Hyderabad Karnataka Education Society's

POOJYA DODDAPPA APPA COLLEGE OF ENGINEERING

Aiwan-E-Shahi Area, Kalaburagi-585102, Karnataka
(An Autonomous Institution Affiliated to VTU, Belagavi.)
Grant-in- Aid Institution
(Government of Karnataka) Accredited by NBA, New Delhi.
Approved by AICTE, New Delhi.
Ph.08472-224360, Fax: 255685, Website: www.pdacek.ac.in
Email ID: principal@pdaengg.com

SCHEME & SYLLABUS (1ST YEAR)

BACHELOR DEGREE IN ENGINEERING

(Common to all Branches)

(With effect from 2025 Academic Year)

Out Come Based Education With

Choice Based Credit System

PREFACE

Poojya Doddappa Appa College of Engineering is the first institution of Hyderabad Karnataka Education(HKE) Society, Kalaburagi, established in the year 1958. The foundation stone of this college was laid down by Dr. S. Radhakrishnan, the then Vice-President of India in 1958. Presently College has 11 UG programmes, 10 PG Programmes, and 13 Research Centres, aimed at spreading and imparting technical education in Kalyan Karnataka Region. College has state-of-the-art technologies with highly equipped laboratories and digitalized smart classrooms having highly qualified and experienced faculties with the highest number of Ph.D. and M.Tech Degrees.

More than 50% of the programs in the institute are accredited by the National Board of Accreditation, New Delhi.

Considering the good academic, innovative, and research initiatives in the college the University Grants Commission and VTU has conferred the Autonomy to the Institution in the year 2007-2008 and the autonomous status was extended to another four years in the second cycle and at present in the third cycle the UGC has granted the extension of autonomy for 10 years i.e. 2028-2029.

This is the only Autonomous Institution in this region, which was sponsored under TEQIP I &II from the World Bank and received grants of rupees 10.43 crores, 12.5 crores, and an additional grant of Rs 5 crores. This is one among 12 institutions having TEQIP-I & TEQIP-II sponsorship. In TEQIP-III the institute was recognized as a mentor institute for BIET Jhansi, Utter Pradesh.

The Institute has been awarded with Bharatiya Vidya Bhavan National Award for Best Overall Performing Engineering College for the year 2017 by ISTE, New Delhi.

The majority of the faculties obtained their M.Tech and Ph.D. degrees from IIT, NIT, IISc. More than 75 faculty are with PhD and 174 with PG and about 120 faculty are pursuing their Ph.D. Maximum number of faculty, staff, and students attend the training program under TEQIP - II. The College witnessed many in-house programs like faculty development programs, guest lectures, industry institute interaction programs, seminars, workshops, and short-term training programs. Faculty from different domains have published near about 400+ publications in the last three years in National and International Journals and conferences. The majority of publications are in journals indexed by Scopus, SCI, and Web of Science.

At present the total intake at UG level is 1140 and PG level 175. It is the only Engineering college in the region having more than three thousand students studying in UG, PG, and Ph.D.

The AICTE New Delhi has sanctioned the "Idea Lab" of one crore, which enable the students to perform their talent and represent their innovative ideas.

The Centre of Excellence in PDA College of Engineering provides a platform for students to get exposure to cutting-edge technologies. 16 different multinational companies under one roof provide training to the students on emerging technologies and enable them to get the Global Certifications.

The Innovation Lab in the campus works as a common platform to connect all disciplines of engineering in the college to address their challenges and provide solutions. This enabled to establish startups in interdisciplinary fields. Interdisciplinary startups are the new business models with an approach to solving many global issues. The Innovation Lab provides an opportunity for the students to explore a variety of topics in greater depth.

The institution has signed MoUs with many industry and premier institutions. Recently, the institute has signed an MoU Skill Development Entrepreneurship Department, Government of Karnataka.

The Indian Space Research Organization recognized the institution as a nodal center to conduct online courses offered by IIRS and ISRO

Thousands of our alumni are in very high positions and serve in many Govt., Public and private sectors across the globe.

Vision of the Institution

To be an institute of excellence in technical education and research to serve the needs of the industry and society at local and global levels.

Mission of the Institution

- To provide a high-quality educational experience for students with values and ethics that enables them to become leaders in their chosen professions.
- To explore, create and develop innovations in engineering and science through research and development activities.
- To provide beneficial service to national and multinational industries and communities through educational, technical and professional activities.

A. Program Outcomes

Engineering Graduates will be able to:

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

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

I Semester **(Physic Group)**

Sl. No	Course and Course Code		Course Title	TD/PSB	Teaching Hours/Week				Examination				Credits
					Theory Lectur	Tutorial	Practical/ Drawing	SAAE	Duration in hours	CIE Marks	SEE Marks	Total MarKS	
					L	T	P	S					
1	ASC	XXMAT101	Applied Mathematics -I (Stream Specific)	Maths Dept	3	2	0		03	50	50	100	04
2	ASC(IC)	XXPHY102	Applied Physics (Stream Specific)	PHY Dept	3	0	2		03	50	50	100	04
3	ESC	XXCED103	Computer-Aided Engineering Drawing (Stream Specific)	ME Dept	2	0	2		03	50	50	100	03
4	ESC	KKxxx104x	Engineering Science Courses-I	Respective Engg Dept	3	0	0		03	50	50	100	03
5	PSC	XXxxx105	Program Specific Courses	Respective Engg Dept	3	0	0		03	50	50	100	03
6	AEC (NCMC)	KKSSC106	Soft Skills	Humanities Dept	1	0	0		--	100	---	100	PP
7	PSC	XXxxxL107x	Program-Specific Course Lab	Respective Engg Dept	0	0	2		02	50	50	100	01
8	AEC/SDC	KKIDTL158	Innovation and Design Thinking Lab (**Project-based learning**- IDEA Lab Workshop/ Maker's space)	Respective Engg Dept	0	0	2		02	50	50	100	01
9	HSMS	KKKSK109/ KKKBK109	Samskrutika Kannada/ Balake Kannada	Humanities Dept	1	0	0		01	50	50	100	01
			TOTAL							500	400	**900**	**20**
	AICTE Activity Points (students have to earn **100** activity points between 01 to 08 semester)			Compulsory requirement for the award of a degree									

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

Credit Definition:
1-hour Lecture **(L)** per week=**1Credit**
2-2-hoursTutorial**(T)** per week–**1Credit**
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

Applied Mathematics-I					Applied Physics				
Code	**Title**	**L**	**T**	**P**	**Code**	**Title**	**L**	**T**	**P**
CVMAT101	Differential Calculus and Linear Algebra: CV Stream	3	2	0	CVPHY102	Physics for Sustainable Structural Systems (CV stream)	3	0	2
MEMAT101	Differential Calculus and Linear Algebra: ME Stream	3	2	0	MEPHY102	Physics of Materials (Mech stream)	3	0	2
EEMAT101	Differential Calculus and Linear Algebra: EEE Stream	3	2	0	ECPHY102	Quantum Physics and Electronics Sensors (EEE stream)	3	0	2
CSMAT101	Differential Calculus and Linear Algebra: CSE Stream	3	2	0	EEPHY102	Electrical Engineering Materials (EEE stream-only for EEE students)	3	0	2
					CSPHY102	Quantum Physics and Applications (CSE stream)	3	0	2
Computer-Aided Engineering Drawing					**Engineering Science Courses-I (ESC-I)**				
CVCED103	Computer-Aided Engineering Drawing for CV Stream	2	0	2	KKBSM104A	Building Sciences & Mechanics	3	0	0
MECED103	Computer-Aided Engineering Drawing for ME stream	2	0	2	KKIEE104B	Introduction to Electrical Engineering	3	0	0
ECCED103	Computer-Aided Engineering Drawing for EEE stream	2	0	2	KKIEC104C	Introduction to Electronics & Communication Engineering	3	0	0
EECED103	Computer-Aided Engineering Drawing for EEE stream (only for EEE Students)	2	0	2	KKIME104D	Introduction to Mechanical Engineering	3	0	0
CSCED103	Computer-Aided Engineering Drawing for CSE stream	2	0	2	KKEIT104E	Essentials of Information Technology	3	0	0
Program Specific Courses (PSC)					**Program-Specific Course Lab (PSCL)**				
CVEMC105	Engineering Mechanics	3	0	0	CVEMCL107	Mechanics and Materials Lab	0	0	2
MEEME105	Elements of Mechanical Engineering	3	0	0	MEEMEL107	Elements of Mechanical Engineering Lab	0	0	2
EEBEE105	Basics of Electrical Engineering	3	0	0	EEEBEL107	Basic Electrical & Electronics Engineering Lab	0	0	2
ECFEC105	Fundamentals of Electronics & Communication Engineering	3	0	0	ECFECL107	Fundamentals of Electronics & Communication Engineering Lab	0	0	2
CSPOC105	Programming in C	3	0	0	CSPOCL107	Programming in C Lab	0	0	2

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

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

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

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

The Mathematics/Physics courses shall be taught by a single faculty member per session, with no sharing of the course (subject) modules.

The **tutorial sessions** for the **mathematics course** shall be conducted in the laboratory environment using **Maxima/Mathematica/ Python/Scilab/MATLAB** software to enhance computational understanding and application skills (one hour for problem solving and one hour laboratory session).

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

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

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

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

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

The Student Induction Program (SIP), initiated by the All India Council for Technical Education (AICTE), is designed to help newly admitted students in technical institutions transition smoothly into the higher education environment. It aims to familiarize students with the institutional culture, foster connections with peers and faculty, and provide a foundation for holistic learning. Activities under SIP may include Physical Activities, Creative Arts, Universal Human Values, Literary Events, Proficiency Modules. Lectures shall be by Eminent Personalities, Local Area Visits, Department/Branch Familiarization, and Innovation-related sessions. The first year of the Engineering programs is composed of I semester, II semester and Summer Semester. SIP activities shall be scheduled in the afternoon sessions during the first week of class commencement of I and II semesters only. The specific program to be conducted will be notified separately by the University via the academic calendar or through a separate notification.

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

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.

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

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

Sl. No	Course and Course Code		Course Title	TD/PSB	Teaching Hours/Week				Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	SAAE	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	ASC	XXMAT201	Applied Mathematics -II (Stream Specific)	Maths Dept	3	2	0		03	50	50	100	04
2	ASC(IC)	XXCHE202	Applied Chemistry (Stream Specific)	CHE Dept	3	0	2		03	50	50	100	04
3	ETC	KKAIA203	Introduction to AI and Applications	CSE & allied Dept	3	0	0		03	50	50	100	03
4	ESC	KKxxx204x	Engineering Science Course-II	Respective Engg Dept	3	0	0		03	50	50	100	03
5	PLC(IC)	KKxxx205x	Programming Language Course	CSE & allied dept	3	0	2		03	50	50	100	04
6	AEC	KKENG206	Communication Skills	Humanities Dept	1	0	0		02	50	50	100	01
7	AEC (NCMC)	KKICO207	Indian Constitution & Professional Ethics	Humanities Dept	1	0	0		--	100	0	100	PP
8	AEC/SDC	KKPRJ258	Interdisciplinary Project-Based Learning	Combination of Multiple Dept	0	0	0	2	02	50	50	100	01
				TOTAL						**450**	**350**	**800**	**20**

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

Integrated courses (IC), combining theory with practical components. The theory sessions shall be conducted for 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.

Applied Mathematics-II					Applied Chemistry				
Code	**Title**	**L**	**T**	**P**	**Code**	**Title**	**L**	**T**	**P**
CVMAT201	Differential Calculus and Numerical Methods: CV Stream	3	2	0	CVCHE202	Applied Chemistry for Sustainable Built Environment (CV)	3	0	2
MEMAT201	Multivariable Calculus and Numerical Methods: ME Stream	3	2	0	MECHE202	Applied Chemistry for Metal Protection and Sustainable Energy (ME)	3	0	2
EEMAT201	Calculus, Laplace Transform, and Numerical Techniques: EEE stream	3	2	0	EECHE202	Applied Chemistry for Futuristic Devices (EEE, ECE)	3	0	2
CSMAT201	Numerical Methods: CSE Stream	3	2	0	CSCHE202	Applied Chemistry for Smart Systems (CSE)	3	0	2
Engineering Sciences Courses-II (ESC-II)					**Programming Language Courses (PLC)**				
KKBSM204A	Building Sciences & Mechanics	3	0	0	KKICP205A	Introduction to C Programming (for Non- IT programs)	3	0	2
KKIEE204B	Introduction to Electrical Engineering	3	0	0	KKPYP205B	Python Programming (For CSE and allied programs)	3	0	2
KKIEC204C	Introduction to Electronics & Communication Engineering	3	0	0					
KKIME204D	Introduction to Mechanical Engineering	3	0	0					
KKEIT204E	Essentials of Information Technology	3	0	0					

The Mathematics/Chemistry courses shall be taught by a single faculty member per session, with no sharing of the course (subject) modules.
The **tutorial sessions** for the **mathematics course** shall be conducted in the laboratory environment using **Maxima/Mathematica/ Python/Scilab/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 to their program stream..

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

For the course ***Interdisciplinary Project*** **(KKPRJ258)**, 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.

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

I Semester **(Chemistry Group)**

Sl. No	Course and Course Code		Course Title	TD/PSB	Teaching Hours/Week				Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	SAAE	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	ASC	XXMAT101	Applied Mathematics -I (Stream Specific)	Maths Dept	3	2	0		03	50	50	100	04
2	ASC(IC)	XXCHE102	Applied Chemistry (Stream Specific)	CHE Dept	3	0	2		03	50	50	100	04
3	ETC	KKAIA103	Introduction to AI and Applications	CSE & allied Dept	3	0	0		03	50	50	100	03
4	ESC	KKESC104x	Engineering Science Course-I	Respective Engg Dept	3	0	0		03	50	50	100	03
5	PLC(IC)	KKxxx105x	Programming Language Course	CSE & allied Dept	3	0	2		03	50	50	100	04
6	AEC	KKENG106	Communication Skills	Humanities Dept	1	0	0		02	50	50	100	01
7	AEC(NCMC)	KKICO107	Indian Constitution & Professional Ethics	Humanities Dept	1	0	0		--	100	--	100	PP
8	AEC/SDC	KKIDTL158	Innovation and Design Thinking Lab (**Project-based learning-** IDEA Lab Workshop/ Maker's space)	Respective Engg Dept	0	0	2		02	50	50	100	01
	TOTAL									**450**	**350**	**800**	**20**
	AICTE Activity Points (students have to earn **100** activity points between 01 to 08 semesters)				Compulsory requirement for the award of a degree								

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

Credit Definition:

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

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

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

04-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

Applied Mathematics-I					Applied Chemistry				
Code	**Title**	**L**	**T**	**P**	**Code**	**Title**	**L**	**T**	**P**
CVMAT101	Differential Calculus and Linear Algebra: CV Stream	3	2	0	CVCHE102	Applied Chemistry for Sustainable Built Environment (CV)	3	0	2
MEMAT101	Differential Calculus and Linear Algebra: ME Stream	3	2	0	MECHE102	Applied Chemistry for Metal Protection and Sustainable Energy (ME)	3	0	2
EEMAT101	Differential Calculus and Linear Algebra: EEE Stream	3	2	0	EECHE102	Applied Chemistry for Futuristic Devices (EEE, ECE)	3	0	2
CSMAT101	Calculus and Linear Algebra: CSE Stream	3	2	0	CSCHE102	Applied Chemistry for Smart Systems (CSE)	3	0	2
Engineering Science Courses-I (ESC-I)					**Programming Language Courses (PLC)**				
Code	**Title**	**L**	**T**	**P**	**Code**	**Title**	**L**	**T**	**P**
KKBSM104A	Building Sciences & Mechanics	3	0	0	KKICP105A	Introduction to C Programming (For non IT programs)	3	0	2
KKIEE104B	Introduction to Electrical Engineering	3	0	0	KKPYP105B	Python Programming (for CSE and allied programs)	3	0	2
KKIEC104C	Introduction to Electronics & Communication	3	0	0					
KKIME104D	Introduction to Mechanical Engineering	3	0	0					
KKEIT104E	Essentials of Information Technology	3	0	0					

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

(i) Theory sessions shall be conducted for 3 hours per week, while the practical sessions shall be conducted for 2 hours per week. (ii)Theory components shall be evaluated through both Continuous Internal Evaluation (CIE) and Semester End Examination (SEE). (iii)The practical component shall be assessed only through CIE.

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

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

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

The Student Induction Program (SIP), initiated by the All India Council for Technical Education (AICTE), is designed to help newly admitted students in technical institutions transition smoothly into the higher education environment. It aims to familiarize students with the institutional culture, foster connections with peers and faculty, and provide a foundation for holistic learning. Activities under SIP may include Physical Activities, Creative Arts, Universal Human Values, Literary Events, Proficiency Modules. Lectures shall be by Eminent Personalities, Local Area Visits, Department/Branch Familiarization, and Innovation-related sessions. The first year of the Engineering programs is composed of I semester, II semester and Summer Semester. SIP activities shall be scheduled in the afternoon sessions during the first week of class commencement of I and II semesters only. The specific program to be conducted will be notified separately by the University via the academic calendar or through a separate notification.

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

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.

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

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

Sl. No	Course and Course Code		Course Title	TD/PSB	Teaching Hours/Week				Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	SAAE	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	ASC	XXMAT201	Applied Mathematics -II (Stream Specific)	Maths	3	2	0		03	50	50	100	04
2	ASC(IC)	XXPHY202	Applied Physics (Stream Specific)	PHY	3	0	2		03	50	50	100	04
3	ESC	XXCED203	Computer-Aided Engineering Drawing (Stream Specific)	ME dept	2	0	2		03	50	50	100	03
4	ESC	KKxxx204x	Engineering Science Course-II	Respective Engg Dept	3	0	0		03	50	50	100	03
5	PSC	XXxxx205	Program Specific Courses	Respective Engg dept	3	0	0		03	50	50	100	03
6	AEC (NCMC)	KKSSC206	Soft Skills	Humanities	1	0	0		--	100		100	PP
7	PSC/ESC	XXxxxL207x	Program-Specific Course Lab	Respective dept	0	0	2		02	50	50	100	01
8	AEC/SDC	KKPRJ258	Interdisciplinary Project-Based Learning	Combination of Multiple Dept	0	0	0	02	02	50	50	100	01
9	HSMC	KKKSK209/ KKKBK209	Samskrutika Kannada/ Balake Kannada	Humanities	1	0	0		01	50	50	100	01
				TOTAL						**500**	**400**	**900**	**20**

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

Integrated courses (IC), combining theory with practical components. The theory sessions shall be conducted for 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.

Applied Mathematics-II					Applied Physics				
Code	**Title**	**L**	**T**	**P**	**Code**	**Title**	**L**	**T**	**P**
CVMAT201	Differential Calculus and Numerical Methods: CV Stream	3	2	0	CVPHY202	Physics for Sustainable Structural Systems (CV stream)	3	0	2
MEMAT201	Multivariable Calculus and Numerical Methods: ME Stream	3	2	0	MEPHY202	Physics of Materials (Mech stream)	3	0	2
EEMAT201	Calculus, Laplace Transform, and Numerical Techniques: EEE stream	3	2	0	ECPHY202	Quantum Physics and Electronics Sensors (EEE stream)	3	0	2
CSMAT201	Numerical Methods: CSE Stream	3	2	0	EEPHY202	Electrical Engineering Materials (EEE stream-only for EEE students)	3	0	2
					CSPHY202	Quantum Physics and Applications (CSE stream)	3	0	2
Computer-Aided Engineering Drawing					**Engineering Science Courses-II (ESC-II)**				
CVCED203	Computer-Aided Engineering Drawing for CV Stream	2	0	2	KKBSM204A	Building Sciences & Mechanics	3	0	0
MECED203	Computer-Aided Engineering Drawing for ME stream	2	0	2	KKIEE204B	Introduction to Electrical Engineering	3	0	0
ECCED203	Computer-Aided Engineering Drawing for EEE stream	2	0	2	KKIEC204C	Introduction to Electronics & Communication Engineering	3	0	0
EECED203	Computer-Aided Engineering Drawing for EEE stream (only for EEE Students)	2	0	2	KKIME204D	Introduction to Mechanical Engineering	3	0	0
CSCED203	Computer-Aided Engineering Drawing for CSE stream	2	0	2	KKEIT204E	Essentials of Information Technology	3	0	0
Programme Specific Courses (PSC)					**Program-Specific Course Lab (PSCL)**				
CVEMC205	Engineering Mechanics	3	0	0	CVEMCL207	Mechanics and Materials Lab	0	0	2
MEEME205	Elements of Mechanical Engineering	3	0	0	MEEMEL207	Elements of Mechanical Engineering Lab	0	0	2
EEBEE205	Basics of Electrical Engineering	3	0	0	EEBEEL207	Basic Electrical & Electronics Engineering Lab	0	0	2
ECFEC205	Fundamentals of Electronics & Communication Engineering	3	0	0	ECFECL207	Fundamentals of Electronics & Communication Engineering Lab	0	0	2
CSPOC205	Programming in C	3	0	0	CSPOCL207	Programming in C Lab	0	0	2

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-II** 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 a specific branch or discipline of engineering to which a student is enrolled (e.g., Mechanical Engineering, Computer Science, Civil Engineering, etc.). These courses are intended to provide students with in-depth knowledge and specialized skills essential for professional competence in the chosen field.
Students must select and complete the 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 **Program Specific Courses Laboratory (PSCL)** group.

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

Engineering Sciences Courses-II(ESC-II): These courses are designed to broaden the technical knowledge of students beyond their core area of study. These courses enable students to gain a foundational understanding of engineering principles from other disciplines. Students are required to select and complete a course under ESC-II that does not belong to their admitted program stream. Students should select a course other than that was selected under ESC-I and other than course not belonging to their stream.
For the course ***Interdisciplinary Project*** **(KKPRJ258)**, 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.

Sl. No	Stream	UG Program under the stream with code
1	Civil Engineering Stream (CV)	(1) Civil engineering (CV), (2) Ceramic and Cement Technology (CC)
2	Mechanical Engineering Stream (ME)	(1) Industrial & Production Engineering (IP), (2) Mechanical Engineering (ME)
3	Electrical and Electronics Engineering Stream (EEE)	(1)Electronics & Communication Engineering (EC), (2) Electronics & Instrumentation Engineering (EI), (3)Electrical & Electronics Engineering (EE)
4	Computer Science and Engineering Stream (CSE)	(1) Computer Science and Engineering (CS), (2) Artificial Intelligence and Machine Learning (AI), (3) Computer Science and Design (CG) (4) Information Science & Engineering (IS)

Differential Calculus and Linear Algebra		Semester	1
Course Code	**CVMAT101**	CIE Marks	50
Teaching Hours/Week(L:T:P:S)	3:2:0:0	SEE Marks	50
Total Hours	40 HoursTheory+20 Hours Tutorials	Total Marks	100
Credits	4 Credits	Exam Hours	3 Hours
Examination type (SEE)	**Theory**		

Course Objectives: The goal of the course **Differential Calculus and Linear Algebra** (**CVMAT101**) is to

- **Familiarize** the importance of calculus associated with one variable and two variables, the importance of Integral calculus for civil engineering.
- **Analyze** Civil engineering problems applying Ordinary Differential Equations.
- **Develop** the knowledge of Linear Algebra refereeing to matrices.

Module	Hours
Module-1 **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 L+4T)**
Module-2 **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 L+4T)**
Module-3 **Ordinary Differential Equations of First Order:** Linear and Bernoulli's differential equation. Exact and reducible to exact differential equations with Integrating factors $\frac{1}{N}(\frac{\partial M}{\partial y}-\frac{\partial N}{\partial x})$ and $\frac{1}{M}(\frac{\partial N}{\partial x}-\frac{\partial M}{\partial y})$ Orthogonal trajectories**,** Law of natural growth and decay**.**	**(8 L+4T)**
Module-4 **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 L+4T)**
Module-5 **Linear Algebra:** Elementary row transformation of a matrix, Rank of a matrix. Consistency and Solution of system of linear equations - Gauss-elimination method and approximate solution by Gauss-Seidel method. Eigen values and Eigen vectors ,Rayleigh's power method to find the dominant Eigen value and Eigen vector .Applications: Traffic flow.	**(8 L+4T)**

List of Laboratory Experiments/Activities:

1) 2D plots for Cartesian and polar curves, Finding angle between polar curves,
2) Finding Radius of curvature,
3) Expansion of Taylor's and Maclaurin's series
4) Finding partial derivatives and Jacobian,
5) Solution of first order and higher order ordinary differential equations,
6) Plotting solutions of ODE,

7) Finding rank reduced to echelon form, solving system of linear equations using Gauss elimination method,
8) Solving system of linear equations using Gauss-Seidel method,
9) Determine Eigen values and Eigen vectors.

Semester End Examination (SEE):

Theory SEE will be conducted by Institute as per the scheduled timetable, with common question papers for the course

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.

Suggested Learning Resources:(Textbook/Reference Book):

Text books:

1. B.S.Grewal ,Higher Engineering Mathematics ,Khanna Publishers, 44thEd.,2021.
2. E.Kreyszig, Advanced Engineering Mathematics, John Wiley&Sons, 10thEd.,2018.
3. Gilbert Strang, Linear Algebra and its Applications, Cengage Publications, 4thEd.,2022.

Reference books:

1. B.V.Ramana ,Higher Engineering Mathematics, McGraw-Hill Education, 11thEd.,2017
2. Srimanta Pal & SubodhC. Bhunia ,Engineering Mathematics,Oxford UniversityPress ,3rdEd.,2016.
3. N.P.Baliand ManishGoyal, A Textbook of Engg. Mathematics ,Laxmi Publications,10thEd., 2022.
4. H.K.D as sand Er.RajnishVerma ,Higher Engineering Mathematics, S.Chand Publication, 3rd Ed.,2014.
5. David CLay, Linear Algebra and its Applications, Pearson Publishers, 4thEd.,2018.

Web links and Video Lectures(e-Resources):

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

CO1	Apply foundational concepts of calculus to analyze geometric properties of curves and demonstrate the problems using modern ICT tools.
CO2	Apply the concept of multivariable calculus to compute derivatives and optimize the functions and solve the problems using modern ICT tools.
CO3	Apply foundational concepts of calculus to solve first order differential equations and demonstrate the problems using modern ICT tools.
CO4	Apply foundational concepts of calculus to solve second and higher order differential equations and demonstrate the problems using modern ICT tools.
CO5	Apply the principles of linear algebra to solve systems of linear equations, determine eigenvalues and eigenvectors and solve the problems using modern ICT tools.

Differential Calculus and Linear Algebra		Semester	1
Course Code	**MEMAT101**	CIE Marks	50
Teaching Hours/Week(L:T:P:S)	3:2:0:0	SEE Marks	50
Total Hours of Pedagogy	40 Hours Theory+20 Hours Tutorials	Total Marks	100
Credits	4Credits	Exam Hours	3Hours
Examination type(SEE)	**Theory**		

Course Objectives: The goal of the course **Differential Calculus and Linear Algebra** (**MEMAT101**) is to

- **Familiarize** the importance of calculus associated with one variable and two variables, the importance of Integral calculus for civil engineering.
- **Analyze** Civil engineering problems applying Ordinary Differential Equations.
- **Develop** the knowledge of Linear Algebra refereeing to matrices.

Module	Hours
Module-1 **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 L +4 T)**
Module-2 **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 L +4 T)**
Module-3 **Ordinary Differential Equations of First Order:** Linear and Bernoulli's differential equation. Exact and reducible to exact differential equations with Integrating factors $\frac{1}{N}(\frac{\partial M}{\partial y} - \frac{\partial N}{\partial x})$ and $\frac{1}{M}(\frac{\partial N}{\partial x} - \frac{\partial M}{\partial y})$ Orthogonal trajectories**,** Law of natural growth and decay**.**	**(8 L +4 T)**
Module-4 **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 L +4 T)**
Module-5 **Linear Algebra:** Elementary row transformation of a matrix, Row echelon form and Rank of a matrix. Consistency and Solution of system of linear equations, LU decomposition method and approximate solution by Gauss-Seidel method. Eigen values and Eigen vectors ,Rayleigh's power method to find the dominant Eigen value and Eigen vector	**(8 L +4 T)**

List of Laboratory Experiments/Activities: (for integrated courses)

1) 2D plots for Cartesian and polar curves,
2) Finding angle between polar curves,
3) Finding Radius of curvature,
4) Expansion of Taylor's and Maclaurin's series,
5) Finding partial derivatives and Jacobian,
6) Solution of first order and higher order ordinary differential equations,
7) Plotting solutions of ODE

8) Finding rank reduced echelon form, solving system of linear equations using Gauss elimination method,
9) Solving system of linear equations using Gauss-Seidel method,
10) Determine Eigen values and Eigen vectors.

Semester End Examination (SEE):

Theory SEE will be conducted by Institute as per the scheduled timetable, with common question papers for the course

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.

Suggested Learning Resources:(Textbook/Reference Book):

Textbooks:

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- https://ocw.mit.edu/courses/18-02sc-multivariable-calculus-fall-2010/

CO1	Apply foundational concepts of calculus to analyze geometric properties of curves and demonstrate the problems using modern ICT tools.	
CO2	Apply the concept of multivariable calculus to compute derivatives and optimize the functions and solve the problems using modern ICT tools.	
CO3	Apply foundational concepts of calculus to solve first order differential equations and demonstrate the problems using modern ICT tools.	
CO4	Apply foundational concepts of calculus to solve second and higher order differential equations and demonstrate the problems using modern ICT tools.	
CO5	Apply the principles of linear algebra to solve systems of linear equations, determine eigenvalues and eigenvectors and solve the problems using modern ICT tools.	

Differential Calculus and Linear Algebra		Semester	1
Course Code	**EEMAT101**	CIE Marks	50
Teaching Hours/Week(L:T:P:S)	3:2:0:0	SEE Marks	50
Total Hours of Pedagogy	40 HoursTheory+20 Hours Tutorials	Total Marks	100
Credits	4 Credits	Exam Hours	3 Hours
Examination type(SEE)	**Theory**		

Course Objectives: The goal of the course **Differential Calculus and Linear Algebra** (**EEMAT101**) is to

- **Familiarize** the importance of calculus associated with one variable and two variables, the importance of Integral calculus for civil engineering.
- **Analyze** Civil engineering problems applying Ordinary Differential Equations.
- **Develop** the knowledge of Linear Algebra refereeing to matrices.

Module	Hours
Module-1 **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 L +4 T)**
Module-2 **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 L +4 T)**
Module-3 **Ordinary Differential Equations(ODE)of First Order and First Degree and Nonlinear ODE:** Exact and reducible to exact differential equations-Integrating factors on $\frac{1}{N}(\frac{\partial M}{\partial y}-\frac{\partial N}{\partial x})$ and $\frac{1}{M}(\frac{\partial N}{\partial x}-\frac{\partial M}{\partial y})$ 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 L +4 T)**
Module-4 **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 L +4 T)**
Module-5 **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 L +4 T)**

List of Laboratory Experiments/Activities:

1) 2D plots for Cartesian and polar curves,
2) Finding angle between polar curves,
3) Finding Radius of curvature,
4) Expansion of Taylor's and Maclaurin's series,
5) Finding partial derivatives and Jacobian,
6) Solution of first order and higher order ordinary differential equations,
7) Plotting solutions of ODE,
8) Finding rank, reduced echelon form, solving system of linear equations using Gauss elimination method,

9) Solving system of linear equations using Gauss-Seidel method,
10) Determine Eigen values and Eigen vectors.

Semester End Examination (SEE):

Theory SEE will be conducted by Institute as per the scheduled timetable, with common question papers for the course

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.

Suggested Learning Resources:(Textbook/Reference Book):

Text books:

1. B.S.Grewal, Higher Engineering Mathematics, Khanna Publishers, 44thEd.,2021.
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CO1	Apply foundational concepts of calculus to analyze geometric properties of curves and demonstrate the problems using modern ICT tools.	
CO2	Apply the concept of multivariable calculus to compute derivatives and optimize the functions and solve the problems using modern ICT tools.	
CO3	Apply foundational concepts of calculus to solve first order differential equations and demonstrate the problems using modern ICT tools.	
CO4	Apply foundational concepts of calculus to solve second and higher order differential equations and demonstrate the problems using modern ICT tools.	
CO5	Apply the principles of linear algebra to solve systems of linear equations, determine eigen values and eigenvectors and solve the problems using modern ICT tools.	

Differential Calculus and Linear Algebra		Semester	1
Course Code	**CSMAT101**	CIE Marks	50
Teaching Hours/Week (L:T:P:S)	3:2:0:0	SEE Marks	50
Total Hours of Pedagogy	40 Hours Theory+20 Hours Tutorials	Total Marks	100
Credits	4 Credits	Exam Hours	3Hours
Examination type(SEE)	**Theory**		

Course Objectives: The goal of the course **Differential Calculus and Linear Algebra** (**CSMAT101**) is to

- **Familiarize** the importance of calculus associated with one variable and two variables, the importance of Integral calculus for civil engineering.
- **Analyze** Civil engineering problems applying Ordinary Differential Equations.
- **Develop** the knowledge of Linear Algebra referring to matrices.

Module	Hours
Module-1 **Series Expansion ,Indeterminate Forms and Multivariable Calculus:** Statement and problem son 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, Statement of Taylor's and Maclaurin's series expansion for two variables. Maxima and minima for the function of two variables.	**(8 L +4 T)**
Module-2 **Differential Equations of First and Higher Order:** Linear and Bernoulli`s differential equations .Exact and reducible to exact differential equations with Integrating factors on $\frac{1}{N}(\frac{\partial M}{\partial y}-\frac{\partial N}{\partial x})$ and $\frac{1}{M}(\frac{\partial N}{\partial x}-\frac{\partial M}{\partial y})$ 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 L +4 T)**
Module-3 **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. Eigen values and Eigenvectors , diagonalization of the matrix, modal matrix.	**(8 L +4 T)**
Module-4 **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 L +4 T)**
Module-5 **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 L +4 T)**

List of Laboratory Experiments/Activities:

1) Finding partial derivatives and Jacobian,
2) Expansion of Taylor's and Maclaurin's series,
3) Solving differential equations of first and higher order,
4) Finding rank ,reduced echelon form, solving system of linear equations using Gauss elimination method,
5) Solving system of linear equations using Gauss-Seidel method,
6) Determine Eigen values and Eigen vectors,
7) Linearly Independence and Dependence sets,
8) Basis and dimension,
9) Linear transformation-range space and null space,
10) Verification of the rank nullity theorem.

Semester End Examination (SEE):

Theory SEE will be conducted by Institute as per the scheduled timetable, with common question papers for the course

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.

Suggested Learning Resources:(Textbook/Reference Book):

Text books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers,44thEd.,2021.
2. GilbertStrang, Linear Algebra and its Applications,Cengage Publications, 4thEd.,2022.
3. Seymour Lipschutz and MarcLipson, Linear Algebra,Schaum's ou tlines series ,4thEd.,2008.

Reference books:

1. V. Ramana ,Higher Engineering Mathematics, McGraw-HillEducation,11thEd.,2017
2. N.P.Baliand Manish Goyal, A Text book of Engineering Mathematics, Laxmi Publications, 10thEd., 2022.
3. James Stewart, Calculus, CengagePublications,7thEd.,2019.
4. David Poole,Linear Algebra,a modern introduction, Cengage publishers,4thEd.,2014.
5. David CLay,Linear Algebra and itsApplications ,Pearson Publishers,4thEd.,2018.
6. Gareth Williams ,Linear Algebra with applications, Jones BartlettPublishersInc.,6thEd.,2017.

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- http://academicearth.org/
- VTU e-Shikshana Program
- VTUEDUSAT Program
- https://nptel.ac.in/courses/111105160
- https://nptel.ac.in/courses/127106019
- https://ocw.mit.edu/courses/18-335j-introduction-to-numerical-methods-spring-2019/
- https://ocw.mit.edu/courses/18-330-introduction-to-numerical-analysis-spring-2012/pages/syllabus/

CO1	Apply the concept of multivariable calculus to compute derivatives and optimize the functions and solve the problems using modern ICT tools.
CO2	Apply foundational concepts of calculus to solve first order differential equations and demonstrate the problems using modern ICT tools.
CO3	Apply the principles of linear algebra to solve systems of linear equations, determine eigen values and eigenvectors and solve the problems using modern ICT tools.
CO4	Apply the concept of vector space to problems in computers science solve the problems using modern ICT tools.
CO5	Apply the concept of linear transformation to problems in computers science solve the problems using modern ICT tools.

Physics for Sustainable Structural Systems		Semester	1 / 2
Course Code: **CVPHY102/202**		CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:0:2:0	SEE Marks	50
Total Hours	40Hours Theory + 20Hours Tutorials	Total Marks	100
Credits	4 Credits	Exam Hours	3 Hours
Examination type (SEE)	**Theory**		

Course Objectives:

- To understand the types of oscillation, shock waves, its generation and applications.
- To Study the elastic properties of materials and failures of engineering materials.
- To Study the acoustics buildings and the essentials of radiometry and photometry.
- To understand the wave propagation in different aspects and structural response to dynamic loads such as earthquakes.
- To understand the properties and applications of smart materials

Pre-requisite: Basics of Oscillations, Elasticity, stress and strain, differential equations for SHM, Basic of Sound, waves and light properties, oscillations and ritcher scale, introduction to materials

Module	Hours
Module-1 **Oscillations:** Simple harmonic motion (SHM), Differential equation for SHM, Springs: Stiffness factor and its physical significance, Series and Parallel combination of springs (Derivation), Types of springs and their applications. Theory of damped oscillations (Qualitative), Types of damping (Graphical Approach). Engineering applications of Damped oscillations, Theory of forced oscillations (Qualitative),Resonance, Sharpness of resonance. Resonance in LCR Circuits (Qualitative),Numerical Problems. Text Books: 1,2, Reference Book : 1	**08**
Module-2 **Elasticity:** Review Stress-Strain Curve, Strain hardening and softening. Elastic Moduli, Poisson's ratio, Relation between Y, n and σ (with derivation), mention relation between K, Y and σ, limiting values of Poisson's ratio. 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. Text Book : 2, Reference Book : 2	**08**
Module-3 **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. **Radiometry and Photometry:** Radiation quantities, Spectral quantities, Relation between luminance and Radiant quantities, Reflectance and Transmittance, Photometry (cosine law and inverse square law). Text Books :1,2, Reference Books :6, 8	**08**
Module-4 **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, Introduction to earthquakes, General characteristics, P-waves, S-	**08**

waves, Love waves, and Rayleigh waves, Ground motion and structural response, Site effects and soil-structure interaction, Physics of earthquakes, Richter scale of measurement and earthquake-resistant measures, Tsunami (causes for tsunami, characteristics, adverse effects, risk reduction measures, engineeringstructures to withstand tsunami), Seismometer and Seismograph, Accelerometer. Text Book : 3, Reference Book : 5	
Module-5 **Smart Materials for Sustainable Structures:** Types of smart materials, Piezo, Magnetostrictive, Electrostrictive, Electro-rheological, Magneto-rheological, Shape memory alloys, Phase transformation in shape memory alloys, Overview of sensor technology, uses of sensors in intelligent structures, Classification of sensors, Temperature sensor, Vibration Sensor, Strain Gauge sensors, Basic concepts of structural health monitoring. Text Book : 5, Reference Books :9,10	**08**

List of Laboratory Experiments/Activities: (for integrated courses)

1. Study of Forced Mechanical Oscillations and Resonance.
2. Study of the frequency response of Series & Parallel LCR circuits.
3. Determination of effective spring constant of the given springs in series and parallel combinations.
4. Determination of Young's modulus of the material of the given bar Uniform Bending.
5. Determination of Fermi energy of copper.
6. Determination of acceptance angle and numerical aperture of given optical fiber.
7. Verification of Inverse Square Law of Intensity of Light.
8. Study on types of damping (Pendulum and Damper / PHET).
9. Interpretation of graphs and images using XRD and SEM
10. Determination of wavelength of Ultrasonic using Ultrasonic Interferometer.
11. Determination of Young's Modulus of the material of the given bar using Single Cantilever
12. STEP Interactive Physical Simulations. (Relevant to Theory part)
13. PHET Interactive Simulations (Relevant to Theory part)
14. Simple case study on acoustics (Auditorium, Cinema Hall, Etc)
15. Determination of Wavelength of Laser using Diffraction Grating
16. Study of motion using spread Sheets
17. Data Analysis using Spread Sheets.

Semester End Examination (SEE):

Theory SEE will be conducted by Institute as per the scheduled timetable, with common question papers for the course

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.

Suggested Learning Resources: Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year):

Text Books:

1. Physics, Oscillations and Waves, Optics and Quantum Mechanics, H M Agarwal and R M Agarwal, Pearson, 2025
2. Engineering Physics, Satyendra Sharma and Jyotsna Sharma, Pearson, 2018.
3. Dynamics of Structures - Theory and Applications to Earthquake Engineering Anil K. Chopra, University of California at Berkeley, Fourth Edition. Prentice Hall.
4. Non Destructive Testing - Hull, J. B., & John, V. (2015). Macmillan International Higher Education.
5. Smart Materials in Structural Health Monitoring, Control and Biomechanics, Suresh Bhalla (IIT Delhi), C. K. Soh, Yaowen Yang, Springer.

Reference Books:

1. Vibrations and Waves, A P French, MIT introductory Physics, 2003.
2. Elements of Properties of Matter, D S Mathus, S Chand, Reprint 2016
3. Engineering Physics by R. K. Gaur and S. L. Gupta, 2010 edition, Dhanpat Rai Publications Ltd., New Delhi-110002,
4. Engineering Physics, S L Kakani, Shubra Kakani, 3rd Edition, 2020, CBS Publishers and Distributers Pvt. Ltd., 2018.
5. Introduction to Seismology, Earthquakes, and Earth Structure, Stein, Seth, and Michael Wysession. Blackwell Publishing, 2003.
6. Photometry Radiometry and Measurements of Optical Losses, Micheal Bukshtab, Springer, 2nd edition.
7. Engineering Physics, S Mani Naidu, Pearson,2025
8. Building Science: Lighting and Accoustics, B. P. Singh and Devaraj Singh, Dhanpat Rai Publications (P) Ltc.,
9. Lagoudas, D. C. Shape Memory Alloys: Modeling and Engineering Applications. Springer, 2008. ISBN: 978-0-387-47684-1.
10. Holnicki-Szulc, J., & Rodellar, J. (Eds.). Smart Structures: Requirements and Potential Applications in Mechanical and Civil Engineering. Springer, 1999. ISBN: 978-0-7923-5612-7.

Web links and Video Lectures (e-Resources):

1. Simple Harmonic Motion (SHM) – NPTEL Lecture: https://www.youtube.com/watch?v=gnD8Se92hfk
2. Waves and Oscillations Playlist (SHM, damping, resonance, etc.)– NPTEL https://www.youtube.com/playlist?list=PLyqSpQzTE6M9X7oRXliYM8t0aaR_N0Csd
3. Simple Harmonic motion: https://www.youtube.com/watch?v=k2FvSzWeVxQ
4. Stress- strain curves :https://web.mit.edu/course/3/3.11/www/modules/ss.pdf
5. Stress curves: https://www.youtube.com/watch?v=f08Y39UiC-o
6. Acoustics: https://www.youtube.com/watch?v=fHBPvMDFyO8
7. INTRO – Fundamentals of Acoustics" (Lecture 1, NPTEL-NOC, IIT Madras) https://www.youtube.com/watch?pp=0gcJCfwAo7VqN5tD&v=rT9B44Q4Rko
8. Fundamentals of Acoustics playlist (multiple lectures on acoustic wave behavior, sound propagation, etc.) https://www.youtube.com/playlist?list=PLgMDNELGJ1CYWnDbcbVET5zCbN4 aLEbZQ
9. Structural Health Monitoring of Composites (IIT Kanpur) – Full NPTEL Course: https://nptel.ac.in/courses/112104160
10. Course Introduction – Structural Health Monitoring (IITM – NPTEL): https://www.youtube.com/watch?v=It4aogUfQis
11. Smart Structures (IIT Kharagpur) – Covers smart materials, actuators, SHM: https://onlinecourses.nptel.ac.in/noc23_ae19/preview

Course outcome (Course Skill Set): At the end of the course the student will be able to:		
CO1	Analyze the behavior of simple harmonic, damped, and forced oscillatory systems in mechanical and electrical contexts	
CO2	Demonstrate the concepts of stress, strain, and elastic moduli to evaluate the elastic behavior of solids under various loading conditions.	
CO3	Apply the principles of acoustics, radiometry, and photometry to design and evaluate systems for sound, light, and radiation measurements.	
CO4	Evaluate wave propagation and structural response to dynamic loads such as earthquakes and blasts, incorporating modern mitigation strategies and smart materials	
CO5	Assess the properties and applications of smart materials to enhance the performance and sustainability of engineering systems.	

Physics of Materials		Semester	1 / 2
Course Code: **MEPHY102/202**		CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:0:2:0	SEE Marks	50
Total Hours	40Hours Theory + 20Hours Tutorials	Total Marks	100
Credits	4 Credits	Exam Hours	3 Hours
Examination type (SEE)	**Theory**		

Course Objectives:

- To understand the types of oscillation, shock waves & its generation, and applications.
- To Study the elastic properties of materials and failures of engineering materials.
- To understand the basics of photonic devices and their application in engineering.
- To understand the Concepts in Low temperature phenomena and generation of low temperature.
- To study the quantum mechanics and various relevant material characterization techniques.

Pre-requisite:

Basics of Oscillations, Elasticity, Stress & Strain, Properties of light, Electrical conductivity and Quantum Mechanics

Module	Hours
Module-1 **Oscillations:** Simple harmonic motion (SHM), Differential equation for SHM, Springs: Stiffness factor and its physical significance, Series and Parallel combination of springs (Derivation), Types of springs and their applications. Theory of damped oscillations, Types of damping (Graphical Approach). Engineering applications of damped oscillations, Theory of forced oscillations with derivation, Resonance, Sharpness of resonance, Resonance in LCR circuits (Qualitative), Numerical problems. Text Book : 1,2, Reference Book : 1	**08**
Module-2 **Elasticity:** Review Stress-Strain Curve, Strain hardening and softening. Elastic Moduli, Poisson's ratio, Relation between Y, n and σ (with derivation), mention relation between K, Y and σ, limiting values of Poisson's ratio. 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. Text Book : 2, Reference Book : 2	**08**
Module-3 **Photonics:** Properties of a LASER Beam, Interaction of Radiation with Matter, LASER action, Population Inversion, Metastable State, Requisites of a LASER System, ND YAG LASER, LASER Range Finder, LIDAR, Cutting, Drilling, Welding and Surface hardening. Principle and Construction of Optical Fibers, Acceptance angle and Numerical Aperture (NA), Expression for NA, Modes of Propagation, Types of optical fibers, Attenuation and Fiber Losses(Qualitative), Fiber Optic Displacement Sensor, Fiber Optic Temperature Sensor, Numerical Problems Text Book : 4,5 Reference Book : 4	**08**
Module-4 **Thermoelectric materials and devices:** Thermo emf and thermo current, Seebeck effect, Peltier effect, Seeback and Peltier coefficients, figure of merit (Mention Expression), laws	**08**

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 Text Book : 3 Reference Book : 3	
Module-5 **Material Characterization and Instrumentation Techniques**: **Materials Properties:** Schrodinger equation, Interpretation of wave function, Particle in an infinite 1D potential well, Quantum confinment in 0, 1, 2 and 3 Dimesion (Qualitative), Density of states expressions and graphical representation, Optical properties due to quantum confinement, blue shift, absorption, florescence, Quantum tunnelling **Instrumentation Techniques**: X-Ray Diffractometer (XRD), Schrerrer equation, Atomic Force Microscope (AFM), X-ray Photoelectron Spectroscopy (XPS), Scanning Electron Microscope (SEM), Numerical Problems. Text Book : 5 Reference Book : 6	**08**

List of Laboratory Experiments/Activities: (for integrated courses)

1. Determination of Young's modulus of the material of the given bar Uniform Bending.
2. Determination of Rigidity modulus of the Material of the wire using Torsional Pendulum.
3. Study of Forced Mechanical Oscillations and Resonance.
4. Study of the frequency response of Series & Parallel LCR circuits.
5. Determination of effective spring constant of the given springs in series and parallel combinations.
6. Verification of Newton's Law of Cooling.
7. Determination of Young's modulus of the material of the given bar using Single Cantilever.
8. Determination of Moment of Inertia of the given irregular body by setting torsional Oscillations.
9. Determination of Grating constant using LASER Diffraction / Estimation of particle size of lycopodium powder using Laser Diffraction
10. Determination of acceptance angle and numerical aperture of given optical fiber.
11. Energy gap of Semiconductor Diode.
12. Data Analysis using Spread Sheets
13. Study the working of Peltier Modules
14. STEP Interactive Physical Simulations. (Springs, Simple Pendulum)
15. Study of motion using spread Sheets (linear and Projectile motion)
16. PHET Interactive Simulation (Relevant to Theory)

Semester End Examination (SEE):

Theory SEE will be conducted by Institute as per the scheduled timetable, with common question papers for the course

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.

Suggested Learning Resources: Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year):

Text Books:

1. Physics, Oscillations and Waves, Optics and Quantum Mechanics, H M Agarwal and R M Agarwal, Pearson, 2025
2. Engineering Physics, Satyendra Sharma and Jyotsna Sharma, Pearson, 2018.
3. A Text book of Engineering Physics by M.N. Avadhanulu, P G. Kshirsagar, S Chand, 2014, Revised Edition.
4. Engineering Physics , S P Basavaraju 2014
5. Engineering Physics, S L Kakani, Shubra Kakani, 3rd Edition, 2020, CBS Publishers and Distributers Pvt. Ltd.
6. Characterization of Materials- Mitra P.K. Prentice Hall India Learning Private Limited.

Reference Books:

1. Vibrations and Waves (MIT introductory Physics Series), A P French, CBS, 2003 Edition
2. Elements of Properties of Matter, D S Mathus, S Chand, Reprint 2016
3. Engineering Physics, S L Kakani, Shubra Kakani, 3rd Edition, 2020, CBS Publishers and Distributers Pvt. Ltd.
4. Saleh, B. E. A., & Teich, M. C. (2019). Fundamentals of Photonics (3rd ed.). Wiley
5. Materials Characterization Techniques-Sam Zhang, Lin Li, Ashok Kumar, CRC Press, First Edition, 2008.

Web links and Video Lectures (e-Resources):

1. Lecture Series on Physics - I: Oscillations and Waves by Prof.S.Bharadwaj, Department of Physics and Meteorology, IIT Kharagpurn: https://www.youtube.com/watch?v=gnD8Se92hfk
2. Waves and Oscillations : https://www.youtube.com/watch?v=xoJWoMQwTAw&list=PLyqSpQzTE6M9X7oRXliYM8t0aaR_N0Csd
3. Stress- strain curves :https://web.mit.edu/course/3/3.11/www/modules/ss.pdf
4. Stress curves: https://www.youtube.com/watch?v=f08Y39UiC-o
5. Introduction to Photonics – NPTEL (IIT Madras, Prof. Balaji Srinivasan) Lecture 03 to Lecture 12 cover: Direct video link (start Lecture 03): https://nptel.ac.in/courses/108106135/03
6. Liquefaction of gases: https://www.youtube.com/watch?v=aMelwOsGpIs
7. Non-destructive testing: https://youtu.be/JGQnbwxPiFA
8. Non-destructive testing: https://youtu.be/uzogGRDSmMA
9. Materials Characterisation : https://youtu.be/SXIYzrFGmkU

Course outcome (Course Skill Set): At the end of the course the student will be able to:

CO1	Analyze the principles of simple harmonic, damped, and forced oscillations, and apply them to solve problems involving mechanical and electrical oscillatory systems.
CO2	Apply the concepts of stress, strain, and elastic moduli to evaluate the elastic behavior of solids under various loading conditions.
CO3	Describe light-matter interaction, laser operations, optical modulators, and photonic devices to illustrate principles of photonics in sensor technologies.
CO4	Evaluate the principles of thermoelectric effects and assess the performance of thermoelectric materials and devices for energy conversion and thermal management.
CO5	Explain the material characterization techniques and instrumentation to analyze the macroscopic and microscopic properties of engineering materials.

ELECTRICAL ENGINNERING MATERIALS		Semester	I/II
Course Code	**EEPHY102/202**	CIE Marks	50
Teaching Hours/Week(L:T:P:S)	3:0:2:0	SEE Marks	50
Total Hours of Pedagogy (Theory and Lab hours)	40hours theory + 10-12 hours of practical sessions	Total Marks	100
Credits	4	Exam Hours	3
Examination type(SEE)	**Theory**		

Course Objectives:

1. Describe light-matter interaction laser operations, optical fibres, and photonic devices to illustrate principles of photonics in technologies.
2. Explain dielectric and magnetic properties of materials and apply them in electrical components like transformers, capacitors, and magnetic switches.
3. Analyze thermoelectric phenomena, device construction, and identify suitable materials and applications for energy conversion.
4. Evaluate electrical transport mechanisms in metals and semiconductors using classical and quantum models, and perform relevant calculations.
5. Describe superconducting principles, distinguish between types of superconductors, and explain their physical properties and technological uses.

Module	Hours
Module-1 **Photonics:** Interaction of radiation with matter – Einstein's A and B coefficients, Prerequisites for lasing actions, Types of LASER – Semiconductor diode LASER, Use of attenuators for single photon sources, Optical modulators – Pockel's effect, Kerr effect, Photodetectors – Photomultiplier tube, Single Photon Avalanche Diode, Optical fiber, Derivation of Numerical aperture, V-number, Number of modes, losses in optical fiber, Mach-Zehnder interferometer, Numerical problems. Text Books: 1, 2, Reference Book: 7	08
Module-2 **Dielectric and Magnetic Materials:** **Dielectrics:** Introduction, Electrical Polarization Mechanisms, Internal fields in solids (qualitative), Clausius-Mossotti relation (Derivation) and its implications, Properties and Frequency dependence of Dielectric constant, Dielectric loss, Solid, Liquid and Gaseous dielectrics. Application of dielectrics in Capacitors, Transformers (Oils), SF6 in High Voltage application, Numerical Problems. **Magnetic material:** Classification of magnetic materials, Weiss Molecular field theory of ferromagnetism (Qualitative), Importance of Curie Temperature, Ferromagnetic Hysteresis and Explanation using Domain theory, Energy loss, Hard and soft ferromagnetic materials and Applications, Transformer Cores, Armature, Inductors and chokes, Permanent Magnets, Numerical Problems TextBooks:1,2,ReferenceBook:1	08
Module-3 **Thermo electric 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 TextBooks:1,2,ReferenceBook:1	8

Module-4 **Electrical Properties of Metals and Semiconductors:** Failures of classical free electron theory, Mechanisms of electron scattering in solids, Matheissen's rule, Assumptions of Quantum Free Electron Theory, Density of States, Fermi Dirac statistics, Fermi Energy, Variation of Fermi Factor With Temperature and Energy, Expression for carrier concentration, Derivation of electron concentration in an intrinsic semiconductor, Expression for electron and hole concentration in extrinsic semiconductor, Fermi level for intrinsic(with derivation) and extrinsic semiconductor (no derivation), Hall effect, Numerical Problems. TextBooks:1,2,ReferenceBook:1	8
Module-5 **Superconductivity** Zero resistance state, Persistent current, Meissner effect, Critical temperature, Critical current (Silsbee Effect) – Derivation for a cylindrical wire using ampere's law, Critical field, Formation of Cooper pairs - Mediation of phonons, Two-fluid model, BCS Theory - Phase coherent state, Limitations of BCS theory, Type-I and Type-II superconductors, High Tc superconductors, Formation of Vortices, Explanation for upper critical field, Josephson junction, Flux quantization, DC Squid, Superconducting Magnet, MAGLEV, Numerical Problems. TextBooks:1,3,ReferenceBook:1,2	8

PRACTICALCOMPONENTSOFIPCC

PART–A:FIXEDSETOFEXPERIMENTS

1. Determination of dielectric constant of the material of capacitor by Charging and Discharging Method.
2. Determination of Magnetic Flux Density at any point along the axis of a circular coil.
3. Determination of resistivity of a semiconductor by Four Probe Method
4. Study the Characteristics of a Photo-Diode and to determine the power responsivity
5. Determination of Fermi Energy of Copper.
6. B-H Curve.
7. Thermo-emf for Peltier Module.
8. Identification of Electronic and Electrical Components and Determination of Value.
9. Energy Gap of a Semiconductor.
10. Distinguishing Hard and Soft Magnetic Material.
11. Light Emitting Diode.
12. Data Analysis using Spreadsheets.
13. Electrical Measuring Instruments: Multimeter.
14. Determination of wavelength of LASER using Diffraction Grating.
15. Determination of acceptance angle and numerical aperture of the given Optical Fiber.

PART–B:OPENENDEDEXPERIMENTS

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

Suggested Learning Resources:(TextBook/ReferenceBook/Manuals):

Textbooks:

1. **Solid State Physics-SOPillai, 8th Ed-NewAgeInternationalPublishers-2018.**
2. **Engineering Physics, Satyendra Sharma and Jyotsna Sharma, Pearson,2018.**
3. **A Text book of Engineering Physics by M.N. Avadhanulu, P G. Kshirsagar, S Chand, 2014, Re-vised Edition.**
4. **Smart Materials and Structures, M.V. Gandhiand B.S. Thompson, Chapman & Hall**

Reference books/Manuals:

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

Web links and Video Lectures(e-Resources):

1. **Mod-02Lec-20:Dielectrics–Prof. D.K.Ghosh, IITBombay https://www.youtube.com/watch?v=P9VyW2wq9ZE**
2. **Mod-01Lec-16:Dielectric(Insulating)Solids–Prof.G.Rangarajan, IITMadras https://www.youtube.com/watch?v=etjZmdmrjSU**
3. **Lecture41:ThermoelectricGenerators–Functioning an dApplications https://www.youtube.com/watch?v=G9NgoxHMPwk**
4. **NPTEL course: Solid State Physics–Prof.A.K.Raychaudhuri, IIT Kharagpur Course link: https://archive.nptel.ac.in/courses/115/105/115105099**
5. **Mod-01Lec-27:Superconductivity–Perfect Conductivity & Diamagnetism–Prof.G.Rangarajan, IIT Madras https://www.youtube.com/watch?v=GglT1RoBPzg**
6. **Lecture01:PMMCInstrument–https://www.youtube.com/watch?v=n1MinLtvnPY**
7. **Lecture 02: Electrodynamic / Moving Iron Instruments – https://www.youtube.com/watch?v=n1MinLtvnPY&list=PLbRMhDVUMngcoKrA4sH-zvbNVSE6IpEio&index=2**
8. **Lecture03:MeasurementSystemsCharacteristics– https://www.youtube.com/watch?v=Hlvbr5DCEfM**
9. **Lecture05:MovingIronInstruments–https://www.youtube.com/watch?v=TgGMqVPsaK0**
10. **Lecture23:ErrorCalculation&Uncertainty –https://www.youtube.com/watch?v=ZpYGQQAix0E**
11. **Electrical Measurement course Prof Avishek Chatterjee IIT Kharagpur : https://www.youtube.com/playlist?list=PLbRMhDVUMngcoKrA4sH-zvbNVSE6IpEio**

Course outcome (Course Skill Set): At the end of the course the student will be able to:

CO1	Analyze the roles of light-matter interaction, laser systems, optical fibres, and photonic devices in the functioning of contemporary photonic technologies.
CO2	Describe the dielectric and magnetic properties of materials and apply these principles in the design and function of electrical components such as transformers, capacitors, and magnetic switches.
CO3	Analyze thermoelectric effects, device construction, and material properties to identify optimal solutions for energy conversion applications.
CO4	Evaluate electrical transport phenomena in metals and semiconductors using classical and quantum models, and justify the choice of model through quantitative analysis.
CO5	Elucidate the principles of superconductivity, classify different types of superconductors, and describe their physical properties and technological applications.

QUANTUM PHYSICS AND ELECTRONICS SENSORS		Semester	I/II
Course Code	**ECPHY102/202**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:0:2:0	SEE Marks	50
Total Hours	40vHours Theory + 12 Hours Lab	Total Marks	100
Credits	4 Credits	Exam Hours	3 Hours
Examination type (SEE)	**Theory**		

Course Objectives:

- **To study the essentials of photonics and photonic devices**
- **To study the principles of quantum mechanics**
- **To understand the electrical properties of metals and semiconductors**
- **To understand the fundamentals of superconductors, distinguish between types of superconductors, and explain their physical properties and technologies uses.**
- **To study the knowledge about semiconductor devices and sensors**

Pre-requisite: Properties of light, Wave-Particle dualism, Classical Free Electron Theory, Superconductors, Basics of Semiconductors

Module	Hours
Module-1 **Photonics:** Interaction of radiation with matter – Einstein's A and B coefficients, Pre requisites for lasing actions, Types of LASER –Semiconductor diode LASER, Use of attenuators for single photon sources, Optical modulators – Pockel's effect, Kerr effect, Photo detectors – Photomultiplier tube, Single Photon Avalanche Diode, Optical fiber, Derivation of Numerical aperture, V-number, Number of modes, losses in optical fiber, Mach-Zehnder interferometer, Numerical problems. Text Books:1,2, Reference Book:7	08
Module-2 **Quantum Physics:** de Broglie Hypothesis, Heisenberg's Uncertainty Principle and its application (Broadneing of Spectral Lines), Principle of Complementarity, Wave Function, Time independent Schrödinger wave equation (Derivation), Physical significance of a wave function and Born Interpretation, Expectation value and its physical significance, Eigen functions and Eigen values, Particle inside one dimensional infinite potential well, Role of higher dimensions (Qualitative), Waveforms and Probabilities, Particle inside a finite potential well and quantum tunneling, Numerical Problems. Text Book:1 and 2	08
Module-3 **Electrical Properties of Metals and Semiconductors:** Failures of classical free electron theory, Mechanisms of electron scattering in solids, Matheissen's rule, Assumptions of quantum free electron theory, Density of states, Fermi Dirac statistics, Fermi energy, Variation of Fermi factor with temperature and energy, Expression for carrier concentration, Derivation of electron concentration in an intrinsic semiconductor, Expression for electron and hole concentration in extrinsic semiconductor, Fermi level for intrinsic (with derivation) and extrinsic semiconductor (no derivation), Hall effect, Numerical Problems. Text Books:1,3 Reference Books:2,3	08
Module-4 **Superconductivity** Zero resistance state, Persitent current, Meissner effect, Critical temperature, Critical current (Silsbee Effect) – Derivation for a cylindrical wire using ampere's law, Critical field, Formation of Cooper pairs - Mediation of phonons, Two-fluid model, BCS Theory - Phase coherent state, Limitations of BCS theory, examples of systems with low and high electron-phonon coupling, Type-I and Type-II superconductors, Formation of Vortices, Explanation for upper critical field, Josephson junction, Flux quantization, DC and AC SQUID, Charge Qubit, Numerical Problems. Text Books:1,2, Reference Book: 4,8	08
Module-5 **Semiconductor devices and Sensors** Direct and indirect band gap, Band gap engineering, Zener Diode, LED, PhotoDiode, Photo Transistor, Light dependent resistor, Resistance temperature detectors (high, medium, low), Sensing mechanisms, Piezo electric Sensors, Metal Oxide Semiconductor (MOS) sensors, Hall sensor, Super conducting Nano wire Single Photon Detector, Numerical Problems. Text Book: 4, Reference Book:1	08

List of Laboratory Experiments/Activities: (for integrated courses)

PART– A: FIXED SET 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. Determination of resistivity of a semiconductor by Four Probe Method
4. Determination of dielectric constant of the material of capacitor by Charging and Discharging method.
5. Study the Characteristics of a Photo-Diode and to determine the power responsivity /Verification of inverse square law of light.
6. Determination of Plank's Constant using LEDs.
7. Determination of Fermi Energy of Copper.
8. Interference by the division of amplitude(Air-wedge/Newton'sRings)
9. Black-Box Experiment
10. Construction and Analyzing Electronic circuits(Exp eyes Simulator/circuit lab)
11. Verification of Inverse Square Law of Intensity of Light.
12. I-V Characteristics of a Bipolar unction Transistor.
13. Resonance in LCR circuit
14. Energy Gap of a Semiconductor

(One Simulation Experiment is compulsory and must be conducted either in the Computer Laboratory for the entire batch or using dedicated systems within the Physics Laboratory as part of the experimental cycles.)

PART–B: OPEN ENDED EXPERIMENTS

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

Semester End Examination (SEE):

Theory SEE will be conducted by Institute as per the scheduled timetable, with common question papers for the course

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.

Suggested Learning Resources: Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year):

Text Books:

1. **Engineering Physics, Satyendra Sharma and Jyotsna Sharma, Pearson, 2018.**
2. **Engineering Physics, S L Kakani, Shubra Kakani, 3rdEdition, 2020, CBS Publishers and Distributers Pvt. Ltd.**
3. **Solid State Physics, S.O.Pillai, New Age International**
4. **Basic Electronics, B LTheraja, Multi- color Edition, S Chand,2006**

Reference Books:

1. **Engineering Physics, S Mani Naidu, Pearson, Fourteenth Impression, 2024.**
2. **Beiser, A.(2002).Concepts of Modern Physics(6thed.).McGraw-Hill Education..**
3. **Griffiths, D.J. (2018). Introduction to Quantum Mechanics (2ndor3rded.).Pearson.**
4. **Tinkham, M.(2004). Introduction to Superconductivity (2nded.). Dover Publications.**
5. **Mishra, P.K.(2009). Superconductivity–Basics and Applications. Ane Books.**
6. **Ghatak, A., &Thyagarajan, K. (2005).Optical Electronics. Oxford University Press.**

7. **Saleh, B.E.A., & Teich, M.C.(2019).Fundamentals of Photonics (3rded.).Wiley**
8. **Nielsen, M. A., & Chuang, I. L. (2010). Quantum Computation and Quantum Information (10th Anniversary Ed.). Cambridge University Press.**

Web links and Video Lectures (e-Resources):

1. NPTEL–Quantum Mechanics I (IITMadras): https://nptel.ac.in/courses/115106066
2. NPTEL–Physics: Introductory Quantum Mechanics(NOC): https://archive.nptel.ac.in/courses/115/104/115104096
3. Solid State Physics–NPTEL(IIT Madras)https://nptel.ac.in/courses/115106127
4. A Brief Course on Superconductivity–NPTEL IIT Guwahati (Prof.S aurabh Basu)
5. Playlist Introduction Video :https://www.youtube.com/watch?v=SHoGV-sezNI
6. Full playlist available via the YouTube channel description or archivelink.
7. Concepts in MagnetismandSuperconductivity–NOC(IITKharagpur)Seriesstart(Lecture1): https://digimat.in/nptel/courses/video/115105131/L01.html
8. Introduction to Photonics–NPTEL(IIT Madras, Prof. Balaji Srinivasan) Lecture03 to Lecture12 cover: Direct video link(startLecture03):https://nptel.ac.in/courses/108106135/03
9. Semiconductor Optoelectronics–NPTEL(IITDelhi,Prof.M.R.Shenoy)Direct video link(start rele-Vant lecture):https://nptel.ac.in/courses/108108174/05
10. Sensors and Actuators–NPTEL (IISc Bangalore, Prof.HardikJ. Pandya)Lecture1 –Introduction to Sensors, Transducers & Actuators, incl. Hall, RTDs, Thermistors https://digimat.in/nptel/courses/video/108108147/L01.html
11. Smart Sensors–NPTEL Lecture34–Covers various sensors including gas, pressure, MOS sensors, photo detectors like SNSPD https://www.youtube.com/watch?v=oRydUfgMdgA
12. Lecture32–Superconducting Qubits (includes Charge Qubit/Cooper-Pair Box) https://www.youtube.com/watch?v=iYo8ALJ-Mls

Course outcome (Course Skill Set): At the end of the course the student will be able to:

CO1	Describe light-matter interaction, laser operations, optical modulators, and photonic devices to illustrate principles of photonics in sensor technologies
CO2	Apply fundamental principles of quantum mechanics to analyze microscopic physical systems and predict quantized energy states and tunneling phenomena.
CO3	Analyze electrical conduction mechanisms in metals and semiconductors using classical and quantum models, and interpret carrier concentration and Fermi energy calculations.
CO4	Evaluate superconductivity phenomena including Meissner effect, Cooper pair formation, and Josephson junction behavior for advanced material applications.
CO5	Demonstrate the principles, characteristics, and applications of semiconductor and optical devices, sensors, and transducers used in electronic and photonic systems.

QUANTUM PHYSICS AND APPLICATIONS		Semester	I/II
Course Code :**CSPHY102/202**		CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:2:0:0	SEE Marks	50
Total Hours	40 hours theory+ 10-12hours of practical	Total Marks	100
Credits	4 Credits	Exam Hours	3 Hours
Examination type (SEE)	**Theory**		

Course Objectives:

1. To study the interaction of light with matter through Einstein's coefficients and its role in lasing action.
2. To study the principles of quantum mechanics and its application in quantum computing.
3. To study the electrical properties of materials.
4. To the characteristic properties of superconductors such as zero resistance, Meissner effect, and persistent current.
5. To study the taxonomy of physics-based animation methods and explain the role of physical laws.

Pre-requisite: Properties of light, Wave Particle dualism, Classical Free Electron Theory, Basics of Electrical conductivity, Motion in one dimension, Probability, computational skills.

Module	Hours
Module-1 **Photonics:** Interaction of radiation with matter – Einstein's A and B coefficients, prerequisites for lasing actions, types of LASER – Semiconductor diode LASER, use of attenuators for single photon sources, optical modulators – Pockel's effect, Kerr effect, photodetectors – Single Photon Avalanche Diode, Superconducting Nanowire Single Photon Detector. Optical fiber: Derivation of numerical aperture, V-number, number of modes, losses in optical fiber, Mach-Zehnder interferometer, numerical problems. Textbooks:1,2 Reference Book: 6	8
Module-2 **Quantum Mechanics:** De Broglie Hypothesis, Heisenberg's Uncertainty Principle and its application (Broadening of Spectral Lines), Principle of Complementarity, Wave Function, Time-independent Schrödinger wave equation (Derivation), Physical significance of a wave function and Born Interpretation, Expectation value and its physical significance, Eigenfunctions and Eigenvalues, Particle inside a one-dimensional infinite potential well, Role of higher dimensions (Qualitative), Waveforms and Probabilities, Particle inside a finite potential well and quantum tunneling, Numerical Problems. Textbooks: 1, 2 Reference Books: 1, 2	8
Module-3 **Electrical Properties of Metals and Semiconductors:** Failures of classical free electron theory, mechanisms of electron scattering in solids, Matthiessen's rule, assumptions of quantum free electron theory, density of states, Fermi-Dirac statistics, Fermi energy, variation of Fermi factor with temperature and energy, expression for carrier concentration, derivation of electron concentration in an intrinsic semiconductor, expression for electron and hole concentration in an extrinsic semiconductor, Fermi level for intrinsic (with derivation) and extrinsic semiconductor (no derivation), Hall effect, numerical problems. Textbook: 1 and 3	8
Module-4 **Superconductivity:** Zero resistance state, Persitent current, Meissner effect, Critical temperature, Critical current (Silsbee Effect) – Derivation for a cylindrical wire using ampere's law, Critical field, Formation of Cooper pairs - Mediation of phonons, Two-fluid model, BCS Theory - Phase coherent state, Limitations of BCS theory, Examples of systems with low and high electron-phonon coupling, Type-I and Type-II superconductors, Formation of Vortices, Explanation for upper critical field, Cooper pair Tunneling (Andreev reflection), Josephson junction, Flux quantization, DC and AC SQUID, Numerical Problems. Text Books:1,3,ReferenceBook:3	8

Module-5	
Applications of Physics in computing: Physics of Animation: Taxonomy of physics based animation methods, Frames, Frames per Second, Size and Scale, Weight and Strength, Motion and Timing in Animations, Constant Force and Acceleration, The Odd rule, Odd-rule Scenarios, Motion Graphs, Examples of Character Animation: Jumping, Parts of Jump, Jump Magnification, Stop Time, Walking: Strides and Steps, Walk Timing. Numerical Problems **Statistical Physics for Computing**: Descriptive statistics and inferential statistics, Poisson distribution and modeling the probability of proton decay, Normal Distributions (Bell Curves), Monte Carlo Method: Determination of Value of π. Numerical Problems. Text Books:1,3, ReferenceBook:9	8

List of Laboratory Experiments/Activities: (for integrated courses)

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 / Verification of Inverse Square Law of Light
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. Resonance in LCR circuit.
8. Characteristics of a Bipolar Junction Transistor.
9. Determination of dielectric constant of the material of capacitor by Charging and Discharging method.
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. Air-wedge /Newtons to study the interference by the division of amplitude.
13. Predicting the outputs of various combinations of single and two-qubit gates using QUISKIT.
14. Data Analysis using Spread Sheet.

Semester End Examination (SEE):

Theory SEE will be conducted by Institute as per the scheduled timetable, with common question papers for the course

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.

Suggested Learning Resources: Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year):

Text books:

1. Engineering Physics – Satyendra Sharma and Jyotsna Sharma, Pearson, 2018.
2. Engineering Physics – S. L. Kakani, Shubra Kakani, 3rd Edition, 2020, CBS Publishers and Distributors Pvt. Ltd.
3. Solid State Physics – S. O. Pillai, New Age International.
4. Lasers and Non-linear Optics – B. B. Laud, New Age International, 2011 Edition.

Reference Books:

1. Concepts of Modern Physics – Arthur Beiser, 6th Edition, McGraw-Hill Education, 2002.
2. Introduction to Quantum Mechanics – D. J. Griffiths, 2nd or 3rd Edition, Pearson, 2018.
3. Introduction to Superconductivity – Michael Tinkham, 2nd Edition, Dover Publications, 2004.
4. Superconductivity – Basics and Applications – P. K. Mishra, Ane Books, 2009.
5. Lasers and Non-Linear Optics – B. B. Laud, New Age International.

6. Fundamentals of Photonics – B. E. A. Saleh & M. C. Teich, 3rd Edition, Wiley, 2019.
7. Quantum Computation and Quantum Information – Michael A. Nielsen & Isaac L. Chuang, 10th Anniversary Edition, Cambridge University Press, 2010.
8. Quantum Computing – Vishal Sahani, McGraw Hill Education, 2007 Edition.
9. Physics for Animators – Michele Bouquet with Alejandro Garcia, CRC Press, Taylor & Francis.

Web Links and Video Lectures (e-Resources):

1. NPTEL – Quantum Mechanics I (IIT Madras):https://nptel.ac.in/courses/115106066
2. NPTEL – Physics: Introductory Quantum Mechanics (NOC): https://archive.nptel.ac.in/courses/115/104/115104096
3. Solid State Physics – NPTEL (IIT Madras):https://nptel.ac.in/courses/115106127
4. A Brief Course on Superconductivity – NPTEL (IIT Guwahati), Prof. Saurabh Basu *(Link not provided; title only)*
5. YouTube Playlist Introduction Video:https://www.youtube.com/watch?v=SHoGV-sezNI
6. Full Playlist Available via YouTube Channel Description or Archive Link
7. Concepts in Magnetism and Superconductivity – NOC (IIT Kharagpur) Lecture 1:https://digimat.in/nptel/courses/video/115105131/L01.html
8. Introduction to Photonics – NPTEL (IIT Madras, Prof. Balaji Srinivasan) Lecture 03 to Lecture 12:Start from Lecture 03
9. Semiconductor Optoelectronics – NPTEL (IIT Delhi, Prof. M. R. Shenoy) Relevant Lecture Link
10. Lecture 04 – Quantum Computing Basics:https://www.youtube.com/watch?v=-fttE1SzpD8
11. Lecture 08 – Quantum Gates and Circuits Part 1:https://www.youtube.com/watch?v=nGPr1QM_XrY

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

CO1	**Interpret the interaction of radiation with matter** and the operational principles of photonic devices such as lasers, optical fibers, modulators, and photodetectors.
CO2	**Explain the core concepts of quantum mechanics** such as matter waves, the uncertainty principle, wave functions, and quantization of energy, with relevance to computational applications.
CO3	**Analyze the behavior of electrons in metals and semiconductors** using classical and quantum models to derive key material properties such as conductivity and carrier concentration.
CO4	**Evaluate the principles and characteristics of superconductivity**, including Meissner's effect, critical parameters, and Cooper pair formation, and their relevance in quantum systems.
CO5	**Summarize the basic concepts of quantum computing**, including qubits, quantum gates, and quantum logic, and predict simple outcomes using theoretical circuit models.

Applied Chemistry for Sustainable Structures & Material Design		Semester	1/2
Course Code	CVCHE102/202	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:0:2:0	SEE Marks	50
Total Hours	40Hours Theory	Total Marks	100
Credits	4 Credits	Exam Hours	3 Hours
Examination type (SEE)	**Theory**		

Course Objectives:

1. To enable students to aquire knowledge on basic principles of chemistry for engineering applications.
2. To develop an intuitive understanding of chemistry by emphasizing the related branches of engineering.
3. To provide students with a solid foundation in analytical reasoning required to solve societal problems.

Module	Hours
Module-1 **Energy Systems and Green Fuels** **Electrochemistry**: Introduction, electrode potential, overview of Nernst equation, concentration cell, numerical problems. **Energy systems**: Batteries-Introduction, classification of batteries, characteristics-capacity, power density, cell balancing and cycle life, construction, working and applications of Li-ion battery, Na-Ion, Li-MnO2.Construction,working and applications of Lead-acid storage battery. Fuel cells - Introduction, construction and working of Methanol-Oxygen fuel cell. **Green Fuels**: Introduction, green hydrogen production by TiO2-Photocatalytical method and applications. **Self Learning** : synthesis by trans-esterification method, advantages and its applications. Production of green hydrogen by photocatalytic water splitting and its advantages.	08
Module-2 **Materials for Structural Integrity** **Polymer**: Introduction, polymerization, types. **Conducting polymers**– synthesis and conducting mechanism of Polyacetylene and Polyaniline. **Fibers:** Introduction, synthesis, properties and industrial applications of Kevlar and Polyester. **Plastics:** Introduction, synthesis, properties and industrial applications of poly (methylmethacrylate)(PMMA) and Teflon. **Polymer composites**: Introduction, properties and applications of fiber reinforced polymers composites(FRPC). **Nanomaterials**: Introduction, size dependent properties *viz*; surface area, water absorption, thermal properties and antimicrobial activity, synthesis of TiO2 nanoparticles by sol-gel method for sensor applications. **Self Leaning :** concrete as composite material, composition of nano-concrete	08
Module-3 **Conventional and Sustainable Construction Materials** **Cement**: Introduction, composition, manufacturing process of cement-wet process, process of setting and hardening of cement, special cements-composition, properties and applications. **Geopolymer Concrete**: Introduction, mechanism of geopolymerization and manufacturing process of geopolymer concrete. **Biopolymers**: Polylactic Acid(PLA)-synthesis, properties and applications. **Photochromic Coatings**: Introduction, spiropyran as photochromic coating, working principle with chemical reactions and applications in construction activities. **Piezoelectric Cement Composites**: Introduction, piezoelectric materials in cement composites and its applications in civil engineering. **Self Learning**: Additives of cement & testing of cement.	08

Module-4 **Corrosion Science and Surface Protection** **Corrosion:** Introduction, electrochemical theory of corrosion, types of corrosion-differential metal and differential aeration corrosion, corrosion control-metal coating; galvanization, surface conversion coating; anodization and cathodic protection; sacrificial anode method, corrosion penetration rate (CPR) - Introduction and numerical problems, factors affecting corrosion. **Coating Technologies:** Introduction, technological importance, electroplating - electroplating of chromium; hard and decorative, electro-less plating - electroless plating of Nickel, difference between electroplating and electroless plating. **Self Learning : Metals and Alloys:** Introduction, classification of metals: ferrous and non-ferrous, composition, properties, applications of iron and its alloys-wrought iron, cast iron, pig iron and steel, aluminium and its alloys-Duralumin and Magnalium.	08
Module-5 **Water Chemistry and Analytical Techniques** **Water Chemistry**: Introduction, sources and nature of impurities of water, hardness of water, types of hardness, determination of temporary, permanent and total hardness and numerical problems. Determination of total hardness by EDTA method. Softening of water by Lime-Soda Process, determination of COD, numerical problems. **Analytical Techniques:** Introduction, potentiometric sensors: principle, instrumentation and application in estimation of iron in industrial effluents, conductometric sensors: principle, instrumentation and application in determination of acid mixture in water and industrial effluents: colorimetric sensor- principle, instrumentation and estimation of copper in brass alloy. **Self learning: Purification of water:** Reverse osmosis and chlorination methods.	08

List of Laboratory Experiments/Activities: (for integrated courses)

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

Semester End Examination (SEE):

Theory SEE will be conducted by Institute as per the scheduled timetable, with common question papers for the course

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.

Suggested Learning Resources: Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year):

Text Books:

1. WileyEngineeringChemistry,WileyIndiaPvt.Ltd.NewDelhi,2013-2nd Edition.
2. ATextbookofEngg.Chemistry,ShashiChawla,DhanpatRai&Co.(P)Ltd.

3. ATextbookofEngineeringChemistry,R.V.GadagandNityanandaShetty,I.K. International Publishing house. 2nd Edition, 2016.

Reference Books:

1. EngineeringChemistry,Satyaprakash&ManishaAgrawal,KhannaBookPublishing,Delhi
2. Nanotechnology A Chemical Approach to Nanomaterials, G.A. Ozin & A.C. Arsenault, RSC Publishing, 2005.
3. Corrosion Engineering, M. G. Fontana, N. D. Greene, McGraw Hill Publications, New York, 3rd Edition, 1996.
4. Linden'sHandbookofBatteries,KirbyW.Beard,FifthEdition,McGrawHill,2019.
5. AppliedChemistryforMechanicalEngineeringandAlliedBranches,CManasa,Vrushabendra B, Srikantamurthy N. ISBN: 978-93-58380-90-3, Astitva Prakashan
6. ExpandingtheVisionofSensorMaterials.NationalResearchCouncil1995,Washington,DC: The National Academies Press. doi:10.17226/4782.
7. Engineering Chemistry, Edited by Dr. Mahesh B and Dr. Roopashree B, Sunstar Publisher, Bengaluru, ISBN 978-93-85155-70-3, 2022
8. PolymerScience,VRGowariker,NVViswanathan,Jayadev,Sreedhar,NewageInt.Publishers, 4th Edition, 2021
9. ChemistryforEngineeringStudents,B.S.JaiPrakash,R.Venugopal,Sivakumaraiah& Pushpa Iyengar., Subash Publications, 5th Edition, 2014
10. PrinciplesofInstrumentalAnalysis,DouglasA.Skoog,F.JamesHoller,StanleyR.Crouch SeventhEdition,CengageLearning,2020

Web links and Video Lectures (e-Resources):

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

https://pmc.ncbi.nlm.nih.gov/articles/PMC11085161/?utm_source

Course outcome : At the end of the course the student will be able to:	
CO1	Understand electrochemical principles, energy storage systems and green hydrogen production for sustainable energy applications.
CO2	Analyze polymers, nanomaterials and composite materials for structural integrity and sensor applications.
CO3	Evaluate sustainable construction materials like geopolymer concrete, biopolymers and smart coatings including photochromic and piezoelectric composites.
CO4	Explain corrosion mechanisms in metals and alloys, types of corrosion in civil structures and apply metal finishing techniques for surface protection.
CO5	Apply water chemistry principles and analytical techniques like potentiometry, Conductometry and colorimetry for environmental and industrial water quality assessment.

Applied chemistry for Advanced Metal Protection and Sustainable Energy System		Semester	1/2
Course Code	**MECHE102/202**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:0:2:0	SEE Marks	50
Total Hours	40Hours Theory	Total Marks	100
Credits	4 Credits	Exam Hours	3 Hours
Examination type (SEE)	**Theory**		

Course Objectives:

1. To enable students to aquire knowledge on basic principles of chemistry for engineering applications.
2. To develop an intuitive understanding of chemistry by emphasizing the related branches of engineering.
3. To provide students with a solid foundation in analytical reasoning required to solve societal problems.

Module	Hours
Module-1 **Corrosion Science and Coating Technologies** **Corrosion:** Introduction, electrochemical theory of corrosion, types of corrosion-differential metal and differential aeration corrosion, factors affecting corrosion. Corrosion control-metal coating; galvanization, surface conversion coating; anodization and cathodic protection; sacrificial anode method, corrosion penetration rate (CPR) - Introduction and numerical problems. **Coating Technologies:** Introduction, technological importance, electroplating - electroplating of chromium; hard and decorative, electro-less plating - electroless plating of Nickel, difference between electroplating and electroless plating. **Self-learning:** Electroless plating of copper in the manufacture of PCB.	08
Module-2 **Sustainable Green Fuels** **Fuels:** Introduction, calorific value, determination of calorific value using bomb calorimeter, numerical problems on GCV and NCV. Cracking, Fluidized bed catalytic cracking method & Reforming of petrol, importance of octane and cetane rating of fuel. **Green Fuels**: Introduction, power alcohol–properties, applications and its limitations, biodiesel - synthesis by trans-esterification method, advantages and its applications. Production of green hydrogen by photocatalytic water splitting and its advantages, hydrogen storage – introduction, advantages and limitations of metal hydride and ammonia as chemical hydrogen carriers. **Self-learning:** Electroless plating of copper in the manufacture of PCB.	08
Module-3 **Materials for Energy Systems** **Nanomaterials:** Introduction, synthesis of TiO_2nanoparticles by sol-gel method for catalytic converter applications, size-dependent properties of nanomaterial-surface area, catalytical, electrical and thermal conductivity. Graphene - Synthesis by chemical vapor deposition method, properties and engineering applications, role of carbon nanotubes (CNTs) in energy devices. **Energy Systems:** Batteries- Introduction, classification of batteries, characteristics-capacity, power density, cell balancing and cycle life. Construction, working and applications of Li-ion battery, Li-MnO_2, Lead-acid storage battery. Fuel cells - Introduction, construction and working of Methanol-Oxygen fuel cell. **Self learning**: Introduction, construction and working of solid oxide fuel (SOFCs) for auxiliary power units (APUs) applications, difference between fuel cell and battery, photovoltaic cells (PV cells) - construction, working, advantages and limitations.	08

Module-4 **Materials for Engineering Applications** **Polymers**: Introduction, types of polymerization (Addition and Condensation).Free radical mechanism of addition polymerization by ethylene. Techniques of addition polymerization, molecular weight; number average and weight average, numerical problems. Glass transition temperature, factors affecting Tg and its significance. Synthesis, properties and industrial applications of polyvinylchloride (PVC), poly(methylmethacrylate)(PMMA) and Teflon. **Conducting polymers**–synthesis and conducting mechanism of Polyacetylene and Polyaniline. **Fibers:** Introduction, synthesis, properties and industrial applications of Kevlar and Polyester. **Polymer composites**: Introduction, properties and applications of fiber reinforced polymers composites(FRPC). **Self learning: 3D Printing materials:** Introduction, synthesis, properties and applications of polylactic acid (PLA) resin.	08
Module-5 **Water Technology and Smart Sensors** **Water technology:** Introduction, sources and nature of impurities of water, hardness of water, types of hardness, determination of temporary, permanent and total hardness and numerical problems. Determination of total hardness by EDTA method. Softening of water by Lime-Soda Process, determination of COD, numerical problems. **Sensors:** Introduction, potentiometric sensor - principle and its application in the estimation of iron in steel industry effluent, conductometric sensor - principle and its application in the estimation of acids in electrochemical bath effluent. pH sensor - principle and its application in the estimation of pKa of acid electrolyte. **Self learning: Purification of water:**Reverseosmosis and chlorination methods.	08

List of Laboratory Experiments/Activities: (for integrated courses)

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

Semester End Examination (SEE):

Theory SEE will be conducted by Institute as per the scheduled timetable, with common question papers for the course

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
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Suggested Learning Resources: Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year):

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4. WileyEngineeringChemistry,WileyIndiaPvt.Ltd.NewDelhi,2013-2nd Edition.
5. ATextbookofEngg.Chemistry,ShashiChawla,DhanpatRai&Co.(P)Ltd.

6. ATextbookofEngineeringChemistry,R.V.GadagandNityanandaShetty,I.K. International Publishing house. 2nd Edition, 2016.

Reference Books:

1. EngineeringChemistry,Satyaprakash&ManishaAgrawal,KhannaBookPublishing,Delhi
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4. Linden'sHandbookofBatteries,KirbyW.Beard,FifthEdition,McGrawHill,2019.
5. AppliedChemistryforMechanicalEngineeringandAlliedBranches,CManasa,Vrushabendra B, Srikantamurthy N. ISBN: 978-93-58380-90-3, Astitva Prakashan
6. ExpandingtheVisionofSensorMaterials.NationalResearchCouncil1995,Washington,DC: The National Academies Press. doi:10.17226/4782.
7. Engineering Chemistry, Edited by Dr. Mahesh B and Dr. Roopashree B, Sunstar Publisher, Bengaluru, ISBN 978-93-85155-70-3, 2022
8. PolymerScience,VRGowariker,NVViswanathan,Jayadev,Sreedhar,NewageInt.Publishers, 4th Edition, 2021
9. ChemistryforEngineeringStudents,B.S.JaiPrakash,R.Venugopal,Sivakumaraiah& Pushpa Iyengar., Subash Publications, 5th Edition, 2014
10. PrinciplesofInstrumentalAnalysis,DouglasA.Skoog,F.JamesHoller,StanleyR.Crouch SeventhEdition,CengageLearning,2020

Web links and Video Lectures (e-Resources):

1. https://www.vturesource.com/post/1570/News/Bomb-calorimeter-construction-working-vtu-chemistry.html?utm_source
2. https://pubs.acs.org/doi/10.1021/acsomega.3c00963?utm_source
3. https://youtu.be/qTw_p9dkiVU
4. https://youtu.be/wdCYXj-bI-U
5. https://youtu.be/Y0EkLYK5i-c
6. https://youtu.be/tzTxMF7CDd4
7. https://youtu.be/YxrpQEX9ORA
8. https://youtu.be/Gxv4r9qoRf8
9. https://youtu.be/XIjDw5Sw9c4
10. https://youtu.be/j_rNjiIiBKE
11. https://youtu.be/GpbcjWstzEE
12. https://youtu.be/ygtbo5KDXeI
13. https://www.youtube.com/watch?v=ygtbo5KDXeI
14. https://youtu.be/y-7t-GdRTKA
15. https://pmc.ncbi.nlm.nih.gov/articles/PMC11085161/?utm_source

Course outcome (Course Skill Set): At the end of the course the student will be able to:

CO1	Understand corrosion mechanism, types of corrosion, evaluate corrosion control with coating techniques.
CO2	Understanding the concept of calorific value & production of green hydrogen.
CO3	Analyze the energy storage system and demonstrate knowledge of nanomaterials.
CO4	Understand the role of functional polymer & composite in flexible electronic applications.
CO5	Apply the principles of water technology & electrochemical concepts for sensor systems.

Applied Chemistry for Emerging Electronics and Futuristic Devices		Semester	1/2
Course Code	EECHE102/202	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:0:2:0	SEE Marks	50
Total Hours	40Hours Theory	Total Marks	100
Credits	4 Credits	Exam Hours	3 Hours
Examination type (SEE)	**Theory(Descriptive)**		

Course Objectives:

1. To enable students to aquire knowledge on basic principles of chemistry for engineering applications.
2. To develop an intuitive understanding of chemistry by emphasizing the related branches of engineering.
3. To provide students with a solid foundation in analytical reasoning required to solve societal problems.

Module	Hours
Module-1 **Materials for Energy Devices** **Semiconductors:** Introduction, n-type and p-type semiconductor materials, difference between organic and inorganic semiconductors. **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, Na-Ion, Li-Polymer battery advantages in EV applications, **Energy Conversion Devices**: Introduction, construction, working principal, advantages and applications of photovoltaic cell of (PV cell), Construction, working and applications of lead-acid storage battery, Ni-MH battery and Li-MnO_2 battery. **Self Learning:** Introduction to MEMS-Based Energy Harvesters, working principle and applications. organic photovoltaics - Poly (3-hexylthiophene) (P3HT) as a donor and Phenyl-C61-butyric acid methyl ester (PCBM) as a acceptor, construction, working and applications.	08
Module-2 **Water Technology, Nanotechnology & Quantum Dots** **Water technology:** Introduction, sources and nature of impurities of water, hardness of water, types of hardness, determination of temporary, permanent and total hardness and numerical problems. Determination of total hardness by EDTA method. Softening of water by Lime-Soda Process, determination of COD, numerical problems. **Purification of water:** Reverse osmosis and chlorination methods. **Nanotechnology:** Introduction, definition, properties and engineering applications of carbon nanotubes & graphene. **Quantum Dots:** Introduction, size dependent properties -quantum confinement effect, surface-to-volume ratio & band gap, synthesis and applications of Cd-Se Quantum dots by wet chemical method **Self Learning:** Introduction, classification, properties and application of silicon carbide.	08
Module-3 **Functional Polymers and Hybrid Composites in Flexible Electronics** **Polymers:** Introduction, types of polymerization (Addition and Condensation).Free radical mechanism of addition polymerization by ethylene. Techniques of addition polymerization. Number average molecular weight and weight average molecular weight and numericals, synthesis and properties of Polydimethylsiloxane (PDMS) in RFID (Radio Frequency Identification) applications, synthesis and properties of Polyvinylidene Fluoride (PVDF) applications in E-nose devices. **Conducting Polymers**: Synthesis, conduction mechanism of polyaniline and Polyacetylene. **Polymer Composites:** Introduction, synthesis and properties of epoxy resin- Fe_3O_4 composite for sensors applications, synthesis of Kevlar Fiber Reinforced Polymer (KFRP)-properties and smart electronic devices applications. **Self Learning: Stretchable and Wearable Microelectronics:** Introduction, basic principle	08

and working of Lithography for micro-patterned copper deposition, synthesis, properties and applications of PDMS (Polydimethylsiloxane) in e-skin (electronic skin) applications.	
Module-4 **Electrode System and Electrochemical Sensors** **Electrode System:** Introduction, types of electrodes, Nernst equation (Preview), reference electrode, construction, working and applications of calomel electrode, Ion selective electrode-definition, construction, working of glass electrode, determination of pH using glass electrode, construction and working of concentration cell and numerical. **Sensing Methods:** Introduction, principle and instrumentation of colorimetric sensors; its application in the estimation of copper in given solution, principle and instrumentation of potentiometric sensors; applications in the estimation of iron in steel, conductometric sensors; its application in the estimation of acid mixture in sample. **Self Learning:** Electrode potential, derivation of Nearnst equation.	08
Module-5 **Corrosion Science and E-waste Management** **Corrosion Chemistry:** Introduction, electrochemical theory of corrosion, types of corrosion differential metal corrosion and differential aeration corrosion, factors affecting corrosion. Corrosion control-galvanization and anodization, cathodic protection and impressed current method, sacrificial anode method. corrosion penetration rate (CPR)- definition, importance and numerical problems. **Metal Finishing:** Introduction, difference between electroplating & electroless plating, electroplating of chromium for hard and decorative coatings, electroless plating of copper on PCBs. **E-waste:** Introduction, need of e-waste management, sources & effects of e-waste on environment and human health, extraction of gold from e-waste from bioleaching method. **Self learning:** Toxic materials and characteristics of e-waste and role of stake holders in e-waste management.	08

List of Laboratory Experiments/Activities: (for integrated courses)

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

Semester End Examination (SEE):

Theory SEE will be conducted by Institute as per the scheduled timetable, with common question papers for the course

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.

Suggested Learning Resources: Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year):

Text Books:

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

Reference Books:

1. EngineeringChemistry,Satyaprakash&ManishaAgrawal,KhannaBookPublishing,Delhi
2. Nanotechnology A Chemical Approach to Nanomaterials, G.A. Ozin & A.C. Arsenault, RSC Publishing, 2005.
3. Corrosion Engineering, M. G. Fontana, N. D. Greene, McGraw Hill Publications, New York, 3rd Edition, 1996.
4. Linden'sHandbookofBatteries,KirbyW.Beard,FifthEdition,McGrawHill,2019.
5. AppliedChemistryforMechanicalEngineeringandAlliedBranches,CManasa,Vrushabendra B, Srikant amurthy N. ISBN: 978-93-58380-90-3, Astitva Prakashan
6. ExpandingtheVisionofSensorMaterials.NationalResearchCouncil1995,Washington,DC: The National Academies Press. doi:10.17226/4782.
7. Engineering Chemistry, Edited by Dr. Mahesh B and Dr. Roopashree B, Sunstar Publisher, Bengaluru, ISBN 978-93-85155-70-3, 2022
8. PolymerScience,VRGowariker,NVViswanathan,Jayadev,Sreedhar,NewageInt.Publishers, 4th Edition, 2021
9. ChemistryforEngineeringStudents,B.S.JaiPrakash,R.Venugopal,Sivakumaraiah& Pushpa Iyengar., Subash Publications, 5th Edition, 2014
10. PrinciplesofInstrumentalAnalysis,DouglasA.Skoog,F.JamesHoller,StanleyR.Crouch SeventhEdition,CengageLearning,2020

Web links and Video Lectures (e-Resources):

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

https://pmc.ncbi.nlm.nih.gov/articles/PMC11085161/?utm_source

Course outcome (Course Skill Set): At the end of the course the student will be able to:

CO1	Understand and analyze the properties, classification and applications of semiconductor materials, energy storage and conversion devices.
CO2	Demonstrate knowledge of nanomaterials, quantum dots including their synthesis, properties and device applications & apply water chemistry principles.
CO3	Explain the role of functional polymers and composites in flexible electronic applications.
CO4	Apply electrochemical concepts and sensor systems.
CO5	Understand corrosion mechanism, types of corrosion, evaluate corrosion control and e-waste management technique.

Applied Chemistry for Smart Systems (CSE stream)		Semester	1/2
Course Code	CSCHE102/202	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:0:2:0	SEE Marks	50
Total Hours	40Hours Theory	Total Marks	100
Credits	4 Credits	Exam Hours	3 Hours
Examination type (SEE)	**Theory(Descriptive)**		

Course Objectives:

1. **To enable students to acquire knowledge on basic principles of chemistry for engineering applications.**
2. **To develop an intuitive understanding of chemistry by emphasizing the related branches of engineering.**
3. **To provide students with a solid foundation in analytical reasoning required to solve societal problems.**

Module	Hours
Module-1 **Sustainable Chemistry for Energy Devices** **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, Na-Ion, Li-Polymer battery advantages in EV applications, **Energy Conversion Devices**: Introduction, construction, working principal, advantages and applications of photovoltaic cell of (PV cell), Construction, working and applications of lead-acid storage battery, Ni-MH battery and Li-MnO2 battery. **Clean Energy Chemistry:** Introduction, fuel cell, difference between fuel cell and battery, construction, working principle, applications and limitations of solid-oxide fuel cell (SOFCs). **Self learning :** organic photovoltaic's - Poly (3-hexylthiophene) (P3HT) as a donor and Phenyl- C61-butyric acid methyl ester (PCBM) as a acceptor, construction, working and applications.	08
Module-2 **Polymers and Quantum Materials** **Polymer**: Introduction, types of polymerization(Addition and Condensation).Free radical mechanism of addition polymerization by ethylene. Techniques of addition polymerization, molecularweight; number average and weight average, numerical problems. Glass Tranition Temperature, factors affecting Tg & its significance. structure-property relationship of polymers, , synthesis and properties of PVC and PMMA for device applications. **Conducting polymers**- Introduction, synthesis & conduction mechanism of Polyaniline & Polyacetylene. **Quantum Dots:** Introduction, size dependent properties -quantum confinement effect, surface-to-volume ratio & band gap, synthesis and applications of Cd-Se Quantum dots by wet chemical method **Self Leaning**: quantum dot sensitized solar cells (QDSSCs)-construction, working principle and applications. synthesis and properties of nylon-12 advantages in 3D printing applications.	08
Module-3 **Chemical Sensors and Corrosion Control** **Sensor:** Introduction, principle and instrumentation of colorimetric sensors; its application in the estimation of copper in given solution, principle and instrumentation of potentiometric sensors; applications in the estimation of iron in steel, conductometric sensors; its application in the estimation of acid mixture in sample. **Corrosion Chemistry:** Introduction, electrochemical theory of corrosion, types of corrosion differential metal corrosion and differential aeration corrosion, factors affecting corrosion. Corrosion control-galvanization and anodization, cathodic protection and impressed current method, sacrificial anode method. Corrosion penetration rate (CPR)- definition, importance and numerical problems. **Self Learning :** Electroless plating of copper in the manufacture of PCB	08
Module-4	08

Green Materials and E-Waste Management **Green Fuels**: Introduction, green hydrogen production by TiO2-Photocatalytical method and applications. synthesis by trans-esterification method, advantages and its applications. Production of green hydrogen by photocatalytic water splitting and its advantages. **E-waste:** Introduction, sources, composition of e-waste, effects of e-waste on environment and human health, Artificial intelligence in e-waste management and its applications, extraction of gold from e-waste by bioleaching method, direct recycling method of lithium-ion batteries. **Self Learning : Biomaterials:** Introduction, synthesis and properties of polylactic Acid (PLA) and polyethylene glycol (PEG) for touch screen applications, synthesis and properties of Alginate Hydrogel for Brain-Computer Interfaces (BCIs) applications.	
Module-5 **Water Technology and Nanotechnology** **Water technology:** Introduction, sources and nature of impurities of water, hardness of water, types of hardness, determination of temporary, permanent and total hardness and numerical problems. Determination of total hardness by EDTA method. Softening of water by Lime-Soda Process, determination of COD, numerical problems. **Purification of water:** Reverse osmosis and chlorination methods. **Nanotechnology:** Introduction, definition, properties and engineering applications of carbon nanotubes & graphene. **Self Learning:** Introduction, classification, properties and application of silicon carbide.	08

List of Laboratory Experiments/Activities: (for integrated courses)

13. Estimation of total hardness of water by EDTA method
14. Determination of chemical oxygen demand(COD) of industrial waste water
15. Estimation of iron in steel industry effluent by diphenylamine indicator method
16. Determination of alkalinity of water using standard NaOH solution
17. Estimation of acid mixture in electrochemical bath effluent using conductometric sensor(Conductometry)
18. Estimation of iron in rust sample by Potentiometric sensor(Potentiometry)
19. Determination of pKa ofacid electrolyte using pH sensor(Glass electrode)
20. Estimation of copper presentine-waste by optical sensor(Colorimetry)
21. Determination of viscosity coefficient of lubricant using Ostwald's viscometer
22. Determination of acid value of biofuel
23. Green synthesis of copper nanoparticles for conductive inks
24. Synthesis of polylacticacid(PLA)

Semester End Examination (SEE):

Theory SEE will be conducted by Institute as per the scheduled timetable, with common question papers for the course

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.

Suggested Learning Resources: Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year):

Text Books:

4. WileyEngineeringChemistry,WileyIndiaPvt.Ltd.NewDelhi,2013-2nd Edition.
5. ATextbookofEngg.Chemistry,ShashiChawla,DhanpatRai&Co.(P)Ltd.
6. ATextbookofEngineeringChemistry,R.V.GadagandNityanandaShetty,I.K. International Publishing house. 2nd Edition, 2016.

Reference Books:

1. EngineeringChemistry,Satyaprakash&ManishaAgrawal,KhannaBookPublishing,Delhi

2. Nanotechnology A Chemical Approach to Nanomaterials, G.A. Ozin & A.C. Arsenault, RSC Publishing, 2005.
3. Corrosion Engineering, M. G. Fontana, N. D. Greene, McGraw Hill Publications, New York, 3rd Edition, 1996.
4. Linden'sHandbookofBatteries,KirbyW.Beard,FifthEdition,McGrawHill,2019.
5. AppliedChemistryforMechanicalEngineeringandAlliedBranches,CManasa,Vrushabendra B, Srikantamurthy N. ISBN: 978-93-58380-90-3, Astitva Prakashan
6. ExpandingtheVisionofSensorMaterials.NationalResearchCouncil1995,Washington,DC: The National Academies Press. doi:10.17226/4782.
7. Engineering Chemistry, Edited by Dr. Mahesh B and Dr. Roopashree B, Sunstar Publisher, Bengaluru, ISBN 978-93-85155-70-3, 2022
8. PolymerScience,VRGowariker,NVViswanathan,Jayadev,Sreedhar,NewageInt.Publishers, 4th Edition, 2021
9. ChemistryforEngineeringStudents,B.S.JaiPrakash,R.Venugopal,Sivakumaraiah& Pushpa Iyengar., Subash Publications, 5th Edition, 2014
10. PrinciplesofInstrumentalAnalysis,DouglasA.Skoog,F.JamesHoller,StanleyR.Crouch SeventhEdition,CengageLearning,2020

Web links and Video Lectures (e-Resources):

15. https://www.vturesource.com/post/1570/News/Bomb-calorimeter-construction-working-vtu-chemistry.html?utm_source
16. https://pubs.acs.org/doi/10.1021/acsomega.3c00963?utm_source
17. https://youtu.be/qTw_p9dkiVU
18. https://youtu.be/wdCYXj-bI-U
19. https://youtu.be/Y0EkLYK5i-c
20. https://youtu.be/tzTxMF7CDd4
21. https://youtu.be/YxrpQEX9ORA
22. https://youtu.be/Gxv4r9qoRf8
23. https://youtu.be/XIjDw5Sw9c4
24. https://youtu.be/j_rNjiIiBKE
25. https://youtu.be/GpbcjWstzEE
26. https://youtu.be/ygtbo5KDXeI
27. https://www.youtube.com/watch?v=ygtbo5KDXeI
28. https://youtu.be/y-7t-GdRTKA

https://pmc.ncbi.nlm.nih.gov/articles/PMC11085161/?utm_source

Course outcome (Course Skill Set): At the end of the course the student will be able to:

CO1	Understand energy storage, conversion devices & clean energy chemistry.
CO2	Explain the role of functional polymers in flexible electronic applications & Quantum dots including their synthesis, properties and device applications.
CO3	Apply concepts of sensors, corrosion mechanism, types of corrosion and corrosion control.
CO4	Understanding green materials in sustainable energy application and e-waste management techniques.
CO5	Understand principles of water technology and demonstrate the knowledge of nanomaterials.

Computer Aided Engineering Drawing for CV Stream		Semester	I/II
Course Code	CVCED103/203	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	2 :0 :2 : 0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03
Examination type(SEE)	Theory (Conducted in batches similar to practical's)		

Course Objectives

Module	Hours
Module-1 **Introduction:** Significance of Engineering drawing, BIS Conventions of Engineering Drawing, Freehand sketching of engineering drawing, Scales. Introduction to Computer Aided Drafting software, Co-ordinate system and reference planes HP, VP, RPP & LPP of 2D/3D environment. Selection of drawing sheet size and scale. Commands and creation of Lines, coordinate points, axes, polylines, square, rectangle, polygons, splines, circles, ellipse, text, move, copy, off-set, mirror, rotate, trim, extend, break, chamfer, fillet and curves. **Orthographic Projections of Points, Lines and Planes:** Introduction to Orthographic projections, Orthographic projections of points in1st and 3rdquadrants. Orthographic projections of lines (Placed in First quadrant only as per BIS) Orthographic projections of planes: triangular, square, rectangular, pentagonal, hexagonal and circular lamina (Placed in First quadrant only using change of position method).	08
Module-2 **Orthographic Projection of Solids:** Orthographic projection of right regular solids (Resting on HP only and inclined to both the planes); Prisms, Pyramids, Cylinders & Cones.	08
Module-3 **Section of Solids:** Introduction, Section planes, Sectional views: apparent shapes and true shapes, Sections of right regular prisms, pyramids, cylinders and cones resting with their base on HP. (Concepts only and No Problems for practice) **Development of Lateral Surfaces of Solids:** Development of lateral surfaces of right regular Prisms, Pyramids, Cylinders & Cones and their frustums and truncations. **Module-4** **Isometric Views:** Introduction to Isometric views, Isometric projections, Isometric scale. Isometric view of hexahedron (cube),right regular prisms, pyramids, cylinders,cones and spheres, Isometric view of combination of two simple solids. Conversion of simple isometric drawings into orthographic views: Problems on conversion of Isometric view of simple objects / engineering components into orthographic views.	08

Module-5 **Section of Solids:** Introduction, Section planes, Sectional views: apparent shapes and true shapes, Sections of right regular prisms, pyramids, cylinders and cones resting with their base on HP. (Concepts only and No Problems for practice) **Development of Lateral Surfaces of Solids:** Development of lateral surfaces of right regular Prisms, Pyramids, Cylinders & Cones and their frustums and truncations.	08

Suggested Learning Resources:(Textbook/ReferenceBook/Manuals):

Text books:

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

Reference books:

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

Web links and Video Lectures (e-Resources):

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

Teaching-LearningProcess(InnovativeDeliveryMethods):

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.

- FlippedClassroom
- Case-BasedTeaching
- SimulationandVirtual Labs
- Partial Deliveryof course by Industry expert/industrial visits
- ICT-EnabledTeaching

Semester End Examination (SEE):

- SEE shall be conducted in batches similar to practical's and evaluated for maximum of 100 Marks. Obtained marks shall be accounted for SEE final marks, reducing it by 50%.
- TwofullquestionsshallbesetfromModules1,2,3 and 4.Studentsneedtoansweronefullquestion from each module.
- Two full questions set from each Module shall cover the entire topic of the respective module.
- Question papers shall be provided by the University for each batch as per schedule.
- SEE shall be conducted by one Internal and one External Examiner.
- Evaluation shall be carried out jointly by both the examiners.

The student may be awarded full marks, if he/she completes a solution on computer display without sketch.	
CO	**Course Outcomes**
CO1	Generate orthographic projections of points, lines, planes, and solids manually and with computer- aided tools.
CO2	Develop the lateral surfaces of solids for real-world applications.
CO3	Draw isometric views and convert isometric drawings to orthographic views.
CO4	Create 3D models of basic building components.

Computer Aided Engineering Drawing for ME Stream		Semester	I/II
Course Code	MECED103/203	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	2 :0 :2 : 0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03
Examination type(SEE)	Theory (Conducted in batches similar to practical's)		

Course Objectives

Module	Hours
Module-1 **Introduction:** Significance of Engineering drawing, BIS Conventions of Engineering Drawing, Freehand sketching of engineering drawing, Scales. Introduction to Computer Aided Drafting software, Co-ordinate system and reference planes HP, VP, RPP & LPP of 2D/3D environment. Selection of drawing sheet size and scale. Commands and creation of Lines, coordinate points, axes, polylines, square, rectangle, polygons, splines, circles, ellipse, text, move, copy, off-set, mirror, rotate, trim, extend, break, chamfer, fillet and curves. **Orthographic Projections of Points, Lines and Planes:**Introduction to Orthographic projections, Orthographic projections of points in 1st and 3rd quadrants. Orthographic projections of lines (Placed in First quadrant only as per BIS) Orthographic projections of planes: triangular, square, rectangular, pentagonal, hexagonal and circular lamina (Placed in First quadrant only using change of position method).	08
Module-2 **Orthographic Projection of Solids:** Orthographic projection of right regular solids (Resting on HP only and inclined to both the planes); Prisms, Pyramids, Cylinders & Cones.	08
Module-3 **Section of Solids:** Introduction, Section planes, Sectional views: apparent shapes and true shapes, Sections of right regular prisms, pyramids, cylinders and cones resting with their base on HP. (Concepts only and No Problems for practice) **Development of Lateral Surfaces of Solids:** Development to lateral surfaces of right regular Prisms, Pyramids, Cylinders & Cones and their frustums and truncations.	08
Module-4 **Isometric Views:** Introduction to Isometric views, Isometric projections, Isometric scale. Isometric view of hexahedron (cube), right regular prisms, pyramids, cylinders, cones and spheres, Isometric view of combination of two simple solids. **Conversion of simple isometric drawing sin to orthographic views:** Problems on conversion of Isometric view of simple objects / engineering components into orthographic views.	08
Module-5 **Concept of Part Design(For CIE Only):** 3D Modeling:Simple machine parts/engineering components.(Applying material properties and rendering for realistic visualization) Sheet Metal & Surface Design: Automotive panels, HVAC ducting Concept of Industrial drawing	08

Suggested Learning Resources:(Textbook/Reference

Book/Manuals): <u>Textbooks:</u>

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

<u>Reference books:</u>

1. S. N. Lal and T. Madhu sudhan, Engineering Visualisation, engage Learning India Pvt. Ltd.; First Edition, 2022
2. P.J.Shah, Computer Aided Engineering Drawing, S. ChandPublishing,2021
3. M.B.Shah & B.C.Rana.,Engineering Drawing, Pearson Education, Revised Edition,2009

Web links and Video Lectures (e-Resources):

- https://nptel.ac.in/courses/112104172
- https://nptel.ac.in/courses/112102304
- https://nptel.ac.in/courses/112105294
- https://www.coursera.org/courses?query=3d%20modeling&utm
- https://www.classcentral.com/subject/sheet-metal-design?utm

Teaching-Learning Process (Innovative Delivery Methods):

Thefollowingaresamplestrategiesthateducatorsmayadopttoenhancetheeffectivenessoftheteaching-learning process and facilitate the achievement of course outcomes.

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

Semester End Examination (SEE):

- SEE shall be conducted in batches similar to practicals and evaluated for maximum of 100 Marks. Obtained marks shall be accounted for SEE final marks, reducing it by 50%.
- Two full questions shall be set from Modules 1, 2,3and4.Students need to answer one full question from each module.
- Two full questions set from each Module shall cover the entire topic of the respective module.
- Question papers shall be provided by the University for each Batch as per schedule.
- SEE shall be conducted by one Internal and one External Examiner.
- Evaluation shall be carried out jointly by both the examiners.

The student may be awarded full marks, if he/she completes a solution on computer display without sketch.

CO	Course Outcomes
CO1	Generate orthographic projections of points, lines, planes, and solids manually and with computer- aided tools.
CO2	Develop the lateral surfaces of solids for real-world applications.
CO3	Draw isometric views and convert isometric drawings to orthographic views.
CO4	Create 3D models of basic building components.

Computer Aided Engineering Drawing for ECE Stream		Semester	I/II
Course Code	ECCED103/203	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	2 :0 :2 : 0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03
Examination type(SEE)	Theory (Conducted in batches similar to practical's)		

Course Objectives

Module	Hours
Module-1 **Introduction:** Significance of Engineering drawing, BIS Conventions of Engineering Drawing, Freehand sketching of engineering drawing, Scales. Introduction to Computer Aided Drafting software, Co-ordinate system and reference planes HP, VP, RPP & LPP of 2D/3D environment. Selection of drawing sheet size and scale. Commands and creation of Lines, coordinate points, axes, polylines, square, rectangle, polygons, splines, circles, ellipse, text, move, copy, off-set, mirror, rotate, trim, extend, break, chamfer, fillet and curves. **Orthographic Projections of Points ,Lines and Planes:** Introduction to Orthographic projections, Orthographic projections of points in1st and 3rd quadrants. Orthographic projections of lines (Placed in First quadrant only as per BIS) Orthographic projections of planes: triangular, square, rectangular, pentagonal, hexagonal and circular lamina (Placed in First quadrant only using change of position method).	08
Module-2 **Ortho graphic Projection of Solids:** Orthographic projection of right regular solids(Restingon HP only and inclined to both the planes); Prisms, Pyramids, Cylinders & Cones.	08
Module-3 **Section of Solids:** Introduction, Section planes, Sectional views: apparent shapes and true shapes, Sections of right regular prisms, pyramids, cylinders and cones resting with their base on HP. (Concepts only and No Problems for practice) **Development of Lateral Surfaces of Solids:** Development of lateral surfaces of right regular Prisms, Pyramids, Cylinders & Cones and their frustums and truncations.	08

Module-4 **Isometric Views:** Introduction to Isometric views, Isometric projections, Isometric scale. Isometric view of hexahedron(cube),right regular prisms, pyramids, cylinders, cones and spheres, Isometric view of combination of two simple solids. Conversion of simple isometric drawings into orthographic views: Problems on conversion of Isometric view of simple objects / engineering components into orthographic views.	08
Module-5 **Concept of Part Design(For CIE Only):** 3D Modelling: Optical fibre cable with core and cladding, photonic crystal fibers, Antenna: Single element patch antenna, antenna array. Sheet Metal & Surface Design: PCB Enclosures: Creation of different geometry with slots as per Standards: NMEA-0183, applying material properties for heat sink and water/dust proofing and rendering for realistic visualization. Concept of Industrial drawing	08

Suggested Learning Resources:(Textbook/ReferenceBook/Manuals):

Textbooks:

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

Reference books:

1. S. N. Lal and T. Madhusudhan, Engineering Visualisation, engage Learning India Pvt. Ltd.; First Edition, 2022
2. P.J.Shah,ComputerAidedEngineeringDrawing, S. ChandPublishing,2021
3. M.B.Shah&B.C.Rana.,EngineeringDrawing,PearsonEducation,RevisedEdition,2009
4. A K Mittal & Kapeel Dev, Electronics Engineering Drawing, Computech Publications Limited, 2025
5. JohnFrostad,ElectronicsDrafting,Goodheart-WillcoxPub;4th Edition,2010.

Web links and Video Lectures (e-Resources):

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

Teaching-Learning Process (Innovative Delivery Methods):

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

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

Semester End Examination (SEE):

- SEE shall be conducted in batches similar to practical's and evaluated for maximum of 100 Marks. Obtained marks shall be accounted for SEE final marks, reducing it by 50%.
- two full questions shall be set from Modules1,2,3 and 4.Students need to answer one full question from each module.
- Two full questions set from each module shall cover the entire topic of the respective module.

Question papers shall be provided by the University for each batch as per schedule.

CO	Course Outcomes
CO1	Generate orthographic projections of points, lines, planes, and solids manually and with computer- aided tools.
CO2	Develop the lateral surfaces of solids for real-world applications.
CO3	Draw isometric views and convert isometric drawings to orthographic views.
CO4	Create 3D models of basic building components.

Computer Aided Engineering Drawing for EE Stream		Semester	I/II
Course Code	EECED103/203	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	2 :0 :2 : 0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03
Examination type(SEE)	Theory (Conducted in batches similar to practical's)		

Course Objectives

Module	Hours
Module-1 **Introduction:** Significance of Engineering drawing, BIS Conventions of Engineering Drawing, Free hand sketching of engineering drawing, Scales. Introduction to Computer Aided Drafting software, Co-ordinate system and reference planes HP, VP, RPP & LPP of 2D/3D environment. Selection of drawing sheet size and scale. Commands and creation of Lines, coordinate points, axes, poly lines, square, rectangle, polygons, splines, circles, ellipse, text, move, copy, off-set, mirror, rotate, trim, extend, break, chamfer, fillet and curves. **Orthographic Projections of Points, Lines and Planes:** Introduction to Orthographic projections, Ortho graphic projections of points in 1st and 3rd quadrants. Orthographic projections of lines (Placed in First quadrant only as per BIS) Orthographic projections of planes: triangular, square, rectangular, pentagonal, hexagonal and circular lamina (Placed in First quadrant only using change of position method).	08
Module-2 **Orthographic Projection of Solids:** Orthographic projection of right regular solids (Resting on HP only and inclined to both the planes); Prisms, Pyramids, Cylinders & Cones.	08
Module-3 **Section of Solids:** Introduction, Section planes, Sectional views: apparent shapes and true shapes, Sections of right regular prisms, pyramids, cylinders and cones resting with their base on HP. (Concepts only and No Problems for practice) **Development of Lateral Surfaces of Solids:** Development of lateral surfaces of right regular Prisms, Pyramids, Cylinders & Cones and their frustums and truncations.	08

Module-4 **Isometric Views:** Introduction to Isometric views, Isometric projections, Isometric scale. Isometric view of hexahedron (cube), right regular prisms, pyramids, cylinders, cones and spheres, Isometric view of combination of two simple solids. Conversion of simple isometric drawing sin to orthographic views: Problems on conversion of Isometric view of simple objects / engineering components into orthographic views.	08
Module-5 **Electrical Drawing (For CIE Only):** 2D drawing of switches, sockets, panels, junction boxes, antenna, electric circuits. Schematic diagrams of Automatic fire alarm, Call bell system, UPS system, Basic power system diagram. Concept of Industrial drawing	08

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

Textbooks:

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

Referencebooks:

1. S. N. Lal and T. Madhu sudhan, Engineering Visualisation, engage Learning India Pvt. Ltd.; First Edition, 2022
2. P.J.Shah, Computer Aided Engineering Drawing, S. Chand Publishing,2021
3. M.B.Shah & B.C.Rana, Engineering Drawing, Pearson Education, Revised Edition,2009

Bhattacharya S.K., Electrical Engineering Drawing, New Age International Publishers, Second edition 1998, reprints 2005.

Web links and Video Lectures (e-Resources):

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

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CO	Course Outcomes
CO1	Generate orthographic projections of points, lines, planes, and solids manually and with computer- aided tools.
CO2	Develop the lateral surfaces of solids for real-world applications.
CO3	Draw isometric views and convert isometric drawings to orthographic views.
CO4	Create 3D models of basic building components.

Computer Aided Engineering Drawing for CS Stream		Semester	I/II
Course Code	CSCED103/203	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	2 :0 :2 : 0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03
Examination type (SEE)	Theory (Conducted in batch similar to practical's)		

Course Objectives:

Module	Hours
Module-1 **Introduction:** Significance of Engineering drawing, BIS Conventions of Engineering Drawing, Freehand sketching of engineering drawing, Scales. Introduction to Computer Aided Drafting software, Co-ordinate system and reference planes HP, VP, RPP & LPP of 2D/3D environment. Selection of drawing sheet size and scale. Commands and creation of Lines, coordinate points, axes, poly lines, square, rectangle, polygons, splines, circles, ellipse, text, move, copy, off-set, mirror, rotate, trim, extend, break, chamfer, fillet and curves. **Orthographic Projections of Points, Lines and Planes:** Introduction to Orthographic projections, Orthographic projections of points in1st and 3rd quadrants. Orthographic projections of lines (Placed in First quadrant only as per BIS). Orthographic projections of planes: triangular, square, rectangular, pentagonal, hexagonal and circular lamina (Placed in First quadrant only using change of position method).	**08**
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conversion of Isometric view of simple objects / engineering components into orthographic views.	
Module-5 **Computer Network Drawing (For CIE Only):** 2D Network drawing with wired and wireless, Network topology-wired and wireless. 3D Modeling: Raspberry Pi / Arduino boards, Router & switches, IoT devices - Concept of converting to 3D printing format (stl) Concept of Industrial drawing	**08**

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

Textbooks:

1. K.R.Gopalakrishna,& Sudhir Gopalakrishna:A Textbook of Computer Aided Engineering Drawing, 39th Edition, Subash Stores, Bangalore, 2017
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2. P.J.Shah, Computer Aided Engineering Drawing, S. ChandPublishing,2021
3. M.B.Shah & B.C.Rana.,Engineering Drawing,Pearson Education,Revised Edition,2009
4. Frederick E. Giesecke,etal.,Technical Drawing with Engineering Graphics,Prentice Hall,2016

Web links and Video Lectures (e-Resources):

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

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Semester End Examination (SEE):

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- Two full questions set from each Module shall cover the entire topic of the respective module.
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CO	Course Outcomes
CO1	Generate orthographic projections of points, lines, planes, and solids manually and with computer- aided tools.
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CO3	Draw isometric views and convert isometric drawings to orthographic views.
CO4	Create 3D models of basic building components.

Introduction to AI and Applications		Semester	1/2
Subject Code: **KKAIA103/203**	**Credits:03**	CIE Marks	50
Teaching Hours/Week (L:T:P:S)	**3:0:0 Hrs**	SEE Marks	50
Total Hours	40 Hours Theory	Total Marks	100
Examination type (SEE) :	**Theory**	Exam Hours	3 Hrs

Prerequisites: NIL

Course Objectives:

1. Explain AI Fundamentals, subfields, capabilities, and limitations.
2. Create Prompt for effective interaction with language models like Chat GPT.
3. Impart knowledge in AI techniques, its applications and aspects of no code/low code AI.

Modules	Hours
Module-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, Reactive Machines, Limited Memory, Theory of Mind, Self-Awareness, Is Artificial Intelligence Same as Augmented Intelligence and Cognitive Computing, Machine Learning and Deep Learning. **Machine Intelligence:** Defining Intelligence, Components of Intelligence, Differences Between Human and Machine Intelligence, Agent and Environment, Search, Uninformed Search Algorithms, Informed Search Algorithms: Pure Heuristic Search, Best-First Search Algorithm (Greedy Search). **Knowledge Representation:** Introduction, Knowledge Representation, Knowledge-Based Agent, Types of Knowledge. **Textbook1:Chapter1(1.1-1.5), Chapter3(3.1-3.7.2), Chapter4(4.1-4.4)**	**08**
Module-II **Introduction to Prompt Engineering**, Introduction to Prompt Engineering, The Evolution of Prompt Engineering, Types of Prompts, How Does Prompt Engineering Work? Comprehending Prompt Engineering's Function in Communication, The Advantages of Prompt Engineering, The Future of LLM Communication. **Prompt Engineering Techniques for ChatGPT**, Introduction to Prompt Engineering Techniques, Instructions Prompt Technique, Zero, One, and Few Shot Prompting, Self-Consistency Prompt. **Prompts for Creative Thinking:** Introduction, Unlocking Imagination and Innovation. **Prompts for Effective Writing:** Introduction, Igniting the Writing Process with Prompts. **Textbook2:Chapters1,3,4&5**	**08**
Module – III **Machine Learning:** Techniques in AI, Machine Learning Model, Regression Analysis in Machine Learning, Classification Techniques, Clustering Techniques, Naïve Bayes Classification, Neural Network, Support Vector Machine (SVM). **Textbook1:Chapter2(2.1-2.8)**	**08**

Module – IV **Trendsin AI:**AI and Ethical Concerns, AIasa Service(AIaaS), Recenttrendsin AI, Expert System, Internet of Things, Artificial Intelligence of Things (AIoT). **Textbook1:Chapter8(8.1,8.2,8.4),Chapter9(9.1-9.3)**	**08**
Module – V Robotics, Robotics-an Application of AI, Drones Using AI, No Code AI, Low Code AI. **Textbook1:Chapter8(8.3),Chapter1(1.7,1.8,1.10,1.11)** **Industrial Applications of AI:** Application of AI in Healthcare, Application of AI in Finance, Application of AI in Retail, Application of AI in Agriculture, Application of AI in Education, Application of AI in Transportation, AI in Experimentation and Multi-disciplinary research. **Textbook3:Chapter3,Chapter5(5.1)**	**08**

Semester End Examination (SEE):

Theory SEE will be conducted by Institute as per the scheduled timetable, with common question papers for the course

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.

Suggested Learning Resources: Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year):

Textbooks:

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

Referencebooks/Manuals:

1. Stuart Russell and Peter Norvig, Artificial Intelligence: A Modern Approach (4thEdition), Pearson Education, 2023.
2. Elaine Rich, Kevin Knight, and Shivashankar B. Nair, Artificial Intelligence, McGraw Hill Education,2013.
3. Tom Taulli, Prompt Engineering for Generative AI: ChatGPT, LLMs, and Beyond, Apress, Springer Nature , 2023.
4. Nilakshi Jain, Artificial Intelligence: Making A System Intelligent, First Edition, Wiley,2020.

CO	Course Outcome(CO)
CO1	Explain the concepts and types of artificial intelligence.
CO2	Make use of prompt engineering techniques to interact with generative AI tools.
CO3	Illustrate basic machine learning methods for regression, classification and clustering.
CO4	Describe recent trends in artificial intelligence and machine learning.
CO5	Explore real-world applications across different disciplines

BUILDING SCIENCE AND MECHANICS		Semester	I/II
Course Code:	KKBSM104A/204A	CIE Marks	50
Teaching Hours/Week (L: T:P: S)	3:0:0:0	SEE Marks	50
Total Hours	42 Hours Theory	Total Marks	100
Credits	3 Credits	Exam Hours	3 Hours
Examination type (SEE)	**Theory**		

Course objectives: The students will be able to acquire knowledge in the following topics.

1. Understanding fundamental concepts of building science.
2. Selection of green materials.
3. Understanding and solving the problems involving forces, loads and reactions, Moments, andits applications of concurrent force system.
4. To determine support reactions.
5. To determine the centroid of simple and composite plane sections.

Pre-requisite: Physics and Mathematics

Module	Hours
Module-1 **Introduction to building science:** **Importance and Scope of various fields of Civil Engineering**: Surveying, Structural Engineering, Geotechnical Engineering, Water Resources Engineering, Transportation Engineering, Environmental Engineering, Construction Planning and Project Management. **Basic Materials of Construction:** Types and Uses of Bricks, Stones, Cement, Structural Steel, Wood, and Concrete. **Structural Elements of a Building:** Concept of Foundation, Plinth, Lintel, Chejja, Masonry wall, Column, Beam, Slab, Flooring and Staircase.	08 Hours
Module-2 **Sustainable Built Environment:** **Emerging materials**: Types and Uses of Autoclaved Aerated Concrete (AAC) blocks, Bamboo, Recycled plastics, Material selection criteria, Durability, Sustainability, Smart City concept. **Green Building:** Green building materials and rating systems IGBC, LEED, GRIHA (Green Rating for Integrated Habitat Assessment) for new buildings – Purpose - Key highlights -Point System with Differential weightage.	08 Hours
Module-3 **Force Systems**: Concept of idealization, System of forces, Principles of transmissibility of a force, Resolution and composition of forces, Law of Parallelogram of forces, Concurrent and non-concurrent coplanar force systems, Moment of forces, Couple, Varignon's theorem: Numerical examples	08 Hours
Module-4 **Equilibrium and Support Reactions** Free body diagram, equations of equilibrium, Lami's Theorem, Equilibrium of Coplanar Concurrent and Non -concurrent force systems: Numerical examples. Types of loadings, beams and supports, Concept of Statically determinate and indeterminate structures (Definitions with examples only), Support reactions: Numerical examples on Statically determinate beams.	08 Hours

Module-5	
Centroid of Plane areas: Introduction, Locating the centroid of rectangle, triangle, circle, semicircle, and quadrant of a circle using method of integration, centroid of composite areas and simple built-up sections: Numerical examples.	08 Hours

Semester End Examination (SEE):

Theory SEE will be conducted by Institute as per the scheduled timetable, with common question papers for the course

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.

Suggested Learning Resources: Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year):

Text Books:

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

Reference Books:

1. Beer F.P. and Johnston E. R., Mechanics for Engineers: Statics and Dynamics, 4th Edition, 1987, McGraw Hill, ISBN: **9780070045842**
2. Meriam J. L. and Kraige L. G, Engineering Mechanics-Statics, Vol I–6th Edition,2008, Wiley publication.
3. Irving H. Shames, Engineering Mechanics-Statics and Dynamics, 4th Edition, 2002, Prentice-Hall of India(PHI).
4. Hibbler R. C., Engineering Mechanics: Principles of Statics and Dynamics, 2017, Pearson Press, New Delhi.
5. Timoshenko S, Young D. H., Rao J. V., Sukumar Patil, Engineering Mechanics, 5th Edition, 2017,McGraw Hill Publisher, ISBN: **9781259062667**
6. Bhavikatti S S, Engineering Mechanics, 4th Edition, 2018, New Age International Publications.
7. Reddy Vijaykumar K and Suresh Kumar K, Engineering Mechanics, 3rd Edition 2013, BS Publications.

Course outcome (Course Skill Set): At the end of the course the student will be able to:

CO1	Explain the fundamental concepts of building science, disciplines of civil engineering, construction materials, and structural elements of buildings.
CO2	Evaluate the sustainability aspects of the built environment through appropriate selection of green materials and interpretation of rating systems
CO3	Determine the resultant of coplanar concurrent and non-concurrent force system.
CO4	Apply the principles of force systems and equilibrium to determine support reactions.
CO5	Locate the centroid of simple and composite plane areas using first principles.

Introduction to Electrical Engineering		Semester	1/II
Course Code:	KKIEE104B/204B	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:0:0:0	SEE Marks	50
Total Hours	40 Hours Theory	Total Marks	100
Credits	3 Credits	Exam Hours	3 Hours
Examination type (SEE)	**Theory**		

Course Objectives:

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

1. Explain the generation of power and the laws used in DC circuits.
2. Analyse single-phase and three-phase circuits.
3. Describe the construction, operation and applications of DC machines.
4. Describe the construction, operation and applications of transformers and induction motors.
5. Explain electricity billing and safety measures

Pre-requisite: Students should have the knowledge of
1. Ohms Law Kirchhoff's Current and Voltage Law.
2. Fundamentals of AC and DC Circuits.
3. Basic of Magnetism.

Module-1 **Power Generation:** Conventional and non-conventional energy sources. Single-line diagram of power supply system showing power station, transmission system and distribution system. Definition of power grid. Hydel, Nuclear, Solar & Wind power generation (Block Diagram approach) **Electromagnetic Induction:** Faraday's law of electromagnetic induction, Lenz's law, dynamically and statically induced emf, Fleming's right-hand rule, Fleming's left-hand rule. Inductance and mutual inductance, coefficient of coupling, Simple problems.	**08**
Module-2 **Single-Phase Circuits**: Generation of single-phase system. Equation of AC voltage and current, average value, RMS value, form factor, peak factor and their relation [No derivations]. Voltage and current relationships in R, L and C circuits, analysis of R-L, R-C and R-L-C series circuits illustrative examples. concept of power, reactive power, apparent power and power factor, **Three-Phase Circuits:** Generation of three-phase systems, star and delta (mesh) connections, relation between phase and line values of voltages and of currents of star and delta connections. Definition of balanced and unbalanced source and load. Problems with balanced loads.	**08**
Module-3 **DC Generator:** Principle of operation, constructional details, induced emf expression, types of generators. Relation between induced emf and terminal voltage. Simple problems. **DC Motor**: Principle of operation, back emf and its significance. Torque equation, types of motors, Applications of DC motors. Simple problems.	**08**
Module-4 **Transformers:** Introduction to transformers, necessity of transformer, principles of operation, Constructional features of single phase transformers. EMF equation, losses, Calculation of efficiency at different loads. Simple problems. **Three-phase induction Motors:** Concept of rotating magnetic field, Principle of operation. Constructional features of squirrel cage type and wound rotor type induction motor. Slip and its significance, Applications. problems.	**08**

Module-5	08
Domestic Wiring: Two-way and three-way control of loads. Electricity Bill: Definition of "unit" used for consumption of electrical energy, power rating of common household appliances. Two-part electricity tariff. Equipment Safety measures: Working principle of fuse and miniature circuit breaker (MCB), merits and demerits. **Personal safety measures:** Electric shock, safety precautions to avoid shock. Earthing and types: Plate earthing and pipe earthing.	

Semester End Examination (SEE):

Theory SEE will be conducted by Institute as per the scheduled timetable, with common question papers for the course

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.

Suggested Learning Resources: Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year):

Textbooks:

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

Reference books

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

Web links and Video Lectures (e-Resources):

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

Course outcome (Course Skill Set): At the end of the course the student will be able to:

CO1	Understand the concepts of various energy sources and Electromagnetism
CO2	Analyze the single phase and three phase AC circuits.
CO3	Discuss the construction and operation of DC Machines.
CO4	Discuss the construction and operation of AC Machines.
CO5	Explain the concepts of electricity billing, circuit protective devices and personal safety measures.

Introduction to Electronics and Communication Engineering			
Course Code	KKIEC104C/204C	Semester	I/II
Teaching hours per week (L:T:P:S)	3:0:0:0	CIE Marks	50
Total Hours	42 Hours (Theory)	SEE Marks	50
Credits	3	Exam Hours	03
Examination Type (SEE)	Theory		

Course Objectives:

- To study the power supplies and its important components
- To understand the concepts of amplifiers, oscillators, operational amplifier and its applications
- To study the basics of analog and digital communication systems
- To study the fundamentals of embedded systems and digital logic gates

Module	Hours
Module-1 **Power Supply**: Block Diagram of power supply, Analysis of Rectifiers: Half wave and Full wave rectifiers with capacitive filter, Zener voltage regulator, Voltage multiplier (Doublers). **Amplifiers**: Types of Amplifiers, Gain, Input and Output Resistance of CE transistor amplifier, Frequency Response of two stages RC coupled amplifier. Text1:PageNo:117-128,139-146	**09**
Module-2 **Oscillators:** Concept of feedback: Positive and Negative Feedback, Condition for Oscillations, RC Phase shift oscillator, Hartley and Colpitt's oscillator, Crystal Controlled Oscillators. (Frequency expressions: No derivation) **Operational Amplifiers:** Basic block diagram, Ideal Characteristics, Parameters: Gain, Input and Output Impedance, CMRR, Bandwidth, Slew rate, PSRR, Input offset voltage and Input offset current, Concept of virtual ground. Op amp Applications**:** Inverting and Non inverting amplifiers, voltage follower, adder, comparator, integrator and differentiator. Text1:PageNo:179-186,165-169,171-175	**09**
Module-3 **Communication Systems:** Introduction, Frequency Spectrum, Modern Communication System Scheme: Information Source, Input transducer, Transmitter, Channel, Noise, Receiver, Concepts of Radio wave Propagation (Ground, space and sky wave propagation) **Modulation Schemes:** Needs of modulation, Analog modulation: Analysis of AM, FM (only waveform and expression), Digital modulation: ASK, FSK and PSK (Definition and waveforms), Advantage of Digital communication over Analog communication, Multiplexing: FDM and TDM Text2:1.1,1.2,1.3,1.4,1.5,1.6,1.9,1.12,1.15,2.2.1,3.2.1,6.1,6.11,6.12,6.13,6.15,6.16	**08**
Module-4 **Embedded Systems:** Definition, Embedded Systems Vs General Computing Systems, Classification of Embedded Systems, Major Application Areas of Embedded Systems, Purpose of an Embedded System, Core of The Embedded System: Microprocessors, GPP Vs ASIP, Microcontrollers, Microprocessor Vs Microcontroller, DSP, RISC V/S CISC, Memory: RAM and ROM, Sensors, Actuators, LED, 7-Segment LED Display. Text3:1.1,1.2,1.4,1.5,1.6,2.1.1.1-2.1.1.6,2.2.1,2.3.1,2.3.2,2.3.3.1,2.3.3.2.	**08**

Module-5	
Boolean Algebra and Logic Circuits: Binary Numbers, Number Base Conversion: Binary, Decimal, Octal and Hexa Decimal Numbers and Vice-Versa, 1's and 2's complements, Arithmetic operations using 2's complement method, Boolean Algebra: Properties and DeMorgans Theorem, Boolean Functions, Canonical and Standard Forms, Digital Logic Gates: Basic and Universal gates. **Combinational Logic:** Introduction, Design of Adders: Half Adder, Full Adder. Text4:1.2,1.3,1.4,1.5,2.1,2.3,2.4,2.5,2.7,4.1,4.2,4.3.	**08**

Question paper pattern:

- The question paper shall have five modules for 100 marks;
- Each full question carries 20 marks.
- Two questions to be set in each module (total ten questions).
- The candidate will have to answer one full question from each module.

Note: There can be a maximum of 4 subsections in each Question.

Text books:

1. Mike Tooley "Electronic Circuits Fundamentals & Applications," 5th Edition, Elsevier, 2020.
2. S L Kakaniand Priyanka Punglia, 'Communication Systems', Ist Edition, New Age International Publisher, 2017.
3. K V Shibu, 'Introduction to Embedded Systems', 2nd Edition, McGraw Hill Education (India), Private Limited, 2019.
4. Digital Logic and Computer Design, M. Morris Mano, Pearson Education, 2017, ISBN-978-93-325-4252-5.

E books and online course materials:

- https://nptel.ac.in/courses/122106025
- https://nptel.ac.in/courses/108105132

CO	Course Outcome (CO)
CO1	Analyze basic electronic circuits using the principles of rectifiers, voltage regulators, and amplifiers.
CO2	Analyze the behavior of analog circuits including oscillators and operational amplifiers in signal generation and conditioning applications.
CO3	Illustrate the fundamental concepts of analog and digital modulation techniques based on their characteristics and suitability for communication systems.
CO4	Interpret the structure and functionality of embedded systems and digital logic components such as microcontrollers, sensors, and logic gates.
CO5	Apply number system conversions and Boolean algebra to design and implement basic combinational logic circuits.

INTRODUCTION TO MECHANICAL ENGINEERING		Semester	I/II
Course Code	**KKIME104D/204D**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3-0-0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	50
Credits	3	Exam Hours	3
Examination type(SEE)	**Theory**		

Course objectives

Module	Hours
Module-1 Introduction: Streams in mechanical engineering and their relevance/significance, role of mechanical engineers in industry. Energy conversion: Introduction of water turbine and basic working principles of Pelton Turbine. Flying machines: Classification, basic parts involved in drone making, working principle of Drones. Refrigeration (VCR only) and Room air conditioning principles.	08
Module-2 **Engines:** Introduction, petrol engine, diesel engines, Working of four Stroke engines, applications simple numerical. **Insight into Future Mobility:** Electric and Hybrid Vehicles, Components of Electric and Hybrid Vehicles. Advantages and disadvantages of EVs and Hybrid vehicles. **Power Transmission systems:** Classification of gears, simple & compound gear trains, simple numerical.	08
Module-3 **Engineering materials**: Introduction, Classification, Ferrous (IRON) and Non-Ferrous metals (COPPER): Types, Properties and their applications. **Composite materials**: Introduction, Constituents of a composite, Classification, Types of Matrix And Reinforcement materials, Advantages, Disadvantages and Applications of composite materials. **Smart materials:** Introduction, Types - Piezoelectric materials, and Advantages, Disadvantages and Applications	08
Module-4 **Manufacturing overview**, types of manufacturing processes. Principles of Welding, soldering, brazing. Introduction to machine tools–lathe, drilling and milling machine. **Lathe operations**: Turning, facing, knurling, **Drilling machine operations:** Drilling,reaming, tapping. **Milling machine operations:** End milling, face milling. **Introduction to CNC**, components, advantages and applications. Basic principles of 3D printing.	08

Module-5 **Advances in mechanical engineering** **Automation technology**: Definition of automation, types of automation, basic elements of automation. **Mechatronic systems:** Definition of mechatronics, elements of mechatronics systems, examples. **Elementary sensors:** Working principle and applications of Potentiometer and optical encoders. **Integrated system**: Need for integration of technologies, ADAS (Advanced Driver Assistance System).	08

Web links and Video Lectures (e-Resources):

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

Teaching-Learning Process(Innovative Delivery Methods):

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

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

CO	Course outcomes
CO1	Recognize the significance of mechanical engineering principles to solve the problems of social relevance.
CO2	Understand the working of I.C. engines, power transmission elements and future mobility vehicles.
CO3	Discuss the properties and applications of engineering materials, composite materials and smart materials.
CO4	Describe the working principles and applications of various manufacturing processes.
CO5	Explain the advances in mechanical engineering.

Essentials of Information Technology		Semester	1
Subject Code :**KKEIT104E/204E**	**Credits:03**	CIE Marks	50
Teaching Hours/Week (L:T:P:S)	**3:0:0Hrs**	SEE Marks	50
Total Hours	40 Hours Theory	Total Marks	100
Examination type (SEE	**Theory**	Exam Hours	3 Hrs

Prerequisites: NIL

Course Objectives:

1. Gain understanding of IT fundamentals, software, hardware, networking, and cyber security.
2. Apply practical skills in data management, application development, and problem-solving for both business and societal applications.
3. Develop essential professional skills such as communication, critical thinking, and an entrepreneurial mindset for roles in diverse IT-driven environments.

Modules	Hours
Module-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. **Text book1:Chapter-1(1.1-1.7),Chapter-2(2.1-2.5)**	**08**
Module-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. **Textbook1:Chapter-3,Chapter-5(5.1-5.3)**	**08**
Module – III **Networking and the Internet:** Network Fundamentals, The Internet,The World Wide Web, Internet Protocols, Security. **Cyber security:** Overview—What is Cyber security?, Brief History of Cyber security Events, The Basic Information Security Model, Cyber Hygiene, Teams in Cybersecurity. **Ethical Issues in Information Technology:** Overview, Ownership Rules, Ethics and Online Content. **Textbook1:Chapter-4** **Textbook2:Chapter-16,Chapter-17**	**08**
Module – 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. **Textbook1: Chapter-7(7.1-7.5),Chapter-9(9.1-9.2)**	**08**
Module – V **Introduction to HTML and Website Development:** What is HTML? Cascading Style Sheets (CSS), Website Design and Story boarding, Structure of a Website. **Computer Graphics:** The Scope of Computer Graphics, Overview of 3D Graphics, Modeling, Rendering. **Text book 2 : Chapter-12. Text book 1: Chapter-10(10.1-10.4)**	**08**

Semester End Examination (SEE):

Theory SEE will be conducted by Institute as per the scheduled timetable, with common question papers for the course

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.

Suggested Learning Resources: Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year):

Textbooks:

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

Reference books/Manuals:

1. V. Rajaraman, "Introduction to Information Technology", Third Edition, PHI Learning,2018.
2. Pelin Aksoy, Information Technology in Theory, First Edition, Cengage 2012.

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

Courseoutcomes:

On completion of the course, the student will have the ability to:

CO#	Course Outcome(CO)
CO1	Illustrate data storage and manipulation concepts.
CO2	Explain the knowledge of operating systems and illustrate the use of algorithms for problem solving.
CO3	Discuss network and Internet concepts, identify role of cyber security and ethical issues in IT.
CO4	Apply basic software engineering concepts and construction.
CO5	Illustrate HTML, CSS for website development and learn basic concepts of computer Graphics.

ENGINEERING MECHANICS		Semester	I/II
Course Code	**CVEMC105/205**	CIE Marks	50
Teaching Hours/Week (L: T:P: S)	3:0:0:0	SEE Marks	50
Total Hours	42 Hours Theory	Total Marks	100
Credits	3 Credits	Exam Hours	3 Hours
Examination type (SEE)	**Theory**		

Course Objectives:

1. Understanding and solving the problems involving forces, loads and reactions, Moments and its applications of concurrent force system.
2. Solving the problems of couples and equilibrium of bodies.
3. To determine friction of rigid bodies on horizontal and inclined planes
4. To determine the center of gravity of planar sections.
5. To determine moment of inertia of planar sections.

Pre-requisite: Physics, Mathematics

Module	Hours
Module-1 **Coplanar force system:** Basic dimensions and units, Idealisation, Force, Classification of force system, principle of transmissibility of a force, Composition and resolution of forces, Free body diagrams, Resultant of coplanar concurrent and non-concurrent force system, Moment, Couple and Characteristics of couple, Varignon's theorem: Numerical Examples	8 Hours
Module-2 **Equilibrium**: Conditions of static equilibrium, Equilibrium of coplanar concurrent force systems, Lami's theorem, Equilibrium of coplanar non-concurrent force system, Numerical examples. Types of supports, loadings and beams, Concept of statically determinate and indeterminate beams. Support reactions for statically determinate beams subjected to various loadings: Numerical examples.	8 Hours
Module-3 **Friction:** Introduction, Types of friction, Concept of static friction, Kinetic (Dynamic) friction, Laws of friction, Angle of repose, Cone of friction, Equilibrium of blocks on horizontal and inclined plane, Ladder friction: Numerical examples.	8 Hours
Module-4 **Centroid:** Introduction, definitions of centroid and centre of gravity. Axes of symmetry, Locating the centroid of square, rectangle, triangle, circle, semicircle, quadrant and sector of a circle using method of integration, Centroid of composite areas and simple built- up sections: Numerical examples.	8 Hours
Module-5 **Moment of Inertia of plane Areas:** Introduction, Moment of inertia about an axis, Parallel axes theorem, Perpendicular axes theorem, Polar moment of inertia, Radius of gyration Moment of inertia of square, rectangular, triangular and circular areas from the method of Integration, Moment of inertia of composite areas and simple built-up sections: Numerical Examples	8 Hours

Semester End Examination (SEE):

Theory SEE will be conducted by Institute as per the scheduled timetable, with common question papers for the course.

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.

Suggested Learning Resources: Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year):

Textbooks:

1 Bansal R. K., Rakesh Ranjan Beohar and Ahmad Ali Khan, Basic Civil Engineering and Engineering Mechanics, third edition, 2015, Laxmi Publications, ISBN: 9789380856674.

2 Kolhapure B K, Elements of Civil Engineering and Engineering Mechanics, Eleventh edition, 2018, Eastern Book Promoters Belgaum [EBPB], ISBN: 5551234003896

Reference Books:

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

2 Meriam J. L. and Kraige L. G, Engineering Mechanics-Statics, Vol I–sixth Edition,2008, Wiley publication.

3 Irving H. Shames, Engineering Mechanics-Statics and Dynamics, fourth edition, 2002, Prentice-Hall of India (PHI).

4 Hibbler R. C., Engineering Mechanics: Principles of Statics and Dynamics, fourteenth edition, 2017, Pearson Press, New Delhi.ISBN:9789332584747.

5 Timoshenko S, Young D. H., Rao J. V., Sukumar Patil, Engineering Mechanics, fifth Edition, 2017, McGraw Hill Publisher, ISBN: 9781259062667

6 Bhavikatti S S, Engineering Mechanics, fourth edition, 2018, New Age International Publications.

7 Reddy Vijaykumar K and Suresh Kumar K, Engineering Mechanics, third edition 2013, BS Publications.

8 J K Gupta and S K Gupta, Engineering Mechanics, and Applied Mechanics, first edition, 2021, Cengage learning. ISBN: 9789353505851.

Web links and Video Lectures (e-Resources):

1. https://www.youtube.com/watch?v=nGfVTNfNwnk&list=PLOSWwFV98rfKXq2KBphJz95rao7q8PpwT
2. https://www.youtube.com/watch?v=nkg7VNW9UCc&list=PLOSWwFV98rfKXq2KBphJz95rao7q8PpwT&i ndex=2
3. https://www.youtube.com/watch?v=ljDIIMvxeg&list=PLOSWwFV98rfKXq2KBphJz95rao7q8PpwT&index=5
4. https://www.youtube.com/watch?v=VQRcChR9IkU&list=PLOSWwFV98rfKXq2KBphJz95rao7q8PpwT&index=18
5. https://www.youtube.com/watch?v=3YBXteL-qY4
6. https://www.youtube.com/watch?v=z95UW4wwzSc&list=PLOSWwFV98rfKXq2KBphJz95rao7q8PpwT&index=10
7. https://www.youtube.com/watch?v=lheoBL2QaqU&list=PLOSWwFV98rfKXq2KBphJz95rao7q8PpwT&index=7
8. https://www.youtube.com/watch?v=atoP5_DeTPE
9. https://www.youtube.com/watch?v=ksmsp9OzAsI
10. https://www.youtube.com/watch?v=x1ef048b3CE
11. https://www.youtube.com/watch?v=l_Nck-X49qc

12. https://play.google.com/store/apps/details?id=appinventor.ai_jgarc322.Resultant_Force
13. https://www.youtube.com/watch?v=RIBeeW1DSZg
14. https://www.youtube.com/watch?v=R8wKV0UQtlo
15. https://www.youtube.com/watch?v=0RZHHgL8m_A
16. https://www.youtube.com/watch?v=Bls5KnQOWkY

Course outcome (Course Skill Set): At the end of the course the student will be able to:

CO1	Explain the fundamentals of force systems, free body diagrams, moments, couples, friction, centroid and second moment of area.
CO2	Analyze the equilibrium of force system including friction.
CO3	Analyze the loading types, reactions for beams and apply the principles of friction
CO4	Locate the centroid of laminas and compute the second moment of area of laminas.
CO5	Determine moment of inertia of planar sections.

Elements of Mechanical Engineering		Semester	I/II
Course Code	MEEME105/205	CIE Marks	50
Teaching Hours/Week (L:T:P:S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	3	Exam Hours	3
Examination type(SEE)	Theory		

Course Outcomes

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

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

Module	Hours
Module-1 **Engineering materials:** Introduction, Classification, Ferrous and Non-Ferrous metals: Types, Properties and their applications. **Composite materials:** Introduction, Constituents of a composite, Classification, Types of Matrix and Reinforcement materials, Advantages, Disadvantages and Applications of composite materials in Aerospace and Automobile industries. **Smart materials:** Introduction, Types - Piezoelectric materials, and Advantages, Disadvantages and Applications. **Nano materials:** Introduction, Types of nano materials, Advantages, Disadvantages and Applications.	**08**
Module-2 **Concepts of Thermodynamics:** Work, Energy, Heat, Modes of Heat transfer: Conduction, Convection and Radiation. **Steam:** Formation of steam, Properties of Steam, Numerical related to the properties of steam. **Introduction to Internal Combustion engines:** Working principle of Two stroke and Four stroke engines (SI & CI Engines), simple Numerical. **Electric vehicles and Hybrid vehicles:** Working principles, Electric and Hybrid vehicle components, Brief introduction to energy storage in Electric vehicles.	**08**
Module-3 **Machine Tools:** **Lathe:** Working principle, Specifications, Operations performed – Turning,	**08**

Facing, Taper turning by swivelling the compound rest, Thread cutting and Knurling. **Drilling Machine:** Working principle, Specifications, Operations performed – Drilling, Reaming, Boring , Counter boring , Counter sinking , Tapping. **Milling machine:** Working principle, Specifications, Operations performed – Plane milling, End milling, Slot milling, Angular milling. (Sketches of machine tools not required. Sketches to be used only for explaining the operations). **Joining Processes:** Introduction, joining methods: Working principle of Soldering, Brazing and Electric Arc welding, Advantages, Limitations and Applications.	
Module-4 **Belt drives:** Introduction, Open and Cross belt drives.(No derivations and numerical) ,Flat belts and V belts. **Gear Drives:** Types of Gears, Velocity ratio, Gear Trains - Simple and Compound gear trains and Numericals. **Robotics:** Introduction, Generation of Robots, Asimov's laws of Robots, Robot anatomy - Links and Joints, Types of Robots, Configurations of Robots, Robot motion - Degrees of Freedom.	**08**
Module-5 **Computer Numerical Control (CNC):** Introduction, Definition of NC and CNC Components of CNC. Definition of CAD, CAM, CAE and CIM. **Automation:** Definition, Types of Automation, Reasons for Automation. **Additive manufacturing:** Introduction, Basic principles (Steps in additive manufacturing), **Applications of AI in Mechanical Engineering:** Automobile industry, manufacturing industry and Mechanical design.	**08**

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

Textbooks:

1. K R Gopala Krishna, Elements of Mechanical Engineering, Subhash Publications, 2018.
2. S K Hajra Choudhury and NirjharRoy, Elements of Workshop Technology (Vol.IandII), Media Promoters and Publishers Pvt. Ltd., 2016.
3. Ganeshan. V,InternalCombustionEngines,TataMcGrawHill,4thEdition,2012.
4. RajputR.K,ThermalEngineering,LaxmiPublications(Pvt)Ltd.,NewDelhi.6thEdition, 2007.
5. Mikell P. Grover, Automation Production Systems and Computer Integrated Manufacturing, PHI, 2004.
6. Husain Iqbal,ElectricandHybridVehicles:DesignFundamentals,CRCPress,3rdEdition, 2021.
7. Ian Gibson, David. W. Rosen, Brent Stucker, Additive Manufacturing Technologies: 3D Printing,RapidPrototyping,andDirectDigitalManufacturing,Springer,2ndEdition,2014.
8. MikellP.GrooverandEmoryW.Zimmers,CAD/CAM.Zimmer&GrooverCAD/CAM, 2007.

Reference books / Manuals:

- SeropeKalpakjianand StevenR Schmid, Manufacturing Engineering and Technology, Fourth Edition, Pearson Education, Asia, 2000.
- RadhaKrishna&S.Subramanian,CAD/CAM/CIM,NewAge InternationalPublishers,2009
- F.L.Matthews and R.D.Rawlings, Composite materials: Engineering and Science, Woodhead Publishing Ltd. & CRC Press, 200
- MikellP.GrooverandMitchelWeissandRogerN.NagelNicholasG.Odrey,Industrial Robotics technology, programming and applications, Tata McGraw Hill Edition, 2008

Web links and Video Lectures (e-Resources):

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

https://www.youtube.com/watch?v=lQ-MYnyxh7M

CO	**Course Outcome**
CO1	Analyze the properties of steam, various engineering materials along with their classifications and applications.
CO2	Illustrate the basic concepts of thermos dynamics, internal combustion engines and electric/hybrid vehicles.
CO3	Demonstrate the working and operations of machine tools and metal joining techniques.
CO4	Outline the configuration, anatomy, and performance parameters of robots.
CO5	Applytheconceptsofbeltandgeardrivestosolvebasicnumericalproblemsrelatedto velocity ratio in gear drives.

Basics of Electrical Engineering		Semester	I
Course Code	EEBEE105/205	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:0:0:0	SEE Marks	50
Total Hours	40Hours Theory	Total Marks	100
Credits	3 Credits	Exam Hours	3 Hours
Examination type (SEE)	**Theory**		

Course Objectives:

Pre- requisite: Students should have the knowledge of
1. Ohms Law Kirchhoff's Current and Voltage Law.
2. Fundamentals of AC and DC Circuits.
3. Basic of Magnetism.

Module	Hours
Module-1 **DC circuits:** Ohm's law and Kirchhoff's laws, analysis of series, parallel and series-parallel circuits. Power and energy. Problems on series and parallel circuits. **Electromagnetic Induction:** definition of magnetic field, mmf, Flux Density and relative Faraday's law of electromagnetic induction, Lenz's law, dynamically and statically induced emf, Fleming's right-hand rule. Inductance and mutual inductance, coefficient of coupling, Simple problems.	**08**
Module-2 **Single-phase Circuits:** Generation of sinusoidal voltage. Expression of average value, RMS value, form factor and peak factor of sinusoidal voltage and current. Phasor representation of alternating quantities. Analysis of R, L and C circuits. Series and parallel R-L, R-C and R-L-C circuits with phasor diagrams, calculation of real power, reactive power, apparent power, and power factor, illustrative examples. **Three- phase Circuits:** Generation of three-phase system, phase sequence, star and delta (mesh) connections, relation between phase and line values of voltages and of currents of star and delta connections, considering the phasor diagram. Definition of balanced and unbalanced source and load. Measurement of 3-phase power by 2-wattmeter method. Effect of low power factor on watt meter readings. Comparison between single phase and three-phase systems.	**08**
Module-3 **Transformer:** Introduction to transformers, principles of operation, Constructional features of single phase transformers. EMF equation. Problems. **Three-phase induction Motors:** Concept of rotating magnetic field, Principle of operation. Constructional features of squirrel cage type and wound rotor type induction motor. Slip and its significance, problems.	**08**
Module-4 **DC machines:** Introduction, construction and working principle of DC generator, EMF equation. Working principle of DC motor, Significance of Back EMF in DC motor problems **Alternator:** Introduction, construction and working principle of alternator ,EMF equation considering pitch factor and winding factor types of alternators and their constructional features , problems on EMF equation	**08**

Module-5 **Domestic Wiring:** Service mains – overhead and underground. Types of wiring: Exposed to open space – wooden batten wiring and casing and capping. Concealed wiring: conduit wiring. Wiring for two-way and three-way control of load. **Domestic Electricity Bill:** Power-rating of household connected loads. Sanctioned Load. Practical unit of measuring energy, Unit, its definition. Electricity bill [as per Electricity Supply Companies (escoms)]: Tariff method considered: two-part tariff. Particulars considered for billing: sanctioned load and units consumed. Calculation of electricity bill for domestic consumers. **Equipment Safety Measures:** Working principles of fuse and miniature circuit breaker (MCB),the merits and demerits of fuse and MCB. Personal safety measures: Electric shock, possible effects of shocks. Safety precautions to avoid personal shock while dealing with electricity. Importance of earthing, types of earthing: Pipe and plate.	**08**

Semester End Examination (SEE):

Theory SEE will be conducted by Institute as per the scheduled timetable, with common question papers for the course

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.

Suggested Learning Resources: Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year):

Textbooks:

1. A textbook of Electrical Technology byB.L. Theraja, Volume-1, S Chand and Company, Reprint Edition 2014. [Covers modules 1 to 4]

2. Basic Electrical Engineering, D.C. Kulshreshtha, McGraw Hill, 2nd Edition, 2024. [Covers all modules]

Reference Books:

1. Basic Electrical Engineering, D. P. Kothari and I. J. Nagrath, McGraw Hill 2nd edition, 3rd Reprint 2024.

2. Principles of Electrical Engineering & Electronics by V. K. Mehta, Rohit Mehta, S. Chand and Company Publications, 2nd edition, 2015.

3. Electrical Technology by E. Hughes, Pearson, 12th Edition, 2016.

4. Basic Electrical and Electronics Engineering, S.K Bhattacharya, et al, Pearson. 2 nd edition,2017.

Course outcome (Course Skill Set): At the end of the course the student will be able to:

CO1	Understand the DC Electric circuits and principles of Electromagnetism.
CO2	Analyze the single phase and three phase AC circuits.
CO3	Discuss the construction and operation of various AC Electrical Machines.
CO4	Discuss the construction and operation of various DC Electrical Machines.
CO5	Explain the concepts electricity billing, circuit protective devices and personal safety measures.

Fundamentals of Electronics and Communication Engineering			
Course Code	ECFEC105/205	Semester	3
Teaching hours per week (L:T:P:S)	3:0:0:0	CIE Marks	50
Total Hours	42 Hours (Theory)	SEE Marks	50
Credits	3	Exam Hours	03
Examination Type (SEE)	Theory		

Course Objectives:

1. To study the PN diode and Zener diode with its characteristics and applications
2. To understand the working principle of BJTs and FETs with its characteristics
3. To study the characteristics and applications of operational amplifiers
4. To understand the fundamentals of wire and wireless communication systems
5. To study the number systems conversion and digital logic circuits

Modules	Hours
Modules-1 **Diodes and Their Application:** Introduction, Characteristics and Parameters, Diode Approximation, DC Load Line Analysis, Half Wave Rectifier, Full Wave Rectifiers, Capacitor Filter Circuit (Only Qualitative Approach), Zener Diode and its Characteristics, Zener Diode as Voltage Regulator. Text1: 2.1, 2.2, 2.3, 2.4, 2.9, 3.1, 3.2, 3.3, 3.7, 3.12.	**09**
Modules-2 **Bipolar Junction Transistors:** Introduction, BJT Voltages & Currents, BJT Amplification, BJT Switching, Common Base Characteristics, Common Emitter Characteristics, BJT Biasing, DC Load Line and Bias Point, Biasing Types: Fixed Biasing and Voltage Divider Biasing. **Field Effect Transistor:** Junction Field Effect Transistor (N-Channel), JFET Characteristics, MOSFETS: Enhancement and Depletion MOSFETs. *Case Study MOSFET as a Switch*. Text1: 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 5.1, 5.2, 5.4, 9.1, 9.2, 9.5.	**08**
Modules-3 **Operational Amplifiers:** Introduction, The Operational Amplifier, Block Diagram Representation of Typical Op- Amp, Schematic Symbol. **Op-Amp Parameters**: Gain, Input Resistance, Output Resistance, CMRR, Slew Rate, Bandwidth, Input Offset Voltage, Input Bias Current and Input Offset Current, The Ideal Op-Amp. Equivalent Circuit of Op-Amp, Open Loop Op-Amp Configurations, Differential Amplifier. **Op-Amp Applications**: Inverting Configuration, Non-Inverting Configuration, Differential Configuration, Voltage Follower, Integrator, Differentiator. Text2: 1.2,1.3,1.5,2.2,2.3,2.4,2.5,2.6,6.5,6.12,6.13.	**09**

Modules-4 **Fundamentals Of Communication:** Elements of a Communication System, Communication Channels and Their Characteristics: Wire line, Fiber Optic, Wireless Electromagnetic Channels, Frequency Spectrum. **Introduction to Analog Modulation:** Analog Modulation Types: Amplitude Modulation and Frequency Modulation, Definitions, Waveforms and Equations. (Excluding Derivation) **Applications:** AM and FM Radio Broadcasting, Super heterodyne Receiver, Mobile Communication, 1G to 5G/6G standards**.** *Case Study of Converting Analog Signal to Digital Signal using PCM* Text3:1.2, 1.3, 3.1. Text4: 3.5, 4.4.1, 4.5, 18.3.1, 18.3.2	**08**
Modules-5 **Digital Systems and Binary Numbers:** Digital Systems, Numbering System (Binary, Octal, Decimal and Hexadecimal), Number Base Conversion – (Binary to Decimal, Hexadecimal And Vice Versa), 1's and 2's Complement Operation, Signed Binary Numbers-Arithmetic Addition and Subtraction, Binary Logic. **Boolean Algebra:** Basic Definitions, Basic Theorems and Properties of Boolean Algebra, Boolean Functions, Canonical and Standard Forms, Digital Logic Gates (Excluding Extension to Multiple Inputs, Positive and Negative Edge) NAND And NOR As Universal Gates (Excluding Multilevel Presentation), Binary Adders. (Half Adder and Full Adder) *Case Study with4-Bit Adder Simulation* Text5:1.1,1.2,1.3,1.4,1.5,1.6,1.9,2.2,2.4,2.5,2.6,2.8,3.6,4.5.	**08**

Question paper pattern:

- The question paper shall have five modules for 100 marks;
- Each full question carries 20 marks.
- Two questions to be set in each module (total ten questions).
- The candidate will have to answer one full question from each module.

Note: There can be a maximum of 4 subsections in each Question.

Text books:

1. David A Bell, Electronic Devices and Circuits, 5th Edition, Oxford University Press, 30th Impression, 2025.
2. Ramakanth A Gayakwad, Op-amps and Linear Integrated Circuits, 4th Edition, Pearson Education, 2015.
3. John G Proakis, Masoud Saleh, Fundamentals of Communication Systems, Second Edition, Pearson Educations, Inc., 2014.
4. D. P Kothari and I J Nagrath, Basic electronics, Second Edition, Mc Graw Hill Education Pvt ltd, 2018.
5. M. Morris Mano and Michael D. Ciletti, Digital Design-With an Introduction to the Verilog HDL, VHDL and System Verilog 6th Edition, Pearson Education Inc, 2024

Reference books:

1. Mike Tooley, Electronic Circuits, Fundamentals & Applications, 5th Edition, Elsevier, 2020.
2. Albert Malvino, Electronic Principles, 9th Edition, McGraw Hill Publications, 2021.
3. Electronic Devices and Circuit Theory, R Nashelsky and L Nashelsky, 11th Edition, Pearson, 2012

E books and online course materials:

- Introduction to Basic Electronics: https://nptel.ac.in/courses/122106025
- Digital Electronic Circuits: https://nptel.ac.in/courses/108105132

Course outcomes: On completion of the course, the student will have the ability to,	
CO	**Course Outcome (CO)**
CO1	Apply the working principles, fundamental characteristics of various semiconductor devices including diodes, transistors and operational amplifiers in basic electronic circuits.
CO2	Analyze basic rectifier and amplifier circuits using the principles of diodes, BJTs, and operational amplifiers.
CO3	Illustrate the fundamental concepts of communication systems and their applications.
CO4	Design basic combinational circuits using the fundamental principles of digital systems.
CO5	Analyze the fundamental concepts of electronic circuits, communication systems and digital systems for their role in building basic electronic applications.

Programming in C		Semester	1
Course Code :	**CSPOC105/205**	CIE Marks	50
Teaching Hours/Week (L:T:P:S)	3:0:0:0	SEE Marks	50
Total Hours	40 Hours Theory	Total Marks	100
Credits	3 Credits	Exam Hours	3 Hours
Examination type (SEE)	**Theory**		

Pre-requisite: NIL

Course Objectives:

1. Introduce the fundamentals of algorithms, flowcharts, the structure of C programs, operators, expressions, and input/output operations.
2. Develop problem-solving skills using decision-making constructs and iterative looping mechanisms.
3. Provide knowledge of arrays and strings for efficient data representation, manipulation, and program development.
4. Promote modular programming using user-defined functions, recursion, and structures for managing complex data.
5. Introduce advanced programming concepts such as pointers and file management for dynamic memory access and persistent data storage.

Modules	Hours
Module-1 **Algorithms, Flowcharts, Introduction to C:** Algorithms, Flowcharts, Basic Structure of C Program, Executing a "C" program, Constants, Variables and Data types. **Operators and Expressions, Managing Input/ Output:** Arithmetic operators, relational operators, logical operators, assignment operators, increment/decrement operators, conditional operators, bitwise operators, special operators. Evaluation of expression, precedence of arithmetic operators, type conversions in expression, operator precedence and associativity. Formatted Input and Output. Examples & exercises.	**08**
Module-2 **Decision making and branching:** Decision Making with if statement, Simple if statement, the if else and nested if statements, the elseif ladder, Switch statement, The?: operator, Unconditionalcontrol Statements. **Decision Making and Looping:** While statement, Do-While statement, For statement, jumps in loop. Examples &exercise	**08**
Module-3 **Arrays:** One dimensional Array, declaration, Initialization, Two dimensional Arrays declaration, Initialization, examples and exercises **Strings:** Declaring and Initializing String Variables, Reading Strings from Terminal, Writing strings to Screen, Arithmetic Operations on Characters, String-handling functions, examples and exercises.	**08**
Module-4 **Functions and Recursion:** Need for User-defined Functions, A multi-functionprogram, Elements of User-defined Functions, Definition of functions, Return value and their types, Function calls, Function declaration, Category of functions, Recursion, examples and exercises. **Structures:** Initialization. Defining Structures, Declaration of Structure variables, Accessing Structure Members, Structure Initialization, Copying and comparing structure variables, operations on individual members.	**08**

Module-5	
Pointers: Introduction, understanding pointers, Accessing the address of a variable, declaring pointer variables, initializing of pointer variables, accessing a variable through its pointer, pointer expressions, Examples &exercises. **File Management:** Defining and opening a file, closing file, input output operations on files, error handling during I/O operations. Examples & exercises.	**08**

Semester End Examination (SEE):

Theory SEE will be conducted by Institute as per the scheduled timetable, with common question papers for the course

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.

Suggested Learning Resources: Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year):

Textbooks:

1. Programming in ANSI C, E Balaguruswamy , 9th Edition, Mc GrawHill.
2. Hassan A fyouni, Behrouz A. Forouzan."A Structured Programming Approach in C", 4th Edition, Cengage.

Reference books:

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

Web links and Video Lectures (e-Resources):

1. elearning.vtu.ac.in/econtent/courses/video/BS/15PCD23.html
2. Introduction to Programming in C[https://onlinecourses.nptel.ac.in/noc23_cs02/preview]
3. C for Everyone: Programming Fundamentals[https://www.coursera.org/learn/c-for-everyone]
4. Computer ProgrammingVirtual Lab[https://cse02-iiith.vlabs.ac.in/exp/pointers/]
5. C Programming: The ultimate way to learn the fundamentals of the C language [https://www.pdfdrive.com/c-programming-the-ultimate-way-to-learn-the-fundamentals-of-the-c-language-e187584209.html]
6. C Programming: The Complete Reference [https://viden.io/knowledge/programming-in-c-language/attachment/28313/c-the-complete-reference-herbert-schildt-4th-edition-pdf/preview]
7. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_013843237039374336345 17_shared/overview
8. C programming Tutorial: https://www.geeksforgeeks.org/c/c-programming-language/.

Course outcome (Course Skill Set): At the end of the course the student will be able to:

CO1	Design algorithms and flowcharts, and implement C programs using operators, expressions, and I/O functions.
CO2	Apply conditional statements and looping constructs to solve computational problems effectively.
CO3	Implement one-dimensional /two-dimensional arrays and string operations using standard string-handling functions.
CO4	Develop modular programs using functions, recursion, and structures for structured problem-solving..
CO5	Utilize pointers for memory manipulation and perform file operations for data handling in C.

Introduction to C Programming		Semester	1
Subject Code :**KKICP105A/205A**	**Credits:04**	CIE Marks	50
Teaching Hours/Week (L:T:P:S)	**3:0:2 Hrs**	SEE Marks	50
Total Hours	40 Hours Theory + 20 Hours Practical	Total Marks	100
Examination type (SEE) :	**Theory**	Exam Hours	3 Hrs

Prerequisites: NIL

Course Objectives:

1. To introduce the fundamentals of algorithms, flowcharts, and the basic structure of C programming, enabling them to design and execute simple programs.
2. To develop problem-solving skills using operators, conditional constructs, branching, and looping mechanisms for decision-making and iterative tasks.
3. To impart knowledge of arrays and strings, along with their operations and built-in functions, for efficient data representation and manipulation.
4. To promote modular programming through user-defined functions, emphasizing code reusability, clarity, and structured problem-solving.
5. To provide a strong foundation in advanced C constructs such as structures and pointers for handling complex data.

Modules	Hours
Module-1 **Flowchart and Algorithms:** Art of Programming through Algorithms & Flowcharts. **Overview of C:** History of C, Importance of C, Basic Structure of C Programs, Programming Style, Compiling And Executing a 'C' Program. **Constants, Variables and Data Types:** Character Set, C Tokens, Keywords and Identifiers, Constants, Variables, Data Types, Declaration of Variables, Assigning Values to Variables, Defining Symbolic Constants, Declaring a Variables as Constants and Volatile, Input/Output Statements in C. **Textbook:Chapter1.6,2.1,2.2,2.8,2.9,2.10,Chapter3.2to3.14,Chapter5.1to 5.5**	**08**
Module-2 **Operators:** Introduction to Operators, Arithmetic Operators, Relational Operators, Logical Operators, Assignment Operators, Increment and Decrement Operators, Conditional Operators, Precedence of Arithmetic Operators. **Decision Making, Branching, Looping:** Introduction, Decision Making with IF Statement, Simple IF Statement, The IF..ELSE Statement, Nesting of IF..ELSE Statements, The ELSE IF Ladder, The Switch Statement, The ?: Operator, The GOTO Statement, WHILE, DO, FOR, Jumps in LOOPS. **Textbook: Chapter 4.1 to 4.7,4.12, Chapter 6.1 to 6.9,Chapter 7.1to7.5**	**08**
Module – 3 **Arrays and Strings:** Introduction, Declaration and Initialization of One-dimensional and Two-Dimensional Arrays, Declaring and Initializing String Variables, Example programs using arrays ,Reading Strings from Terminal, Writing Strings to Screen, Arithmetic Operations on Characters, Comparison of Two Strings, String-handling Functions. **Textbook: Chapter 8.1 to 8.6, Chapter 9.2 to 9.5,9.7, 9.8**	**08**

Module – 4 **User-defined Functions:** Introduction, Need for User-defined Functions, A Multi-functional Program, Elements of User-defined Functions, Definition of Function, Return Values and their Types, Function Calls, Function Declaration, NoArguments and noReturn Values, Arguments but no ReturnValues,Nestingof Functions. **Textbook: Chapter 10.1 to 10.8, 10.10 to 10.14**	**08**
Module – 5 **Structures:** Introduction, Defining a Structure, Declaring and Accessing Structure Variables and Members, Structure Initialization, Copying and Comparing Structure Variables, Array of Structures, Arrays within Structures. **Pointers:** Introduction, Understanding Pointers, Accessing the Address of Variable, Declaring pointer variables, initialization of pointers, accessing variables through its pointer. **Textbook:Chapter11.1to11.6,11.8,11.19, Chapter12.1to12.6**	**08**

List of Laboratory Experiments/Activities: (for integrated courses)

1. Develop a program to calculate the temperature converter from degree toFahrenheit.
2. Develop a program to find the roots of quadratic equations.
3. Given age and gender of a person, develop a program to categorize seniorcitizen (male&female).
4. Develop a program to find the sum of digits of a given number.
5. Develop a program to find whether a given number is prime or not.
6. Develop a program to find key elements in an array using linear search..
7. Generate Floyd' s triangle for given rows.
8. Develop a program to find the transpose of a matrix.
9. Develop a Program to perform Matrix Multiplication.
10. Develop a program to concatenate two strings, find length of a string and copy one string to other using string operations.
11. Develop a modular program to find GCD and LCM of given numbers.
12. Develop a program to declare the structure of employees and display the employee records with higher salary among two employees.

Semester End Examination (SEE):

Theory SEE will be conducted by Institute as per the scheduled timetable, with common question papers for the course

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.

Suggested Learning Resources: Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year):

Textbooks:

- Programming in ANSIC, 9e, E Balaguruswamy, Tata McGraw Hill Education.

Referencebooks/Manuals:

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

WeblinksandVideoLectures(e-Resources):

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

Courses can be adopted for more clarity in understanding the topics and verities of problem-solving methods.

- https://www.tutorialspoint.com/what-is-an-algorithm-and-flowchart-in-c-language
- https://www.tutorialspoint.com/cprogramming/c_data_types.htm
- https://www.tutorialspoint.com/cprogramming/c_operators.htm
- https://www.ccbp.in/blog/articles/decision-making-statements-in-c
- https://www.tutorialspoint.com/cprogramming/c_arrays.htm
- https://www.geeksforgeeks.org/variables-in-c/
- https://www.w3schools.com/c/c_arrays.php
- https://www.programiz.com/c-programming/c-strings
- https://www.programiz.com/c-programming/c-pointers
- https://www.scaler.com/topics/c/structures-c/

Course outcomes: On completion of the course, the student will have the ability to:

CO#	Course Outcome(CO)
CO1	Apply algorithms, flowcharts, and fundamental C constructs to design and implement structured programs.
CO2	Use operators, branching, and looping statements effectively to solve computational and logical problems.
CO3	Implement arrays and strings for data storage, manipulation, and basic problem-solving in C.
CO4	Develop modular programs using user-defined functions to improve code readability, reusability, and maintainability.
CO5	Utilize structures and pointers for managing complex data types and memory efficiently in practical applications.

Python Programming		Semester	1
Subject Code :**KKPYP105B/205B**	**Credits:04**	CIE Marks	50
Teaching Hours/Week (L:T:P:S)	**3:0:2**	SEE Marks	50
Total Hours	40 Hours Theory + 20 Hours Practical	Total Marks	100
Examination type (SEE)	**Theory**	Exam Hours	3

Prerequisites: NIL

Course Objectives:

1 Gain the basic knowledge of Python programming concepts.
2 Develop python programs using control statements and data structures in Python.
3 Apply an object-oriented approach to solve a given problem using python.

Modules	Hours
Module-I **The way of the program:** The Python programming language, what is a program? What is debugging? Syntax errors, Runtime errors, Semantic errors, Experimental debugging. **Variables, Expressions and Statements:** Values and data types, Variables, Variable names and keywords, Statements, Evaluating expressions, Operators and operands, Type converter functions, Order of operations, Operations on strings, Input, Composition, The modulus operator. **Iteration:** Assignment, Updating variables, the for loop, the while statement, The Collatz 3n + 1 sequence, tables, two-dimensional tables, break statement, continue statement, paired data, Nested Loops for Nested Data. **Functions:** Functions with arguments and return values. **Chapters:1.1-1.7,2.1-2.12,3.3,4.4,4.5**	**08**
Module-II **Strings:** Working with strings as single things, working with the parts of a string, Length, Traversal and the for loop, Slices, String comparison, Strings are immutable, the in and not in operators, A find function, Looping and counting, Optional parameters, The built-in find method, The split method, Cleaning up your strings, The string format method. **Tuples:** Tuples are used for grouping data, Tuple assignment, Tuples as return values, Compos ability of Data Structures. **Lists:** List values, accessing elements, List length, List membership, List operations, List slices, Lists are mutable, List deletion, Objects and references, Aliasing, cloning lists, Lists and for loops, List parameters, List methods, Pure functions and modifiers, Functions that produce lists, Strings and lists, list and range, Nested lists, Matrices. **Chapter:5.1,5.2,5.3**	**08**

Module – III **Dictionaries:** Dictionary operations, dictionary methods, aliasing and copying. **Numpy:** About, Shape, Slicing, masking, Broadcasting, dtype. **Files:** About files, writing our first file, reading a file line-at-a-time, turning a file into a list of lines, Reading the whole file at once, working with binary files, Directories, fetching something from the Web. **Chapter:5.4,6.1-6.5,7.1-7.8**	**08**
Module – IV **Modules:** Random numbers, the time module, the math module, creating your own modules, Namespaces, Scope and lookup rules, Attributes and the dot Operator, Three import statement variants. **Mutable versus immutable and aliasing** **Object oriented programming:** Classes and Objects—The Basics, Attributes, Adding methods to our class, Instances as arguments and parameters, Converting an instance to a string, Instances as return values. **Chapter:8.1-8.8,9.1,11.1**	**08**
Module – V **Object oriented programming**: Objects are mutable, Sameness, Copying. **Inheritance:** Pure functions, Modifiers, Generalization, Operator Overloading, Polymorphism. **Exceptions**: Catching Exceptions , Raising your own exceptions. **Chapter:11.2.2-11.2.4,11.3.2-11.3.9,12.1,12.2**	**08**

List of Laboratory Experiments/Activities: (for integrated courses) basic

1. Develop a python program to read 2 numbers from the keyboard and perform the arithmetic operations based on the choice. (1-Add, 2-Subtract, 3-Multiply, 4-Divide).
2. Develop a program to read the name and year of birth of a person. Display whether the person is a senior citizen or not.
3. Develop a program to generate Fibonacci sequence of length (N). Read N from the console.
    a. b. Write a python program to create a list and perform the following operations
    b. Inserting an element
    c. Removing an element
    d. Appending an element
    e. Displaying the length of the list
    f. Popping an element
    g. Clearing the list
4. Read N numbers from the console and create a list. Develop a program to print mean, variance and standard deviation with suitable messages.
    a. Read a multi-digit number (as chars) from the console. Develop a program to print the frequency of each digit with a suitable message.
5. Develop a program to print 10 most frequently appearing words in a text file. [Hint: Use a dictionary with distinct words and their frequency of occurrences. Sort the dictionary in the reverse order of frequency and display the dictionary slice of the first 10 items.
6. Develop a program to read 6 subject marks from the keyboard for a student. Generate a report that displays the marks from the highest to the lowest score attained by the student. [Read the marks into a 1-Dimesional array and sort using the Bubble Sort technique].
7. Developaprogramtosortthecontentsofatextfileandwritethesortedcontentsintoaseparatetext file. [Hint:

Use string methods strip(), len (), list methods sort(), append(), and file methods open(), readlines (), and write().

8. Develop a function named DivExp which takes TWO parameters a, b, and returns a value c (c=a/b). Write a suitable assertion for a > 0 in the function DivExpand raise an exception for when b=0. Develop a suitable program that reads two console values and calls the function DivExp.
9. Define a function that takes TWO objects representing complex numbers and returns a new complex number with the sum of two complex numbers. Define a suitable class 'Complex' to represent the complex number. Develop a program to read N (N>=2) complex numbers and to compute the addition of N complex numbers.
10. Text Analysis Tool: Build a tool that analyses a paragraph: frequency of each word, longest word, number of sentences, etc.
11. Develop Data Summary Generator: Read a CSV file (like COVID data or weather stats), convert to dictionary form, and allow the user to run summary queries: max, min, average by column.
12. Develop Student Grade Tracker: Accept multiple students' names and marks. Store them in a list of Tuples or dictionaries. Display summary reports (average, topper, etc.).

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

Semester End Examination (SEE): Theory SEE will be conducted by Institute as per the scheduled timetable, with common question papers for the course

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.

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

Textbooks:

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

Reference books/ Manuals:

1. Al Sweigart," Automate the Boring Stuff with Python, 2nd Edition: Practical Programming for Total Beginners",2nd Edition, No Starch Press, 2022. (Available under CC-BY-NC-SA license at https://automatetheboringstuff.com/).
2. Kyla McMullen, Elizabeth Matthews and June Jamrich Parsons, Programming with Python, Cengage, 2023.

Web links and Video Lectures (e-Resources):

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

Course outcomes: On completion of the course, the student will have the ability to:

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

Soft Skills		Semester	I/II
Course Code	**KKSSC106/206**	CIE Marks	100
Teaching Hours/Week (L:T:P: S)	1:0:0	SEE Marks	----
Total Hours	01 Hours/Week	Total Marks	100
Credits	PP	Exam Hours	----

Course Objectives: The competencies those are important for engineering students joining the digital age workforce or looking to become entrepreneurs are listed in 5 modules**:**

1. Apply social skills for clear communication, persuasion, self-awareness, and active listening.
2. Use emotional skills to build confidence, manage stress, time management & discipline
3. Set ambitious goals, practice empathy and apply creativity for problem-solving.
4. Develop presentation skills, public speaking and body language
5. Work in teams, negotiate, resolve conflicts and think critically.

Pre-requisite: None

Module	Hours
Module-1 **Social Skills :** ➢ Communication: Principles of clear and effective exchange of ideas in professional and social contexts. ➢ Persuasion: Techniques to influence and convince through logical, emotional and ethical appeals. ➢ Self Awareness: Identifying personal strengths, weaknesses, opportunities and challenges (SWOC analysis). ➢ Active Listening: Paraphrasing, questioning techniques and demonstrating attentiveness.	**3**
Module-2 **Emotional Skills I :** ➢ Emotional Intelligence (EI): Recognizing and managing emotions, empathy, relationship management, and conflict resolution. ➢ Stress Management: Identifying stress triggers, relaxation techniques, work-life balance strategies, and mindfulness practices. ➢ Time Management: Prioritization(Eisenhower Matrix), setting SMART goals, avoiding procrastination ➢ Discipline: Building consistency, accountability, and professional habits. ➢ Adaptability & Resilience: Handling change, bouncing back from setbacks and developing a growth mindset.	**3**
Module-3 **Emotional Skills II :** ➢ Ambition & Goal Setting: Defining personal and professional aspirations, creating SMART goals and aligning actions with long-term vision. ➢ Sympathy & Empathy: Understanding emotional perspectives, differentiating between the two and applying them in workplace and social interactions. ➢ Creativity & Innovation: Generating original ideas, problem-solving and applying creative thinking techniques (mind-mapping, SCAMPER).	**3**
Module-4 **Professional Skills I :** Presentation – Element of Presentation – Designing and delivering Power Point Presentation (PPT), Public Speaking on various occasions, Non-verbal Communications - Body Language, facial expressions, Eye Contact, audience research, social etiquette, Creativity in oral communication. Communication through telephonic and video conference, Grooming – do's & don'ts	**3**

Module-5	
Professional Skills II : ➢ Collaboration & Teamwork: Teamwork, Advantages and disadvantages of teamwork, challenges in teamwork ➢ Negotiation Skills & Conflict Resolution: Strategies to resolve differences and reach win– win outcomes (with examples of case studies). ➢ Group Discussion – Do's and Don'ts in Group discussion, Group Presentation. Debate – do's and don'ts in Debate. Group Communication- Meetings, Notice, objectives, timing, venue of meetings, leading meetings, Minutes of meeting,	**3**

Semester End Examination (SEE): Nil

Suggested Learning Resources: Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year):

Text Books:

1. PrinciplesofScientificandTechnicalWriting,1e,ByPratapK.J.Mohapatra,Sanjib Moulick, © 2025 | Published: December 23, 2024
2. SoftSkills,1e,BySomaMahesh Kumar ©2024|Published:June 8,2023
3. EffectiveTechnicalCommunication,3e,ByAshrafM.Rizvi,PriyadarshiPatnaik,© 2024 | Published: September 12, 2024
4. Yadav,D.P.(2022).*AcourseinEnglishpronunciation*.NotionPublications.

Reference Books:

1. Murphy – Effective Business Communication – Mc Graw Hill.

2. Nageshwar Rao and Rajendra Das – Business Skills – HPH.

3. Advance Business Communcation – Penrose, Rasberry, Myers, 5/e, cengage learning 2004.

4. Prasad P. Communication Skills, S.K. Kataria & Sons.

Web links and Video Lectures (e-Resources):

- GoogleDocs+VoiceTyping-https://docs.google.com
- LearnEnglish–https://learnenglish.britishcouncil.org/
- TakeIELTS-https://www.britishcouncil.in/exam/ielts

Course outcome (Course Skill Set): At the end of the 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, time management & discipline
CO3	Set ambitious goals, practice empathy, and apply creativity for problem-solving.
CO4	Develop presentation skills, public speaking and body language
CO5	Work in teams, negotiate, resolve conflicts and think critically.

COMMUNICATION SKILLS		Semester	I/II
Course Code	**BENGL106/206**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	1:0:0	SEE Marks	50
Total Hours	01 Hours/Week	Total Marks	100
Credits	01	Exam Hours	90 Minutes
Examination Type (SEE)	**Theory**		

Course Objectives:

1. Build essential verbal, non-verbal communication and phonetic communication skills for clarity and effectiveness
2. Develop better professional reading and writing skills
3. Apply formal writing, email etiquette and creative content development for employability
4. Communicate effectively in digital platforms, following etiquette and academic integrity.
5. Prepare job applications, resume and perform confidently in interviews

Pre-requisite: None

Module	Hours
Module-1 **Communication skills** Communication Skills and its importance, process, verbal and non-verbal, proxemics, chronemics and barriers for communication .Vocabulary - definition and Importance of vocabulary, types of vocabulary, ways to improve vocabulary – Exercises on it. Homonyms, Homographs, Homophones ,One Word Substitutes, phrasal Verbs, auxiliary verbs.	**3**
Module-2 **Interpersonal skills** Reading: Skimming and Scanning of Case Studies , Reading Comprehension – Reading rate and reading comprehension, paraphrasing, interpretations of graphical information, data, reports etc, book reading and summarizing it. Writing: purposes of writing,. Principles of effective writing. better writing using personal Experiences – describing a person, situation, memorable events , future plans, food, culture , daily life etc.	**3**
Module-3 **English for employability** Formal Letter writing (Job application, joining, resignation, enquiry, order and Complaint). Grammar: Sentence patterns, tenses, Email etiquettes, structure, writing and responding to Emails. paragraph writing (Descriptive, Argumentative, Expository, Short Story, and Narrative), blog writing.	**3**
Module-4 **English in digital world** Writing: Framing of search terms / keywords in search engines/ Commands for search on open AIs - Tools to support synchronous communication such as webinar platforms, and asynchronous communication such as forums and social media - Online communication - Types – pros and cons of online communication. Acceptable online roles and behaviors – etiquettes - 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**.**	**3**
Module-5 **Applying for jobs** Listening: TED Talks. Preparation of resume, Speaking: mock interview, telephone interviews. Preparing for job Interview- language used in formal professional settings,	**3**

formal vs. informal tone, non-verbal communication cues, things to do before going to interview, during interview and after interview.	

Semester End Examination (SEE):
Theory SEE will be conducted by Institute as per the scheduled timetable, with common question papers for the course
1. The question paper will have ten questions. Each question is set for 10 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.

Suggested Learning Resources: Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year):

Text Books:

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.

Reference Books:

1."Professional Writing Skills in English" published by Fillip Learning – Education (ILS), Bangalore – 2022. 2)
2."Functional English" (As per AICTE 2018 Model Curriculum) (ISBN-978-93-5350-047-4) Cengage learning India Pvt Limited [Latest Edition 2019].
3.Murphy – Effective Business Communication – Mc Graw Hill.
4 Nageshwar Rao and Rajendra Das – Business Skills – HPH.
5.Advance Business Communcation – Penrose, Rasberry, Myers, 5/e, cengage learning 2004.
6.Prasad P. Communication Skills, S.K. Kataria & Sons.

Web links and Video Lectures (e-Resources):

- Google Docs + Voice Typing - https://docs.google.com
- LearnEnglish – https://learnenglish.britishcouncil.org/
- TakeIELTS - https://www.britishcouncil.in/exam/ielts

Course outcome (Course Skill Set): At the end of the course the student will be able to:

CO1	Build essential verbal, non-verbal, and phonetic communication skills for clarity and effectiveness.
CO2	Develop better professional reading and writing skills
CO3	Apply formal writing, email etiquette and creative content development for employability.
CO4	Communicate effectively in digital platforms, following etiquette and academic integrity.
CO5	Prepare job applications, resumes, and perform confidently in interviews

MECHANICS AND MATERIALS LABORATORY		Semester	I/II
Course Code	CVEMCL107/207	CIE Marks	50
Teaching Hours/Week (L: T:P: S)	0:0:2:0	SEE Marks	50
Total Hours	12 Hours Lab	Total Marks	100
Credits	1 Credits	Exam Hours	02 Hours
Examination type (SEE)	**Laboratory**		

Course outcome

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

1. Analyse coplanar force systems by analytical and graphical methods and verifying Lami's theorem.
2. Compute support reactions in simply supported beams experimentally and analytically.

Identify and understand the properties of various construction materials.

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
COVENTIONAL EXPERIMENTS

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

AND

Visual identification of building materials:
Bricks, Stones, Tiles, M-Sand, Bitumen, Fly-Ash, GGBS, Steel Bars of Various Sizes.

PART – B
TYPICAL OPEN-ENDED EXPERIMENTS

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

1. Reactions.
2. Field tests on cement.
3. Particle size distribution.
4. Gap graded.
5. Uniformly graded.
6. Well graded.

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

Text books:

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

Reference books / Manuals:

1. Meriam J. L. and Kraige L. G, Engineering Mechanics-Statics, Vol I–sixth Edition,2008, Wiley publication.
2. Rattan S.S., Strength of Materials, Third edition, 2017, McGraw Hill Education; New Delhi. ISBN- 13978-9385965517.
3. Bansal R K, Strength of Materials, Laxmi Publications. 2023, 4th Edition, ISBN:978-8131808146.
4. IS 4031 (Part 11):1988 – Specific gravity test for hydraulic cement.
5. IS 383:1970 – Specification for coarse and fine aggregates from natural sources for concrete.
6. IS 2386(Part 3):1963 Methods of test for aggregates for concrete: Part 3 Specific gravity, density, voids, absorption and bulking.
7. IS 2720 (Part 3/Sec 1):1980 – Determination of specific gravity of soil.

Web links and Video Lectures (e-Resources):

1. https://www.nptel.ac.in/courses/122104015/
2. https://nptel.ac.in/courses/112103109/
3. http://vlab.co.in/

Teaching-Learning Process (Innovative Delivery Methods):

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

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

Assessment Structure:

The assessment for each course is equally divided between Continuous Internal Evaluation (CIE) and the Semester End Examination (SEE), with each component carrying **50% weightage** (i.e., 50 marks each).
The CIE Theory component will be 25 marks and CIE Practical component will be 25 marks.

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

Elements of Mechanical Engineering Lab		Semester	I/II
Course Code	MEEMEL107/207	CIE Marks	50
Teaching Hours/Week (L:T:P:S)	0:0:2	SEE Marks	50
Total Hours of Pedagogy	24Hours(12-weeksession)	Total Marks	100
Credits	1	Exam Hours	3
Examination type(SEE)	**Practical**		

Course Outcomes

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

1. Perform various operations using lathe and welding machine.
2. Calibrate various measuring devices to achieve accuracy of measurement.
3. Demonstrate angular measurement of a given specimen using appropriate device.
4. Determine the properties and characteristics of fuels and oils.
5. Determine the hardness of materials using hardness testing machine.

Note:

1. The laboratory syllabus consists of PART-A and PART-B.
2. While PART-A has 4 conventional experiments,
3. PART-B has 4 typical open-ended experiments. The maximum marks for the laboratory course are 100.
4. Both PART-A and PART-B are considered for CIE and SEE.
5. 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.
6. For continuous internal evaluation, during the semester, class work, the typical open-ended questions shall be from PART-B, and any other similar questions to enhance the skill of the students.

PART– A
CONVENTIONAL EXPERIMENTS

1. Performing facing, plain turning and step turning operations by using a lathe.
2. Performing **Chamfering**, threading and knurling operations by using a lathe.
3. Calibration of vernier caliper and micrometer using slip gauges.
4. Determination of the angle of a specimen using a sine bar.

PART– B

TYPICAL OPEN-ENDED EXPERIMENTS

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

1. Comparative study off lash point and fire point of various fuels/oils using the open cup method
2. Comparative study of flash point and fire point of various fuels/oils using the closed cup method
3. Selection and justification of appropriate joining techniques for given applications (L ,T, LAP joint)
4. Fabrication of a sheet metal part with simple geometry and soldering.

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

Textbooks:

1. Amitabh Ghosh and Amit Kumar Mallik, Manufacturing Science, Affiliated East West Press (p) Ltd, New Delhi, 2002
2. Hajara and Choudhary, WorkshopTechnologyVol.I(2008)&II(2010),Median Promoters & publishers, Bombay.
3. Khanna O.P, Workshop Practice, Vol. I, Dhanpat Rai&Co.,2000.
4. EngineeringMetrology,R.K.Jain,KhannaPublishers,Delhi,2009.

Referencebooks/Manuals:

1. SeropeKalpakjianandStevenRSchmid,ManufacturingEngineeringandTechnology, Fourth Edition, Pearson Education, Asia, 2000.
2. P.N.Rao, Manufacturing technology--Foundry, Forming and Welding,TataMcGrawHill Education, 2001.
3. I.C.Gupta, Engineering Metrology,DhanpatRai Publications,NewDelhi,2018.
4. Ganeshan. V, Interna lCombustionEngines,TataMcGrawHill,4thEdition,2012**.**

Web links and Video Lectures (e-Resources):

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

Teaching-Learning Process (Innovative Delivery Methods):
The following are sample strategies that educators may adopt to enhance the effectiveness of the teaching-learning process and facilitate the achievement of course outcomes.

- Flipped Classroom
- Simulation and Virtual Labs
- Video demonstration

Assessment Structure:

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

The CIE marks awarded shall be based on the continuous evaluation of the laboratory report using a defines to frubrics.Eachexperimentreportcanbeevaluatedfor30marks.Thelaboratorytest (duration 03 hours) at the end of the last week of the semester /after completion of all the experiments (whichever is early) shall be conducted for 50 marks and scaled down to 20 marks. For both CIE and SEE, the student is required to conduct one experiment each from both Part A and Part B.

Basic Electrical Lab		Semester	I/II
Course Code:	**EEBEEL107/207**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	0:0:2:0	SEE Marks	70
Total Hours	2	Total Marks	100
Credits	1 Credits	Exam Hours	03
Examination type (SEE)	**Practical**		

Course outcome (Course Skill Set)

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

(1)Conduct standard electrical experiments to verify theoretical principles.

(2)Measure key electrical parameters such as resistance, inductance, impedance, power, and power factor with standard methods.

(3)Design and perform experiments to solve practical open-ended electrical problems.

(4)Analyse experimental data from non-routine method to arrive at a solution.

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.

(iv 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.

PART – A **CONVENTIONAL EXPERIMENTS**	
(1) Verification of Ohm's law and Kirchhoff's laws. (2) Measurement of low range resistance using voltmeter-ammeter method. Verification of resistance value using multimeter/LCR meter. (3) Measurement of earth's resistance by 3-electrode method. (4) Measurement of resistance, inductance, impedance and power factor using voltmeter, ammeter and watt meter in single-phase AC circuits. (5) Measurement of three-phase power of a delta connected by 2-wattmeter method, when the load is 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 **TYPICAL OPEN-ENDED EXPERIMENTS** Open-ended experiments are a type of laboratory activity where the outcome is not predetermined and students are given the freedom to explore, design, and conduct the experiment based on the problem statements as per the concepts defined by the course coordinator. It encourages creativity, critical thinking, and inquiry-based learning.	
(1) Creation of short circuit to determine the time taken by a fuse of different length. Documenting the test data and the conclusions. (2) Trouble shooting experiments in simple DC circuits. The trouble may be due to loose connection, faulty component leading to open circuits or short circuits. Detection of fault and the reasons for that and conclusion. (3) Measurement of voltage between line and neutral, ground and line, ground and neutral in respect of heathy and unhealthy 3-pin socket. Conclusions arrived for the faulty wiring. Allowable ground voltage. (4) A 12 V battery is available. It is required to obtain 3 V from the battery to charge a mobile. Create a circuit to obtain the required voltage. Specify all the ratings of the components used. (5) Determine the efficiency of a given single phase transformer by direct loading using 2 low p.f wattmeters. (6) To draw OCC characteristics of a given DC generator to estimate the critical resistance of the Field and emf induced due to residual flux.	
Suggested Learning Resources: **Textbooks:** **1. Manual prepared for the conventional experiments by EEE Departments**.	
Web links and Video Lectures (e-Resources): (1) https://bes-iitr.vlabs.ac.in/List%20of%20experiments.html [Virtual Labs, an ministry of education (MOE) Govt.of India Initiative]	
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. (i)Demonstration with hands-on practice. Perform the experiment step-by-step to reinforce understanding and skill after a demonstration. (ii)Problem-based learning (PBL) Students to work individually or in groups to analyse the situation, design solutions, and present their findings.	
Assessment of CIE and SEE The assessment of the practical course is for a maximum of 100 marks. Both CIE and SEE are evaluated for 50 marks each.	

Fundamentals of Electronics and Communication Engineering Lab			
Course Code	ECFECL107/207	Semester	I/II
Teaching hours per week (L:T:P:S)	0:0:2:0	CIE Marks	50
Total Hours	(13) Lab slots	SEE Marks	50
Credits	1	Exam Hours	03
Examination Type (SEE)	Theory		

Course Objectives:

- Design and verification of Half wave and Full wave rectifier with an without filter
- To study and understand the characteristics of BJT and MOSFET
- To study the various applications of op amp circuits
- To study and understand anlog modulation techniques
- To study and verify simple digital arithmetic circuits using logic gates

List of experiments of the laboratory to be conducted

1. Design and Testing of Half-Wave and Full-Wave Rectifiers with and without Filter for determining Ripple Factor, Voltage Regulation, and Efficiency
2. Design and Testing of Bridge Rectifier with and without Filter for determining Ripple Factor, Voltage Regulation, and Efficiency
3. Analysis of Input and Output Characteristics of a Bipolar Junction Transistor in Common Emitter Configuration
4. Study of Transfer and Drain Characteristics of a MOSFET in Common Source Configuration
5. Investigation of Op-Amp in Inverting and Non-Inverting Modes with Gain Measurement
6. Study of Truth Tables for OR, AND, NOT, NAND and NOR Gates using Basic and Universal Gates
7. Design and Testing of Clipping and Clamping Circuits to obtain desired Transfer Characteristics
8. Design and test a single stage bipolar junction transistor amplifier to obtain desired gain and bandwidth requirements.
9. Testing of Op-Amp as voltage follower and a weighted summer with waveform analysis.
10. Design and Testing of Integrator and Differentiator Circuits using Op-Amp with Waveform Analysis

11. Amplitude Modulation using Discrete Components for given specifications.
12. Realization of Half/Full Adder and Subtractor using Logic Gates.

Conduct of Practical Examination:

- All laboratory experiments are to be included for practical examination
- Students are allowed to pick one experiment from the lot.
- Strictly follow the instructions as printed on the cover page of answer script for breakup of marks.
- Change of experiment is allowed only once and will be evaluated for 85% of the total marks.

CO #	Course Outcome (CO)
CO1	Apply the operating principles of diodes, transistors, and MOSFETs to construct and test basic analog circuits
CO2	Implement operational amplifier configurations such as inverting, non-inverting, integrator, and differentiator for analog signal processing applications.
CO3	Analyze the functionality of logic gates and combinational circuits including adders, subtractors, and code converters using digital ICs.
CO4	Investigate amplitude modulation to explore fundamental analog communication techniques.
CO5	Develop solutions to open-ended electronic design problems by selecting appropriate components, constructing circuits, and interpreting results to meet defined objectives.

Programming in C Lab		Semester	1
Subject Code :**CSPOCL107/207**	**Credits:01**	CIE Marks	50
Teaching Hours/Week (L:T:P:S)	**0:0:2:0Hrs**	SEE Marks	50
Total Hours	24 Hours Practical	Total Marks	100
Examination type (SEE) : **Practical**		Exam Hours	3 Hrs

Prerequisites: NIL

Course Objectives:

1. To enable students to design algorithms and flowcharts as a foundation for structured problem-solving.
2. To develop C programs for solving mathematical, logical, and engineering problems using appropriate control structures.
3. To impart practical knowledge of arrays, strings, functions, and pointers for modular and efficient programming.
4. To train students in applying C concepts to real-world inspired applications.
5. To familiarize students with problem-solving strategies through both conventional and open-ended laboratory experiments, encouraging innovation and analytical thinking.

PART-A

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

1. A robot needs to find how far it must travel between two points on a 2D plane. Develop a C program to calculate the straight-line distance between the given coordinates.

2. Develop a C program that takes a student's marks as input and displays their grade based on the following criteria:
   a. 90 and above:
      Grade A 75 to 89:
      Grade B
   b. 60 to74: Grade C
   c. 50 to 59: Grade D
      Below 50: Grade F
   d. Choose a suitable control structure to implement this logic efficiently.

3. Develop a C program that takes a unique identification input like PAN Number, AADHAR_Number, APAAR_Id, Driving License, Passport and checks it against a set of stored KYC records. Based on the input, display whether the individual is verified or not. Use an appropriate control structure to handle multiple possible ID matches. Assume all Unique identification are of integer type.

4. A math app needs to determine the type of roots for a quadratic equation based on user input. Develop a C program to calculate and display the roots based on the given coefficients.

5. A sensor in a robotic arm needs to calculate the angle of rotation in real-time, but the hardware doesn't support built-in trigonometric functions. Develop a C program to approximate the value of sin(x) using a series expansion method for improved performance.

6. Implement matrix multiplication and validate the rules of multiplication.

7. Develop a C program that accepts a course description string and a keyword from the user. Search whether the keyword exists within the course description using appropriate string functions. If found, display: "Keyword '<keyword>' found in the course description." Otherwise, display: "Keyword '<keyword>' not found in the course description."

8. Develop a C program that takes marks for three subjects as input. Use a function to check if the student has passed (minimum 40 marks in each subject). Display the average and whether the student passed or failed.

9. In an ATM system, two account balances need to be swapped temporarily for validation. Develop a C program that accepts two balances and uses a function with pointers to swap them. Display the balances before and after swapping.

10. Write a C program to copy a text file to another, read both the input filename and target filename.

PART–B

TYPICAL OPEN-ENDED EXPERIMENTS

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

1. A college library has a digital bookshelf system where each book is assigned a unique BookID. The bookshelf is organized in ascending order of Book IDs. Develop a C Program to quickly find whether a book with a specific Book ID is available in the shelf.

2. A sports teacher has recorded the scores of students in a 100-meter race. To prepare the result sheet, the teacher wants the scores arranged in descending order (from highest to lowest). Develop a C program to sort the scores.

3. A small warehouse tracks how many units of different products are shipped from multiple branches. Another dataset shows how much revenue each product generates per unit. Develop a C program which combines these datasets to calculate the total revenue generated by each branch.

4. A basic mobile contact manager stores first and last names separately. For displaying full names in the contact list, you need to join them manually. Additionally, the system must check the length of each full name to ensure it fits the screen. Perform these operations by developing a C program without using built- in string functions.

5. A currency exchange booth allows users to convert between two currencies. Before confirming the exchange, the system simulates a swap of the values to preview the result without actually changing the original data. In other cases, it updates the actual values. Develop a C program that implements both 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.

Semester End Examination (SEE):
Note:

1. The laboratory syllabus consists of PART-A and PART-B. While PART-A has 10 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.
   - 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.
   - 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, class work, the typical open-ended questions
   Shall be from PART-B, and any other similar questions to enhance the skill of the students

Suggested Learning Resources: Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year):

Textbook:

- Hassan A fyouni, Behrouz A. Forouzan. "A Structured Programming Approach in C", 4th Edition, Cengage.

Reference books:

- Schildt, Herbert. "C the complete reference", 4th Edition, McGrawHill.
- BrianW.Kernighan and Dennis M. Ritchie, The 'C' Programming Language, 2nd edition, Prentice Hall of India.

Web links and Video Lectures (e-Resources):

- Introduction to Programming in C [https://onlinecourses.nptel.ac.in/noc23_cs02/preview]
- C for Everyone: Programming Fundamentals [https://www.coursera.org/learn/c-for-everyone]
- Computer Programming Virtual Lab [https://cse02-iiith.vlabs.ac.in/exp/pointers/]
- C Programming: The ultimate way to learn the fundamentals of the C language [https://www.pdfdrive.com/c-programming-the-ultimate-way-to-learn-the-fundamentals-of-the-c- language-e187584209.html].
- C Programming: The Complete Reference https://viden.io/knowledge/programming-in-c- language/attachment/28313/c-the-complete-reference-herbert-schildt-4th-edition-pdf/preview]

Course outcomes: **On completion of the course, the student will have the ability to:**	
CO#	**Course Outcome(CO)**
CO1	Design algorithms and flowcharts, and implement corresponding C programs for mathematical and logical computations.
CO2	Apply conditional statements, loops, and control structures to develop programs for decision-making and iterative tasks.
CO3	Implement string operations and arrays to solve real-world computational problems effectively.
CO4	Utilize functions (including recursion and modular functions) and structures for modular program design in practical applications and demonstrate the ability to solve real-world inspired open-ended problems with creativity, accuracy, and efficiency.
CO5	Illustrate pointers, FILE's structures for memory manipulation, data storage and processing to solve real-world problems .

Innovation & Design Thinking Lab		Semester	1
Course Code:	**KKIDTL158**	**CIE Marks**	**50**
Teaching Hours/Week (L:T:P:S)	**0:0:2**	**SEE Marks**	**50**
Total Hours of Pedagogy	**2**	**Total Marks**	**100**
Credits	**1**	**Exam Hours**	
Examination type (SEE)	**Practical/Presentation/Seminar**		

Course Outcome (Course Skill Set) -

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

1. Empathize with community problems and define meaningful challenges.
2. Apply design thinking principles and multidisciplinary skills to develop user-centric solutions.
3. Build and test basic prototypes using tools available in the Atal Idea/Tinkering Lab or Makers Space.
4. Pitch socially relevant ideas with scalable models.
5. Collaborate effectively in diverse teams.

Week 1, 2 & 3: Orientation and Team Formation

Week -1&2: Introduction to Social Entrepreneurship**,** Innovation and Design Thinking
Group discussion on What is **Innovation** vs **Invention**. Why **Design Thinking** is important. Brief about **5 stages**: Empathize – Define – Ideate – Prototype – Test.

Week -3: Innovation warm-up activities, forming interdisciplinary teams, Instructions about Next week activities

Week 4–5: Empathy and Field Exploration

Week-4&5: Field (any public places of student's interest Eg- Village, Government Office, Industry. R&D institute, NGO etc) visits, stakeholder interviews and interaction. Recording all interaction through handwritten in activity book prescribed by the University.

Week 6, 7 and 8: Problem Definition

Week-6: Documentation, categorization and Group discussion on interactions and problems/challenges.

Week-7&8: Problem framing using "How Might We" approach, Identification of social problems and user insights through affinity Clustering and Problem Tree. Mention of clearly defined challenge statements.

Week 9, 10 &11: Ideation Sprint

Week-9&10: Presentation by teams on Defined Problems, Brainstorming interactions and Mind Mapping.

Week-10: Idea Filtering - Shortlist of creative, eco -friendly and feasible ideas. Selection of one Suitable IDEA for next process, Designing/Structuring of Prototype model.

Week 12, 13 &14: Rapid Prototyping using Atal Idea Lab/Makers Space
Week-12&13: Building low-fidelity and working models using tools like Arduino, 3D printers,: Digital fabrication, electronics kits and recycled materials **Week-14:** User testing, Feedback collection, Iteration - Observation Notes, Feedback Forms (Designing a business model for impact and scalability, if possible) Preparation of Draft of social venture plan
Week 15 &16: Final Demo and Social Pitch
Innovation showcase, Poster display, Project pitching to jury ***Presentation of the project with impact with assessment, prototype, and sustainability plan***
Teaching-Learning Process (Innovative Delivery Methods) **1. Activity Based Learning** **2. Group discussion, Presentations.** **3. one faculty member shall be assigned to group of 60 students or one division.** **4. Each group shall contain Min. 4 and Max. 6 students.** **5. Nature of the group shall be multidisciplinary. (Group shall be formed by selecting students from all branches)**

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 Internal Evaluation (CIE) –

CIE Marks allocation Parameters for Social Entrepreneurship, Innovation & Design Thinking using Atal Idea/Tinkering Lab or Maker Space

CIE Parameters (50 Marks)

Sl. No.	CIE Component/Week	Marks	Description
1	Orientation Activities & Communication Skills	5	Participation in Week 1–3 orientation, communication and teamwork skill-building exercises.
2	Empathy & Field Exploration Documentation	10	Quality and completeness of field visit reflections, stakeholder interviews, and activity book.
3	Problem Definition and Framing	10	Clarity of challenge statements, use of "How Might We", Affinity Mapping, Problem Trees.
4	Ideation & Mind Mapping	5	Participation in brainstorming, mind mapping, idea filtering sessions.
5	Prototype Development & Iteration	10	Quality and creativity of prototype/model, user testing, feedback collection, iterations.
6	Final Presentation & Pitch	5	Project pitching, poster presentation, storytelling and scalability model.
7	Teamwork, Journal, and Engagement	5	Peer and mentor evaluation of participation, teamwork, journal

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

Semester End Examination (SEE) –

SEE to be conducted in batches where the students will exhibit their projects along with the presentation and Viva -voce. – 100 Marks

Sl. No.	Evaluation Parameter	Marks	Details
1	Prototype / Solution Demonstration	30	Working functionality, creativity, use of lab tools, relevance to the problem.
2	Final Presentation / Social Pitch	20	Clarity, storytelling, problem-solution fit, communication, visual aids.
3	Business Model or Sustainability Plan	10	Feasibility, cost-effectiveness, scalability, and alignment with SDGs.
4	Viva Voce	20	Individual understanding, contribution, tools used, learning outcomes.
5	Documentation Report / Portfolio	20	Project report, reflection, team activity log, stakeholder input summaries.

Submission Requirements:

- Handwritten activity book with CIE marks and Final project report (Typed or Handwritten).
- Final presentation ppt/pdf (hard and soft copy).
- Prototype or working model [physical or conceptual (shall be drawn/sketched clearly on card sheet paper)].
- Peer/team feedback and reflection entries (if applicable).

ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ		Semester	1&2
Course Code	KKKSK109/209	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	01 Hour	SEE Marks	50
Total Hours	15Hours Theory	Total Marks	100
Credits	1 Credits	Exam Hours	1.5 Hours
Examination type (SEE)	**Theory**		

Course Objectives:ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ ಪಠ್ಯ ಕಲಿಕೆಯ ಉದ್ದೇಶಗಳು

The course (_____) will enable the students.

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

Pre-requisite:

Module	Hours
ಘಟಕ – 1 ಕನ್ನಡ ಸಂಸ್ಕೃತಿ ಮತ್ತು ಭಾಷೆ ಕುರಿತಾದ ಲೇಖನಗಳು 1. ಕರ್ನಾಟಕ ಸಂಸ್ಕೃತಿ– ಹಂಪ ನಾಗರಾಜಯ್ಯ 2. ಕರ್ನಾಟಕದ ಏಕೀಕರಣ : ಒಂದು ಅಪೂರ್ವ ಚರಿತ್ರೆ– ಜಿ. ವೆಂಕಟಸುಬ್ಬಯ್ಯ 3. ಆಡಳಿತ ಭಾಷೆಯಾಗಿ ಕನ್ನಡ – ಡಾ.ಎಲ್. ತಿಮ್ಮೇಶ ಮತ್ತು ಪ್ರೋ. ವಿ. ಕೇಶವ ಮೂರ್ತಿ	03 hours
ಘಟಕ –2 ಆಧುನಿಕ ಪೂರ್ವದ ಕಾವ್ಯ ಭಾಗ 1. ವಚನಗಳು : ಬಸವಣ್ಣ ಅಕ್ಕಮಹಾದೇವಿ, ಅಲ್ಲಮಪ್ರಭು, ಆಯ್ದಕ್ಕಿ ಮಾರಯ್ಯ ಜೇಡರದಾಸಿಮಯ್ಯ, ಆಯ್ದಕ್ಕಿ ಲಕ್ಕಮ್ಮ 2. ಕೀರ್ತನೆಗಳು : ಅದರಿಂದೇನು ಫಲ ಇದರಿಂದೇನು ಫಲ– ಪುರಂದರದಾಸರು ತಲ್ಲಣಿಸದಿರು ಕಂಡ್ಯ ತಾಳು ಮನವೇ – ಕನಕದಾಸರು 3. ತತ್ವ ಪದಗಳು : ಸಾವಿರ ಕೊಡಗಳ ಸುಟ್ಟು – ಶಿಶುನಳ ಶರೀಫ	03 hours
ಘಟಕ –3 ಆಧುನಿಕ ಕಾವ್ಯಭಾಗ 1. ಡಿವಿಜಿ ರವರ ಮಂಕುತಿಮ್ಮನ ಕಗ್ಗದಿಂದ ಆಯ್ದ ಕೆಲವು ಭಾಗಗಳು 2. ಕುರುಡು ಕಾಂಚಾಣ : ದ.ರಾ. ಬೇಂದ್ರೆ 3. ಹೊಸ ಬಾಳಿನ ಗೀತೆ : ಕುವೆಂಪು	03 hours
ಘಟಕ –4ತಾಂತ್ರಿಕ ವ್ಯಕ್ತಿಗಳ ಪರಿಚಯ 1. ಡಾ. ಸರ್. ಎಂ. ವಿಶ್ವೇಶ್ವರಯ್ಯ : ವ್ಯಕ್ತಿ ಮತ್ತು ಐತಿಹ್ಯ– ಎ.ಎನ್. ಮೂರ್ತಿರಾವ್ 2. ಕರಕುಶಲ ಕಲೆಗಳು ಮತ್ತು ಪರಂಪರೆಯ ವಿಜ್ಞಾನ : ಕರೀಗೌಡ ಬೀಚನಹಳ್ಳಿ	03 hours
ಘಟಕ –5ಸಾಂಸ್ಕೃತಿಕ ಜನಪದ ಕಥೆ ಮತ್ತು ಪ್ರವಾಸ ಕಥನ 1. ಯುಗಾದಿ ವಸುಧೇಂದ್ರ	

2. ಮೆಗಾನೆ ಎಂಬ ಗಿರಿಜನ ಪರ್ವತ : ಹಿ.ಚಿ. ಬೋರಲಿಂಗಯ್ಯ
3. ಕಂಪ್ಯೂಟರ ಹಾಗೂ ಮಾಹಿತಿ ತಂತ್ರಜ್ಞಾನ ('ಕ' ಮತ್ತು 'ಬ' ಬರಹ ತಂತ್ರಾಂಶಗಳು ಮತ್ತು ಕನ್ನಡದ ಟೈಪಿಂಗ್)

List of Laboratory Experiments/Activities: (for integrated courses)

Suggested Learning Resources: Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year):

Text Books: ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ

ಡಾ. ಹಿ.ಚಿ. ಬೋರಲಿಂಗಯ್ಯ ಮತ್ತು ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ

ಪ್ರಕಟಣೆ : ಪ್ರಸಾರಾಂಗ,

ವಿಶ್ವೇಶ್ವರಯ್ಯ ತಾಂತ್ರಿಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಬೆಳಗಾವಿ.

Reference Books:

Web links and Video Lectures (e-Resources):
VTU Website

Course outcome (Course Skill Set): At the end of the course the student will be able to:

CO1	ಕನ್ನಡ ಭಾಷೆ, ಸಾಹಿತ್ಯ ಮತ್ತು ಕನ್ನಡದ ಸಂಸ್ಕೃತಿಯ ಕುರಿತು ಅರಿವು ಮೂಡಿರುತ್ತದೆ.
CO2	ಕನ್ನಡ ಸಾಹಿತ್ಯದ 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 ಪರಿಚಯ ಹಾಗೂ ಅವರುಗಳ ಸಾಧಿಸಿದ ವಿಷಯಗಳನ್ನು ತಿಳಿದುಕೊಂಡು ನಾಡಿನ ಇನ್ನಿತರ ವ್ಯಕ್ತಿಗಳ ಬಗ್ಗೆ ತಿಳಿದುಕೊಳ್ಳಲು ಕೌತುಕತೆ ಹೆಚ್ಚಾಗುತ್ತದೆ.
CO5	ಸಾಂಸ್ಕೃತಿಕ ಜನಪದ ಹಾಗೂ ಪ್ರವಾಸ ಕಥನಗಳ ಪರಿಚಯ ಮಾಡಿಕೊಡುವುದು.

Assessment Structure :

Theory SEE will be conducted by Institute as per the scheduled timetable, with common question papers for the course The Weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam)SEE) is 50% The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50). The minimum passing mark for the SEE is 35% of the maximum marks (18 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination (SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

ಬಳಕೆ ಕನ್ನಡ (Balake Kannada)		Semester	1&2
Course Code	KKKBK109/209	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	1 Hours	SEE Marks	50
Total Hours	15Hours Theory	Total Marks	100
Credits	1 Credits	Exam Hours	1.5 Hours
Examination type (SEE)	**Theory**		

Course Objectives:ಬಳಕೆ ಕನ್ನಡ ಪಠ್ಯಕಲಿಕೆಯ ಉದ್ದೇಶಗಳು

The course (_____) will enable the students.

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

Pre-requisite:

Module	Hours
Module-1 4. Introduction, Necessity of learning a local language. Methods to learn the kannada language. 5. Easy learning of a kannada language A few tips. Hints for correct and polite conservation, Listening and Speaking Activities, key to Transcription 6. ವೈಯಕ್ತಿಕ, ಸ್ವಾಮ್ಯ ಸೂಚಕ/ಸಂಬಂಧಿತ ಸಾರ್ವನಾಮಗಳು ಮತ್ತು ಪ್ರಶ್ನಾರ್ಥಕ ಪದಗಳು –Perosnal pronouns, possessive Forms, Interrogative words.	03 hours
Module-2 4. ನಾಮಪದಗಳ ಸಂಬಂಧಾರ್ಥಕ ರೂಪಗಳು, ಸಂದೇಹಾಸ್ಪದ ಪ್ರಶ್ನೆಗಳು ಮತ್ತು ಸಂಬಂಧವಾಚಕ ನಾಮಪದಗಳು – Possessive forms of nouns, dubitive question and Relative nouns 5. ಗುಣ, ಪರಿಮಾಣ ಮತ್ತು ವರ್ಣಬಣ್ಣ ವಿಶೇಷಣಗಳು, ಸಂಖ್ಯಾವಾಚಕಗಳು Qualitative, Quantitative and Colour Adjectives, Numerals 6. ಕಾರಕ ರೂಪಗಳು ಮತ್ತು ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯಗಳು–ಸಪ್ತಮಿ ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯ– (ಆ, ಅದು, ಅವು, ಅಲ್ಲಿ) Predictive Forms, Locative Case	03 hours
Module-3 4. ಚತುರ್ಥಿ ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯದ ಬಳಕೆ ಮತ್ತು ಸಂಖ್ಯಾವಾಚಕಗಳು –Dative Cases, and Numerals 5. ಸಂಖ್ಯಾಗುಣವಾಚಕಗಳು ಮತ್ತು ಬಹುವಚನ ನಾಮರೂಪಗಳು –Ordinal numerals and Plural markers 6. ನ್ಯೂನ/ ನಿಷೇಧಾರ್ಥಕ ಕ್ರಿಯಾಪದಗಳು - ವರ್ಣ ಗುಣವಾಚಕಗಳು –Defective/ Negative Verbs &ColourAdjectves	03 hours
Module-4 ೩. ಅಪ್ಪಣೆ/ ಒಪ್ಪಿಗೆ ನಿರ್ದೇಶನ, ಪ್ರೋತ್ಸಾಹ ಮತ್ತುಒತ್ತಾಯಅರ್ಥರೂಪ ಪದಗಳು ಮತ್ತು ವಾಕ್ಯಗಳು Permission, Commands, encouraging and Urging words (Imperative words and sentences) ೪. ಸಾಮಾನ್ಯ ಸಂಭಾಷಣೆಗಳಲ್ಲಿ ದ್ವಿತೀಯ ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯಗಳು ಮತ್ತು ಸಂಭವನೀಯ ಪ್ರಕಾರಗಳು Accusative cases and Potential Forms used in General Communication	03 hours

5. “ಇರು ಮತ್ತುಇರಲ್ಲ” ಸಹಾಯಕ ಕ್ರಿಯಾಪದಗಳು, ಸಂಭಾವ್ಯ ಸೂಚಕ ಮತ್ತು ನಿಷೇಧಾರ್ಥಕಕ್ರಿಯಾ ಪದಗಳು– Helping Verbs “iru and iralla” Corresponding Future and Negation Verbs 6. ಹೋಲಿಕೆ (ತರತಮ), ಸಂಬಂಧ ಸೂಚಕ, ವಸ್ತು ಸೂಚಕ ಪ್ರತ್ಯಯಗಳು ಮತ್ತು ನಿಷೇಧಾರ್ಥಕ ಪದಗಳ ಬಳಕೆ Comparative, Relatiship identification and Negation Words	
Module-5 4. ಕಾಲ ಮತ್ತು ಸಮಯದ ಹಾಗೂ ಕ್ರಿಯಾಪದಗಳ ವಿವಿಧ ಪ್ರಕಾರಗಳು Different types of Tense, Time and verbs 5. ಜಜಿಜಿ.ತ್.ತು, ಇತು.–ಆಗಿ.–ಅಲ್ಲ.–ಗ್.– ಕ್, ಇದೆ, ಕ್ರಿಯಾ ಪ್ರತ್ಯಯಗಳೊಂದಿಗೆ ಭೂತ, ಭವಿಷ್ಯತ್ ಮತ್ತು ವರ್ತಮಾನ ಕಾಲ ವಾಕ್ಯರಚನೆ Formation of Past, Future and Present Tense Sentences with Verb Forms 6. Knnada Vocabulary List : ಸಂಭಾಷಣೆಯಲ್ಲಿ ದಿನೋಪಯೋಗಿಕನ್ನಡ ಪದಗಳು –Kannada Words Conversation	03 hours

Semester End Examination (SEE and CIE):
Theory SEE will be conducted by Institute as per the scheduled timetable, with common question papers for the course The Weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50% The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50). The minimum passing mark for the SEE is 35% of the maximum marks (18 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination (SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Suggested Learning Resources: Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year):

Text Books: “ಬಳಕೆ ಕನ್ನಡ”

ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ ,ಪ್ರಕಟಣೆ : ಪ್ರಸಾರಾಂಗ,

ವಿಶ್ವೇಶ್ವರಯ್ಯತಾಂತ್ರಿಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಬೆಳಗಾವಿ.

Reference Books:
Web links and Video Lectures (e-Resources):
VTU Website

Course outcome (Course Skill Set): At the end of the course the student will be able to:

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

Differential Calculus and Numerical Methods		Semester	1
Course Code	**CVMAT201**	CIE Marks	50
Teaching Hours/Week(L:T:P:S)	3:2:0:0	SEE Marks	50
Total Hours of Pedagogy	40HoursTheory+20HoursTutorials	Total Marks	100
Credits	4Credits	Exam Hours	3Hours
Examination type(SEE)	**Theory**		

Course Objectives: The goal of the course **Differential Calculus and Numerical Methods (CVMAT201)**is to

- **Familiarize** Vector calculus essential for civil engineering.
- **Analyze** Civil engineering problems by applying Partial Differential Equations.
- **Develop** the knowledge of solving civil engineering problems numerically

Module	Hours
Module-1 **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. Simple examples	**(8 Hours Theory+ 4 Hours Tutorials)**
Module-2 **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 ,problem swith out verification..	**(8 Hours Theory+ 4 Hours Tutorials)**
Module-3 **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's1/3rdrule and Simpson's3/8thrule.	**(8 Hours Theory+ 4 Hours Tutorials)**
Module-4 **Numerical Methods-2** Numerical solution of ordinary differential equations of first order and first degree: Taylor's series method, Modified Euler'smethod,Runge-Kutta method of fourth order and Milne's predictor corrector method and Adam-Bashforth predictor-corrector method.	**(8 Hours Theory+ 4 Hours Tutorials)**
Module-5 **Partial Differential Equations (PDE)** Formation of PDEs by elimination of arbitrary constants and functions. Solution of non-homogeneus 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 Tutorials)**

List of Laboratory Experiments/Activities

1) Evaluate double integration and compute area and volume,
2) Evaluate triple integration and compute volume,
3) Finding gradient ,divergence and curl,
4) Evaluate line integrals,
5) Regula Falsi and Newton Raphson method,
6) Interpolation,

7) Numerical integration,
8) Modified Euler's method,
9) Fourth order Runge-Kutta method,
10) Milne's method.

Semester End Examination (SEE):

Theory SEE will be conducted by Institute as per the scheduled timetable, with common question papers for the course

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.

Suggested Learning Resources:(Textbook/Reference Book):

Text books:

1. B.S.Grewal, Higher Engineering Mathematics, Khanna Publishers, 44thEd.,2021.
2. E.Kreyszig ,Advanced Engineering Mathematics ,John Wiley&Sons ,10thEd.,2018.
3. M.K.Jain, S.R.K .Iyengarand R.K. Jain ,Numerical Methods for Scientific and Engineering Computation, New Age International Publishers, 8thEd., 2022.

Reference books:

1. B.V.Ramana, Highe rEngineering Mathematics, McGraw-Hill Education, 11thEd.,2017
2. Srimanta Pal & SubodhC .Bhunia, Engineering Mathematics, Oxford University Press, 3rdEd.,2016.
3. N.P .Bali and Manish Goyal, A Text book of Engineering Mathematics, Laxmi Publications ,10thEd., 2022.
4. H.K. Dass and Er.Rajnish Verma ,Higher Engineering Mathematics ,S.Chand Publication, 3rdEd., 2014.
5. Steven V.Chapra and Raymond P.Canale, Applied Numerical Methods with Matlab for Engineers and Scientists, McGraw-Hill, 3rdEd., 2011.
6. RichardL. Burden, Douglas J.Fairesand A.M.Burden,Numerical Analysis, 10thEd.,2010,Cengage Publishers.
7. S.S .Sastry, "Introductory Methods of Numerical Analysis",PHI Learning Private Limited, 5thEd.,2012.

Web links and Video Lectures(e-Resources):

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

CO1	Apply the knowledge of multiple integrals to compute area and volume and demonstrate the problems using modern ICT tools.
CO2	Understand the applications of vector calculus refer to solenoidal, irrotational vectors, line integral and surface integral and demonstrate the problems using modern ICT tools.
CO3	Apply appropriate numerical methods to find approximate solutions of algebraic and transcendental equations, to perform interpolation and numerical integration in engineering contexts and Solve the problems using modern ICT tools.
CO4	Apply appropriate numerical methods to find approximate solutions of ordinary differential equations and to perform interpolation and numerical integration in engineering contexts and demonstrate the problems using modern ICT tools.
CO5	Demonstrate partial differential equations and their solutions for physical interpretations and Solve the problems using modern ICT tools.

Differential Calculus and Numerical Methods		Semester	1
Course Code	**MEMAT201**	CIE Marks	50
Teaching Hours/Week(L:T:P:S)	3:2:0:0	SEE Marks	50
Total Hours of Pedagogy	40HoursTheory+20HoursTutorials	Total Marks	100
Credits	4Credits	Exam Hours	3Hours
Examination type(SEE)	**Theory**		

Course Objectives: The goal of the course **Differential Calculus and Numerical Methods (CVMAT201)**is to

- **Familiarize** Vector calculus essential for civil engineering.
- **Analyze** Civil engineering problems by applying Partial Differential Equations.
- **Develop** the knowledge of solving civil engineering problems numerically

Module	Hours
Module-1: Integral Calculus	**(8 Hours Theory+ 4 Hours Tutorials)**
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. Simple problems	
Module-2:VectorCalculus	**(8 Hours Theory+ 4 Hours Tutorials)**
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 with out verifications.	
Module-3:NumericalMethods-1	**(8 Hours Theory+ 4 Hours Tutorials)**
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.	
Module-4:NumericalMethods–2	**(8 Hours Theory+ 4 Hours Tutorials)**
Numerical solution of ordinary differential equations of first order and first degree: Taylor's series method, Modified Euler's method, Runge-Kutta method of fourth order, Milne's predictor-corrector formula and Adams-Bashforth predictor-corrector method.	
module-5:PartialDifferentialEquations(PDE)	**(8HoursTheory+ 4HoursTutorials**
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.	

List of Laboratory Experiments/Activities:

11) Evaluate double integration and compute area and volume,
12) Evaluate triple integration and compute volume,
13) Finding gradient, divergence and curl,
14) Evaluate line integrals,
15) Regula Falsi and Newton Raphson method,
16) Interpolation,
17) Numerical integration,
18) Modified Euler's method,
19) Fourth order Runge-Kutt a method,
20) Milne's method.

Semester End Examination (SEE):

Theory SEE will be conducted by Institute as per the scheduled timetable, with common question papers for the course

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.

Suggested Learning Resources:(Textbook/Reference Book):

Text books:

4. B.S.Grewal, Higher Engineering Mathematics, Khanna Publishers, 44thEd.,2021.
5. E.Kreyszig, Advanced Engineering Mathematics ,John Wiley&Sons, 10thEd.,2018.
6. M.K.Jain, S.R.K. Iyengar and R.K.Jain ,Numerical Methods for Scientific and Engineering Computation, New Age International Publishers, 8thEd., 2022.

Referencebooks:

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2. Sri manta Pal & Subodh C. Bhunia, Engineering Mathematics, Oxford University Press, 3rdEd.,2016.
3. N.P.Baliand Manish Goyal, ATextbook ofEngineering Mathematics, Laxmi Publications, 10thEd., 2022.
4. H.K. Dassand Er. Rajnish Verma, Higher Engineering Mathematics, S.Chand Publication, 3rdEd., 2014.
5. Steven V. Chapraand Raymond P.Canale ,Applied Numerical Methods with Matlab for Engineers and Scientists, McGraw-Hill, 3rdEd., 2011.
6. Richard L. Burden, Douglas J.Fairesand A.M. Burden, Numerical Analysis, 10thEd.,2010,Cengage Publishers.
7. S.S. Sastry ,"Introductory Methods o fNumerical Analysis" , PH ILearning Private Limited, 5thEd.,2012.

Course outcome (Course Skill Set): At the end of the course the student will be able to:

CO1	Apply the knowledge of multiple integrals to compute area and volume and demonstrate the problems using modern ICT tools.	
CO2	Understand the applications of vector calculus refer to solenoidal, irrotational vectors, line integral and surface integral and demonstrate the problems using modern ICT tools.	
CO3	Apply appropriate numerical methods to find approximate solutions of algebraic and transcendental to perform interpolation and numerical integration in engineering contexts and Solve the problems using modern ICT tools.	
CO4	Apply appropriate numerical methods to find approximate solutions of ordinary differential equations and to perform interpolation and numerical integration in engineering contexts and demonstrate the problems using modern ICT tools.	
CO5	Demonstrate partial differential equations and their solutions for physical interpretations and Solve the problems using modern ICT tools.	

Calculus, Numerical Techniques and Laplace Transform		Semester	1
Course Code	**EEMAT201**	CIE Marks	50
Teaching Hours/Week(L:T:P:S)	3:2:0:0	SEE Marks	50
Total Hours of Pedagogy	40HoursTheory+20Hours Tutorials	Total Marks	100
Credits	4 Credits	Exam Hours	3Hours
Examination type(SEE)	**Theory**		

Course Objectives: The goal of the course **Calculus, Laplace Transform and Numerical Techniques (EEMAT201)** is to

- **Familiarize** the importance of Integral calculus and Vector calculus essential for electronics and electrical engineering..
- **Develop** the knowledge of solving electronics and electrical engineering problems numerically.
- **Analyze** electrical and electronics engineering problems by applying Laplace Transform

Module	Hours
Module-1:Integral Calculus and its Applications	**(8 Hours Theory+ 4 Hours Tutorials)**
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. Simple problem	
Module-2:Vector Calculus and its Applications	**(8 Hours Theory+ 4 Hours Tutorials)**
Vector Differentiation: Scalar and vector fields, gradient of a scalar field, directional derivatives, divergence of a vector field, solenoidal vector, curl of a vector field, irrotational vector, physical interpretation of gradient, divergence and curl and scalar potential. Vector Integration**:** Line integrals, Statement of Green's and Stokes' theorem without verification problems.	
Module-3:Numerical Methods-1	**(8 Hours Theory+ 4 Hours Tutorials)**
Solution of algebraic and transcendental equations: Regula-Falsimethod 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's1/3rdrule and Simpson's3/8thrule.	
Module-4:Numerical Methods-2	**(8 Hours Theory+ 4 Hours Tutorials)**
Numerical solution of ordinary differential equations of first order and first degree: Taylor's series method, Modified Euler's method, Runge-Kutta method of fourth order and Milne's predictor corrector method and Adam-Bashforth predictor-corrector method.	
Module-5:LaplaceTransform	**(8 Hours Theory+ 4 Hours Tutorials)**
Laplace Transform (LT): Definition and Formulae of Laplace Transform, LT of elementary functions. Properties– linearity, scaling, shifting property, differentiation in the s-domain, division by t. LT of periodic functions, square wave, saw-tooth wave, triangular wave, full and half wave rectifier, Heaviside Unit step function. Inverse Laplace Transforms: Definition, properties, evaluation using different methods and applications to solve ordinary differential equations.	

List of Laboratory Experiments/Activities:

1) Evaluate double integration and compute area and volume,
2) Evaluate triple integration and compute volume,
3) Finding gradient, divergence and curl,
4) Evaluate line integrals,
5) Regula Falsi and Newton Raphson method,
6) Interpolation,
7) Numerical integration,
8) Modified Euler's method, Fourth order Runge-Kutta method,
9) Laplace transform,

10) Inverse Laplace transform.

Semester End Examination (SEE):

Theory SEE will be conducted by Institute as per the scheduled timetable, with common question papers for the course

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.

Suggested Learning Resources:(Textbook/Reference Book):

Textbooks:

1. B.S.Grewal, Higher Engineering Mathematics, Khanna Publishers, 44thEd.,2021.
2. E.Kreyszig, Advanced Engineering Mathematics, JohnWiley&Sons, 10thEd.,2018.
3. M.K.Jain, S.R.K.Iyengar and R.K.Jain, Numerical Methods for Scientific and Engineering Computation, New Age International Publishers, 8thEd., 2022.

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1. B.V.Ramana, Higher Engineering Mathematics, McGraw-Hill Education,11thEd.,2017
2. Srimanta Pal &Subodh C.Bhunia, Engineering Mathematics, Oxford University Press,3rdEd.,2016.
3. N.P.Bali and Manish Goyal, A Text book of Engineering Mathematics, Laxmi Publications, 10thEd., 2022.
4. H.K.Dass and Er.Rajnish Verma, Higher Engineering Mathematics, S.Chand Publication, 3rdEd., 2014.
5. Steven V. Chapraand Raymond P.Canale, Applied Numerical Methods with Matlab for Engineers and Scientists, McGraw-Hill, 3rdEd., 2011.
6. RichardL.Burden, Douglas J.Fairesand A. M .Burden, Numerical Analysis,10thEd.,2010,Cengage Publishers.
7. S.S.Sastry ,“ Introductory Methods of Numerical Analysis”, PHI Learning Private Limited,5thEd.,2012.

Web links and Video Lectures(e-Resources):

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

CO1	Apply the knowledge of multiple integrals to compute area and volume and demonstrate the problems using modern ICT tools.	
CO2	Understand the applications of vector calculus refer to solenoidal, irrotational vectors, line integral and surface integral and demonstrate the problems using modern ICT tools.	
CO3	Apply appropriate numerical methods to find approximate solutions of algebraic and transcendental to perform interpolation and numerical integration in engineering contexts and Solve the problems using modern ICT tools.	
CO4	Apply appropriate numerical methods to find approximate solutions of ordinary differential equations and to perform interpolation and numerical integration in engineering contexts and demonstrate the problems using modern ICT tools.	
CO5	To understand the concept of Laplace transform and to solve initial value problems and Solve the problems using modern ICT tools.	

NUMERICAL METHODS		Semester	1
Course Code	**CSMAT201**	CIE Marks	50
Teaching Hours/Week(L:T:P:S)	3:2:0:0	SEE Marks	50
Total Hours of Pedagogy	40 Hours Theory+20 Hours Tutorials	Total Marks	100
Credits	4 Credits	Exam Hours	3Hours
Examination type(SEE)	**Theory**		

Course Objectives: The goal of the course **NUMERICAL METHODS** (**CSMAT201**) is to

- **Develop** the knowledge of numerical methods and apply them to solve transcendental and differential equations..
- **Familiarize** the importance of Vector calculus

Module	Hours
Module-1:Introduction to Numerical Methods	**(8 Hours Theory+ 4 Hours Tutorials)**
Errors and their computation : Round off error, Truncation error, Absolute error, Relative error and Percentage error. Solution of algebraic and transcendental equations: Bisection, Regular-Falsie, Secant and Newton-Raphson methods.	
Module-2: Numerical solutions for system of linear equations	**(8 Hours Theory+ 4 Hours Tutorials)**
Norms: Vector norms and Matrix norms- $L1$,$L2$ and $L\infty$, Ill conditioned linear system, condition number. Solution of system of linear equations: Gauss Seidel method and LU-decomposition method. Eigen values and Eigen vectors :Rayleigh power method, Jacobi's method	
Module-3: Interpolation	**(8 Hours Theory+ 4 Hours Tutorials)**
Finite differences ,interpolation using Newton Gregory forward and Newton Gregory backward difference formulae, Newton's divided difference. Lagrange interpolation formulae, piecewise interpolation-linear and quadratic.	
Module-4: Numerical Integration and Numerical Solution of Differential Equations	**(8 Hours Theory+ 4 Hours Tutorials)**
Numerical integration: Trapezoidal, Simpson's$1/3^{rd}$, Simpson's$3/8^{th}$ rule and Weddle's rule. Numerical solution of ordinary differential equations of first order and first degree -Taylor's series method, Modified Euler's method, Runge-Kutta method of fourth order and Milne's predictor-corrector method.	
Module-5: Vector Calculus	**(8HoursTheory+ 4HoursTutorials**
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 polarcurves. Curvilinear coordinates: Scale factors ,base vectors, Cylindrical polar coordinates ,Spherical polar coordinates, transformation between Cartesian and curvilinear systems, orthogonality.	

List of Laboratory Experiments/Activities:

1) Errors and approximation,
2) Root finding methods,
3) Norms, Condition number,
4) Gauss Seidel method and Rayleigh power's method,
5) Forward and Backward interpolation,
6) Lagrange's interpolation,,

7) Numerical integration,
8) Taylor's method, Modified Euler's method,
9) Runge-Kutta method of fourth order.
10) Finding Gradient, divergence and curl,

Semester End Examination (SEE):

Theory SEE will be conducted by Institute as per the scheduled timetable, with common question papers for the course

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.

Suggested Learning Resources:(Textbook/Reference Book):

Text books:

4. M.K. Jain, S.R.K. Iyengar and R.K. Jain, Numerical Methods for Scientific and Engineering Computation, New Age International Publishers, 8thEd., 2022.
5. David Clay ,Linear Algebra and its Applications, Pearson Publishers, 5thEd.,2023.
6. B.S.Grewal, Higher Engineering Mathematics, Khanna Publishers,44thEd.,2021.

Reference books:

1. V. Ramana ,Higher Engineering Mathematics, McGraw-HillEducation,11thEd.,2017
2. N.P.Baliand Manish Goyal, A Text book of Engineering Mathematics, Laxmi Publications, 10thEd., 2022.
3. S.S.Sastry, Introductory Methods of Numerical Analysis, PHI Learning Private Limited, 5thEd.2012.
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- https://nptel.ac.in/courses/127106019
- https://ocw.mit.edu/courses/18-335j-introduction-to-numerical-methods-spring-2019/
- https://ocw.mit.edu/courses/18-330-introduction-to-numerical-analysis-spring-2012/pages/syllabus/

CO1	Apply appropriate numerical methods to find approximate solutions of algebraic and transcendental equations in engineering contexts and Solve the problems using modern ICT tools.
CO2	Apply numerical methods to solve system of linear equations and Solve the problems using modern ICT tools.
CO3	Apply appropriate numerical methods to perform interpolation and demonstrate the problems using modern ICT tools.
CO4	Apply appropriate numerical methods to find approximate solutions of ordinary differential equations and to perform interpolation and numerical integration in engineering contexts and demonstrate the problems using modern ICT tools.
CO5	Understand the applications of vector calculus refer to solenoidal, irrotational vectors, line integral and surface integral and demonstrate the problems using modern ICT tools.