ್ನೆಗಳು ಮತ್ತು ಸಂಬಂಧವಾಚಕ ನಾಮಪದಗಳು – Possessive forms of nouns, doubtive question and Relative nouns
2. ಗುಣ, ಪರಿಮಾಣ ಮತ್ತು ವರ್ಣ ಬಣ್ಣ ವಿಶೇಷಣಗಳು, ಸಂಖ್ಯಾವಾಚಕಗಳು - Qualitative, Quantitative and Colour Adjectives, Numerals.
3. ಕಾರಕ ರೂಪಗಳು ಮತ್ತು ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯಗಳು - ಸಪ್ತಮಿ ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯ - (ಆ, ಅದು, ಅವು, ಅಲ್ಲಿ) Predictive Forms, Locative Case.

03 Hrs

Unit III

1. ಚತುರ್ಥಿ ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯದ ಬಳಕೆ ಮತ್ತು ಸಂಖ್ಯಾವಾಚಕಗಳು - Dative cases and Numerals
2. ಸಂಖ್ಯಾಗುಣವಾಚಕಗಳು ಮತ್ತು ಬಹುವಚನ ನಾಮರೂಪಗಳು Ordinal Numerals and Plural markers
3. ನ್ಯೂನ/ ನಿಷೇಧಾರ್ಥಕ ಕ್ರಿಯಾಪದಗಳು ಮತ್ತು ವರ್ಣ ಗುಣವಾಚಕಗಳು - Defective / Negative verbs and Colour Adjectives. **03 Hrs**

Unit IV

1. ಅಪ್ಪಣೆ/ಒಪ್ಪಿಗೆ, ನಿರ್ದೇಶನ, ಪ್ರೋತ್ಸಾಹ ಮತ್ತು ಒತ್ತಾಯ ಅರ್ಥರೂಪ ಪದಗಳು ಮತ್ತು ವಾಕ್ಯಗಳು Permission, Commands, Encouraging and Urgin words (Imperative words and sentences)
2. ಸಾಮಾನ್ಯ ಸಂಭಾಷಣೆಗಳಲ್ಲಿ ದ್ವಿತೀಯ ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯಗಳು ಮತ್ತು ಸಂಭವನೀಯ ಪ್ರಕಾರಗಳು Accusative cases and Potential Forms used in General Communication.
3. "ಇರು ಮತ್ತು ಇರಲ್ಲ" ಸಹಾಯಕ ಕ್ರಿಯಾಪದಗಳು, ಸಂಭಾವ್ಯಸೂಚಕ ಮತ್ತು ನಿಷೇಧಾರ್ಥಕ ಕ್ರಿಯಾಪದಗಳು Helping verbs '*iru* and *iralla*'. Corresponding Future and Negation verbs.
4. ಹೋಲಿಕೆ (ತರತಮ), ಸಂಬಂಧ ಸೂಚಕ, ವಸ್ತುಸೂಚಕ ಪ್ರತ್ಯೆಯಗಳು ಮತ್ತು ನಿಷೇಧಾರ್ಥಕ ಪದಗಳ ಬಳಕೆ Comparative, Relationship, Identification and Negation words.

03 Hrs

Unit V

1. ಕಾಲ ಮತ್ತು ಸಮಯದ ಹಾಗೂ ಕ್ರಿಯಾಪದಗಳ ವಿವಿಧ ಪ್ರಕಾರಗಳು
   Different types of Tense, Time and Verbs
2. -ದ್, -ತ್, -ತು, -ಇತು, -ಆಗಿ, -ಅಲ್ಲ, -ಗ್, -ಕ್, ಇದೆ ಕ್ರಿಯಾ ಪ್ರತ್ಯಯಗಳೊಂದಿಗೆ ಭೂತ, ಭವಿಷ್ಯತ್ ಮತ್ತು ವರ್ತಮಾನ ಕಾಲ ವಾಕ್ಯ ರಚನೆ
   Formation of Past, Future and Present Tense Sentences with Verb Forms.
3. ಸಂಭಾಷಣೆಯಲ್ಲಿ ದಿನೋಪಯೋಗಿ ಕನ್ನಡ ಪದಗಳು
   Kannada Vocabulary List. Kannada Words in Conversation

03 Hrs

Course Outcomes: At the end of the course the student will be able:

CO1 To familiarize the necessity of learning of local language for comfortable life.

CO2 To speak, read and write Kannada language as per requirement.

CO3 To communicate (converse) in Kannada language in their daily life with Kannada speakers.

CO4 To Listen and understand the Kannada language properly.

CO5 To speak in polite conservation.

Text Book:

ಬಳಕೆ ಕನ್ನಡ –ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ
ಪ್ರಕಟಣೆ: ಪ್ರಸಾರಾಂಗ, ವಿಶ್ವೇಶ್ವರಯ್ಯ ತಾಂತ್ರಿಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಬೆಳಗಾವಿ.

ಸೂಚನೆ:

1. ಹೆಚ್ಚಿನ ಮಾಹಿತಿ ಮತ್ತು ವಿವರಣೆಗಳಿಗೆ ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ (9900832331) ಇವರನ್ನು ಸಂಪರ್ಕಿಸಿ.
2. ಮಾದರಿ ಪ್ರಶ್ನೆಪತ್ರಿಕೆ, ಕೋರ್ಸ್ ಆಯ್ಕೆ ಮಾಹಿತಿ, ಅಧ್ಯಯನ ಸಾಮಗ್ರಿ ಮತ್ತು ಬಹು ಆಯ್ಕೆ ಮಾದರಿಯ ಪ್ರಶ್ನೆಗಳ ಕೈಪಿಡಿಗಾಗಿ ವಿಶ್ವವಿದ್ಯಾಲಯದ ವೆಬ್‌ಸೈಟ್ ನೋಡುವುದು.

ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ

Contact Hours/Week	:	1(L) + 0(T) + 0(P)	Credits	:	1.0
Total Lecture Hours	:	15	CIE Marks	:	50
Total Tutorial Hours	:	00	SEE Marks	:	50
Total Practical Hours	:	00	Exam Hours	:	1:30
Course Type	:	Theory	Course Code	:	**CC04**

Course Objectives: This course will enable students to:

ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ ಪಠ್ಯ ಕಲಿಕೆಯ ಉದ್ದೇಶಗಳು:

1. ವೃತ್ತಿಪರ ಪದವಿ ವಿದ್ಯಾರ್ಥಿಗಳಾಗಿರುವುದರಿಂದ ಕನ್ನಡ ಭಾಷೆ, ಸಾಹಿತ್ಯ ಮತ್ತು ಕನ್ನಡದ ಸಂಸ್ಕೃತಿಯ ಪರಿಚಯ ಮಾಡಿಕೊಡುವುದು.
2. ಕನ್ನಡ ಸಾಹಿತ್ಯದ ಪ್ರಧಾನ ಭಾಗವಾದ ಆಧುನಿಕ ಪೂರ್ವ ಮತ್ತು ಆಧುನಿಕ ಕಾವ್ಯಗಳನ್ನು ಸಾಂಕೇತಿಕವಾಗಿ ಪರಿಚಯಿಸುವುದು.
3. ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ಸಾಹಿತ್ಯ ಮತ್ತು ಸಂಸ್ಕೃತಿಯ ಬಗ್ಗೆ ಅರಿವು ಹಾಗೂ ಆಸಕ್ತಿಯನ್ನು ಮೂಡಿಸುವುದು.
4. ತಾಂತ್ರಿಕ ವ್ಯಕ್ತಿಗಳ ಪರಿಚಯವನ್ನು ಹಾಗೂ ಅವರುಗಳು ಸಾಧಿಸಿದ ವಿಷಯಗಳನ್ನು ಪರಿಚಯಿಸುವುದು.
5. ಸಾಂಸ್ಕೃತಿಕ, ಜನಪದ ಹಾಗೂ ಪ್ರವಾಸ ಕಥನಗಳ ಪರಿಚಯ ಮಾಡಿಕೊಡುವುದು.

ಘಟಕ-1 ಕನ್ನಡ ಸಂಸ್ಕೃತಿ ಮತ್ತು ಭಾಷೆ ಕುರಿತಾದ ಲೇಖನಗಳು

1. ಕರ್ನಾಟಕ ಸಂಸ್ಕೃತಿ – ಹಂ.ಪ. ನಾಗರಾಜಯ್ಯ
2. ಕರ್ನಾಟಕದ ಏಕೀಕರಣ – ಒಂದು ಅಪೂರ್ವ ಚರಿತ್ರೆ – ಜಿ. ವೆಂಕಟಸುಬ್ಬಯ್ಯ
3. ಆಡಳಿತ ಭಾಷೆಯಾಗಿ ಕನ್ನಡ – ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ ಮತ್ತು ಪ್ರೊ. ವಿ. ಕೇಶವಮೂರ್ತಿ

03 ಗಂಟೆಗಳು

ಘಟಕ-2 ಆಧುನಿಕ ಪೂರ್ವದ ಕಾವ್ಯ ಭಾಗ

1. ವಚನಗಳು – ಬಸವಣ್ಣ, ಅಕ್ಕಮಹಾದೇವಿ, ಅಲ್ಲಮಪ್ರಭು, ಆಯ್ದಕ್ಕಿ ಮಾರಯ್ಯ, ಜೇಡರ ದಾಸಿಮಯ್ಯ, ಆಯ್ದಕ್ಕಿ ಲಕ್ಕಮ್ಮ
2. ಕೀರ್ತನೆಗಳು: ಅದರಿಂದೇನು ಫಲ ಇದರಿಂದೇನು ಫಲ – ಪುರಂದರದಾಸರು
   ತಲ್ಲಣಿಸದಿರು ಕಂಡ್ಯ ತಾಳು ಮನವೇ - ಕನಕದಾಸರು
3. ತತ್ವಪದಗಳು : ಸಾವಿರ ಕೊಡಗಳ ಸುಟ್ಟು – ಶಿಶುನಾಳ ಶರೀಫ

03 ಗಂಟೆಗಳು

ಘಟಕ-3 ಆಧುನಿಕ ಕಾವ್ಯಭಾಗ

1. ಡಿವಿಜಿ ರವರ ಮಂಕುತಿಮ್ಮನ ಕಗ್ಗದಿಂದ ಆಯ್ದ ಕೆಲವು ಭಾಗಗಳು
2. ಕುರುಡು ಕಾಂಚಾಣ: ದ.ರಾ. ಬೇಂದ್ರೆ
3. ಹೊಸಬಾಳಿನ ಗೀತೆ : ಕುವೆಂಪು

03 ಗಂಟೆಗಳು

ಘಟಕ-4 ತಾಂತ್ರಿಕ ವ್ಯಕ್ತಿಗಳ ಪರಿಚಯ

1. ಡಾ. ಸರ್ ಎಂ. ವಿಶ್ವೇಶ್ವರಯ್ಯ: ವ್ಯಕ್ತಿ ಮತ್ತು ಐತಿಹ್ಯ – ಎ.ಎನ್. ಮೂರ್ತಿರಾವ್
2. ಕರಕುಶಲ ಕಲೆಗಳು ಮತ್ತು ಪರಂಪರೆಯ ವಿಜ್ಞಾನ – ಕರೀಗೌಡ ಬೀಚನಹಳ್ಳಿ

03 ಗಂಟೆಗಳು

ಘಟಕ-5 ಸಾಂಸ್ಕೃತಿಕ, ಜನಪದ ಕಥೆ ಮತ್ತು ಪ್ರವಾಸ ಕಥನ

1. ಯುಗಾದಿ : ವಸುಧೇಂದ್ರ
2. ಮೆಗಾನೆ ಎಂಬ ಗಿರಿಜನ ಪರ್ವತ : ಹಿ.ಚಿ. ಬೋರಲಿಂಗಯ್ಯ

03 ಗಂಟೆಗಳು

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

ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ ಪಠ್ಯ ಕಲಿಕೆಯ ನಂತರ ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ:

CO1 ಕನ್ನಡ ಭಾಷೆ, ಸಾಹಿತ್ಯ ಮತ್ತು ಕನ್ನಡದ ಸಂಸ್ಕೃತಿಯ ಕುರಿತು ಅರಿವು ಮೂಡಿರುತ್ತದೆ.

CO2 ಕನ್ನಡ ಸಾಹಿತ್ಯದ ಪ್ರಧಾನ ಭಾಗವಾದ ಆಧುನಿಕ ಪೂರ್ವ ಮತ್ತು ಆಧುನಿಕ ಕಾವ್ಯಗಳನ್ನು ಸಾಂಕೇತಿಕವಾಗಿ ಕಲಿತು ಹೆಚ್ಚಿನ ಓದಿಗೆ ಮತ್ತು ಜ್ಞಾನಕ್ಕೆ ಸ್ಫೂರ್ತಿ ಮೂಡುತ್ತದೆ.

CO3 ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ಸಾಹಿತ್ಯ ಮತ್ತು ಸಂಸ್ಕೃತಿಯ ಬಗ್ಗೆ ಅರಿವು ಹಾಗೂ ಆಸಕ್ತಿ ಹೆಚ್ಚಾಗುತ್ತದೆ.

CO4 ತಾಂತ್ರಿಕ ವ್ಯಕ್ತಿಗಳ ಪರಿಚಯವನ್ನು ಹಾಗೂ ಅವರುಗಳು ಸಾಧಿಸಿದ ವಿಷಯಗಳನ್ನು ತಿಳಿದುಕೊಂಡು ನಾಡಿನ ಇನ್ನಿತರ ವ್ಯಕ್ತಿಗಳ ಬಗ್ಗೆ ತಿಳಿದುಕೊಳ್ಳುವ ಕೌತುಕತೆ ಹೆಚ್ಚಾಗುತ್ತದೆ.

CO5 ಸಾಂಸ್ಕೃತಿಕ, ಜನಪದ ಹಾಗೂ ಪ್ರವಾಸ ಕಥನಗಳ ಪರಿಚಯವಾಗುತ್ತದೆ.

Text Book:

ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ – ಡಾ. ಹಿ.ಚಿ. ಬೋರಲಿಂಗಯ್ಯ ಮತ್ತು ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ
ಪ್ರಕಟಣೆ: ಪ್ರಸಾರಾಂಗ, ವಿಶ್ವೇಶ್ವರಯ್ಯ ತಾಂತ್ರಿಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಬೆಳಗಾವಿ.

ಸೂಚನೆ:

1. ಹೆಚ್ಚಿನ ಮಾಹಿತಿ ಮತ್ತು ವಿವರಣೆಗಳಿಗೆ ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ (9900832331) ಇವರನ್ನು ಸಂಪರ್ಕಿಸಿ.
2. ಮಾದರಿ ಪ್ರಶ್ನೆಪತ್ರಿಕೆ, ಕೋರ್ಸ್ ಆಯ್ಕೆ ಮಾಹಿತಿ, ಅಧ್ಯಯನ ಸಾಮಗ್ರಿ ಮತ್ತು ಬಹು ಆಯ್ಕೆ ಮಾದರಿಯ ಪ್ರಶ್ನೆಗಳ ಕೈಪಿಡಿಗಾಗಿ ವಿಶ್ವವಿದ್ಯಾಲಯದ ವೆಬ್‌ಸೈಟ್ ನೋಡುವುದು.

COMMUNICATION SKILLS

Contact Hours/Week	:	1(L) + 0(T) + 0(P)	Credits	:	1.0
Total Hours of Pedagogy	:	15 hours + 15 hours	CIE Marks	:	50
Course Code	:	CC08	SEE Marks	:	50
Course Type	:	Theory	Exam Hours	:	2:00

Unit I - COMMUNICATION SKILLS (3 Hours)

Glimpses of Essential English for Engineers (General Overview). Communication Skills: Process, Verbal and Non-Verbal, Proxemics, Chronemics and Barriers. **Writing**: Word Classification – Parts of Speech, Sentence structures.

Speaking & Listening: Listening to English Pronunciation – English Phonemes – Intelligible Accent – Speech Organs- Syllable Structures, Stress, Intonation, and Practice.

Teaching Methodology	TBTL (Task-Based Teaching Learning) & Eclectic Approach
Digital Tools	ALL 44 sounds of English in 75 minutes - https://www.youtube.com/watch?v=QxQUapA-2w4&t=51s. AI-based grammar and writing tools (e.g., Grammarly, ChatGPT, Quillbot) to analyze and classify parts of speech. AI-based pronunciation tools (Google Speech-to-Text) for real-time feedback
Reading Material	"**The Chimney Sweeper"** by William Blake Martin Luther King Jr's "I Have a Dream" Speech
Assessment Techniques and Tools	**Role Play**: Formal/informal scenarios, **Group Discussion (GD), Case Studies Analysis**: Identify barriers and suggest solutions, **Mini-Presentation**: Focused on proxemics. Observation Rubric (for body language, tone, time cues), (Sample Rubric, please refer the annexure), Video Recording + Self-evaluation Sheet.

UNIT II - INTERPERSONAL SKILLS (3 Hours)

Speaking: Role Play Exercises Based on Workplace Contexts, Introducing Oneself - PEP Talks- Personal Empowerment, Participating in Group Discussion and Debates, Giving Technical Presentation.

Reading: Reading the Interview of an Achiever (Skimming and Scanning) (Case Studies).

Writing: Writing a Short Biography of an Achiever Based on given reflections, **Grammar:** Sentence patterns. **Vocabulary** Development: Idioms and Phrases.

Teaching Methodology	TBTL (Task-Based Teaching Learning) & Eclectic Approach
Digital Tools	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, synonyms/antonyms
Assessment Techniques and Tools	Group discussion performance (listening, turn-taking, clarity) Technical presentations (confidence, structure, clarity) Role plays (relevance, tone, spontaneity) Case Studies Oral communication rubric (clarity, relevance, tone, confidence, non-verbal cues), **Activity**: Read a short **interview of an achiever** (e.g., A. P. J. Abdul Kalam, Sudha Murthy) **LMS (Learning Management Systems)**: Moodle or Google Classroom for submissions and reflections. **Video Submissions**: Students submit videos of role plays or presentations for asynchronous review.

UNIT III - ENGLISH FOR EMPLOYABILTY (3 Hours)

Writing: Formal Letter writing (Enquiry, Order, and Complaint). Tenses – Reported Speech-Voice - Email Etiquettes, Structure, Writing and Responding to Emails. Paragraph Writing (Descriptive, Argumentative, Expository, Short Story, and Narrative), Blog Writing. **Reading**: Proof Reading (Spelling, Punctuation, Grammar). Error Identification Exercises. **Speaking:** Questions & Requests (non-Wh questions and Question tags).

Teaching Methodology	TBTL (Task-Based Teaching Learning) & Eclectic Approach
Digital Tools	Grammarly – Check grammar, tone, spelling Canva – Free templates to create posters, ads, infographics Adobe Express – Visual storytelling and ad design
Assessment Techniques and Tools	**Paragraph Writing -** Descriptive, Argumentative, Expository, Short Story, Narrative - Paragraph rubric (structure, logic, vocabulary, grammar) Writing - **Tool**: Digital submission + rubric for content originality, reader engagement, clarity. **Speaking Skills -** Oral assessment rubric (intonation, clarity, accuracy) Email simulator (Google Forms/Canvas/Docs template)

UNIT IV - ENGLISH IN DIGITAL WORLD (3 Hours)

Writing: Framing of search terms / keywords in search engines/ Commands for search on open AIs - Tools to support synchronous communication such as webinar platforms, and asynchronous communication such as forums and social media - Online communication - Types – pros and cons of online communication. Acceptable online roles and behaviours – Netiquettes - Etiquettes of social media. Problems and opportunities in handling digital resources -Tools to check grammar. **Writing:** Citing information accurately from source material - Plagiarism – Infringement, Importance of academic integrity.

Teaching Methodology	TBTL (Task-Based Teaching Learning) & Eclectic Approach
Digital Tools	Google Meet - Integrated with Gmail, free for students Google Classroom - Forum, assignments, comments
Assessment Techniques and Tools	Write a short essay (150–200 words) on the **problems and opportunities.** Evaluation rubric (structure, coherence, grammar). Grammar assessment rubric (before vs after comparison, understanding of corrections).

UNIT V - APPLYING FOR JOBS (3 Hours)

Listening: TED Talks. **Speaking:** Mock Interview, Telephone Interviews. **Reading:** Reading a Job Interview- language used in formal professional settings, formal vs. informal tone, non-verbal communication cues, Statement of Purpose, Company Profile and Completing Comprehension Exercises **Writing:** Job Applications and Resumes **Grammar:** Conditional Clauses, Modal verbs **Vocabulary Development:** Technical Vocabulary, Purpose Statement.

Teaching Methodology	TBTL (Task-Based Teaching Learning) & Eclectic Approach
Digital Tools	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
Assessment Techniques and Tools	TED Talk worksheet - Listening rubric (comprehension, inference, note-taking), Reading comprehension tests, Resume & Application rubric (content, layout, tone, language), Grammar MCQs / Editing worksheet, Scenario-based MCQs or roleplay, Vocabulary worksheet

Extra Reading:

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

Learning Resources:

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

Course outcomes:

After the completion of this course, students will be able to:

CO1: Build essential verbal, non-verbal, and phonetic communication skills for clarity and effectiveness.

CO2: Use interpersonal skills in group discussions, presentations, and professional interactions.

CO3: Apply formal writing, email etiquette, and creative content development for employability.

CO4: Communicate effectively in digital platforms, following netiquette and academic integrity.

CO5: Prepare job applications, resumes, and perform confidently in interviews.

SOFT SKILLS

Contact Hours/Week	:	1(L) + 0(T) + 0(P)	Credits	:	0.0
Total Hours of Pedagogy	:	15 hours	CIE Marks	:	100
Course Code	:	CC09	SEE Marks	:	--
Course Type	:	Theory	Exam Hours	:	--:--

Module I – Social Skills (3 hours)

- **Communication:** Principles of clear and effective exchange of ideas in professional and social contexts.
- **Persuasion:** Techniques to influence and convince through logical, emotional, and ethical appeals.
- **Self-Awareness:** Identifying personal strengths, weaknesses, opportunities, and challenges (SWOC analysis).
- **Active Listening:** Paraphrasing, questioning techniques, and demonstrating attentiveness.

Instructional Design	Each competency is taught and assessed through guided visualizations, reflections, explainers and hands on activities conducted during sessions build both conceptual understanding and real-world application.
Teaching Methodology	TBTL (Task-Based Teaching Learning) – interactive workshops, simulations, activities, peer feedback. Eclectic Approach
Experiential Learning Methods	To embed skills, participants get hands-on through: Guided reflections and explainers to connect concepts with relatable real-life situations Guided visualization to prompt reflection and self-discovery Role-plays and activities to practice behaviours in context Peer discussions to gain diverse perspectives.
Assessment Methods	**Formative:** Role-plays, activities, group discussions, peer feedback. **Summative:** Presentations, written reflections, problem-solving exercises.

Module II - Emotional Skills I (3 hours)

- **Emotional Intelligence (EI):** Recognizing and managing emotions, empathy, relationship management, and conflict resolution.
- **Stress Management:** Identifying stress triggers, relaxation techniques, work-life balance strategies, and mindfulness practices.
- **Time Management:** Prioritization (Eisenhower Matrix), setting SMART goals, avoiding procrastination, and effective scheduling.
- **Adaptability & Resilience:** Handling change, bouncing back from setbacks, and developing a growth mindset.

Instructional Design	Each competency is taught and assessed through guided visualizations, reflections, explainers and hands on activities conducted during lab sessions those build both conceptual understanding and real-world
Teaching Methodology	TBTL (Task-Based Teaching Learning) – interactive workshops, simulations, activities, peer feedback. Eclectic Approach
Experiential Learning Methods	To embed skills, participants get hands-on through: Guided reflections and explainers to connect concepts with relatable real-life situations Guided visualization to prompt reflection and self-discovery Role-plays and activities to practice behaviours in context Peer discussions to gain diverse perspectives.
Assessment Methods	**Formative:** Role-plays, activities, group discussions, peer feedback. **Summative:** Presentations, written reflections, problem-solving exercises.

Module III - Emotional Skills II (3 hours)

- Ambition & Goal Setting: Defining personal and professional aspirations, creating SMART goals, and aligning actions with long-term vision.

- Sympathy & Empathy: Understanding emotional perspectives, differentiating between the two, and applying them in workplace and social interactions.

- Creativity & Innovation: Generating original ideas, problem-solving, and applying creative thinking techniques (mind-mapping, SCAMPER).

Instructional Design	Each competency is taught and assessed through guided visualizations, reflections, explainers and hands on activities conducted during lab sessions those build both conceptual understanding and real-world
Teaching Methodology	TBTL (Task-Based Teaching Learning) – interactive workshops, simulations, activities, peer feedback. Eclectic Approach
Experiential Learning Methods	To embed skills, participants get hands-on through: Guided reflections and explainers to connect concepts with relatable real-life situations Guided visualization to prompt reflection and self-discovery Role-plays and activities to practice behaviours in context Peer discussions to gain diverse perspectives.
Assessment Methods	**Formative:** Role-plays, activities, group discussions, peer feedback. **Summative:** Presentations, written reflections, problem-solving exercises.

Module IV - Professional Skills I (3 hours)

- **Problem Solving:** Identifying root causes, analysing options, and implementing solutions using methods like 5 Whys and Fishbone Diagram.
- **Discipline:** Building consistency, accountability, and professional habits.
- **Time Management:** Prioritizing tasks (Eisenhower Matrix), scheduling, avoiding procrastination.

Instructional Design	Each competency is taught and assessed through guided visualizations, reflections, explainers and hands on activities conducted during lab sessions those build both conceptual understanding and real-world
Teaching Methodology	TBTL (Task-Based Teaching Learning) – interactive workshops, simulations, activities, peer feedback. Eclectic Approach
Experiential Learning Methods	To embed skills, participants get hands-on through: Guided reflections and explainers to connect concepts with relatable real-life situations Guided visualization to prompt reflection and self-discovery Role-plays and activities to practice behaviours in context Peer discussions to gain diverse perspectives.
Assessment Methods	**Formative:** Role-plays, activities, group discussions, peer feedback. **Summative:** Presentations, written reflections, problem-solving exercises.

Module V - Professional Skills II (3 hours)

- **Collaboration & Teamwork:** Working effectively in diverse teams, fostering trust, and achieving shared goals.
- **Negotiation & Conflict Resolution:** Strategies to resolve differences and reach win–win outcomes.
- **Critical Thinking:** The ability to analyze, evaluate, and synthesize information to make well-reasoned decisions.

Instructional Design	Each competency is taught and assessed through guided visualizations, reflections, explainers and hands on activities conducted during lab sessions those build both conceptual understanding and real-world
Teaching Methodology	TBTL (Task-Based Teaching Learning) – interactive workshops, simulations, activities, peer feedback. Eclectic Approach
Experiential Learning Methods	To embed skills, participants get hands-on through: Guided reflections and explainers to connect concepts with relatable real-life situations Guided visualization to prompt reflection and self-discovery Role-plays and activities to practice behaviours in context Peer discussions to gain diverse perspectives.

Assessment Methods	**Formative:** Role-plays, activities, group discussions, peer feedback. **Summative:** Presentations, written reflections, problem-solving exercises.

Extra Reading:

1.Principles of Scientific and Technical Writing, 1e, By Pratap K. J. Mohapatra, Sanjib Moulick, © 2025 | Published: December 23, 2024

2. Soft Skills, 1e, By Soma Mahesh Kumar © 2024 | Published: June 8, 2023

3. Effective Technical Communication, 3e, By Ashraf M. Rizvi, Priyadarshi Patnaik, © 2024 | Published: September 12, 2024

4. Yadav, D. P. (2022). *A course in English pronunciation*. Notion Publications.

Learning Resources:

1. Oxford Advance Learners Dictionary

2. Cambridge English Skills Real Listening and Speaking by Miles Craven

3. Communicative English for Professionals by Nitin Bhatnagar and Mamta Bhatnagar

Course outcomes:

Upon completion of this course the student will be able to:

CO1: Apply social skills for clear communication, persuasion, self-awareness, and active listening.

CO2: Use emotional skills to build confidence, manage stress, and adapt to change.

CO3: Set ambitious goals, practice empathy, and apply creativity for problem-solving.

CO4: Demonstrate discipline, time management, and structured problem-solving.

CO5: Work in teams, negotiate, resolve conflicts, and think critically.

Indian Constitution and Engineering Ethics

Contact Hours/Week	:	1(L) + 0(T) + 0(P)	Credits	:	0
Total Lecture Hours	:	15	CIE Marks	:	100
Total Tutorial Hours	:	0	SEE Marks	:	0
Total Practical Hours	:	0	Exam Hours	:	1:30
Course Type	:	Theory	Course Code	:	**CC10**

Course Objectives: This course will enable students:

1. To know about the basic structure of Indian Constitution.
2. To know the Fundamental Rights (FR's), DPSP's and Fundamental Duties (FD's) of our constitution.
3. To know about our Union Government, political structure & codes, procedures.
4. To know the State Executive & Elections system of India.
5. To learn the Amendments and Emergency Provisions, other important provisions given by the constitution.

Unit I

Introduction to Indian Constitution: The Necessity of the Constitution, The Societies before and after the Constitution adoption. Introduction to the Indian constitution, The Making of the Constitution, The Role of the Constituent Assembly. The Preamble of Indian Constitution & Key concepts of the Preamble. Salient features of Indian Constitution. **3 Hrs**

Unit II

FR's, FD's and DPSP's: Fundamental Rights and its Restriction and limitations in different Complex Situations. Directive Principles of State Policy (DPSP) and its present relevance in our society with examples. Fundamental Duties and its Scope and significance in Nation building. **3 Hrs**

Unit III

Union Executive: Parliamentary System, Union Executive – President, Prime Minister, Union Cabinet, Parliament - LS and RS, Parliamentary Committees, Important Parliamentary Terminologies. Supreme Court of India, Judicial Reviews and Judicial Activism. **3 Hrs**

Unit IV

State Executive & Elections, Amendments and Emergency Provisions: State Executive, Election Commission, Elections & Electoral Process. Amendment to Constitution (How and Why) and Important Constitutional Amendments till today. Emergency Provisions. **3 Hrs**

Unit V

Professional Ethics: Ethics & Values. Types of Ethics. Scope & Aims of Professional & Engineering Ethics. Positive and Negative Faces of Engineering Ethics. Clash of Ethics, Conflicts of Interest. The impediments to Responsibility. Trust & Reliability in Engineering, IPRs (Intellectual Property Rights), Risks, Safety and liability in Engineering. **3 Hrs**

Textbook:

1. **"Constitution of India"** (for Competitive Exams) - Published by Naidhruva Edutech Learning Solutions, Bengaluru. – 2022.
2. **"Engineering Ethics",** M. Govindarajan, S. Natarajan, V.S. Senthilkumar, Prentice –Hall, 2004.

Reference Books:

1. "**Samvidhana Odu" -** for Students & Youths by Justice HN Nagamohan Dhas, Sahayana, kerekon.
2. **"Constitution of India, Professional Ethics and Human Rights"** by Shubham Singles, Charles E. Haries, and et al: published by Cengage Learning India, Latest Edition – 2019.
3. **"Introduction to the Constitution of India",** (Students Edition.) by Durga Das Basu (DD Basu): Prentice –Hall, 2008.
2. **"The Constitution of India"** by Merunandan K B: published by Merugu Publication, Second Edition, Bengaluru.

Course outcomes: After the completion of this course, students will be able to:

CO1. Analyse the basic structure of Indian Constitution.

CO2. Remember their Fundamental Rights, DPSP's and Fundamental Duties (FD's) of our constitution.

CO3. Know about our Union Government, political structure & codes, procedures.

CO4. Understand our State Executive & Elections system of India.

CO5. Remember the Amendments and Emergency Provisions, other important provisions given by the constitution.

Computer Aided Engineering Drawing for Civil Engineering Stream

Contact Hours/ Week:	2(L) + 0(T) + 2(P)	Credits:	3.0
Total Lecture Hours: Total Practical Hours	26 + 26 = 52	CIE Marks:	50
Sub. Code:	CAEDC	SEE Marks:	50

Course objectives: This course will enable students to:	
1.	To expose the students to standards and conventions followed in preparation of engineering drawings.
2.	To make them understand the concepts of orthographic projections,Development of surfaces and isometric projections.
3.	Develop the ability of conveying the engineering information through drawings.
4.	To make them understand the relevance of engineering drawings to different engineering domains.
5.	To expose them to Computer aided drafting package and generation of computer assisted drawings.

UNIT I

Introduction, Drawing Instruments and their uses, BIS conventions, Lettering, Dimensioning and free hand practicing. Computer screen, layout of the software, standard tool bar/menus and description of most commonly used tool bars, navigationaltools.

Co-ordinate system and reference planes HP, VP, RPP & LPP of 2D environment. Selection of drawing sheet size and scale of a drawing, Commands and creation of Lines, Co-ordinate points, axes, poly- lines, square, rectangle, polygons,circles, ellipse, text, move, copy, off-set, mirror, rotate, trim, extend, break, chamfer, fillet, curves, constraints viz. tangency, inclination and perpendicularity. Dimensioning,line conventions, material conventions.

Orthographic Projections of Points, Straight lines and Planes:

Introduction, Orthographic projection, Planes of projection, reference line and conventions employed, Projections of points in all the four quadrants.

Projections of straight lines (located in First quadrant/First angle only), True and apparent lengths, True and apparent inclinations to reference planes, (No mid point problems). Application problems on Projection of Lines (For CIE only)

Projections of Plane Surfaces

Orthographic projections of regular plane Surfaces – triangle, square, rectangle, pentagon, hexagon and circle in simple positions inclined to both the planes, planes indifferent positions by change of position method only. (No problems on punched plates, composite plates, Lamina resting on VP)

14 Hours

UNIT II

Projections of solids: Introduction , Classification of Solids, Projections of prisms, pyramids, cylinders and cones with axis inclined to both the planes, Solids in different positions by change

of position method only.(No problems on octahedrons, freely suspended solids, Solid resting on VP). Projections of Frustum of cone and pyramids (For practice only, not for CIE andSEE)
12 Hours

UNIT III
Development of Lateral Surfaces of Solids: Introduction to section planes and sectional views, Development of lateral surfaces ofright regular prisms, cylinders, pyramids, cones resting with base on HP only, Development of lateral surfaces of their frustums and truncations. Application problems on development of lateral surfaces like funnels and trays (For CIE only).
10 Hours

UNIT IV
Isometric Projection: Introduction, Isometric scale, Isometric projection of simple plane figures, Isometric projection of hexahedron(cube), right regular prisms, pyramids, cylinders, cones, spheres. Isometric view of combination of two simple solids.
10 Hours

UNIT V
Civil Drawing (For CIE Only): **Free hand Sketching;** Free hand Roads, Buildings, Hand tools and Furniture's etc. **Materials representation:** Conventions used to represent materials. **Orthographic and Isometric Drawing Transformations**: Conversion of simple Isometric drawings to Orthographic views of simple objects, Conversion of simple Orthographic views to Isometric projection of simple objects. **Basic Building Drawing:** Like, Architectural floor plan, Drafting a 2D floor plan for a simple single-storey residential/commercial building, basic foundation drawing
6 Hours

TEXT BOOKS:

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

REFERENCE BOOKS:

1.	S. N. Lal and T. Madhusudhan	Engineering Visualisation, engage Learning India Pvt. Ltd.; First Edition, 2022.
2.	P.J. Shah	Computer Aided Engineering Drawing, S. Chand Publishing, 2021.

3.	V.B.Sikka	A Course in Civil Engineering Drawing, 11th edition, S. K. Kataria & Sons, reprint 2024.

Course outcomes: After the completion of this course, students will be able to:

CO1: Draw orthographic projections of Lines and Planes according to the constraints of the problem.

CO2: Draw orthographic projections of solids both in conventional way and using modern engineering tool according to the constraints of the problem.

CO3: Develop the lateral surfaces of the objects both in conventional way and using modern engineering tool

CO4: Draw the isometric projection of combination of solids both in conventional way and using modern engineering tool.

CO5: Demonstrate the ability to convert between orthographic and isometric views of simple objects. Also, draw basic 2D structural drawings such as floor plans and foundation layouts.

COs and POs Mapping (CO-PO mappings are only Indicative)

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

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

Computer Aided Engineering Drawing for CSE Stream

Contact Hours/ Week:	2(L) + 0(T) + 2(P)	Credits:	3.0
Total Lecture Hours: Total Practical Hours	26 + 26 = 52	CIE Marks:	50
Sub. Code:	CAEDS	SEE Marks:	50

Course objectives: This course will enable students to:	
1.	To expose the students to standards and conventions followed in preparation of engineering drawings.
2.	To make them understand the concepts of orthographic projections,Development of surfaces and isometric projections.
3.	Develop the ability of conveying the engineering information through drawings.
4.	To make them understand the relevance of engineering drawings to differentengineering domains.
5.	To expose them to Computer aided drafting package and generation ofcomputer assisted drawings.

UNIT I

Introduction to Computer Aided Drawing:

Introduction, Drawing Instruments and their uses, BIS conventions, Lettering, Dimensioning and free hand practicing. Computer screen, layout of the software, standard tool bar/menus and description of most commonly used tool bars, navigationaltools.

Co-ordinate system and reference planes HP, VP, RPP & LPP of 2D environment. Selection of drawing sheet size and scale of a drawing, Commands and creation of Lines, Co-ordinate points, axes, poly- lines, square, rectangle, polygons,circles, ellipse, text, move, copy, off-set, mirror, rotate, trim, extend, break, chamfer, fillet, curves, constraints viz. tangency, inclination and perpendicularity. Dimensioning,line conventions, material conventions.

Orthographic Projections of Points, Straight lines and Planes:

Introduction, Orthographic projection, Planes of projection, reference line and conventions employed, Projections of points in all the four quadrants.

Projections of straight lines (located in First quadrant/First angle only), True and apparent lengths, True and apparent inclinations to reference planes, (No mid point problems).

Application problems on Projection of Lines (For CIE only)

Projections of Plane Surfaces:

Orthographic projections of regular plane Surfaces – triangle, square, rectangle, pentagon, hexagon and circle in simple positions inclined to both the planes, planes indifferent positions by change of position method only. (No problems on punched plates, composite plates, Lamina resting on VP)

14 Hours

UNIT II

Projections of solids:

Introduction , Classification of Solids, Projections of prisms, pyramids, cylinders and cones with axis inclined to both the planes, Solids in different positions by change of position method only.(No problems on octahedrons, freely suspended solids, Solid resting on VP).

Projections of Frustum of cone and pyramids (For practice only, not for CIE andSEE)
12 Hours

UNIT III
Development of Lateral Surfaces of Solids: Introduction to section planes and sectional views, Development of lateral surfaces ofright regular prisms, cylinders, pyramids, cones resting with base on HP only, Development of lateral surfaces of their frustums and truncations. **Application problems on development of lateral surfaces like funnels and trays (For CIE only).**
10 Hours

UNIT IV
Isometric Projection: Introduction, Isometric scale, Isometric projection of simple plane figures, Isometric projection of hexahedron(cube), right regular prisms, pyramids, cylinders, cones, spheres. Isometric view of combination of two simple solids.
10 Hours

UNIT V
Computer Network Drawing (For CIE Only); **2D Network Drawings with wired and wireless:** Typical Computer network, Simple WAN network, Simple LAN network, Simple Star network, Simple wireless network, Internet network **Gate Circuits:** AND gate stimulation circuit, OR gate stimulation circuit, NOT gate stimulation circuit.
6 Hours

TEXT BOOKS:

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

REFERENCE BOOKS:

1.	S. N. Lal and T. Madhusudhan	Engineering Visualisation, engage Learning India Pvt. Ltd.; First Edition, 2022.
2.	P.J. Shah	Computer Aided Engineering Drawing, S. Chand Publishing, 2021.

3.	M.S. Sukhija and T.K.Nagsarkar	Circuits and Networks: Analysis Design and Synthesis, Oxford University press, Second Edition 2016.

Course outcomes: After the completion of this course, students will be able to:

CO1: Draw orthographic projections of Lines and Planes according to the constraints of the problem.

CO2: Draw orthographic projections of solids both in conventional way and using modern engineering tool according to the constraints of the problem.

CO3: Develop the lateral surfaces of the objects both in conventional way and using modern engineering tool

CO4: Draw the isometric projection of combination of solids both in conventional way and using modern engineering tool.

CO5: Interpret basic 2D network diagram and digital logic gate circuits understanding various network topologies.

COs and POs Mapping (CO-PO mappings are only Indicative)

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

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

Computer Aided Engineering Drawing for ME Stream

Contact Hours/ Week:	2(L) + 0(T) + 2(P)	Credits:	3.0
Total Lecture Hours: Total Practical Hours	26 + 26 = 52	CIE Marks:	50
Sub. Code:	CAEDM	SEE Marks:	50

Course objectives: This course will enable students to:	
1.	To expose the students to standards and conventions followed in preparation of engineering drawings.
2.	To make them understand the concepts of orthographic projections,Development of surfaces and isometric projections.
3.	Develop the ability of conveying the engineering information through drawings.
4.	To make them understand the relevance of engineering drawings to different engineering domains.
5.	To expose them to Computer aided drafting package and generation of computer assisted drawings

UNIT I

Introduction to Computer Aided Drawing:

Introduction, Drawing Instruments and their uses, BIS conventions, Lettering, Dimensioning and free hand practicing. Computer screen, layout of the software, standard tool bar/menus and description of most commonly used tool bars, navigationaltools.

Co-ordinate system and reference planes HP, VP, RPP & LPP of 2D environment. Selection of drawing sheet size and scale of a drawing, Commands and creation of Lines, Co-ordinate points, axes, poly- lines, square, rectangle, polygons,circles, ellipse, text, move, copy, off-set, mirror, rotate, trim, extend, break, chamfer, fillet, curves, constraints viz. tangency, inclination and perpendicularity. Dimensioning,line conventions, material conventions.

Orthographic Projections of Points, Straight lines and Planes: Introduction, Orthographic projection, Planes of projection, reference line and conventions employed, Projections of points in all the four quadrants. Projections of straight lines (located in First quadrant/First angle only), True and apparent lengths, True and apparent inclinations to reference planes, (No mid point problems). Application problems on Projection of Lines (For CIE only)

Projections of Plane Surfaces:

Orthographic projections of regular plane Surfaces – triangle, square, rectangle, pentagon, hexagon and circle in simple positions inclined to both the planes, planes indifferent positions by change of position method only. (No problems on punched plates, composite plates, Lamina resting on VP)

14 Hours

UNIT II

Projections of solids: Introduction , Classification of Solids, Projections of prisms, pyramids, cylinders and cones with axis inclined to both the planes, Solids in different positions by change of position method only.(No problems on octahedrons, freely suspended solids, Solid resting on VP).

Projections of Frustum of cone and pyramids (For practice only, not for CIE andSEE)
12 Hours

UNIT III
Development of Lateral Surfaces of Solids: Introduction to section planes and sectional views, Development of lateral surfaces ofright regular prisms, cylinders, pyramids, cones resting with base on HP only, Development of lateral surfaces of their frustums and truncations. **Application problems on development of lateral surfaces like funnels and trays (For CIE only).**
10 Hours

UNIT IV
Isometric Projection: Introduction, Isometric scale, Isometric projection of simple plane figures, Isometric projection of hexahedron(cube), right regular prisms, pyramids, cylinders, cones, spheres. Isometric view of combination of two simple solids.
10 Hours

UNIT V
Multidisciplinary Applications & Practice (For CIE Only): **Drawing Simple Mechanisms;** Four bar mechanism, Engine mechanism, Gear trains. **Materials representations:** Conventions used to represent materials. **Orthographic and Isometric Drawing Transformations**: Conversion of simple Isometric drawings to Orthographic views of simple objects, Conversion of simple Orthographic views to Isometric projection of simple objects. **Gate Circuits:** AND gate stimulation circuit, OR gate stimulation circuit, NOT gate stimulation circuit.
6 Hours

TEXT BOOKS:

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

REFERENCE BOOKS:

1.	S. N. Lal and T. Madhusudhan	Engineering Visualisation, engage Learning India Pvt. Ltd.; First Edition, 2022.
2.	P.J. Shah	Computer Aided Engineering Drawing, S. Chand Publishing, 2021.

3.	R.S. Khurmi and J.K. Gupta	Theory of Machines, R.S. Khurmi and J.K. Gupta, S. Chand & Company Ltd., 14th Edition, 2005

Course outcomes: After the completion of this course, students will be able to:

CO1: Draw orthographic projections of Lines and Planes according to the constraints of the problem.

CO2: Draw orthographic projections of solids both in conventional way and using modern engineering tool according to the constraints of the problem.

CO3: Develop the lateral surfaces of the objects both in conventional way and using modern engineering tool

CO4: Draw the isometric projection of combination of solids both in conventional way and using modern engineering tool.

CO5: Identify the interdisciplinary engineering components or systems through its graphical representation.

COs and POs Mapping (CO-PO mappings are only Indicative)

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

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

Computer Aided Engineering Drawing for EE Stream

Contact Hours/ Week:	2(L) + 0(T) + 2(P)	Credits:	3.0
Total Lecture Hours: Total Practical Hours	26 +26 = 52	CIE Marks:	50
Sub. Code:	CAEDEE	SEE Marks:	50

Course objectives: This course will enable students to:	
1.	To expose the students to standards and conventions followed in preparation of engineering drawings.
2.	To make them understand the concepts of orthographic projections,Development of surfaces and isometric projections.
3.	Develop the ability of conveying the engineering information through drawings.
4.	To make them understand the relevance of engineering drawings to different engineering domains.
5.	To expose them to Computer aided drafting package and generation of computer assisted drawings

UNIT I

Introduction to Computer Aided Drawing:

Introduction, Drawing Instruments and their uses, BIS conventions, Lettering, Dimensioning and free hand practicing. Computer screen, layout of the software, standard tool bar/menus and description of most commonly used tool bars, navigationaltools.

Co-ordinate system and reference planes HP, VP, RPP & LPP of 2D environment. Selection of drawing sheet size and scale of a drawing, Commands and creation of Lines, Co-ordinate points, axes, poly- lines, square, rectangle, polygons,circles, ellipse, text, move, copy, off-set, mirror, rotate, trim, extend, break, chamfer, fillet, curves, constraints viz. tangency, inclination and perpendicularity. Dimensioning,line conventions, material conventions.

Orthographic Projections of Points, Straight lines and Planes: Introduction, Orthographic projection, Planes of projection, reference line and conventions employed, Projections of points in all the four quadrants. Projections of straight lines (located in First quadrant/First angle only), True and apparent lengths, True and apparent inclinations to reference planes, (No mid point problems). Application problems on Projection of Lines (For CIE only).

Projections of Plane Surfaces:

Orthographic projections of regular plane Surfaces – triangle, square, rectangle, pentagon, hexagon and circle in simple positions inclined to both the planes, planes indifferent positions by change of position method only. (No problems on punched plates, composite plates, Lamina resting on VP)

14 Hours

UNIT II

Projections of solids:

Introduction , Classification of Solids, Projections of prisms, pyramids, cylinders and cones with axis inclined to both the planes, Solids in different positions by change of position method only.(No problems on octahedrons, freely suspended solids, Solid resting on VP).

Projections of Frustum of cone and pyramids (For practice only, not for CIE andSEE)
12 Hours

UNIT III
Development of Lateral Surfaces of Solids: Introduction to section planes and sectional views, Development of lateral surfaces ofright regular prisms, cylinders, pyramids, cones resting with base on HP only, Development of lateral surfaces of their frustums and truncations. **Application problems on development of lateral surfaces like funnels and trays (For CIE only).**
10 Hours

UNIT IV
Isometric Projection: Introduction, Isometric scale, Isometric projection of simple plane figures, Isometric projection of hexahedron(cube), right regular prisms, pyramids, cylinders, cones, spheres. Isometric view of combination of two simple solids.
10 Hours

UNIT V
Electrical Drawing (For CIE Only): 2D drawing of switches, sockets, panels, junction boxes, antenna **Electrical component symbols and Circuits:** Electrical Circuit Symbols **Electric Wiring and lighting diagrams;** Like, Call bell system, Two-way control of Lamp, Current sensitive circuit.
6 Hours

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2.	P.J. Shah	Computer Aided Engineering Drawing, S. Chand Publishing, 2021.

3.	Bhattacharya S.K.	Electrical Engineering Drawing, New Age International Publishers, Second edition 1998, reprint 2005.

Course outcomes: After the completion of this course, students will be able to:

CO1: Draw orthographic projections of Lines and Planes according to the constraints of the problem.

CO2: Draw orthographic projections of solids both in conventional way and using modern engineering tool according to the constraints of the problem.

CO3: Develop the lateral surfaces of the objects both in conventional way and using modern engineering tool

CO4: Draw the isometric projection of combination of solids both in conventional way and using modern engineering tool.

CO5: Identify the electrical components or circuits through graphical representation.

COs and POs Mapping (CO-PO mappings are only Indicative)

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

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

Computer Aided Engineering Drawing for EC Stream

Contact Hours/ Week:	2(L) + 0(T) + 2(P)	Credits:	3.0
Total Lecture Hours: Total Practical Hours	26 + 26 = 52	CIE Marks:	50
Sub. Code:	CAEDEC	SEE Marks:	50

Course objectives: This course will enable students to:	
1.	To expose the students to standards and conventions followed in preparation of engineering drawings.
2.	To make them understand the concepts of orthographic projections,Development of surfaces and isometric projections.
3.	Develop the ability of conveying the engineering information through drawings.
4.	To make them understand the relevance of engineering drawings to different engineering domains.
5.	To expose them to Computer aided drafting package and generation of computer assisted drawings.

UNIT I

Introduction to Computer Aided Drawing:

Introduction, Drawing Instruments and their uses, BIS conventions, Lettering, Dimensioning and free hand practicing. Computer screen, layout of the software, standard tool bar/menus and description of most commonly used tool bars, navigationaltools.

Co-ordinate system and reference planes HP, VP, RPP & LPP of 2D environment. Selection of drawing sheet size and scale of a drawing, Commands and creation of Lines, Co-ordinate points, axes, poly- lines, square, rectangle, polygons,circles, ellipse, text, move, copy, off-set, mirror, rotate, trim, extend, break, chamfer, fillet, curves, constraints viz. tangency, inclination and perpendicularity. Dimensioning,line conventions, material conventions.

Orthographic Projections of Points, Straight lines and Planes:
Introduction, Orthographic projection, Planes of projection, reference line and conventions employed,
Projections of points in all the four quadrants.
Projections of straight lines (located in First quadrant/First angle only), True and apparent lengths, True and apparent inclinations to reference planes, (No mid point problems).
Application problems on Projection of Lines (For CIE only)

Projections of Plane Surfaces

Orthographic projections of regular plane Surfaces – triangle, square, rectangle, pentagon, hexagon and circle in simple positions inclined to both the planes, planes indifferent positions by change of position method only. (No problems on punched plates, composite plates, Lamina resting on VP)

14 Hours

UNIT II

Projections of solids:

Introduction, Classification of Solids, Projections of prisms, pyramids, cylinders and cones with axis inclined to both the planes, Solids in different positions by change of position method only.(No problems on octahedrons, freely suspended solids, Solid resting on VP).

Projections of Frustum of cone and pyramids (For practice only, not for CIE andSEE)

12 Hours

UNIT III

Development of Lateral Surfaces of Solids:

Introduction to section planes and sectional views, Development of lateral surfaces ofright regular prisms, cylinders, pyramids, cones resting with base on HP only, Development of lateral surfaces of their frustums and truncations.

Application problems on development of lateral surfaces like funnels and trays (For CIE only).

10 Hours

UNIT IV

Isometric Projection:

Introduction, Isometric scale, Isometric projection of simple plane figures, Isometric projection of hexahedron(cube), right regular prisms, pyramids, cylinders, cones, spheres. Isometric view of combination of two simple solids.

10 Hours

UNIT V

Electronics Components Visualization (For CIE Only):

Electronics component symbols and Circuits: Basic electronic components symbols, Transistor as a switch, Zener regulator.

Electronic Components Visualization: Optical fiber cable with core and cladding, photonic crystal fibers, Antenna: Single element patch antenna, antenna array.

Gate Circuits: AND gate stimulation circuit, OR gate stimulation circuit, NOT gate stimulation Circuit.

6 Hours

TEXT BOOKS:

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

REFERENCE BOOKS:

1.	S. N. Lal and T. Madhusudhan	Engineering Visualisation, engage Learning India Pvt. Ltd.; First Edition, 2022.
2.	P.J. Shah	Computer Aided Engineering Drawing, S. Chand Publishing, 2021.
3.	Robert L. Boylestad and Louis Nashelsky	Electronic Devices and Circuit Theory, Pearson, 14th edition, 2023

Course outcomes: After the completion of this course, students will be able to:

CO1: Draw orthographic projections of Lines and Planes according to the constraints of the problem.

CO2: Draw orthographic projections of solids both in conventional way and using modern engineering tool according to the constraints of the problem.

CO3: Develop the lateral surfaces of the objects both in conventional way and using modern engineering tool

CO4: Draw the isometric projection of combination of solids both in conventional way and using modern engineering tool.

CO5: Identify electronics components or circuits through graphical representation.

COs and POs Mapping (CO-PO mappings are only Indicative)

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

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

Design Thinking Laboratory

Contact Hours/ Week	: 2 (P)	Credits:	01
Total Lecture Hours	: -	CIE Marks:	50
Total Tutorial Hours	: -	SEE Marks:	50
Course Code	: SDCxx1		

Course Outcomes:
Upon completion of this course the student will be able to:

CO1: Identify different modes of thinking to understand the problem instead of finding answers/solutions for questions/problems
CO2: Acquire abductive reasoning to find new problems
CO3: Apply the concepts of design thinking concepts to develop a solution to the problem

Guidelines for Design Thinking Laboratory:

1	The Design Thinking Lab (DTL) is to be carried out by a team of four students.
2	Each student in a team must contribute equally in the tasks mentioned below
3	Each group must select a theme that will provide solutions to the challenges of societal concern. Normally three to four themes would be identified by the department.
4	The five stages specified will be evaluated in three phases.
6	The team should prepare a Digital Poster and a report should be submitted after incorporation of any modifications suggested by the evaluation committee.

Syllabus

I Empathy Stage – Understanding the User

Objective: Develop skills to observe, engage, and immerse into the users' experiences.
Topics Covered:

- Introduction to empathy in design thinking
- User-centered design principles
- Role of empathy in innovation
- Techniques of empathy research:
    - User interviews (structured, semi-structured, probing)
    - Shadowing and observations
    - Contextual inquiry
    - Probes (cultural probes, diary studies, role-play)
- Capturing insights from observations

Practical Activities:

- Conduct field visits and user interviews
- Use empathy probes (photo diaries, self-reporting tools)
- Record and map observations in a journal

Expected Outcome: Students learn to identify latent needs, emotions, and motivations of users.

II Define Stage – Developing a Point of View

Objective: Frame the right problem statement from the gathered data.

Topics Covered:

- Synthesizing research findings
- Empathy mapping (say, think, do, feel framework)
- Identifying user needs and insights
- Crafting problem statements using "Point of View (POV)"
- Converting broad challenges into actionable problem definitions

Practical Activities:

- Create empathy maps from interview data
- Group discussion on hidden user needs
- Write multiple POV statements and refine them

Expected Outcome: Students articulate a clear and actionable problem definition.

III Ideate Stage – Generating Solutions

Objective: Encourage divergent and convergent thinking for idea generation.

Topics Covered:

- Principles of ideation: defer judgment, encourage wild ideas, build on others' ideas
- Brainstorming techniques:
    - Classic brainstorming
- Criteria for idea selection and convergence

Practical Activities:

- Conduct group brainstorming sessions
- Use clustering and voting techniques to prioritize ideas
- Develop idea portfolios (quick sketches or concept notes)

Expected Outcome: Students generate a large volume of ideas and shortlist potential solutions.

IV Prototype Stage – Constructing Representations

Objective: Make ideas tangible and testable.

Topics Covered:

- Importance of prototyping in design thinking
- Types of prototypes: low-fidelity vs high-fidelity
- Prototyping techniques: paper prototypes, role play, storyboarding, mock-ups, 3D models, digital wireframes
- Rapid prototyping mindset (fail fast, learn fast)

Practical Activities:

- Build low-fidelity prototypes of selected ideas
- Storyboard user interaction scenarios
- Present prototypes for peer review

Expected Outcome: Students learn to communicate ideas effectively through tangible models.

V Test Stage – Getting Feedback

Objective: Validate ideas and identify improvements.

Topics Covered:

- Testing as a co-creation process
- Methods of testing: usability testing, A/B testing, role play with users, think-aloud protocols
- Capturing user feedback: what works, what doesn't, what could be improved
- Iterating based on feedback

Practical Activities:

- Conduct usability testing with real users or peers
- Record user reactions and feedback
- Refine prototypes based on test results

Expected Outcome: Students develop skills to iterate designs using constructive user feedback.

		PO											PSO			
		1	2	3	4	5	6	7	8	9	10	11	1	2	3	4
COs	CO1	3	3						3	2			3			3
	CO2	3	2	2					2	2			3			3
	CO3	3	2	2	2				2	2			3			3

Interdisciplinary Project-Based Learning

Contact Hours/ Week	: 2 Hrs.	Credits:	01
Total Lecture Hours	: -	CIE Marks:	50
Total Tutorial Hours	: -	SEE Marks:	50
Course Code	: SDC2		

For the course ***Interdisciplinary Project***, 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.