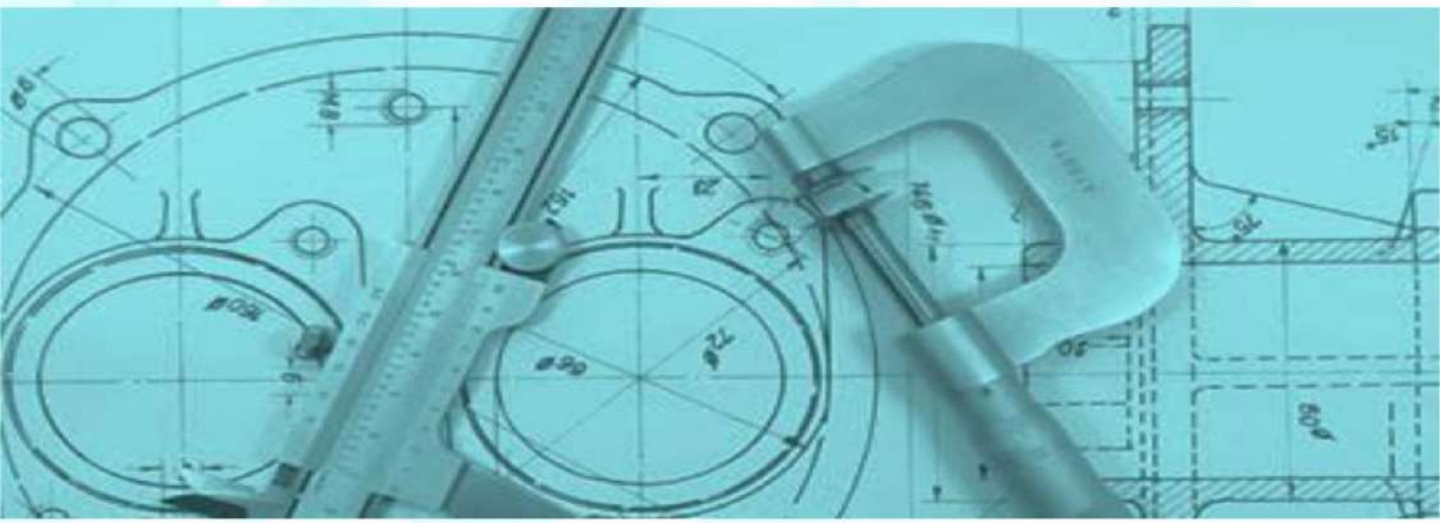
DAYANANDA SAGAR COLLEGE OF ENGINEERING

AN AUTONOMOUS INSTITUTE AFFILIATED TO VTU, APPROVED BY AICTE & UGC
ACCREDITED BY NAAC WITH 'A' GRADE



I/II Semester BE Scheme

(All streams)

2022-23

Vision

To impart quality technical education with a focus on Research and Innovation emphasizing on Development of Sustainable and Inclusive Technology for the benefit of society.

Mission

•To provide an environment that enhances creativity and Innovation in pursuit of Excellence.

•To nurture teamwork in order to transform individuals as responsible leaders and entrepreneurs.

•To train the students to the changing technical scenario and make them to understand the importance of Sustainable and Inclusive technologies.

Dayananda Sagar College of Engineering, Bengaluru -78

Scheme of Teaching and Examinations-2022

Outcome-Based Education (OBE)and Choice Based Credit System(CBCS)

(Effective from the academic year 2022-23)

I Semester (CSE Stream) **(Physics Group)**

Sl. No	Course and course code		Course title	TD/PSB	Teaching Hours/Week				Examination				Credits
					Lecture	Tutorial	Practical	SDA	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	*ASC(IC)	**22MATS11	Essential Mathematics I - CSE Stream	Maths	2	2	2	0	03	50	50	100	04
2	#ASC(IC)	22PHYS12	Applied Physics - CSE stream	Physics	2	2	2	0	03	50	50	100	04
3	ESC	22POP13	Principles of Programming Using C	CSE	2	0	2	0	03	50	50	100	03
4	ESC-I	22ESC14x	Engineering Science Course-I	Respective Engg Dept	3	0	0	0	03	50	50	100	03
5	ETC-I	22ETC15x	Emerging Technology Course-I	Any Dept	3	0	0	0	03	50	50	100	03
6	AEC	22ENG16	Communicative English	Humanities	1	0	0	0	01	50	50	100	01
7	HSMC	22ICO17	Indian Constitution	Humanities	1	0	0	0	01	50	50	100	01
8	AEC/SDC	22SFH18	Scientific Foundations of Health and Happiness	Any Dept	1	0	0	0	02	50	50	100	01
				TOTAL						**400**	**400**	**800**	**20**

SDA-Skill Development Activities, **TD/PSB**- Teaching Department / Paper Setting Board, **ASC**-Applied Science Course, **ESC**- Engineering Science Courses, **ETC**-Emerging Technology Course, **AEC**- Ability Enhancement Course, **HSMS**-Humanity and Social Science and management Course, **SDC**- Skill Development Course, **CIE**–Continuous Internal Evaluation, **SEE**- Semester End Examination, **IC** – Integrated Course (Theory Course Integrated with Practical Course)

Credit Definition: 1- hour Lecture **(L)** per week=**1Credit** 2-hoursTutorial**(T)** per week=**1Credit** 2- hours Practical / Drawing (**P**) per week=**1Credit** **2-**hous Skill Development Actives **(SDA)** per week = **1 Credit**	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 12-14 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 12-15 hours of Teaching-Learning sessions

Student's Induction Program: Motivating (Inspiring) Activities under the Induction program – The main aim of the induction program is to provide newly admitted students a broad understanding of society, relationships, and values. Along with the knowledge and skill of his/her study, students' character needs to be nurtured as an essential quality by which he/she would understand and fulfill the responsibility as an engineer. The following activities are to be covered in 21 days. Physical Activity, Creative Arts, Universal Human Values, Literary, Proficiency Modules, Lectures by Eminent People, Visits to Local areas, Familiarization with Department/Branch and Innovation, etc. For details, refer the ANNEXURE-I of Induction Programs notification of the University published at the beginning of the 1st semester.

AICTE Activity Points to be earned by students admitted to BE/ B.Tech., / B. Plan day college program (For more details refer to Chapter 6, AICTE Activity Point Program, Model Internship Guidelines): Over and above the academic grades, every regular student admitted to the 4 years Degree program and every student entering 4 years Degree programs through lateral entry, shall earn 100 and 75 Activity Points respectively for the award of degree through AICTE Activity Point Program. Students transferred from other Universities to the fifth semester are required to earn 50 Activity Points from the year of entry to VTU. The Activity Points earned shall be reflected on the student's eighth semester Grade Card. The activities can be spread over the years, any time during the semester weekends, and holidays, as per the liking and convenience of the student from the year of entry to the program. However, the minimum hours' requirement should be fulfilled. Activity Points (non-credit) do not affect SGPA/CGPA and shall not be considered for vertical progression. In case students fail to earn the prescribed activity Points, an Eighth Semester Grade Card shall be issued only after earning the required activity points. Students shall be admitted for the award of the degree only after the release of the Eighth semester Grade Card.

***-22MATS11** Shall have the 03 hours of theory examination (SEE), however, practical sessions question shall be included in the theory question papers. ****The mathematics subject should be taught by a single faculty member per division, with no sharing of the course (subject)module-wise by different faculty members.**

#-22PHYS12 SEE shall have the 03 hours of theory examination and 02-03 hours of practical examination

ESC or ETC of 03 credits Courses shall have only a theory component (L:T :P:S=3:0:0:0) or **if the nature then, of course, required practical learning syllabus shall be designed as an Integrated course (L:T:P:S= 2:0:2:0).**

(ESC-I) Engineering Science Courses-I					(ETC-I) Emerging Technology Courses-I				
Code	**Title**	**L**	**T**	**P**	**Code**	**Title**	**L**	**T**	**P**
22ESC141	Introduction to Civil Engineering	3	0	0	22ETC15A	Smart Materials and Systems	3	0	0
22ESC142	Introduction to Electrical Engineering	3	0	0	22ETC15B	Green Buildings	3	0	0
22ESC143	Introduction to Electronics Engineering	3	0	0	22ETC15C	Introduction to Nano Technology	3	0	0
22ESC144	Introduction to Mechanical Engineering	3	0	0	22ETC15D	Introduction to Sustainable Engineering	3	0	0
					22ETC15E	Renewable Energy Sources	3	0	0
					22ETC15F	Waste Management	3	0	0
					22ETC15G	Emerging Applications of Biosensors	3	0	0
					22ETC15H	Introduction to Internet of Things (IOT)	3	0	0
					22ETC15I	Introduction to Cyber Security	3	0	0
					22ETC15K	Introduction to Artificial Intelligence	3	0	0
(PLC-I) Programming Language Courses-I					22ETC15L	Introduction to Cloud Computing	3	0	0
Code	**Title**	**L**	**T**	**P**					
22PLC15A	Introduction to Web Programming	2	0	2					
22PLC15B	Introduction to Python Programming	2	0	2					
22PLC15C	Basics of JAVA programming	2	0	2					
22PLC15D	Introduction to C++ Programming	2	0	2					
The course 22ESC145/245, Introduction to C Programming, and all courses under PLC and ETC groups can be taught by ANY DEPARTMENT									

- The students must select one course from ETC-I for I SEM and 1 course from PLC for II SEM.

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Scheme of Teaching and Examinations-2022

Outcome-Based Education (OBE)and Choice Based Credit System(CBCS)

(Effective from the academic year 2022-23)

II Semester (CSE Stream) **(Chemistry Group)**

Sl. No	Course and Course Code		Course Title	TD/PSB	Teaching Hours/Week				Examination				Credits
					Lecture	Tutorial	Practical	SDA	Duration in hours	CIEE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	*ASC(IC)	**22MATS21	Essential Mathematics II - CSE Stream	Maths	2	2	2	0	03	50	50	100	04
2	#ASC(IC)	22CHES22	Applied Chemistry - CSE Stream	Chemistry	2	2	2	0	03	50	50	100	04
3	ESC	22CED23	Computer-Aided Engineering Drawing	Civil/Mech Engg dept	2	0	2	0	03	50	50	100	03
4	ESC-II	22ESC242	Engineering Science Course-II (Introduction to Electrical Engineering, Course Code: 22ESC242)	Respective Engg. Dept	3	0	0	0	03	50	50	100	03
5	PLC-II	22PLC25D	Programming Language Course-II (Introduction to C++ Programming)	Any Dept	2	00	2	0	03	50	50	100	03
6	AEC	22PWS26	Professional Writing Skills in English	Humanities	1	0	0	0	01	50	50	100	01
7	HSMS	22KSK27/ 22KBK27	Samskrutika Kannada/ Balake Kannada	Humanities	1	0	0	0	01	50	50	100	01
8	HSMS	22IDT28	Innovation and Design Thinking	Any Dept	1	0	0	0	01	50	50	100	01
				TOTAL						**400**	**400**	**800**	**20**

SDA-Skill Development Activities, **TD/PSB**- Teaching Department / Paper Setting Board, **ASC**-Applied Science Course, **ESC**- Engineering Science Courses, **ETC**- Emerging Technology Course, **AEC**- Ability Enhancement Course, **HSMS**-Humanity and Social Science and management Course, **SDC**- Skill Development Course, **CIE**–Continuous

Computer Science and Engineering and allied branches (CSE/ISE and BT all allied branches of CSE)

Internal Evaluation, **SEE**- Semester End Examination, **IC** – Integrated Course (Theory Course Integrated with Practical Course)
***-22MATS21** Shall have the 03 hours of theory examination (SEE), however, practical sessions question shall be included in the theory question papers. ****The mathematics subject should be taught by a single faculty member per division, with no sharing of the course (subject) module-wise by different faculty members.** **#-22CHES22-** SEE shall have the 03 hours of theory examination and 02-03 hours of practical examination **ESC or ETC of 03 credits Courses** shall have only a theory component (L:T :P:S=3:0:0:0) or if the nature of course required experimental learning syllabus shall be designed as an Integrated course (L:T:P:S= 2:0:2:0),

Computer Science and Engineering and allied branches (CSE/ISE and BT all allied branches of CSE)

(ESC-II) Engineering Science Courses-II					(ETC-II) Emerging Technology Courses-II				
Code	**Title**	**L**	**T**	**P**	**Code**	**Title**	**L**	**T**	**P**
22ESC241	Introduction to Civil Engineering	3	0	0	22ETC25A	Smart materials and Systems	3	0	0
22ESC242	Introduction to Electrical Engineering	3	0	0	22ETC25B	Green Buildings	3	0	0
22ESC243	Introduction to Electronics Engineering	3	0	0	22ETC25C	Introduction to Nano Technology	3	0	0
22ESC244	Introduction to Mechanical Engineering	3	0	0	22ETC25D	Introduction to Sustainable Engineering	3	0	0
					22ETC25E	Renewable Energy Sources	3	0	0
					22ETC25F	Waste Management	3	0	0
					22ETC25G	Emerging Applications of Biosensors	3	0	0
					22ETC25H	Introduction to Internet of Things (IoT)	3	0	0
					22ETC25I	Introduction to Cyber Security	3	0	0
					22ETC15K	Introduction to Artificial Intelligence	3	0	0
(PLC-II) Programming Language Courses-II					22ETC15L	Introduction to Cloud Computing	3	0	0
Code	**Title**	**L**	**T**	**P**					
22PLC25A	Introduction to Web Programming	2	0	2					
22PLC25B	Introduction to Python Programming	2	0	2					
22PLC25C	Basics of JAVA programming	2	0	2					
22PLC25D	Introduction to C++ Programming	2	0	2					
The course 22ESC145/245, Introduction to C Programming, and all courses under PLC and ETC groups can be taught by ANY DEPARTMENT									

- The students must select one course from PLC II for 2nd SEM.

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Scheme of Teaching and Examinations-2022

Outcome-Based Education (OBE)and Choice Based Credit System (CBCS)

(Effective from the academic year 2022-23)

I Semester (Civil Engineering Stream) **(Physics Group)**

Sl. No	Course and Course Code		Course Title	TD/PSB	Teaching Hours/Week				Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	SDA	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	*ASC(IC)	**22MATC11	Essential Mathematics I - Civil Stream	Maths	2	2	2	0	03	50	50	100	04
2	#ASC (IC)	22PHYC12	Applied Physics - Civil Stream	Physics	2	2	2	0	03	50	50	100	04
3	ESC	22CIV13	Engineering Mechanics	Civil Engg Dept	2	2	0	0	03	50	50	100	03
4	ESC-I	22ESC144	Engineering Science Course-I (Introduction to Mechanical Engineering)	Respective Dept	3	0	0	0	03	50	50	100	03
5	ETC-I	22ETC15J	Emerging Technology Course-I (Introduction to C Programming)	Any Dept	3	0	0	0	03	50	50	100	03
6	AEC	22ENG16	Communicative English	Humanities	1	0	0	0	01	50	50	100	01
7	HSMC	20ICO17	Indian Constitution	Humanities	1	0	0	0	01	50	50	100	01
8	HSMS	22SFH18	Scientific Foundations of Health and Happiness	Any Dept	1	0	0	0	01	50	50	100	01
				TOTAL	**15**	**06**	**10**	00	**27**	**400**	**400**	**800**	**20**

SDA-Skill Development Activities, **TD/PSB**- Teaching Department / Paper Setting Board, **ASC**-Applied Science Course, **ESC**- Engineering Science Courses, **ETC**-Emerging Technology Course, **AEC**- Ability Enhancement Course, **HSMS**-Humanity and Social Science and management Course, **SDC**- Skill Development Course,

SDA-Skill Development Activities, **TD/PSB**- Teaching Department / Paper Setting Board, **ASC**-Applied Science Course, **ESC**- Engineering Science Courses, **ETC**-Emerging Technology Course, **AEC**- Ability Enhancement Course, **HSMS**-Humanity and Social Science and management Course, **SDC**- Skill Development Course,

CIE -Continuous Internal Evaluation, **SEE**- Semester End Examination, **IC** – Integrated Course (Theory Course Integrated with Practical Course)

***-22MAT11** Shall have the 03 hours of theory examination (SEE), however, practical sessions question shall be included in the theory question papers. ****The mathematics subject should be taught by single faculty member per division, with no sharing of the course (subject) module-wise by different faculty members.**

#-22CHEC12- SEE shall have the 03 hours of theory examination and 02-03 hours of practical examination

ESC or ETC of 03 credits Courses shall have only a theory component (L:T :P:S=3:0:0:0) or if the nature of the course required practical learning syllabus shall be designed as an Integrated course (L:T:P:S= 2:0:2:0).

Credit Definition: 1- hour Lecture **(L)** per week=**1Credit** 2-hoursTutorial**(T)** per week=**1Credit** 2- hours Practical / Drawing (**P**) per week=**1Credit** **2-**hous Skill Development Actives **(SDA)** per week = **1 Credit**	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 12-14 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 12-15 hours of Teaching-Learning sessions

Student's Induction Program: Motivating (Inspiring) Activities under the Induction program – The main aim of the induction program is to provide newly admitted students a broad understanding of society, relationships, and values. Along with the knowledge and skill of his/her study, students' character needs to be nurtured as an essential quality by which he/she would understand and fulfill the responsibility as an engineer. The following activities are to be covered in 21 days. Physical Activity, Creative Arts, Universal Human Values, Literary, Proficiency Modules, Lectures by Eminent People, Visits to Local areas, Familiarization with Department/Branch and Innovation, etc. For details, refer the ANNEXURE-I of Induction Programs notification of the University published at the beginning of the 1st semester.

AICTE Activity Points to be earned by students admitted to BE/ B.Tech., / B. Plan day college program (For more details refer to Chapter 6, AICTE Activity Point Program, Model Internship Guidelines): Over and above the academic grades, every regular student admitted to the 4 years Degree program and every student entering 4 years Degree programs through lateral entry, shall earn 100 and 75 Activity Points respectively for the award of degree through AICTE Activity Point Program. Students transferred from other Universities to the fifth semester are required to earn 50 Activity Points from the year of entry to VTU. The Activity Points earned shall be reflected on the student's eighth semester Grade Card. The activities can be spread over the years, any time during the semester weekends, and holidays, as per the liking and convenience of the student from the year of entry to the program. However, the minimum hour's requirement should be fulfilled. Activity Points (non-credit) do not affect SGPA/CGPA and shall not be considered for vertical progression. In case students fail to earn the prescribed activity Points, an Eighth Semester Grade Card shall be issued only after earning the required activity points. Students shall be admitted for the award of the degree only after the release of the Eighth semester Grade Card.

(ESC-I) Engineering Science Courses-I					(ETC-I) Emerging Technology Courses-I				
Code	**Title**	**L**	**T**	**P**	**Code**	**Title**	**L**	**T**	**P**
22ESC141	Introduction to Civil Engineering	3	0	0	22ETC15A	Smart Materials and Systems	3	0	0
22ESC142	Introduction to Electrical Engineering	3	0	0	22ETC15B	Green Buildings	3	0	0
22ESC143	Introduction to Electronics Engineering	3	0	0	22ETC15C	Introduction to Nano Technology	3	0	0
22ESC144	Introduction to Mechanical Engineering	3	0	0	22ETC15D	Introduction to Sustainable Engineering	3	0	0
					22ETC15E	Renewable Energy Sources	3	0	0
					22ETC15F	Waste Management	3	0	0
					22ETC15G	Emerging Applications of Biosensors	3	0	0
					22ETC15H	Introduction to Internet of Things (IOT)	3	0	0
					22ETC15I	Introduction to Cyber Security	3	0	0
					22ETC15J	Introduction to C Programming	3	0	0
(PLC-I) Programming Language Courses-I					22ETC15K	Introduction to Artificial Intelligence	3	0	0
Code	**Title**	**L**	**T**	**P**	22ETC15L	Introduction to Cloud Computing	3	0	0
22PLC15A	Introduction to Web Programming	2	0	2					
22PLC15B	Introduction to Python Programming	2	0	2					
22PLC15C	Basics of JAVA programming	2	0	2					
22PLC15D	Introduction to C++ Programming	2	0	2					
The course 22ESC145/245, Introduction to C Programming, and all courses under PLC and ETC groups can be taught by faculty of ANY DEPARTMENT									

- Civil Engineering Students shall opt for any one of the courses from the ESC-I group **except, 22ESC141-Introduction to Civil Engineering**
- The students must select one course from ETC-I for I SEM and 1 course from PLC for II SEM.

Dayananda Sagar College of Engineering, Bengaluru -78

Scheme of Teaching and Examinations-2022

Outcome-Based Education (OBE)and Choice Based Credit System (CBCS)

(Effective from the academic year 2022-23)

II Semester (Civil Engineering Stream) **(Chemistry Group)**

Sl. No	Course and Course Code		Course Title	TD/PSB	Teaching Hours/Week				Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	SDA	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	*ASC(IC)	**22MATC21	Essential Mathematics II - Civil Stream	Maths	2	2	2	0	03	50	50	100	04
2	#ASC (IC)	22CHEC22	Applied Chemistry- Civil Stream	Physics	2	2	2	0	03	50	50	100	04
3	ESC	22CED23	COMPUTER-AIDED ENGINEERING DRAWING	ME Dept	2	2	0	0	03	50	50	100	03
4	ESC-I	22ESC243	INTRODUCTION TO ELECTRONICS ENGINEERING [ESC-II]	EC Dept.	3	0	0	0	03	50	50	100	03
5	ETC-I	22PLC25D	INTRODUCTION TO C ++ PROGRAMMING	CSE Dept	3	0	0	0	03	50	50	100	03
6	AEC	22PWS26	PROFESSIONAL WRITING SKILLS ENGLISH	Humanities	1	0	0	0	01	50	50	100	01
7	HSMC	22KSK27/ 22KBK27	SAMSKRUTIKA KANNADA/BALAKE KANNADA	Humanities	1	0	0	0	01	50	50	100	01
8	HSMS	22IDT28	INNOVATION AND DESIGN THINKING (MINI PROJECT)	Any Dept	1	0	0	0	01	50	50	100	01
				TOTAL	**15**	**06**	**10**	00	**27**	**400**	**400**	**800**	**20**

SDA-Skill Development Activities, **TD/PSB**- Teaching Department / Paper Setting Board, **ASC**-Applied Science Course, **ESC**- Engineering Science Courses, **ETC**-Emerging Technology Course, **AEC**- Ability Enhancement Course, **HSMS**-Humanity and Social Science and management Course, **SDC**- Skill Development Course,

Dayananda Sagar College of Engineering, Bengaluru -78

Scheme of Teaching and Examinations-2022

Outcome-Based Education(OBE)and Choice Based Credit System(CBCS)

(Effective from the academic year 2022-23)

I Semester (Electrical & Electronics Engineering Stream) **(For Chemistry Group)**

Sl. No	Course and Course Code		Course Title	TD/PSB	Teaching Hours/Week				Examination				Credits
					Lecture	Tutorial	Practical	SDA	Duration in hours	CIE Marks	SEE Marks	Total marks	
					L	T	P	S					
1	*ASC(IC)	**22MATE11	Essential Mathematics I - EE Stream	Maths	2	2	2	0	03	50	50	100	04
2	#ASC(IC)	22CHEE12	Applied Chemistry - EE Stream	Chemistry	2	2	2	0	03	50	50	100	04
3	ESC	22CED13	Computer-Aided Engineering Drawing	Mechanical	2	0	2	0	03	50	50	100	03
4	ESC-I	22ESC14x	Engineering Science Course-I	Respective Engg Dept	3	0	0	0	03	50	50	100	03
5	ETC-I	22ETC15x	Emerging Technology Course-I	Any Dept	3	0	0	0	03	50	50	100	03
6	AEC	22ENG16	Communicative English	Humanities	1	0	0	0	01	50	50	100	01
7	HSMS	22KSK17/ 22KBK17	Samskrutika Kannada/ Balake Kannada	Humanities	1	0	0	0	01	50	50	100	01
8	HSMS	22SFH18	Scientific Foundations of Health and Happiness	Any Dept.	1	0	0	0	01	50	50	100	01
				TOTAL						**400**	**400**	**800**	**20**

SDA-Skill Development Activities, **TD/PSB**- Teaching Department / Paper Setting Board, **ASC**-Applied Science Course, **ESC**- Engineering Science Courses, **ETC**- Emerging Technology Course, **AEC**- Ability Enhancement Course, **HSMS**-Humanity and Social Science and Management Course, **SDC**- Skill Development Course, **CIE** -Continuous Internal

Evaluation, **SEE**- Semester End Examination, **IC** – Integrated Course (Theory Course Integrated with Practical Course)

-22MATE11** Shall have the 03 hours of theory examination(SEE), however, practical sessions question shall be included in the theory question papers. * The mathematics subject should be taught by a single faculty member per division, with no sharing of the course (subject)module-wise by different faculty members.**

#-22CHEE12- SEE shall have the 03 hours of theory examination and 02-03 hours of practical examination

ESC or ETC of 03 credits Courses shall have only a theory component (L:T :P:S=3:0:0:0) or if the nature of course required practical learning syllabus shall be designed as an Integrated course (L:T:P:S= 2:0:2:0)

Credit Definition:	
1- hour Lecture **(L)** per week=**1Credit**	04-Credits courses are to be designed for 50 hours of Teaching-Learning Session
2-hoursTutorial**(T)** per week=**1Credit**	04-Credits (IC) are to be designed for 40 hours' theory and 12-14 hours of practical sessions
2- hours Practical / Drawing (**P**) per week=**1Credit**	03-Credits courses are to be designed for 40 hours of Teaching-Learning Session
2-hous Skill Development Actives **(SDA)** per week = **1 Credit**	02- Credits courses are to be designed for 25 hours of Teaching-Learning Session
	01-Credit courses are to be designed for 12-15 hours of Teaching-Learning sessions

Student's Induction Program: Motivating (Inspiring) Activities under the Induction program – The main aim of the induction program is to provide newly admitted students a broad understanding of society, relationships, and values. Along with the knowledge and skill of his/her study, students' character needs to be nurtured as an essential quality by which he/she would understand and fulfill the responsibility as an engineer. The following activities are to be covered in 21 days. Physical Activity, Creative Arts, Universal Human Values, Literary, Proficiency Modules, Lectures by Eminent People, Visits to Local areas, Familiarization with Department/Branch and Innovation, etc. For details, refer the ANNEXURE-I of Induction Programs notification of the University published at the beginning of the 1st semester.

AICTE Activity Points to be earned by students admitted to BE/ B.Tech., / B. Plan day college program (For more details refer to Chapter 6, AICTE Activity Point Program, Model Internship Guidelines): Over and above the academic grades, every regular student admitted to the 4 years Degree program and every student entering 4 years Degree programs through lateral entry, shall earn 100 and 75 Activity Points respectively for the award of degree through AICTE Activity Point Program. Students transferred from other Universities to the fifth semester are required to earn 50 Activity Points from the year of entry to VTU. The Activity Points earned shall be reflected on the student's eighth semester Grade Card. The activities can be spread over the years, any time during the semester weekends, and holidays, as per the liking and convenience of the student from the year of entry to the program. However, the minimum hours' requirement should be fulfilled. Activity Points (non-credit) do not affect SGPA/CGPA and shall not be considered for vertical progression. In case students fail to earn the prescribed activity Points, an Eighth Semester Grade Card shall be issued only after earning the required activity points. Students shall be admitted for the award of the degree only after the release of the Eighth semester Grade Card.

(ESC-I) Engineering Science Courses-I					(ETC-I) Emerging Technology Courses-I				
Code	**Title**	**L**	**T**	**P**	**Code**	**Title**	**L**	**T**	**P**
22ESC141	Introduction to Civil Engineering	3	0	0	22ETC15A	Smart Materials and Systems	3	0	0
22ESC142	Introduction to Electrical Engineering	3	0	0	22ETC15B	Green Buildings	3	0	0
22ESC143	Introduction to Electronics Engineering	3	0	0	22ETC15C	Introduction to Nano Technology	3	0	0
22ESC144	Introduction to Mechanical Engineering	3	0	0	22ETC15D	Introduction to Sustainable Engineering	3	0	0
					22ETC15E	Renewable Energy Sources	3	0	0
					22ETC15F	Waste Management	3	0	0
					22ETC15G	Emerging Applications of Biosensors	3	0	0
					22ETC15H	Introduction to Internet of Things (IOT)	3	0	0
					22ETC15I	Introduction to Cyber Security	3	0	0
					22ETC15J	Introduction to C Programming	3	0	0
(PLC-I) Programming Language Courses-I					22ETC15K	Introduction to Artificial Intelligence	3	0	0
Code	**Title**	**L**	**T**	**P**	22ETC15L	Introduction to Cloud Computing	3	0	0
22PLC15A	Introduction to Web Programming	2	0	2					
22PLC15B	Introduction to Python Programming	2	0	2					
22PLC15C	Basics of JAVA programming	2	0	2					
22PLC15D	Introduction to C++ Programming	2	0	2					
The course 22ESC145/245, Introduction to C Programming, and all courses under PLC and ETC groups can be taught by faculty of ANY DEPARTMENT									

- The student has to select one course from the ETC-I group (1st Sem) and has to select one course from PLC-II in the 2nd semester.

Dayananda Sagar College of Engineering, Bengaluru -78

Scheme of Teaching and Examinations-2022

Outcome-Based Education(OBE)and Choice Based Credit System

(CBCS)(Effective from the academic year 2022-23)

II Semester (Electrical & Electronics Engineering Stream) **(Physics Group)**

Sl. No	Course and Course Code		Course Title	TD/PSB	Teaching Hours/Week				Examination				Credits
					Lecture	Tutorial	Practical	SDA	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	*ASC(IC)	**22MATE21	Essential Mathematics II - EE Stream	Maths	2	2	2	0	03	50	50	100	04
2	#ASC(IC)	22PHYE22	Applied Physics EE Stream	Physics	2	2	2	0	03	50	50	100	04
3	ESC	22EEE23	# Elements of Electrical Engineering (EEE students only)	EEE/ECE/TCE	2	2	0	0	03	50	50	100	03
		OR											
		22BEE23	## Basic Electronics (EC/ET/MD/EI students only)		3	0	0	0					
4	ESC-II	22ESC241	Engineering Science Course-II (Introduction to Civil engineering)	Respective Engg Dept.	3	0	0	0	03	50	50	100	03
5	PLC-II	22PLC25D	Programming Language Course-II (Introduction to C++ Programming)	Any Dept	2	0	2	0	03	50	50	100	03
6	AEC	22PWS26	Professional Writing Skills in English	Humanities	1	0	0	0	01	50	50	100	01
7	HSMC	22ICO27	Indian Constitution	Humanities	1	0	0	0	01	50	50	100	01
8	AEC/SDC	22IDT28	Innovation and Design Thinking	Any Dept	1	0	0	0	01	50	50	100	01
				TOTAL						**400**	**400**	**800**	**20**

 # Electrical & Electronics Engineering Students have to study 22EEE23- Elements of Electrical Engineering compulsorily **## Whereas Electronics and allied stream students have to study 22BEE23 Basic Electronics compulsorily**
SDA-Skill Development Activities, **TD/PSB**- Teaching Department / Paper Setting Board, **ASC**-Applied Science Course, **ESC**- Engineering Science Courses, **ETC**-Emerging Technology Course, **AEC**- Ability Enhancement Course, **HSMS**-Humanity and Social Science and Management Course, **SDC**- Skill Development Course, **CIE**–Continuous Internal Evaluation, **SEE**- Semester End Examination, **IC** – Integrated Course (Theory Course Integrated with Practical Course)
***-22MATE21** Shall have the 03 hours of theory examination(SEE), however, practical sessions question shall be included in the theory question papers. ** **The mathematics subject should be taught by a single faculty member per division, with no sharing of the course(subject)module-wise by different faculty members.** **#-22PHYE22** SEE shall have the 03 hours of theory examination and 02-03 hours of practical examination. **ESC or ETC of 03 credits Courses** shall have only a theory component (L:T :P:S=3:0:0:0) or if the nature of course required practical learning syllabus shall be designed as an Integrated course (L:T:P:S= 2:0:2:0),.

(ESC-II) Engineering Science Courses-II					(ETC-II) Emerging Technology Courses-II				
Code	**Title**	**L**	**T**	**P**	**Code**	**Title**	**L**	**T**	**P**
22ESC241	Introduction to Civil Engineering	3	0	0	22ETC25A	Smart materials and Systems	3	0	0
22ESC242	Introduction to Electrical Engineering	3	0	0	22ETC25B	Green Buildings	3	0	0
22ESC243	Introduction to Electronics Engineering	3	0	0	22ETC25C	Introduction to Nano Technology	3	0	0
22ESC244	Introduction to Mechanical Engineering	3	0	0	22ETC25D	Introduction to Sustainable Engineering	3	0	0
					22ETC25E	Renewable Energy Sources	3	0	0
					22ETC25F	Waste Management	3	0	0
					22ETC25G	Emerging Applications of Biosensors	3	0	0
					22ETC25H	Introduction to Internet of Things(IoT)	3	0	0
					22ETC25I	Introduction to Cyber Security	3	0	0
					22ETC15J	Introduction to C Programming	3	0	0
(PLC-II) Programming Language Courses-II					22ETC15K	Introduction to Artificial Intelligence	3	0	0
Code	**Title**	**L**	**T**	**P**	22ETC15L	Introduction to Cloud Computing	3	0	0
22PLC25A	Introduction to Web Programming	2	0	2					
22PLC25B	Introduction to Python Programming	2	0	2					
22PLC25C	Basics of JAVA programming	2	0	2					
22PLC25D	Introduction to C++ Programming	2	0	2					
The course 22ESC145/245, Introduction to C Programming, and all courses under PLC and ETC groups can be taught by faculty of ANY DEPARTMENT									

- The student has to select one course from the PLC-II group.

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Scheme of Teaching and Examinations-2022

Outcome-Based Education(OBE)and Choice Based Credit System(CBCS)

(Effective from the academic year 2022-23)

I Semester (Mechanical Engineering Stream) **(For Chemistry Group)**

Sl. No	Course and Course Code		Course Title	TD/PSB	Teaching Hours/Week				Examination				Credits
					Lecture	Tutorial	Practical	SDA	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	*ASC(IC)	**22MATM11	Essential Mathematics I - ME Stream	Maths	2	2	2	0	03	50	50	100	04
2	#ASC(IC)	22CHEM12	Applied Chemistry - ME Stream	Chemistry	2	2	2	0	03	50	50	100	04
3	ESC	22CED13	Computer Aided Engineering Drawing	Civil/Mech Engg dept	2	0	2	0	03	50	50	100	03
4	ESC-I	22ESC14x	Engineering Science Course-I	Respective Engg Dept	3	0	0	0	03	50	50	100	03
5	ETC-I	22ETC15x	Emerging Technology Course-I	Any Dept	3	0	0	0	03	50	50	100	03
6	AEC	22ENG16	Communicative English	Humanities	1	0	0	0	01	50	50	100	01
7	HSMS	22KSK17 22KBK17	Samskrutika Kannada/ Balake Kannada	Humanities	1	0	0	0	01	50	50	100	01
8	AEC/SEC	22SFH18	Scientific Foundations for Health and Happiness	Any Dept	1	0	0	0	01	50	50	100	01
				TOTAL						**400**	**400**	**800**	**20**

SDA-Skill Development Activities, **TD/PSB**- Teaching Department / Paper Setting Board, **ASC**-Applied Science Course, **ESC**- Engineering Science Courses, **ETC**-Emerging Technology Course, **AEC**- Ability Enhancement Course, **HSMS**-Humanity and Social Science and management Course, **SDC**- Skill Development Course, **CIE** - Continuous Internal Evaluation, **SEE**- Semester End Examination, **IC** – Integrated Course (Theory Course Integrated with Practical Course)

-22MATM11** Shall have the 03 hours of theory examination(SEE), however, practical sessions question shall be included in the theory question papers. * The mathematics subject should be taught by a single faculty member per division, with no sharing of the course (subject)module-wise by different faculty members.**

#-22CHEM12- SEE shall have the 03 hours of theory examination and 02-03 hours of practical examination

ESC or ETC of 03 credits Courses shall have only a theory component (L:T :P:S=3:0:0:0) or if the nature of course required practical learning syllabus shall be designed as an Integrated course (L:T:P:S= 2:0:2:0) Questions from the practical component shall be included in SEE, however, there is no SEE for practical component.

Credit Definition:	
1- hour Lecture **(L)** per week=**1Credit**	04-Credits courses are to be designed for 50 hours of Teaching-Learning Session
2-hoursTutorial**(T)** per week=**1Credit**	04-Credits (IC) are to be designed for 40 hours' theory and 12-14 hours of practical sessions
2- hours Practical / Drawing (**P**) per week=**1Credit**	03-Credits courses are to be designed for 40 hours of Teaching-Learning Session
2-hous Skill Development Actives **(SDA)** per week = **1 Credit**	02- Credits courses are to be designed for 25 hours of Teaching-Learning Session
	01-Credit courses are to be designed for 12-15 hours of Teaching-Learning sessions

Student's Induction Program: Motivating (Inspiring) Activities under the Induction program – The main aim of the induction program is to provide newly admitted students a broad understanding of society, relationships, and values. Along with the knowledge and skill of his/her study, students' character needs to be nurtured as an essential quality by which he/she would understand and fulfill the responsibility as an engineer. The following activities are to be covered in 21 days. Physical Activity, Creative Arts, Universal Human Values, Literary, Proficiency Modules, Lectures by Eminent People, Visits to Local areas, Familiarization with Department/Branch and Innovation, etc. For details, refer the ANNEXURE-I of Induction Programs notification of the University published at the beginning of the 1st semester.

AICTE Activity Points to be earned by students admitted to BE/ B.Tech., / B. Plan day college program (For more details refer to Chapter 6, AICTE Activity Point Program, Model Internship Guidelines): Over and above the academic grades, every regular student admitted to the 4 years Degree program and every student entering 4 years Degree programs through lateral entry, shall earn 100 and 75 Activity Points respectively for the award of degree through AICTE Activity Point Program. Students transferred from other Universities to the fifth semester are required to earn 50 Activity Points from the year of entry to VTU. The Activity Points earned shall be reflected on the student's eighth semester Grade Card. The activities can be spread over the years, any time during the semester weekends, and holidays, as per the liking and convenience of the student from the year of entry to the program. However, the minimum hours' requirement should be fulfilled. Activity Points (non-credit) do not affect SGPA/CGPA and shall not be considered for vertical progression. In case students fail to earn the prescribed activity Points, an Eighth Semester Grade Card shall be issued only after earning the required activity points. Students shall be admitted for the award of the degree only after the release of the Eighth semester Grade Card.

Scheme for ME/IPE/AE/AU/CH/ST/TX/AG/AM/MS/MR/MM/MT/PC/RA/RI

(ESC-I) Engineering Science Courses-I					(ETC-I) Emerging Technology Courses-I				
Code	**Title**	**L**	**T**	**P**	**Code**	**Title**	**L**	**T**	**P**
22ESC141	Introduction to Civil Engineering	3	0	0	22ETC15A	Smart Materials and Systems	3	0	0
22ESC142	Introduction to Electrical Engineering	3	0	0	22ETC15B	Green Buildings	3	0	0
22ESC143	Introduction to Electronics Engineering	3	0	0	22ETC15C	Introduction to Nano Technology	3	0	0
22ESC144	Introduction to Mechanical Engineering	3	0	0	22ETC15D	Introduction to Sustainable Engineering	3	0	0
					22ETC15E	Renewable Energy Sources	3	0	0
					22ETC15F	Waste Management	3	0	0
					22ETC15G	Emerging Applications of Biosensors	3	0	0
					22ETC15H	Introduction to Internet of Things (IOT)	3	0	0
					22ETC15I	Introduction to Cyber Security	3	0	0
					22ETC15J	Introduction to C Programming	3	0	0
(PLC-I) Programming Language Courses-I					22ETC15K	Introduction to Artificial Intelligence	3	0	0
Code	**Title**	**L**	**T**	**P**	22ETC15L	Introduction to Cloud Computing	3	0	0
22PLC15A	Introduction to Web Programming	2	0	2					
22PLC15B	Introduction to Python Programming	2	0	2					
22PLC15C	Basics to JAVA programming	2	0	2					
22PLC15D	Introduction to C++ Programming	2	0	2					

The course 22ESC145/245, Introduction to C Programming, and all courses under PLC and ETC groups can be taught by faculty of ANY DEPARTMENT

- The student has to select one course from the ETC-I group for 1st Sem and one course from PLC-II for 2nd Sem.

Dayananda Sagar College of Engineering, Bengaluru -78

Scheme of Teaching and Examinations-2022

Outcome-Based Education(OBE) and Choice Based Credit System(CBCS)

(Effective from the academic year 2022-23)

II Semester (Mechanical Engineering Stream) **(Physics Group)**

Sl. No	Course and Course Code		Course Title	TD/PSB	Teaching Hours/Week				Examination				Credits
					Lecture	Tutorial	Practical	SDA	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	*ASC(IC)	**22MATM21	Essential Mathematics II - ME Stream	Maths	3	0	2	0	03	50	50	100	04
2	#ASC(IC)	22PHYM22	Applied Physics - ME Stream	Physics	2	2	2	0	03	50	50	100	04
3	ESC	22EME23	Elements of Mechanical Engineering	Mechanical	2	2	0	0	03	50	50	100	03
4	ESC-II	22ESC243	Engineering Science Course-II (Introduction to Electronics Engineering)	Respective Engg Dept	3	0	0	0	03	50	50	100	03
5	PLC-II	22PLC25D	Programming Language Course-II (Introduction to C++ Programming)	Any Dept	2	0	2	0	03	50	50	100	03
6	AEC	22PWS26	Professional Writing Skills in English	Humanities	0	2	0	0	01	50	50	100	01
7	HSMC	22ICO27	Indian Constitution	Humanities	0	2	0	0	01	50	50	100	01
8	AEC/SDC	22IDT28	Innovation and Design Thinking	Any Dept	0	0	2	0	02	50	50	100	01
				TOTAL						**400**	**400**	**800**	**20**

SDA-Skill Development Activities, **TD/PSB**- Teaching Department / Paper Setting Board, **ASC**-Applied Science Course, **ESC**- Engineering Science Courses, **ETC**- Emerging

Scheme for ME/IPE/AE/AU/CH/ST/TX/AG/AM/MS/MR/MM/MT/PC/RA/RI

Technology Course, **AEC**- Ability Enhancement Course, **HSMS**-Humanity and Social Science and management Course, **SDC**- Skill Development Course, **CIE**– Continuous Internal Evaluation, **SEE**- Semester End Examination, **IC** – Integrated Course (Theory Course Integrated with Practical Course)

***-22MATM21** Shall have the 03 hours of theory examination (SEE), however, practical sessions question shall be included in the theory question papers. ** **The mathematics subject should be taught by a single faculty member per division, with no sharing of the course (subject) module-wise by different faculty members.**

#-22PHYM22 SEE shall have the 03 hours of theory examination and 02-03 hours of practical examination

ESC or ETC of 03 credits Courses shall have only a theory component (L:T :P:S=3:0:0:0) or if the nature of course required practical learning syllabus shall be designed as an Integrated course (L:T:P:S= 2:0:2:0),.

(ESC-II) Engineering Science Courses-II					(ETC-II) Emerging Technology Courses-II				
Code	**Title**	**L**	**T**	**P**	**Code**	**Title**	**L**	**T**	**P**
22ESC241	Introduction to Civil Engineering	3	0	0	22ETC25A	Smart materials and Systems	3	0	0
22ESC242	Introduction to Electrical Engineering	3	0	0	22ETC25B	Green Buildings	3	0	0
22ESC243	Introduction to Electronics Engineering	3	0	0	22ETC25C	Introduction to Nano Technology	3	0	0
22ESC244	Introduction to Mechanical Engineering	3	0	0	22ETC25D	Introduction to Sustainable Engineering	3	0	0
					22ETC25E	Renewable Energy Sources	3	0	0
					22ETC25F	Waste Management	3	0	0
					22ETC25G	Emerging Applications of Biosensors	3	0	0
					22ETC25H	Introduction to Internet of Things (IoT)	3	0	0
					22ETC25I	Introduction to Cyber Security	3	0	0
					22ETC15J	Introduction to C Programming	3	0	0
(PLC-II) Programming Language Courses-II					22ETC15K	Introduction to Artificial Intelligence	3	0	0
Code	**Title**	**L**	**T**	**P**	22ETC15L	Introduction to Cloud Computing	3	0	0
22PLC25A	Introduction to Web Programming	2	0	2					
22PLC25B	Introduction to Python Programming	2	0	2					
22PLC25C	Basics to JAVA programming	2	0	2					
22PLC25D	Introduction to C++ Programming	2	0	2					

The course 22ESC145/245, Introduction to C Programming and all courses under PLC and ETC groups can be taught by faculty of ANY DEPARTMENT

- The student has to select one course from the PLC-II group for 2nd Sem.

Assessment Evaluation pattern for standalone theory and Lab courses

CIE in Theory Course (50 Marks)

(Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analysing, Evaluating and Creating)

		Marks			
Each Test will be conducted for 50 Marks adding up to 150 Marks. Final test marks will be reduced to 30 Marks.	**IAT**	**Max. Marks**	**Reduced to 30 Marks**	**Average**	**IAT Final Marks**
	IAT-I	50	30(A)	(A+B+C)/3 =30 (D)	Total out of 30 marks
	IAT-II	50	30(B)		
	IAT-III	50	30(C)		
QUIZ	**Evaluated for 30 Marks**			**Reduced to 10 Marks**	
	30			**10 (E)**	
Alternate Assessment Tool (AAT)	Reflection Note on Guest Lecture/ Reflection note on Industrial Visit/ E-course certification/Building models/Group discussion/case study/Seminar/Paper Presentation/Open Book Assignment				
	10 Marks (F)				
Total CIE Marks	CIE (D) +QUIZ (E)+ AAT(F)			**50 Marks**	

CIE in Laboratory (50 Marks)

Conduction of Experiments(E)		**30 (G)**	**Total= G+H=50**	**Total out of 50 Marks**
Performance of the Experiment (On completion of every experiment/program in the laboratory, the students shall be evaluated and marks shall be awarded on the same day. 20 marks are for conducting the experiment and calculations/observations/output)	20			
Record	05			
Evaluation of Outcome/ Viva	05			
Final test/Case Study/Open Ended Experiment(if it is not test then a five page report stapled has to be submitted)	50	**Reduced to 20 (H)**		

Final theory CIE marks =50 Marks
Final Lab CIE marks =50 Marks

*** SEE Theory will be conducted for 100 marks**
***SEE Lab will be conducted for 50 marks**

***Refer Annexure-I Evaluation Guidelines and Minimum Marks for Eligibility Table**

Assessment Evaluation pattern for AEC/UHV courses

CIE in Theory Course (50 Marks)

(Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating and Creating)

Each Test will be conducted for 50 Marks adding up to 100 Marks. Final test marks will be reduced to 30 Marks.	IAT	Marks			
		Max. Marks	**Reduced to 30 Marks**	**Average**	**IAT Final Marks**
	IAT-I	50	30(A)	(A+B)/2 =30 (C)	Total out of 30 marks
	IAT-II	50	30(B)		
QUIZ	**Evaluated for 30 Marks**			**Reduced to 10 Marks**	
	30			**10 (D)**	
Alternate Assessment Tool (AAT)	Reflection Note on Guest Lecture/ Reflection note on Industrial Visit/ E-course certification/Building models/Group discussion/case study/Seminar/Paper Presentation/Open Book Assignment				
	10 Marks (E)				
Total CIE Marks	CIE (C) +QUIZ (D)+ AAT(E)			**50 Marks**	

CIE in AEC Laboratory (50 Marks)

Conduction of Experiments(E)				
Performance of the Experiment (On completion of every experiment/program in the laboratory, the students shall be evaluated and marks shall be awarded on the same day. 20 marks are for conducting the experiment and calculations/observations/output)	20	**30 (G)**	**Total= G+H=50**	**Total out of 50 Marks**
Record	05			
Evaluation of Outcome/ Viva	05			
Final test/Case Study/Open Ended Experiment(if it is not test then a five page report stapled has to be submitted)	50	**Reduced to 20 (H)**		

Final theory CIE marks =50 Marks
Final Lab CIE marks =50 Marks

*** SEE Theory will be conducted for 50 marks**
***SEE Lab will be conducted for 50 marks**

***Refer Annexure-I Evaluation Guidelines and Minimum Marks for Eligibility Table**

Assessment Evaluation pattern for Integrated Professional Core Courses

CIE for the theory component of Integrated Professional Core Courses (IPCC)
(Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating and Creating)

		Marks			
Each Test will be conducted for 50 Marks adding up to 150 Marks. Final test marks will be reduced to 30 Marks.	**IAT**	**Max. Marks**	**Reduced to 30 Marks**	**Average**	**IAT Final Marks**
	IAT-I	50	30(A)	(A+B+C)/3 =30 (D)	Total out of 30 marks
	IAT-II	50	30(B)		
	IAT-III	50	30(C)		
QUIZ (One Quiz to be evaluated for 30 marks)	**Evaluated for 30 Marks**			**Reduced to 10 Marks**	
	30			**10 (E)**	
Alternate Assessment Tool (AAT)	Reflection Note on Guest Lecture/ Reflection note on Industrial Visit/ E-course certification/Building models/Group discussion/Seminar/Paper Presentation/Open Book Assignment				
	10 Marks (F)				
Total theory CIE Marks	CIE (D) +QUIZ (E)+ AAT(F)			**50 (G) reduced to 30 (K) Marks**	

CIE for the practical component of Integrated Professional Core Courses (IPCC)

Conduction of Experiments				
Performance of the Experiment (On completion of every experiment/program in the laboratory, the students shall be evaluated and marks shall be awarded on the same day. 20 marks are for conducting the experiment and calculations/observations/output)	20	**30 (H)**	**Total= H+I=50 (J)**	**Total out of 50 (J) Marks reduced to 20 (L)**
Record	05			
Evaluation of outcome/Viva	05			
Final test/Case Study/Open Ended Experiment(if it is not test then a five page report stapled has to be submitted)	50	**Reduced to 20 (I)**		

Final CIE of IPCC=[CIE of Theory (K)+CIE of Lab (L)]=CIE marks scored by the student

The minimum marks to be secured in CIE of the lab to appear for SEE of IPCC shall be the 8 marks (40% of maximum marks) and 12 marks (40% of maximum marks) in the CIE theory component.

The laboratory component of the IPCC shall be for CIE only. However, in SEE, the questions from laboratory component shall be included. The total marks of all questions in SEE should not be more than the 25 marks from the practical component of IPCC. The theory component of the IPCC shall be for both CIE and SEE.

***SEE Theory will be conducted for 100 marks**

***Refer Annexure-I Evaluation Guidelines and Minimum Marks for Eligibility Table**

Annexure-I

Evaluation Guidelines and Minimum Marks for Eligibility

Course	Evaluation Type	Maximum Marks	Minimum Marks
IPCC	CIE-IA Tests	30	12
	CIE-AAT (Quiz & Assignment)	20	08
	Total CIE Theory	**50**	**20**
	Reduce overall theory marks from 50 to 30. The minimum marks to be secured in CIE of the THEORY to appear for SEE of IPCC shall be 12 marks [40% of maximum marks (30)] in the CIE theory component.		
	CIE-Practical (Conduction)	30	12
	CIE-Practical (Test)	20	08
	Total CIE Practical	**50**	**20**
	Reduce overall lab marks from 50 to 20. The minimum marks to be secured in CIE of the LAB to appear for SEE of IPCC shall be the 8 marks [40% of maximum marks (20)].		
	CIE(THEORY+PRACTICAL)	30+20=50	12+8=20
	SEE	**50**	**18**
	CIE+SEE	**100**	**40**
Stand Alone Theory and AEC Theory Courses	**Total CIE Theory**	**50**	**20**
	CIE-IA Tests	30	12
	CIE-AAT(Quiz & Assignment)	20	08
	SEE	**50**	**18**
	CIE+SEE	**100**	**40**
Stand Alone Lab and AEC Lab Courses	**Total CIE Practical**	**50**	**20**
	CIE-Practical(Conduction)	30	12
	CIE-Practical (Test)	20	08
	SEE	**50**	**18**
	CIE+SEE	**100**	**40**

Essential Mathematics I - Civil Stream

Course Code for the stream: 22MATC11 **Credits 4**

L:P:T:S : 2:2:2:0 **CIE Marks 50**

Exam Hours: 3 **SEE Marks 50**

Course Type (Theory/Practical/Integrated): Integrated

Course Objectives:

1. To distinguish the importance of calculus associated with one variable and two variables for civil engineering.
2. To analyze Civil engineering problems applying Ordinary Differential Equations
3. To apply the knowledge of Linear Algebra refereeing to matrices.

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

CO1	Acquire basic Knowledge of Matrix theory, Multivariable calculus, and differential equations and learn Numerical techniques to obtain an approximate solution to mathematical problems.
CO2	Solve the linear system of equation, ODE, and choose the appropriate calculus for evaluating Multivariate functions.
CO3	Develop/Discuss the methodology for determining the eigenvalue & Eigenvector numerically and evaluate the accuracy of common numerical methods.
CO4	Interpret the solution of Calculus and Develop a mathematical solution for application-oriented concepts in Linear Algebra, Calculus, and Numerical methods.
CO5	Familiarize yourself with the modern mathematical tool-wxMAXIMA.

Mapping of Course outcomes to Program outcomes:

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

Unit	Course content	Hours	COs
1	**Module-1: Differential Calculus** Polar Curves- Angle between radius vector and tangents, Angle between two curves, Curvature, Radius of curvature (Cartesian and Polar form-formulae only). Taylor's and Maclaurin's Series expansions for a function of one variable (statement only) – problems. **Applications:** Centre and circle of curvature. **(RBT Levels: L1, L2 and L3)**	**8**	**CO1-CO5**
2	**Module-2 : Partial Differentiation** Partial differentiation; Total derivatives-differentiation of composite functions, Jacobians (without properties) - Problems. Taylor's series for a function of two variables (Illustrative Problems), Maxima and Minima of functions of two variables by Lagrange Multiplier Method, Differentiation under the integral sign- Leibnitz rule– problems. **Applications:** Errors and approximations, Estimating the critical points and extreme values. **(RBT Levels: L1, L2 and L3)**	**8**	**CO1-CO5**
3	**Module-3: Ordinary Differential Equations** Solution of the first order and first-degree Differential equations: Bernoulli's differential equations, Exact Differential equations, Reducible to Exact Differential equations – problems. **Nonlinear differential equations**: Introduction to general and singular solutions, solvable for p only, Clairaut's equations, reducible to Clairaut's equations– problems. **Applications:** Applications of ODE's – Orthogonal trajectories, Newton's law of cooling **(RBT Levels: L1, L2 and L3)**	**8**	**CO1-CO5**
4	**Module-4 Linear Algebra** The rank of a matrix-echelon form. Solution of a system of linear equations (Homogeneous and Non-Homogeneous) – consistency. Gauss- Elimination method, Gauss Jordan method – problems. **Applications:** LU decomposition method – problems. **(RBT Levels: L1, L2 and L3)**	**8**	**CO1-CO5**
5	**Module-5 Numerical Methods** **Roots of an Equation :** Solution of Algebraic and Transcendental Equations–Newton-Raphson and Regula-Falsi Methods (only formulae)-Problems. **Solution of System of Non-homogeneous Equations:** Solution of Linear Simultaneous Equations - Iteration methods: Gauss Jacobi's method, Gauss-Seidal method. **Applications:** Eigen values and Eigen vectors-Rayleigh's power method **(RBT Levels: L1, L2 and L3)**	**8**	**CO1-CO5**

Prerequisites:

Module 1: Pre-requisite: Basic Calculus
Module 2: Pre-requisite: Function of multivariate
Module 3: Pre-requisite: Variable separable method
Module 4: Pre-requisite: Matrix Theory
Module 5: Pre-requisite: Algebraic and Transcendental Equations

NOTE: 1. Questions for CIE and SEE not to be set from Self Study Component.

2. Assignment Questions should be only from Self Study Component.

Module 1: Self-study component: Evolutes and involutes.
Module 2: Self-study component: Euler's theorem and problems.
Module 3: Self-study component: Applications of ODE's: Solvable for x and y.
Module 4: Self-study component: Solution of a system of linear equations by Gauss-Jacobi iterative method. Inverse of a square matrix by Cayley- Hamilton theorem.
Module 5: Self-study component: Bisection Method & Trapezoidal rule.

Text books:

1. B.S. Grewal, "Higher Engineering Mathematics" Khanna Publishers, 44th Edition, 2021 June, ISBN: 9788193328491.
2. Erwin Kreyszig; Advanced Engineering Mathematics; John Wiley & Sons, 9th Edition, 2007, ISBN: 9788126531356.
3. H. K. Dass and Er. Rajnish Verma: Higher Engineering Mathematics; S. Chand Publication, 3rd Ed., 2014, ISBN:9788121938907.
4. Srimanta Pal and Subobh C. Bhunia, Engineering Mathematics: Oxford University press, 3rd Edition,2016: 9780198070894.
5. C. Ray Wylie, Louis C. Barrett: "Advanced Engineering Mathematics" McGraw – Hill Book Co., New York, 6th Edition, 2017, ISBN: 9780070722064.

Reference books:

1. B. V. Ramana, "Higher Engineering Mathematics", Tata McGraw-Hill, 2006; ISBN: 9780070634190.
2. Murray Speigel, Schaum's Outline of "Advanced Mathematics for Engineers and Scientists" McGraw-Hill, 1971; ISBN: 9780070602168.
3. N.P. Bali and Manish Goyal, A textbook of Engineering Mathematics, Laxmi Publications, 9 th Edition Reprint, 2008; ISBN:9788131808320.
4. M. K. Jain, S. R. K. Iyengar, and R. K. Jain "Numerical Methods: For Scientific and Engineering Computation", New Age International Publications, 6 th Edition, 2012, ISBN: 9788122433234.
5. David C Lay: "Linear Algebra and its Applications", Pearson Publishers, 4th Edition, 2018, ISBN: 9780134013473.

Web links and Video Lectures (e-Resources):

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- https://archive.nptel.ac.in/courses/111/107/111107105/

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

- https://www.mb.uni-siegen.de/kobelev/maxima.pdf
- https://www.ms.uky.edu/ lee/amspalg05/MaximaTutorial.pdf
- https://www.youtube.com/playlist?list=PLEDEE2F7C6750729F

Essential Mathematics I - ME Stream

Course Code for the stream: 22MATM11 **Credits : 4**

L:P:T:S : 2:2:2:0 **CIE Marks : 50**

Exam Hours: 3 **SEE Marks : 50**

Course Type (Theory/Practical/Integrated): Integrated

Course Objectives:

1. To distinguish the importance of calculus associated with one variable and two variables for Mechanical engineering.
2. To analyze Mechanical engineering problems applying Ordinary Differential Equations
3. To apply the knowledge of Linear Algebra refereeing to matrices.

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

CO1	Acquire basic Knowledge of Matrix theory, Multivariable calculus, differential equations and learn Numerical techniques to obtain approximate solution to mathematical problems.
CO2	Solve linear system of equation, ODE and choose appropriate calculus for evaluating Multivariate functions.
CO3	Develop/Discuss the methodology for determining the eigen value & eigen vector numerically and evaluate the accuracy of common numerical methods.
CO4	Interpret the solution of Calculus and Develop mathematical solution for application-oriented concepts in Linear Algebra, Calculus and Numerical methods.
CO5	Familiarize with modern mathematical tool-wxMAXIMA.

Mapping of Course outcomes to Program outcomes:

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

Unit	Course content	Hours	COs
1	**Module-1: Differential Calculus** Polar Curves- Angle between radius vector and tangents, Angle between two curves, Curvature, Radius of curvature (Cartesian and Polar form-formulae only). Taylor's and Maclaurin's Series expansions for a function of one variable (statement only) – problems. **Applications:** Centre and circle of curvature. **(RBTLevels:L1, L2andL3)**	**8**	**CO1-CO5**
2	**Module-2 : Partial Differentiation** Partial differentiation; Total derivatives-differentiation of composite functions, Jacobians (without properties) - Problems. Taylor's series for a function of two variables (Illustrative Problems), Maxima and Minima of functions of two variables by Lagrange Multiplier Method, Differentiation under the integral sign- Leibnitz rule– problems. **Applications:** Errors and approximations, Estimating the critical points and extreme values. **(RBTLevels:L1, L2andL3)**	**8**	**CO1-CO5**
3	**Module-3: Ordinary Differential Equations** Solution of the first order and first-degree Differential equations: Bernoulli's differential equations, Exact Differential equations, Reducible to Exact Differential equations – problems. **Nonlinear differential equations**: Introduction to general and singular solutions, solvable for p only, Clairaut's equations, reducible to Clairaut's equations– problems. **Applications:** Applications of ODE's – Orthogonal trajectories, Newton's law of cooling **(RBTLevels:L1, L2andL3)**	**8**	**CO1-CO5**
4	**Module-4 LinearAlgebra** The rank of a matrix-echelon form. Solution of a system of linear equations (Homogeneous and Non-Homogeneous) – consistency. Gauss- Elimination method, Gauss Jordan method – problems. **Applications:** LU decomposition method – problems. **(RBTLevels:L1, L2andL3)**	**8**	**CO1-CO5**
5	**Module-5 Numerical Techniques** **Roots of an Equation:** Solution of Algebraic and Transcendental Equations–Newton-Raphson and Regula-Falsi Methods (only formulae)-Problems. **Solution of System of Non-homogeneous Equations**: Solution of Linear Simultaneous Equations - Iteration methods: Gauss Jacobi's method, Gauss-Seidal method, Relaxation methods. **Applications:** Eigen values and Eigen vectors-Rayleigh's power method **(RBTLevels:L1, L2andL3)**	**8**	**CO1-CO5**

Prerequisites:

Module 1: Pre-requisite: Basic Calculus
Module 2: Pre-requisite: Function of multivariate
Module 3: Pre-requisite: Variable separable method
Module 4: Pre-requisite: Matrix Theory
Module 5: Pre-requisite: Algebraic and Transcendental Equations

NOTE: 1. Questions for CIE and SEE not to be set from Self Study Component.

2. Assignment Questions should be only from Self Study Component.

Module 1: Self-study component: Evolutes and involutes.
Module 2: Self-study component: Euler's theorem and problems.
Module 3: Self-study component: Applications of ODE's: Solvable for x and y.
Module 4: Self-study component: Solution of a system of linear equations by Gauss-Jacobi iterative method. Inverse of a square matrix by Cayley- Hamilton theorem.
Module 5: Self-study component: Bisection Method & Trapezoidal rule.

Text books:

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2. Erwin Kreyszig; Advanced Engineering Mathematics; John Wiley & Sons, 9th Edition, 2007, ISBN: 9788126531356.
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4. Srimanta Pal and Subobh C. Bhunia, Engineering Mathematics: Oxford University press, 3rd Edition,2016: 9780198070894.
5. C. Ray Wylie, Louis C. Barrett: "Advanced Engineering Mathematics" McGraw – Hill Book Co., Newyork, 6th Edition, 2017, ISBN: 9780070722064.

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5. David C Lay: "Linear Algebra and its Applications", Pearson Publishers, 4th Edition, 2018, ISBN: 9780134013473.

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- https://archive.nptel.ac.in/courses/111/106/111106100/
- https://archive.nptel.ac.in/courses/111/106/111106135/
- https://archive.nptel.ac.in/courses/111/107/111107105/

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

- https://www.mb.uni-siegen.de/kobelev/maxima.pdf
- https://www.ms.uky.edu/ lee/amspalg05/MaximaTutorial.pdf
- https://www.youtube.com/playlist?list=PLEDEE2F7C6750729F

Essential Mathematics I - EE Stream

Course Code for the stream: 22MATE11 **Credits** **4**

L:P:T:S : 2:2:2:0 **CIE Marks** **50**

Exam Hours: 3 **SEE Marks** **50**

Course Type (Theory/Practical/Integrated): Integrated

Course Objectives:

1. To distinguish the importance of calculus associated with one variable and two variables for computer science and engineering.
2. To analyze computer science and engineering problems by applying Ordinary Differential Equations.
3. To develop the knowledge of Linear Algebra and Laplace transform.

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

CO1	Acquire basic Knowledge of Matrix theory, Multivariable calculus, differential equations and Laplace transform.
CO2	Solve linear system of equation, ODE and choose appropriate calculus for evaluating Multivariate functions.
CO3	Develop/Discuss the methodology for determining the eigen value & eigen vector numerically and Laplace transform.
CO4	Interpret the solution of Calculus and Develop mathematical solution for application-oriented concepts in Linear Algebra, Calculus and Laplace transform.
CO5	Familiarize with modern mathematical tool-wxMAXIMA.

Mapping of Course outcomes to Program outcomes:

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

Unit	Course content	Hours	COs
1	**Module-1: Differential Calculus** Polar Curves- Angle between radius vector and tangents, Angle between two curves, Curvature, Radius of curvature (Cartesian and Polar form- formulae only). Taylor's and Maclaurin's Series expansions for a function of one variable (statement only) – problems. **Applications:** Centre and circle of curvature **(RBT Levels: L1, L2 and L3)**	**8**	**CO1-CO5**
2	**Module-2: Partial Differentiation** Partial differentiation; Total derivatives-differentiation of composite functions, Jacobians (without properties) - Problems. Taylor's series for a function of two variables (Illustrative Problems), Maxima and Minima of functions of two variables by Lagrange Multiplier Method, Differentiation under the integral sign- Leibnitz rule– problems. **Applications:** Errors and approximations, Estimating the critical points and extreme values. **(RBT Levels: L1, L2 and L3)**	**8**	**CO1-CO5**
3	**Module-3: Ordinary Differential Equations** Solution of the first order and first-degree Differential equations: Bernoulli's differential equations, Exact Differential equations, Reducible to Exact Differential equations – problems. **Nonlinear differential equations:** Introduction to general and singular solutions, solvable for p only, Clairaut's equations, **r**educible to Clairaut's equations– problems. **Applications:** Applications of ODE's – Orthogonal trajectories, Newton's law of cooling **(RBT Levels: L1, L2 and L3)**	**8**	**CO1-CO5**
4	**Module-4 Linear Algebra** The rank of a matrix-echelon form. Solution of a system of linear equations (Homogeneous and Non-Homogeneous) – consistency. Gauss- Elimination method, Gauss Jordan method– problems. **Applications:** LU decomposition method – problems. **(RBT Levels: L1, L2 and L3)**	**8**	**CO1-CO5**
5	**Module-5 Laplace Transform** Definition and Laplace Transforms of Elementary functions, Laplace Transforms of $e^{at}f(t), t^n f(t), \frac{f(t)}{t}$, Periodic functions, Unit Impulse function (statements only)-problems. Inverse Laplace Transforms**:** Inverse Laplace Transforms of Logarithmic and Trigonometric functions, Inverse Laplace transform by the method of Partial Fractions. Convolution Theorem (statement only)-problems. **Applications:** Application to solve ordinary differential equations **(RBT Levels: L1, L2 and L3)**	**8**	**CO1-CO5**

Prerequisites:

Module 1: Pre-requisite: Basics of Calculus
Module 2: Pre-requisite: Function of multivariate
Module 3: Pre-requisite: Variable separable method
Module 4: Pre-requisite: Matrix theory
Module 5: Pre-requisite: Solving Ordinary Differential equation by analytical method

NOTE: 1. Questions for CIE and SEE not to be set from Self Study Component.

2. Assignment Questions should be only from Self Study Component.

Module 1: Self-study component: Evolutes and involutes.
Module 2: Self-study component: Euler's theorem and problems**.**
Module 3: Self-study component: Applications of ODE's: Solvable for x and y.
Module 4: Self-study component: Solution of a system of linear equations by Gauss-Jacobi iterative method. Inverse of a square matrix by Cayley- Hamilton theorem. **Module 5:** Self-study component: Bisection Method & Trapezoidal rule.

Text books:

1. B.S. Grewal, "Higher Engineering Mathematics" Khanna Publishers, 44th Edition, 2021 June, ISBN: 9788193328491.
2. Erwin Kreyszig; Advanced Engineering Mathematics; John Wiley & Sons, 9th Edition, 2007, ISBN: 9788126531356.
3. H. K. Dass and Er. Rajnish Verma: Higher Engineering Mathematics; S. Chand Publication, 3rd Edition, 2014, ISBN:9788121938907.
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5. C. Ray Wylie, Louis C. Barrett: "Advanced Engineering Mathematics" McGraw – Hill Book Co., Newyork, 6th Edition, 2017, ISBN: 9780070722064.

Reference books:

1. Murray Speigel, Schaum's Outline of "Advanced Mathematics for Engineers and Scientists" McGraw-Hill, 1971; ISBN: 9780070602168.
2. B. V. Ramana, "Higher Engineering Mathematics", Tata McGraw-Hill, 2006; ISBN: 9780070634190
3. N.P. Bali and Manish Goyal, A textbook of Engineering Mathematics, Laxmi Publications, 9 th Edition Reprint, 2008; ISBN:9788131808320.
4. Gupta C.B, Sing S.R and Mukesh Kumar: "Engineering Mathematic for Semester I and II", Mc-Graw Hill Education(India) Pvt. Ltd 2015, ISBN:9789339219642.
5. David C Lay: "Linear Algebra and its Applications", Pearson Publishers, 4th Edition, 2018, ISBN: 9780134013473.

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- https://nptel.ac.in/courses/111104092
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- https://archive.nptel.ac.in/courses/111/106/111106135/
- https://archive.nptel.ac.in/courses/111/106/111106139/

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

- **https://www.mb.uni-siegen.de/kobelev/maxima.pdf**
- **https://www.ms.uky.edu/**
- **https://www.youtube.com/playlist?list=PLEDEE2F7C6750729F**

Essential Mathematics I - CSE Stream

Course Code for the stream: 22MATS11 **Credits** **4**

L:P:T:S: 2:2:2:0 **CIE Marks** **50**

Exam Hours: 3 **SEE Marks** **50**

Course Type (Theory/Practical/Integrated): Integrated

Course Objectives:

1. To distinguish the importance of calculus associated with one variable and multivariable for computer science and engineering.
2. To analyze computer science and engineering problems by applying ordinary Differential Equations.
3. To apply the knowledge of modular arithmetic to computer algorithms.

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

CO1	Acquire basic Knowledge of Matrix theory, Multivariable calculus, differential equations and learn modular arithmetic.
CO2	Solve linear system of equation, ODE and choose appropriate calculus for evaluating Multivariate functions.
CO3	Develop/Discuss the methodology for determining the eigen value & eigen vector numerically.
CO4	Interpret the solution of Calculus and Develop mathematical solution for application-oriented concepts in Linear Algebra. Apply modular arithmetic to computer algorithms.
CO5	Familiarize with modern mathematical tool-wxMAXIMA.

Mapping of Course outcomes to Program outcomes:

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

Unit	Course content	Hours	COs
1	**Module-1: Differential Calculus** Polar Curves- Angle between radius vector and tangents, Angle between two curves, Curvature, Radius of curvature (Cartesian and Polar form- formulae only). Taylor's and Maclaurin's Series expansions for a function of one variable (statement only) – problems. **Applications:** Centre and circle of curvature, **(RBT Levels: L1, L2 and L3)**	**8**	**CO1-CO5**
2	**Module-2 : Partial Differentiation** Partial differentiation; Total derivatives-differentiation of composite functions, Jacobians (without properties) - Problems. Taylor's series for a function of two variables (Illustrative Problems), Maxima and Minima of functions of two variables by Lagrange Multiplier Method, Differentiation under the integral sign- Leibnitz rule– problems. **Applications:** Errors and approximations, Estimating the criticalpoints and extreme values. **(RBT Levels: L1, L2 and L3)**	**8**	**CO1-CO5**
3	**Module-3: Ordinary Differential Equations** Solution of the first order and first-degree Differential equations: Bernoulli's differential equations, Exact Differential equations, Reducible to Exact Differential equations – problems. **Nonlinear differential equations:** Introduction to general and singular solutions, solvable for p only, Clairaut's equations, **r**educible to Clairaut's equations– problems. **Applications:** Applications of ODE's – Orthogonal trajectories, Newton's law of cooling **(RBT Levels: L1, L2 and L3)**	**8**	**CO1-CO5**
4	**Module-4 Linear Algebra** The rank of a matrix-echelon form. Solution of a system of linear equations (Homogeneous and Non-Homogeneous) – consistency. Gauss- Elimination method, Gauss Jordan method – problems. **Applications:** LU decomposition method – problems. **(RBT Levels: L1, L2 and L3)**	**8**	**CO1-CO5**
5	**Module-5 Modular Arithmetic** Introduction to Congruences, Linear Congruences, The Chinese Remainder theorem, Solving Polynomials, Linear Diophantine Equation, System of Linear Congruences, Euler's Theorem, Wilson Theorem and Fermat's little theorem. **Applications:** Applications of Congruences-RSA algorithm **(RBT Levels: L1, L2 and L3)**	**8**	**CO1-CO5**

Prerequisites:

Module 1: Pre-requisite: Basics of Calculus
Module 2: Pre-requisite: Function of multivariate
Module 3: Pre-requisite: Variable separable method
Module 4: Pre-requisite: Matrix theory
Module 5: Pre-requisite: Divisibility

NOTE: 1. Questions for CIE and SEE not to be set from Self Study Component.

2. Assignment Questions should be only from Self Study Component.

Module 1: Self-study component: Evolutes and involutes.
Module 2: Self-study component: Euler's theorem and problems
Module 3: Self-study component: Applications of ODE's: Solvable for x and y.
Module 4: Self-study component: Solution of a system of linear equations by Gauss-Jacobi iterative method. Inverse of a square matrix by Cayley- Hamilton theorem. **Module 5:** Self-study component: Bisection Method & Trapezoidal rule.

Text books:

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3. H. K. Dass and Er. Rajnish Verma: Higher Engineering Mathematics; S. Chand Publication, 3rd Edition, 2014, ISBN:9788121938907.
4. William Stallings: "Cryptography and Network Security" Pearson Prentice Hall, 6th Edition, 2013, ISBN: 9781488682957.
5. C. Ray Wylie, Louis C. Barrett: "Advanced Engineering Mathematics" McGraw – Hill Book Co., New York, 6th Edition, 2017, ISBN: 9780070722064.

Reference books:

1. Murray Speigel, Schaum's Outline of "Advanced Mathematics for Engineers and Scientists" McGraw-Hill, 1971; ISBN: 9780070602168.
2. B. V. Ramana, "Higher Engineering Mathematics", Tata McGraw-Hill, 2006; ISBN: 9780070634190.
3. N.P. Bali and Manish Goyal, A textbook of Engineering Mathematics, Laxmi Publications, 9 th Edition Reprint, 2008; ISBN:9788131808320.
4. David M Burton, "Elementary Number Theory" Mc Graw Hill, 7th Edition, 2010, ISBN: 9780071289191.
5. David C Lay: "Linear Algebra and its Applications", Pearson Publishers, 4th Edition, 2018, ISBN: 9780134013473.

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- https://archive.nptel.ac.in/courses/111/106/111106100/
- https://archive.nptel.ac.in/courses/111/106/111106135/
- https://archive.nptel.ac.in/courses/111/101/111101137/

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

- **https://www.mb.uni-siegen.de/kobelev/maxima.pdf**
- **https://www.ms.uky.edu/**
- **https://www.youtube.com/playlist?list=PLEDEE2F7C6750729F**

APPLIED PHYSICS - CSE Stream

Course Code for the stream : 22PHYS12 **Credits 4**

L:P:T:S : 3:2:0:0 **CIE Marks 50**

Exam Hours : 3 **SEE Marks 50**

Course Type (Theory/Practical/Integrated): Integrated

Course objectives:

1. To give hands on experience on various experiments.
2. To acquire knowledge in various techniques and working principles in Physics.
3. To impart knowledge in the field of semiconductors and their applications.
4. To train students in techniques and principles related to various devices orcomponents.
5. To acquire ability to use measuring instruments.
6. To assess the importance of Optics, Modern Physics and Engineering.

Course Outcomes: After completion of the course, the graduates will be able to

CO1	Distinguish the principles of Classical Physics and Modern Physics.
CO2	Analyze different materials for various scientific applications.
CO3	Apply the acquired knowledge in Physics, Nano science and Quantum computing for future applications.
CO4	Develop the ability to use concepts of Physics for the working components like capacitors, diodes and transistors and various measuring instruments like ammeters, voltmeters and signal generators.

Mapping of Course outcomes to Program outcomes:

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

Unit	Course content	Hours	COs
1	**Module-1: Modern Physics and Quantum Mechanics** **Modern Physics:** Black body radiation spectrum, Weins law, Rayleigh Jeans law, Planck's Law, Derivation of Weins law and Rayleigh Jeans law from Planck's law, de-Broglie hypothesis, Compton effect and its Physical significance, Matter waves and its significances, Phase Velocity and Group Velocity, Problems. **Quantum Mechanics:** Heisenberg's Uncertainty Principle and its applications (mention 4 significances no derivations), Wave Function and its properties, Time independent Schrodinger wave equation, Probability density and Normalization of wave function, Eigen functions and Eigen Values, Motion of a particle in a one dimensional potential well of infinite depth, Numerical Problems.	8	CO1
2	**Module-2 : LASER and Optical Fibers** **LASER:** Basic properties of a LASER beam, Interaction of Radiation with Matter, Einstein's A and B Coefficients with expression for energy density (derivation), Laser Action, Population Inversion, Metastable State, Requisites and conditions for of a laser system, Semiconductor Diode Laser, Applications: Bar code scanner, Laser Printer, Laser Cooling, LASER range finder, LIDAR, Numerical Problems. **Optical Fibers:** Propagation mechanism in optical fibers. Angle of acceptance and Numerical aperture (derivation), Types of optical fibers for different modes of propagation, Absorption coefficient (qualitative), Application of optical fiber: Optical networking, Optical fiber point to point Communication with block diagram, 3 advantages of optical fiber communication, Problems.	8	CO1 CO2
3	**Module-3: Electrical Properties of Materials, Dielectrics and Superconductivity** **Electrical conductivity:** Electrical Conductivity in metals, Resistivity and Mobility, Concept of Phonon, Matheissen's rule. **Dielectric Properties**: Polar and non-polar dielectrics, Types of Polarization, internal fields in solid, Clausius-Mossotti equation (Derivation), solid, liquid and gaseous dielectrics. Application of dielectrics in transformers, Capacitors and electrical insulation. Problems. **Superconductors:** Introduction to Super Conductors, Temperature dependence of resistivity, Meissner Effect, Critical Current, Types of Super Conductors, Temperature dependence of Critical field, BCS theory (Qualitative), Type I superconductor and Type II superconductors with examples, High Temperature superconductivity, Applications in MRI, MAGLEV vehicles, Numerical Problems.	8	CO1 CO3

4	**Module-4 Semiconductors, Nano Science and Applications** **Semiconductors**: Conductivity of semi conducting materials, Concentration of electrons and holes in intrinsic semiconductors (derivations). Fermi level in an intrinsic Semiconductor, Proof of $E_F = E_g/2$, Hall effect, Hall coefficient derivation, Application, Problems. **Nano science**: Introduction to Nano science, Mesoscopic state, Density of states in 0D, 1D, 2D and 3D structures. Synthesis: Top–down and Bottom–up approach examples: Ball Milling and Sol–Gel methods explanations with diagrams. Carbon nano tubes: Types, properties and applications.	**8**	**CO2** **CO3**
5	**Module-5 Quantum Computing, Quantum Gates & Physics of Animation** **Principles of Quantum Information & Quantum Computing**: Introduction to Quantum Computing, Moore's law & its end, Classical & quantum information, Differences between classical & quantum computing, quantum superposition and the concept of qubit. **Quantum Gates:** Single Qubit Gates: Quantum Not Gate , Pauli -Z Gate, Hadamard Gate , Phase Gate (or S Gate) , T Gate Multiple Qubit Gates: Controlled gate, CNOT Gate, (Discussion for 4 different input states). **Physics of Animation**: Taxonomy of physics based animation methods, Frames, Frames per Second, Size and Scale, Motion and Timing in Animations. Examples of Character Animation: Jumping, Walking. Numerical Problems.	**8**	**CO2** **CO3**

Prerequisites:

Module 1:

Pre-requisite: Wave–Particle dualism

Module 2:

Pre-requisite: Properties of light

Module 3:

Pre-requisite: Basics of Electrical conductivity

Module 4:

Pre-requisite: Basics of semiconductors and doping

Module 5:

Pre-requisite: Matrices and motion in one dimension

NOTE: 1. Questions for CIE and SEE not to be set from Self Study Component.

2. Assignment Questions should be only from Self Study Component.

Module 1: Self study component: Davisson Germer Experiment, Properties of matter waves.

Module 2: Self study component: Other applications of LASER: atmospheric pollutant analysis, Types of attenuation for fiber losses.

Module 3: Self study component: Josephson junction, DC and AC SQUIDs. Applications of Superconductivity in Quantum Computing.

Module 4: Self study component: Synthesis of Carbon nano tubes, Applications of nanotechnology and thin films in solar cells, LEDs, OLED and applications, flexible wearables and displays.

Module 5: Self study component: Constant Force and Acceleration, The Odd rule, Motion Graphs, Numerical Calculations based on Odd Rule.

Text books:

1. Hitendra K Malik and A K Singh, Engineering Physics, Tata McGraw Hill, India.
2. B V Narayana Rao, Engineering Physics, Wiley Eastern Ltd., India
3. Solid State Physics, S O Pillai, New Age International Private Limited, 8th Edition, 2018.
4. Quantum Computation and Quantum Information, Michael A. Nielsen & Isaac L. Chuang, Cambridge Universities Press, 2010 Edition.
5. Quantum Computing, Vishal Sahani, McGraw Hill Education, 2007 Edition.

Reference books:

1. S P Basavaraju, Engineering Physics, Subhas Publications, India.
2. Physics for Animators, Michele Bousquet with Alejandro Garcia, CRC Press, Taylor & Francis, 2016.
3. Quantum Computation and Logic: How Quantum Computers Have Inspired Logical Investigations, Maria Luisa, Dalla Chiara, Roberto Giuntini, Roberto Leporini, Giuseppe Sergioli, Trends in Logic, Volume 48, Springer.
4. Statistical Physics: Berkely Physics Course, Volume 5, F. Reif, Mc Graw Hill.
5. Introduction to Superconductivity, Michael Tinkham, Mc Graw Hill, INC, II Edition.

Web links and Video Lectures (e-Resources):

Quantum Mechanics: https://www.youtube.com/watch?v=p7bzE1E5PMY&t=136s
LASER: https://www.youtube.com/watch?v=WgzynezPiyc
Optical Fiber: https://www.youtube.com/watch?v=N_kA8EpCUQo
Superconductivity: https://www.youtube.com/watch?v=MT5Xl5ppn48
Quantum Computing: https://www.youtube.com/watch?v=jHoEjvuPoB8
Physics of Animation: https://www.youtube.com/watch?v=kj1kaA_8Fu4
Statistical Physics Simulation: https://phet.colorado.edu/sims/html/plinko-probability/latest/plinkoprobability_
en.html

NPTEL Supercoductivity:https://archive.nptel.ac.in/courses/115/103/115103108/
NPTEL Quantum Computing: https://archive.nptel.ac.in/courses/115/101/115101092
Virtual LAB:https://www.vlab.co.in/participating-institute-amrita-vishwa-vidyapeetham
Virtual LAB: https://vlab.amrita.edu/index.php?sub=1&brch=189&sim=343&cnt=1

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

http://nptel.ac.in
https://swayam.gov.in
https://virtuallabs.merlot.org/vl_physics.html
https://phet.colorado.edu
https://www.myphysicslab.com

Department of Physics

Applied Physics Laboratory

No	Title of the Experiment & streams
1	I–V Characteristics of a Zener Diode (CS & Elect streams)
2	Four probe technique (All streams)
3	Newton's Rings (Mech & Civil stream)
4	Dielectric constant (All streams)
5	Photo Diode Characteristics (All streams)
6	Diffraction grating (All streams)
7	Planck's constant (All streams)
8	Series and parallel LCR Circuits (All streams)
9	Characteristics of a Transistor (CS & Elect streams)
10	Fermi Energy (All streams)
11	Energy gap of a given semiconductor (All streams)

Marks distribution for Physics Lab

1. Experiment (1 experiment) for 50 marks

Sl No	Description	Marks
1	Circuit diagram, brief procedure, formula, model graph (Write up part)	16
2	Conduction of Experiment, Calculation, result statements with SI units	24
3	Viva	10
Total = 50 Marks		

Total Lab Test Marks = 50 Marks
Reduced to 20 Marks (A)
Continuous Evaluation 30 Marks (B)
Total A + B = 50 Marks reduced to 20 Marks (C)
Final Lab Marks (C)

Principles of Programming using C

Course Code for the stream: 22POP13/23 **Credits 3**

L:P:T:S : 2:0:2 **CIE Marks: 50**

Exam Hours: 3 **SEE Marks : 50**

Course Type: Integrated

Course Objectives:

CLO 1. Elucidate the basic architecture and functionalities of a Computer

CLO 2. Apply programming constructs of C language to solve the real-world problems

CLO 3. Explore user-defined data structures like arrays, structures and pointers in implementing solutions to problems

CLO 4. Design and Develop Solutions to problems using structured programming constructs such as functions and procedures

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

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

Mapping of Course outcomes to Program outcomes:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	2	1	-	-	-	-	-	-	-	-	-	1
CO2	2	2	-	-	-	-	-	-	-	-	-	1

CO3	2	2	-	-	-	-	-	-	-	-	-	1
CO4	2	2	-	-	-	-	-	-	-	-	-	1
CO5	2	2	-	-	-	-	-	-	-	-	-	1

Unit	Course content	Hours	COs
1	**Module-1:** **Introduction to Computer-** Introduction to Computer, Functional Units of a Computer, Software types. **Introduction to C-** Introduction to C language, Algorithm & Flowchart, Structure of C program, C Tokens and Data types, Input/output statements in C.	**8**	**CO1**
2	**Module-2 :** **Operators and Expression-** Operators in C, Precedence and Associativity, Evaluation of Expression, Type conversion and typecasting. **Decision control and Looping statements:** Introduction to decision control, Conditional branching statements, iterative statements, nested loops, break and continue statements, goto statement	**8**	**CO2**
3	**Module-3:** **Functions:** Introduction to functions, function declaration, function call, return statement, Categories of Functions, passing parameters to functions, recursive functions. **Arrays:** Introduction to 1D array, Declaration & Initialization of 1D array, accessing the elements of an array, applications of 1D arrays, passing arrays to functions, Introduction to 2D array, Declaration & Initialization of 2D array, applications of 2D arrays.	**8**	**CO3**
4	**Module-4:** **Strings:** Introduction to string, Declaration & Initialization of String, string taxonomy, operations on strings, Miscellaneous string and character functions, arrays of strings.	**8**	**CO4**

	Pointers: Introduction to pointers, declaring pointer variables, Types of pointers, arithmetic operations on pointers.		
5	**Module-5:** **Structure, Union, and Enumerated Data Type:** Introduction t o structures, Unions, unions inside structures, Enumerated data type. **Files:** Introduction to files, using files in C, reading and writing data files. Detecting end of file.	**8**	**CO5**

NOTE: 1. Questions for CIE and SEE not to be set from Self Study Component.

2. Assignment Questions should be only from Self Study Component.

Module 1: Types of Computer

Module 2: Evaluation of Expression

Module 3: Actual & Formal Parameters

Module 4: Real Time Implementation of Pointer

Module 5: To Copy the Content of One File to another File

Textbooks

1. Computer fundamentals and programming in c, "Reema Thareja", Oxford University, Second edition,2017.

Reference Books:

1. E. Balaguruswamy, Programming in ANSI C, 7th Edition, Tata McGraw-Hill.
2. Brian W. Kernighan and Dennis M. Ritchie, The 'C' Programming Language, Prentice Hall of India.

Web links and Video Lectures (e-Resources):

1. elearning.vtu.ac.in/econtent/courses/video/BS/15PCD23.html
2. https://nptel.ac.in/courses/106/105/106105171/ MOOC courses can be adopted for more clarity inunderstanding the topics and verities of problem solving methods.
3. https://tinyurl.com/4xmrexre

Lab Assignments

1.	Design and develop a C program that accepts three coefficients (a, b, and c) of a Quadratic equation (ax2 +bx +c=0) as input and compute all possible roots and print the possible roots for a given set of coefficients. Also print the message in case of zero valued coefficient/s.
2.	An electricity board charges the following rates for the use of electricity: for the first 200 units 80 paisa per unit: for the next 100 units90 paisa per unit: beyond 300 units Rs. 1 per unit. All users are charged a minimum of Rs. 100 as meter charge. If the total amount is more than400, then an additional surcharge of 15% of total amount is charged. Design and Develop a program to read the name of the user, number of units consumed and print out the charges.
3.	Design and develop a C program to find the reverse of an integer number NUM and check whether it is PALINDROME or NOT with suitable messages. Ex: Num: 1234, Reverse: 4321, Not a Palindrome.
4.	Design and develop a C program that reads N integer numbers and arrange them in ascending order using Bubble Sort.
5.	Design and develop a C program that reads N integer numbers and search a key element using Binary searching Technique.
6.	Design and develop a C program that reads two matrices A (m x n) and B(p x q) and Compute product of matrices A and B. Read matrix A and matrix B in row major order. Print both the input matrices and resultant matrix appropriately.
7.	Design and develop a C program to implement the following operations without using library functions. Display the results after every operation. a. Read STRING s1 = “Dayananda” b. Read STRING s2 = “Sagar” c. Output the concatenated string STRING s3 = “DayanandaSagar”
8.	Design and Develop a C function isprime (num) that accepts an integer argument and returns 1 if the argument is prime, 0 otherwise. Write a C program that invokes this function to generate prime numbers between the given range.
9.	Design and Develop a C program to create a structure called Employee to maintain record of details using an array of structures with four fields (Emp_name, Emp_id, Emp_age and Emp_sal). Assume appropriate data type for each field. Print the Employee details in Tabular Format.
10.	Write a C program using pointers to compute the sum, mean and standard deviation of all elements stored in an array of n real numbers.

COMMUNICATIVE ENGLISH

Course Code: 22ENG16 **Credits: 1**

L:P:T:S : 1:0:0:0 **CIE Marks: 50**

Exam Hours: 2 **SEE Marks: 50**

Course Type (Theory/Practical/Integrated): Theory

Course Objectives:

1. To know about Fundamentals of Communicative English and Communication Skills in general.
2. To train to identify the nuances of phonetics, intonation and enhance pronunciation skills for better Communication skills.
3. To impart Basic English grammar and essentials of important language skills.
4. To enhance with English vocabulary and language proficiency for better communication skills.
5. To learn about the Techniques of Information Transfer through presentation.

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

CO1	Understand and apply the Fundamentals of Communication Skills in their communication.
CO2	Identify the nuances of word stress, intonation and enhance pronunciation skills.
CO3	To impart basic English grammar and essentials of language skills as per present requirement.
CO4	Understand and use all types of English vocabulary and language proficiency.
CO5	Adopt the Techniques of Information Transfer through presentation.

Mapping of Course outcomes to Program outcomes:

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

Unit	Course content	Hours	COs
1	**Module-1: Introduction to Communicative English:** Communicative English, Fundamentals of Communicative English, Process of Communication, Barriers to Effective Communicative English, Different styles and levels in Communicative English. Interpersonal and Intrapersonal Communication Skills.	**3**	**CO1**
2	**Module-2: Introduction to Language Skills:** Language skills and types of language skills. **Reading Skills** Reading skills, Types, Barriers and tips for effective reading. Reading Comprehension– Exercises	**3**	**CO3**
3	**Module-3: Speaking Skills:** English Pronunciation, Word Accent, Stress and Intonation, Fluency, Introduction of Vocabulary, All Types of Vocabulary, Sounds Mispronounced, Silent and Non silent Letters. Words often Misspell. Common Errors in Pronunciation- Exercises on it.	**3**	**CO2** **CO4**

4	**Module-4: Basic English Communicative Grammar and Vocabulary:** Basic English Grammar and Parts of Speech, Articles and Preposition, Question Tags, One Word Substitutes, Words formation - Prefixes and Suffixes, Contractions and Abbreviations. Tense and Types of tenses, The Sequence of Tenses (Rules in use of Tenses) and Exercises on it.	**3**	**CO3 CO4**
5	**Module-5: Communication Skills for Employment:** Information Transfer: Oral Presentation and its Practice. Difference between Extempore / Public Speaking, Communication Guidelines. Mother Tongue Influence (MTI), Various Techniques for Neutralization of Mother Tongue Influence.	**3**	**CO1 CO3 CO5**

Text books:

1. Communication Skills by Sanjay Kumar & Pushp Lata, Oxford University Press India Pvt. Ltd - 2019.

2. A Textbook of English Language Communication Skills, (ISBN-978-81-955465-2-7), Published by Infinite Learning Solutions, Bengaluru - 2022.

Reference books:

1. Technical Communication by Gajendra Singh Chauhan, and Et al,(ISBN-978-93-5350-050-4), Cengage learning India Pvt. Limited [Latest Revised Edition] - 2019.

2. English for Engineers by N.P. Sudharshana and C. Savitha, Cambridge University Press– 2018.

3. English Language Communication Skills – Lab Manual cum Workbook, Cengage learning India Pvt. Limited [Latest Revised Edition] – (ISBN-978-93-86668-45-5), 2019.

4. A Course in Technical English – D Praveen Sam, KN Shoba, Cambridge University Press – 2020.

5. Practical English Usage by Michael Swan, Oxford University Press – 2016.

INDIAN CONSTITUTION

Course Code for the stream: 22ICO17 / 27 **Credits** 1

L: P: T: S : 1:0:0:0 **CIE Marks** 50

Exam Hours: 2 **SEE Marks: 50**

Course Type (Theory/Practical/Integrated): Theory

Course Objectives:

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

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

CO1	Analyse the basic structure of Indian Constitution
CO2	Remember their Fundamental Rights. DPSP's & Fundamental Duties(FD's) of our Constitution.
CO3	Know about our Union Government, political structure & code, procedures.
CO4	Understand our State Executive & Elections system of India.
CO5	Remember the Amendments and Emergency Provisions, other important provisions given by the Constitution.

Mapping of Course outcomes to Program outcomes:

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

Unit	Course content	Hours	COs
1	Module-1: Indian Constitution: Necessity of the Constitution, Societies before and after the Constitution adoption. Introduction to the Indian Constitution. Making of the Constitution, Role of the Constituent Assembly.	**3**	**CO1**
2	Module-2 : Salient features of the Indian Constitution. Preamble of Indian Constitution & Key concepts of the Preamble. Fundamental Rights (FR's) and its Restriction and limitations in different Complex Situations. Building. Special provision to SC, ST, OBC and women and children under Indian Constitution.	**3**	**CO1** **CO2**
3	Module-3: Directive Principles of State Policy(DPSP's) and its present relevance in Indian society. Fundamental Duties and its Scope and significance in Nation. Union Executive: Parliamentary System, Union Executive –President, Vice-President, Prime Minister, Union Cabinet. Emergency Provisions and types.	**3**	**CO1** **CO3**
4	Module-4: Parliament – LS and RS, Parliamentary Committees, Important Parliamentary Terminologies. Judicial System in India, Supreme Court of India and other Courts, Judicial Reviews and Judicial Activism.	**3**	**CO2** **CO3**
5	Module-5: State Executive and Governor, CM, State Cabinet, Legislature – VS & VP , State High Court, Writs, Election Commission, Elections & Electoral Process. Amendment to Constitution, and Important Constitutional Amendments till today. Human Rights National Human Rights Commission and Protection of Human Rights Act 1993 and 2006 amendment.	**3**	**CO2** **CO3**

Text books:

1. "Constitution of India" (for Competitive Exams) - Published by Naidhruva Edutech Learning Solutions, Bengaluru. – 2022.

2. "**Introduction to the Constitution of India**", (Students Edition.) by Durga Das Basu (**DD Basu**): Prentice –Hall, 2008.

Reference books:

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

Scientific Foundations of Health and Happiness

Course Code for the stream : 21SFH18/28 **Credit 1**

L:P:T:S : 1:0:0:0 **CIE Marks 50**

Exam Hours : 1 Hour **SEE Marks 50**

Course Type (Theory/Practical/Integrated): Theory

Course Objectives:

1. To know about Health and wellness (and its Beliefs)
2. To acquire Good Health & It's balance for positive mind-set
3. To Build the healthy lifestyles for good health for their better future
4. To Create of Healthy and caring relationships to meet the requirements of MNC and LPG world
5. To learn about Avoiding risks and harmful habits in their campus and outside the campus for their bright future
6. To Prevent and fight against harmful diseases for good health through positive mind-set

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

CO1	To understand Health and wellness (and its Beliefs)
CO2	To acquire Good Health & It's balance for positive mindset
CO3	To inculcate and develop the healthy lifestyle habits for good health.
CO4	To Create of Healthy and caring relationships to meet the requirements of MNC and LPG world
CO5	To adopt the innovative & positive methods to avoid risks from harmful habits in their campus & outside the campus.

Mapping of Course outcomes to Program outcomes:

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

Unit	Course content	Hours	COs
1	**Module-1: Good Health and It's balance for positive mind-set:** What is Health, Why Health is very important Now? – What influences your Health?, Health and Behaviour, Health beliefs and advertisements, Advantages of good health (Short term and long term benefits), Health and Society, Health and family, Health and Personality - Profession. Health and behaviour, Disparities of health in different vulnerable groups. Health and psychology, Methods to improve good psychological health. Psychological disorders (Stress and Health - Stress management), how to maintain good health, Mindfulness for Spiritual and Intellectual health, Changing health habits for good health. Health and personality. **Emotional Management** What are emotions, Cognitive errors of emotions, How thoughts influence emotions - Anxiety, panic attacks, anger, stress, overwhelmed and loneliness.	8	CO1
2	**Module-2 : Emotional Management** Avoiding suicidal thoughts, identifying positive & negative emotions, usage of SOS I Feel tool in THAP App **Building of healthy lifestyles for better future:** Developing a healthy diet for good health, Food and health, Nutritional guidelines for good health and well beingness, Obesity and overweight disorders and its management, Eating disorders - proper exercises for its maintenance (Physical activities for health), Fitness components for health, Wellness and physical function	8	CO1 CO2
3	**Module-3: Creation of Healthy and caring relationships :** Building communication skills (Listening and speaking), Friends and friendship - education, the value of relationships and communication, Relationships for Better or worsening of life, understanding of basic instincts of life (more than a biology), Changing health behaviours through social engineering, **Failure and Expectation Management** What is failure? How do people process failure? Positive and Negative Coping Mechanisms. How to embrace all experiences including failure. Expectation management techniques **Meet Happiness** Happiness, role of being happy in personal and professional life, happiness workout, Learning to be happy alone, Embracing sadness in the pursuit of happiness.	8	CO1 CO3

4	**Module-4 Avoiding risks and harmful habits :** Characteristics of health compromising behaviours, Recognizing and avoiding of addictions, How addiction develops and addictive behaviours, Types of addictions, influencing factors for addictions, Differences between addictive people and non-addictive people and their behaviour with society, Effects and health hazards from addictions Such as..., how to recovery from addictions. **Happiness Relationships** Difference between healthy and toxic relationships, How do they manifest in our lives, and how to deal with toxic friends and family members. How to establish safe spaces and healthy boundaries.	**8**	**CO2** **CO3**
5	**Module-5 Preventing and fighting against diseases for good health :** Process of infections and reasons for it, How to protect from different types of transmitted infections such as…., Current trends of socio economic impact of reducing your risk of disease, How to reduce risks for good health, Reducing risks and coping with chronic conditions, Management of chronic illness for Quality of life, Health and Wellness of youth : a challenge for the upcoming future Measuring of health and wealth status **Happiness Coach** What is therapy, how to decide if therapy is for you, what happens in therapy, Myths about therapy, Signs you have found a good therapist, Signs you need to change your therapist, Signs that therapy is working and signs that therapy is not working, scheduling an appointment with therapist, sorting out and identifying feelings and patterns. Happiness expeditions.	**8**	**CO2** **CO3**

Reference books:

1. Health Psychology (Second edition) by Charles Abraham, Mark Conner, Fiona Jones and Daryl O'Connor – Published by Routledge, 711 Third Avenue, New York, NY 10017.

2. Health Psychology - A Textbook, FOURTH EDITION by Jane Ogden McGraw Hill Education (India) Private Limited - Open University Press

3. HEALTH PSYCHOLOGY (Ninth Edition) by SHELLEY E. TAYLOR - University of California, Los Angeles, McGraw Hill Education (India) Private Limited - Open University Press

4. Scientific Foundations of Health (Health & Wellness) - General Books published for university and colleges references by popular authors and published by the reputed publisher.

Web links and Video Lectures (e-Resources):

SWAYAM / NPTL/ MOOCS/ We blinks/ Internet sources/ YouTube videos and other materials / notes

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

- Contents related activities (Activity-based discussions).
- For active participation of students, instruct the students to prepare Flowcharts and Handouts.
- Organizing Group wise discussions and Health issues based activities.
- Quizzes and Discussions ⏐ Seminars and assignments

Practical Components:

1: Complete 32 Happiness workouts on the App.

2: Complete 2 Happiness Expeditions on the App.

3: Group Presentation on how your definition of happiness and emotional management has evolved through this course (i.e. what you thought it was and how this course has helped you get clarity on what it means for you).

4: Submit a report on how you could have used the learning from this course in a difficult situation in the past.

5: Attend the workshop and write a reflective note.

Introduction to Electronics Engineering

Course Code for the stream: 22ESC143 **Credits 3**

L:P:T:S : 3:0:0:0 **CIE Marks 50**

Exam Hours: 3 **SEE Marks 50**

Course Type (Theory/Practical/Integrated): Theory

Course Objectives:

- Operation of Semiconductor diode and their applications.
- Transistor operation, its biasing.
- Study of linear Op-amps and its applications.
- Logic circuits and their optimization.
- Principles of Communication Systems.

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

CO1	Identify the different building blocks in digital electronics using logic gates and realize simple logic functions
CO2	Understand the fundamental concepts and operation of different basic electronic components and devices
CO3	Apply the concept of transistors and design simple circuits like amplifiers (inverting and non-inverting), adders, integrator and differentiator using OPAMPS.
CO4	Describe the functioning of a communication system, and different modulation techniques
CO5	Appreciate electronic devices and their significance in different applications.
CO6	Understand the concepts of electronic devices and circuits and realize the Applications of Electronics in Interdisciplinary Engineering Domains

Mapping of Course outcomes to Program outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	-	-	-	-	-	-	-	-	1
CO2	3	2	2	-	-	-	-	-	-	-	-	-
CO3	3	2	2	-	-	-	-	-	-	-	-	-
CO4	3	1	-	-	-	-	-	-	-	-	-	-
CO5	3	1	1	-	-	-	-	-	-	-	-	-
CO6	3	2	2	-	-	-	-	-	-	-	-	-

Unit	Course content	Hours	COs
1	**Digital Electronics 1 :** Introduction to Number Systems, Binary Number System, Decimal Number System, Octal Number System, Hexadecimal Number System. Conversion from one number system to another number system, 1's and 2's complement method and their arithmetic. **Digital Electronics 2 :** Binary logic functions, Boolean algebra, De-Morgan's Theorem, Logic gates, Realization of Boolean functions using basic gates, Implementation of logic gates as half & full adder.	**8**	**CO1**
2	**Bipolar Junction Transistors:** P-N Junction Diode – Working principle and Characteristics, BJT - Construction, Operation, Common Base, Common Emitter and Common Collector Characteristics, Numerical examples. **Field Effect Transistor (FET):** Construction, Operation, Transfer Characteristics, p-channel FET - construction, operation and drain characteristics.	**8**	**CO2** **CO3**
3	**Operational Amplifiers :** Introduction, Block diagram representation of OPAMP, Schematic symbol and pin configuration, Ideal and Practical Characteristics of OPAMP, Virtual ground concepts, **OPAMP applications:** Inverting and Non-Inverting amplifiers, Voltage Follower, Summer, Differentiator, Integrator, Numericals.	**8**	**CO3** **CO5**

4	**Communication Systems 1:** Introduction, Elements of Communication Systems, Concept of modulation, methods of modulation - principles of AM, FM. AM / FM transmitters & receivers (block diagram description only). **Communication Systems 2:** Block diagram and Principles of Optical fibre Communication, Advantages and Applications of Optical Fibre communication.	**8**	**CO4 CO5**
5	**Applications of Electronics:** Principle of operation of Mobile Phone, GSM Architecture, Generations of Communications, Anti-Lock Braking System (ABS) : Introduction and Block Diagram, Internet of Things (IoT): Introduction, Applications: Smart Home Automation System, IC voltage regulators, Introduction to Microcontroller & Microprocessors& its differences, AI & ML, Robots & Robotics, Applications of AI/ML/Robots/Robotics.	**8**	**CO2 CO5 CO6**

Prerequisites:

Module 1:

Basics of number systems

Module 2:

Diode Characteristics

Module 3:

Integration and Differentiation basics

Module 4:

Different blocks in a communication system

Module 5:

How electronics is an important aspect in any engineering application

NOTE: 1. Questions for CIE and SEE not to be set from Self Study Component.

2. Assignment Questions should be only from Self Study Component.

Module 1: Digital – 9's & 10's Compliment methods, Universal gates.
Module 2: Applications of Diodes and transistors.
Module 3: Applications of CMOS Circuits, SCR, UJT.
Module 4: Applications of OPAMPs – Oscillators, Schmitt Trigger

Module 5: Satellite Communication, ISDN, Cloud computing, Electrical & Electronic Instruments, Multimeters

Text books:

1. Electronic Devices and Circuits, David A Bell, 5th Edition, Oxford, 2016
2. Op-amps and Linear Integrated Circuits, Ramakanth A Gaykwad, Pearson Education, 4th Edition
3. Digital Logic and Computer Design, M. Morris Mano, PHI Learning, 2008 ISBN-978-81-203-0417-8
4. Dr T C Manjunath et. al, "Basic Electronics", 2017, 1st edition, Subhash Publications
5. Electronic Instrumentation and Measurements (3rd Edition) – David A. Bell, Oxford University Press, 2013 Electronic Communication Systems, George Kennedy, 4th Edition, TMH

Reference books:

1. Mike Tooley, 'Electronic Circuits, Fundamentals & Applications',4 thEdition, Elsevier, 2015. DOI https://doi.org/10.4324/9781315737980. eBook ISBN9781315737980.
2. D P Kothari, I J Nagrath, 'Basic Electronics', 2nd edition, McGraw Hill Education (India),PrivateLimited, 2018.

Web links and Video Lectures (e-Resources):

- https://nptel.ac.in/courses/122106025
- https://nptel.ac.in/courses/108105132
- https://nptel.ac.in/courses/117104072
- https://www.rfwireless-world.com
- https://en.wikipedia.org/wiki/Anti-lock_braking_system
- https://en.wikipedia.org/wiki/Internet_of_things
- https://www.synergy.ac.in

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

http://nptel.ac.in
https://swayam.gov.in
https://www.electronics-notes.com/articles/basic_concepts/
https://www.vssut.ac.in/lecture_notes/lecture1423726156.pdf

WASTE MANAGEMENT

Course Code for the stream : 22ETC15F/25F **Credits 3**

L:P:T:S : 3:0:0:0 **CIE Marks 50**

Exam Hours : 3 **SEE Marks 50**

Course Type (Theory/Practical/Integrated): Theory

Course Objectives:

1. To learn broader understandings on various aspects of solid waste management practiced in industries.
2. To learn recovery of products from solid waste to compost and biogas, incineration and energy recovery, hazardous waste management and treatment, and integrated waste management.
3. To apply suitable methods of waste management.

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

CO1	Apply the basics of solid waste management towards sustainable development.
CO2	To study the characteristics and generation of wastes.
CO3	Apply technologies to process waste and dispose the same.
CO4	Design working models to convert waste to energy.
CO5	Identify and classify hazardous waste and manage the hazard.
CO6	To study the disposal methods.

Mapping of Course outcomes to Program outcomes:

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

Unit	Course content	Hours	COs
1	**Module-1: INTRODUCTION TO SOLID WASTE MANAGEMENT** Classification of solid wastes (source and type based), solid waste management (SWM), elements of SWM, ESSWM (environmentally sound solid waste management) and EST (environmentally sound technologies), factors affecting SWM, Indian scenario, progress in MSW (municipal solid waste) management in India. Indian and global scenario of e-waste.	8	CO1
2	**Module-2 : WASTE GENERATION ASPECTS** Waste stream assessment (WSA), waste generation and composition, waste characteristics (physical and chemical), health and environmental effects (public health and environmental), comparative assessment of waste generation and composition of developing and developed nations, a case study results from an Indian city, handouts on solid waste compositions. E-waste generation.	8	CO1 CO2
3	**Module-3: COLLECTION, STORAGE, TRANSPORT AND DISPOSAL OF WASTES** Waste Collection, Storage and Transport: Collection components, storage-containers/collection vehicles, collection operation, transfer station, waste collection system design, record keeping, control, inventory and monitoring, implementing collection and transfer system, a case study. Waste Disposal: key issues in waste disposal, disposal options and selection criteria, sanitary landfill, landfill gas emission, leachate formation, environmental effects of landfill, landfill operation issues, a case study.	8	CO1 CO3
4	**Module-4**: **WASTE PROCESSING TECHNIQUES & SOURCE REDUCTION, PRODUCT RECOVERY & RECYCLING** Purpose of processing, mechanical volume and size reduction, component separation, drying and dewatering. Source Reduction, Product Recovery and Recycling: basics, purpose, implementation monitoring and evaluation of source reduction, significance of recycling, planning of a recycling programme, recycling programme elements, commonly recycled materials and processes, a case study.	8	CO2 CO3
5	**Module-5: HAZARDOUS WASTE MANAGEMENT AND TREATMENT** Identification and classification of hazardous waste, hazardous waste treatment, pollution prevention and waste minimization, hazardous wastes management in India. E-waste recycling.	8	CO2 CO3

Prerequisites:

Module 1:

Pre-requisite: Waste Management

Module 2:

Pre-requisite: Sources of Waste

Module 3:

Pre-requisite: Characteristics of Waste

Module 4:

Pre-requisite: Importance of Processing

Module 5:

Pre-requisite: Impacts of Hazardous Wastes

NOTE: 1. Questions for CIE and SEE not to be set from Self Study Component.

2. Assignment Questions should be only from Self Study Component.

Module 1: Self study component: Indian scenario of Solid Waste Management.
Module 2: Self study component: Effluent Standards.
Module 3: Self study component: Energy recovery through Pyrolysis.
Module 4: Self study component: planning of a recycling programme.

Text books:

1. George Tchobanoglous, Hilary Theisen , Samuel A Vigil, Integrated Solid Waste Management: Engineering principles and management issues, M/c Graw hill Education, Indian edition.

2. Hazardous Waste Management-Charles A. Wentz – 1998.

3. E-waste: Implications, regulations, and management in India and current global best practices By Rakesh Johri.

4. S K Garg, "Environmental Engineering vol-II, Water supply Engineering", Khanna Publishers, – New Delhi, 28th edition and 2017.

5. Bilitewski B., Hard He G., Marek K., Weissbach A., and Boeddicker H., Waste Management, Springer, 1994.

Reference books:

1. Municipal Solid Wastes (Management and Handling) Rules, 2000.Ministry of Environment and Forests Notification, New Delhi, 25th September, 2000. Amendment – 1357(E) – 08-04-2016.

2. Municipal Solid waste management manual, Part II published under Swachh Bharat Mission, Central Public Health And Environmental Engineering Organization (CPHEEO), 2016, Ministry of Urban Development, Government of India.

3. Handbook of Solid waste management, second edition, George Tchobanoglous, Frank Kreith, published by M/c Graw hill Education, 2002, ISBN-13 9780071356237 ISBN -10 0071356231.

4. White, F. R., Franke P. R.,, & Hindle M., Integrated solid waste management: a life cycle inventory. McDougall,P. John Wiley & Sons. 2001.

5. Nicholas, P., & Cheremisinoff, P. D., Handbook of solid waste management and waste minimization technologies, Imprint of Elsevier Science. 2005.

Web links and Video Lectures (e-Resources):

- **NPTEL**: **https://nptel.ac.in/courses/105103205**
- **NPTEL**: **https://nptel.ac.in/courses/103/107/103107125/**
- **NPTEL: https://onlinecourses.nptel.ac.in/noc22_ce76/preview**
- **NPTEL: https://onlinecourses.swayam2.ac.in/cec20_ge13/preview**
- **Youtube: https://www.youtube.com/watch?v=k0ktJRoRcOA**

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

- AV presentation by students (on specific topics).
- Discussion of case studies based on research findings.
- Model making and Poster presentations

INTRODUCTION TO NANOTECHNOLOGY

Course Code for the stream :22ETC15C/25C **Credits 3**

L:P:T:S : 3:0:0:0 **CIE Marks 50**

Exam Hours : 3 **SEE Marks 50**

Course Type (Theory/Practical/Integrated): Theory

Course Objectives:

1. To provide a comprehensive overview of synthesis and characterization of nanoparticles, nanocomposites and hierarchical materials with nanoscale features.
2. To provide all the engineering students for utilization advance software tools to analyze the nanoparticles properties
3. To develop an understanding of the basis of the choice of material for device applications
4. To provide insights for the importance and utilization of nanotechnology in our everyday life.

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

CO1	Demonstrate the synthesis of nanoparticles by various techniques. [L2]
CO2	Compare different characterization techniques to analyze the properties of nanoparticles. [L2]
CO3	Develop nanotechnology based devices related to all engineering branches. [L3]
CO4	Classify the nanomaterials based on the dimensions. [L3]
CO5	Assess the suitability of nanomaterials for various device applications. [L4]
CO6	Prediction of nanomaterial structure and application development. [L6]

Mapping of Course outcomes to Program outcomes:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1		1		1								1
CO2	1	1		1	1							
CO3			2		2	2						2
CO4	2				2	2						
CO5			2				2	2				
CO6			3	3		3			3			

Unit	Course content	Hours	COs
1	**Module-1:** **Introduction to Nanomaterials** History and scientific revolutions in Nanoscience and Nanotechnology, Concepts of size effect phenomenon, Variation of physical properties from bulk to thin films to nanomaterials, Confinement of electron in 0D, 1D, 2D and 3D systems, Surface to Volume Ratio, Synthesis of Nanomaterials: Bottom-Up approach: Hydrothermal method, Combustion method, Lithography : Top-Down approach - Laser Ablation, Sputtering.	8	CO1 CO2
2	**Module-2 :** **Characterization of Nanomaterials** Basic principles of characterization technique, Scanning Electron Microscopy (SEM), Transmission Electron Microscopy (TEM), Atomic Force Microscopy (AFM). Working principle of X-ray diffraction, Derivation of Debye-Scherrer equation, numericals on Debye Scherrer equation, Optical Spectroscopy- Instrumentation and application of IR, UV/VIS (Band gap measurement)	8	CO1 CO2
3	**Module-3:** **Carbon Based Materials** Introduction to graphite, fullerene, graphene, carbon nanotubes, types of carbon nanotubes geometry (Armchair, Zigzag, Chiral), Synthesis : Mechanical and chemical exfoliation, Chemical vapor deposition, Applications : Woven conductive nanofabrics, nanofibres, nanodiscs, nanodiamonds.	8	CO1 CO3 CO4
4	**Module-4** **Nanotechnology in Energy storage and conversion** Background principle of energy storage system, Effect of nanosize anode and cathode characteristics, Design and fabrication : Dye sensitized solar cell, Quantum dot sensitized solar cells, Next generation batteries : Li-Air, Supercapacitor, Fuel cell technology and Hydrogen storage batteries.	8	CO4 CO5

5	**Module-5** **Applications of Nanotechnology** Introduction and significance of interdisciplinary engineering, Nanoantenna for energy conversion, Fabrication of CNTFET, Design of nano wind turbines, nanoself cleaning technology, nano thermistor, lightweight nano spacecraft, drug delivery system for cancer treatment, simulation of molecular modelling for nanomaterial, integration of artificial intelligence based nanobots, Nano photonics, Agriculture and Food Applications.	**8**	**CO5** **CO6**

Prerequisites:

Module 1:

Pre-requisite: Basic concepts Nanoscience and Nanotechnology synthesis methods

Module 2:

Pre-requisite: Principles of characterization techniques used for micro and macro particles

Module 3:

Pre-requisite: Basic of Carbon element, bonding nature and its electric conductivity concept

Module 4:

Pre-requisite: Basics of mechanism of energy harvesting and energy storage

Module 5:

Pre-requisite: Design and Fabrication process of microparticles based devices

NOTE: 1. Questions for CIE and SEE not to be set from Self Study Component.

2. Assignment Questions should be only from the Self Study Component.

Module 1: Self study component: Precipitation and Co-precipitation method. Sol-Gel method

Module 2: Self study component: Determination of Band gap of nano material using Tauc plot

Module 3: Self study component: Applications of Graphene, Carbon nanocomposites

Module 4: Self study component: Nanotechnology in Lithium ion battery- working, Requirements of anodic and cathodic materials, classification based on ion storage mechanisms

Module 5: Self study component: Nano coatings (Photocatalysts) and super hydrophobic coatings (Lotus effect)

Text books:

1. Nano Materials – A.K. Bandyopadhyay/ New Age Publishers

2. Nanocrystals: Synthesis, Properties and Applications – C.N.R. Rao, P. John Thomas and G. U. Kulkarni, Springer Series in Materials Science

3. Nano Essentials- T. Pradeep/TMH

4. Peter J. F. Harris, Carbon nanotube science: synthesis, properties, and applications. Cambridge University Press, 2011

5.M.A. Shah, K.A. Shah, "Nanotechnology: The Science of Small", Wiley India, ISBN 13: 9788126538683

Reference books:

1. Introduction to Nanotechnology, C. P. Poole and F. J. Owens, Wiley, 2003
2. Understanding Nanotechnology, Scientific American 2002
3. Nanotechnology, M. Ratner and D. Ratner, Prentice Hall 2003
4. Nanotechnology, M. Wildon, K. Kannagara, G. Smith, M. Simmons and B. Raguse, CRC Press Boca Raton 2002

Web links and Video Lectures (e-Resources):

- https://nptel.ac.in/courses/118104008
- https://www.digimat.in/nptel/courses/video/118104008/L16.html
- https://archive.nptel.ac.in/courses/113/106/113106099/
- https://nptel.ac.in/courses/112107283
- https://onlinecourses.nptel.ac.in/noc22_me131/preview

Virtual LAB: https://nanoyou.eu/en/virtual-lab.html

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

https://www.teachengineering.org/lessons/view/uoh_nano_lesson02
https://trynano.org/education-resources/nanotechnology-lesson-plans/
https://nanoyou.eu/en/virtual-lab.html
https://swayam.gov.in
https://www.nnin.org/education-training/k-12-teachers/nanotechnology-curriculum-materials/search?key=&field_topic_tid%5B%5D=20
https://www.researchgate.net/publication/360519120_Interactive_Tool_Kit_for_Teaching-Learning_Nanoscience_and_Nanotechnology_for_High_School_Students

INTRODUCTION TO INTERNET OF THINGS

Course Code for the stream : 22ETC15H/25H **Credits 3**

L:P:T:S : 3:0:0:0 **CIE Marks 50**

Exam Hours : 3 **SEE Marks 50**

Course Type (Theory/Practical/Integrated): Theory

Course Objectives:

1. Understand about the fundamentals of the Internet of Things and its building blocks along with their characteristics.
2. Understand the recent application domains of IoT in everyday life.
3. Gain insights about the current trends of Associated IOT technologies and IOT Analytics

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

CO1	Describe the evolution of IoT, IoT networking components, and addressing strategies in IoT.
CO2	Classify various sensing devices and actuator types.
CO3	Demonstrate the processing in IoT
CO4	Explain Associated IOT Technologies
CO5	Illustrate architecture of IOT Applications

Mapping of Course outcomes to Program outcomes:

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

Unit	Course content	Hours	COs
1	**Module-1:** **Basics of Networking:** Introduction, Network Types, Layered network models, Functional blocks of IOT ecosystem, Applications of IoT devices **Emergence of IoT:** Introduction, Evolution of IoT, Enabling IoT and the Complex Interdependence of Technologies, IoT Networking Component.	8	CO1 CO2
2	**Module-2 :** **IoT Sensing and Actuation:** Introduction, Sensors, Sensor Characteristics, Sensorial Deviations, Sensing Types, Sensing Considerations, Actuators, Actuator Types, Actuator Characteristics.	8	CO2 CO3
3	**Module-3:** **IoT Processing Topologies and Types:** Data Format, Importance of Processing in IoT, Processing Topologies, IoT Device Design and Selection Considerations, Processing Offloading.	8	CO2 CO3
4	**Module-4** **ASSOCIATED IOT TECHNOLOGIES** Cloud Computing: Introduction, Virtualization, Cloud Models, Service-Level Agreement in Cloud Computing, Cloud Implementation, Sensor-Cloud: Sensors-as-a-Service., Introduction to Embedded system and application(ARDUINO board)	8	CO3 CO4
5	**Module-5** **IOT CASE STUDIES AND FUTURE TRENDS** Vehicular IoT – Introduction of Vehicular IoT, Healthcare IoT, Home automation, Smart energy consumption and AI trained IoT devices – Case studies and IoT Analytics	8	CO4 CO5

Prerequisites:

Module 1:

Pre-requisite: Basics of wireless data communication system. Study of encryption and decryption

Module 2:

Pre-requisite: Sensors mechanism and electrical and pressure properties

Module 3:

Pre-requisite: HTTP, SMTP, FTP principles of data transfer topologies

Module 4:

Pre-requisite: Basic concepts of operating systems model, Kernel OS model

Module 5:

Pre-requisite: Basic of Embedded C programming

NOTE: 1. Questions for CIE and SEE not to be set from Self Study Component.

2. Assignment Questions should be only from Self Study Component.

Module 1: Self study component: IoT communication protocols of bluetooth and WiFi technologies

Module 2: Self study component: Basics of TE connectivity sensor used in applications

Module 3: Self study component: Self organization network topology for IoT automation

Module 4: Self study component: Basics of JavaScript and Python programming languages

Module 5: Self study component: Arduino and Raspberry Pi device communication protocols

Text books:

1. Sudip Misra, Anandarup Mukherjee, Arijit Roy, "Introduction to IoT", Cambridge University Press 2021.

Reference books:

1. S. Misra, C. Roy, and A. Mukherjee, 2020. Introduction to Industrial Internet of Things and Industry 4.0. CRC Press.
2. Vijay Madisetti and Arshdeep Bahga, "Internet of Things (A Hands-on-Approach)",1st Edition, VPT, 2014.

3. Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to connecting everything.

Web links and Video Lectures (e-Resources):

- https://nptel.ac.in/noc/courses/noc19/SEM1/noc19-cs31/
- https://nielit.gov.in/sites/default/files/Gangtok/IoT_arduino_Gangtok_9th_Jan_2020.pdf

- https://docs.aws.amazon.com/whitepapers/latest/aws-overview/internet-of-things-services.html
- https://codelabs.developers.google.com/codelabs/iot-data-pipeline#
- https://www.udemy.com/course/introduction-of-internet-of-things-iot/

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

https://github.com/topics/project-based-learning
https://onlinecourses.nptel.ac.in/noc22_cs53/preview
https://onlinecourses.swayam2.ac.in/arp19_ap52/preview
https://mqttlab.iotsim.io/

Introduction to Cyber Security

Course Code for the stream: 22ETC15I/25I **Credits 3**

L:P: T:S : 3:0:0:0 **CIE Marks 50**

Exam Hours: 3 **SEE Marks: 50**

Course Type: Theory

Course Objectives:

- To familiarize cybercrime terminologies and perspectives
- To understand Cyber Offenses and Botnets
- To gain knowledge on tools and methods used in cybercrimes
- To understand phishing and computer forensics

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

CO1	Explain the cybercrime terminologies
CO2	Describe Cyber offenses and Botnets
CO3	Illustrate Tools and Methods used on Cybercrime
CO4	Explain phishing and Identity Theft
CO5	Justify the need of computer forensics

Mapping of Course outcomes to Program outcomes:

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

Unit	Course content	Hours	COs
1	**Module-1:** **Introduction to Cybercrime:** **Cybercrime:** Definition and Origins of the Word, Cybercrime and Information Security, Who are Cybercriminals? Classifications of Cybercrimes, An Indian Perspective, Hacking and Indian Laws., Global Perspectives	**8**	**CO1**
2	**Module-2 :** **How Criminals Plan Them:** Introduction, How criminals plan the attacks, Social Engineering, Cyber Stalking, Cyber cafe & cyber-crimes. **Botnets:** The fuel for cybercrime, Attack Vector.	**8**	**CO2**
3	**Module-3:** **Tools and Methods used in Cybercrime:** Introduction, Proxy Servers, Anonymizers, Phishing, Password Cracking, Key Loggers and Spyways, Virus and Worms, Trojan Horses and Backdoors, Steganography, DoS and DDOS Attacks, Attacks on Wireless networks.	**8**	**CO3**
4	**Module-4** **Phishing and Identity Theft:** Introduction, methods of phishing, Phishing techniques, spear phishing, types of phishing scams, phishing toolkits and spy phishing, counter measures, Identity Theft.	**8**	**CO4**

5	**Module-5** **Understanding Computer Forensics:** Introduction, Historical Background of Cyber forensics, Digital Forensics Science, Need for Computer Forensics, Cyber Forensics and Digital Evidence, Digital Forensic Life cycle, Chain of Custody Concepts, network forensics.	**8**	**CO5**

NOTE: 1. Questions for CIE and SEE not to be set from Self Study Component.

2. Assignment Questions should be only from Self Study Component.

Module 1: Scope of Cyber Crime

Module 2: Cyber Attacks
Module 3: Tools for Cyber Crime Detection

Module 4: Preventions of Theft

Module 5: Applications of Cyber Forensics

Text Books:

1. Sunit Belapure and Nina Godbole, "Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives", Wiley India Pvt Ltd, ISBN: 978-81- 265-21791, 2011, First Edition (Reprinted 2018)

MOOC's

- https://www.youtube.com/watch?v=yC_hFm0BX28&list=PLxApjaSnQGi6Jm7LLSxvmNQjS_rt9swsu
- https://www.youtube.com/watch?v=nzZkKoREEGo&list=PL9ooVrP1hQOGPQVeapGsJCktzIO4DtI4_
- https://www.youtube.com/watch?v=6wi5DI6du-4&list=PL_uaeekrhGzJlB8XQBxU3z hDwT95xlk
- https://www.youtube.com/watch?v=KqSqyKwVuA8

Introduction to Artificial Intelligence

Course Code for the stream: 22ETC15K **Credits 3**

L: P: T: S: 3:0:0:0 **CIE Marks : 50**

Exam Hours: 3 **SEE Marks: 50**

Course Type: Theory

Course Objectives:

1. To develop the understanding of fundamentals and technological aspects of Artificial Intelligence.
2. To learn about basics of how to use Artificial Intelligence.
3. To understand and explain the various Real World Applications of Artificial Intelligence.

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

CO1	Illustrate the ideas behind Artificial Intelligence, benefits, as well as current and future challenges.
CO2	Analyse and Apply the basics of Intelligent Agents
CO3	Examine the importance of formulating problems for solving Real world Applications
CO4	Discuss the concept of Knowledge representation
CO5	Understand and Apply the basic ideas of sub domains of Artificial Intelligence.

Mapping of Course outcomes to Program outcomes:

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

Unit	Course content	Hours	COs
1	**Module-1: Introduction and History:** What is AI? , Foundation of AI, History of AI, State of the Art	8	C01
2	**Module-2 : Intelligent Agents:** Agents and Environments, Good Behaviour: Concept of Rationality, Nature of Environments, Structure of Agents	8	CO2
3	**Module-3: Solving Problem by Searching**: Problem Solving Agents: Well-defined problems and solutions, Formulating problems, Example Problems: Toy problems, Real-world problems, Measuring problem-solving performance	8	CO3
4	**Module-4: Knowledge Representation:** Ontological Engineering, Categories and Objects, Events, Mental Events and Mental Object	8	CO4
5	**Module-5: AI Applications:** Introduction to AI Domains: Data Science, Computer Vision, Natural Language Processing, AI Ethics: Moral Issues, Data Privacy, AI Bias, AI Access, Introduction to Robotics	8	CO5

NOTE: 1. Questions for CIE and SEE not to be set from Self Study Component.

2. Assignment Questions should be only from Self Study Component.

Module 1: Research Areas of Artificial Intelligence
Module 2: Examples of PEAS
Module 3: Basic Search Strategies
Module 4: Reasoning System for Categories
Module 5: Application of Recommended

Text Books:

1. Artificial Intelligence: A Modern Approach Textbook by Peter Norvig and Stuart J. Russell
2. A First Course in Artificial Intelligence by Deepak Khemani

Reference Books:

1. NCERT Introduction to AI – Curate with the Support of Intel https://cbseacademic.nic.in/web_material/Curriculum21/publication/secondary/Class10_Facilitator_Handbook.pdf

MOOC's

1. https://www.coursera.org/learn/introduction-to-ai
2. https://www.udemy.com/course/introduction-to-artificial-inteligence
3. https://www.udacity.com/course/ai-artificial-intelligence-nanodegree--nd898

Introduction to Cloud Computing

Course Code for the stream: 22ETC15L **Credits 3**

L:P: T:S : 3:0:0:0 **CIE Marks 50**

Exam Hours: 3 **SEE Marks : 50**

Course Type: Theory

Course Objectives:

1. To develop the understanding of fundamentals and technological aspects of Cloud Computing.
2. To learn about basics of how to use Cloud Services.
3. To understand and explain the various Architectures of Cloud Computing and Virtualization.

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

CO1	The fundamental ideas behind Cloud Computing, benefits, as well as current and future challenges.
CO2	Understand various cloud Service models, Virtualization & Cloud computing technologies.
CO3	Understand the importance of Cloud Server, Deployment Models In Cloud Computing
CO4	Illustrate the concept of Scaling and SLA
CO5	The basic ideas and principles in data center design.

Mapping of Course outcomes to Program outcomes:

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

Unit	Course content	Hours	COs
1	**Module-1:** **Introduction:** Cloud computing, History of Cloud Computing, how Cloud Computing works, challenges of Cloud Computing, Advantages and Disadvantages of Cloud Computing, Cloud Computing Architecture, Cloud computing applications, Security Risks of Cloud Computing. **Types of Cloud-** Private Cloud, Public Cloud, Hybrid Cloud, Community Cloud.	**8**	**CO1**
2	**Module-2 :** **Cloud Computing Service Models**-Software as a Service (SaaS),Platform as a Service (PaaS), Infrastructure as a Service (IaaS). **Virtualization**- Introduction to Virtualization, Types of Virtualization, Cloud Service Providers. **Cloud Computing Technologies-**Virtualization, **Service**-Oriented Architecture (SOA).Grid Computing, Utility Computing.	**8**	**CO2**
3	**Module-3:** Cloud Server, **Deployment Models In Cloud Computing-** public cloud model, private cloud model, hybrid cloud model, community cloud model. **Cloud Hypervisor**- Introduction to Cloud Hypervisor, Types of Cloud Hypervisor, Cloud Computing Examples, Features of Cloud Computing, Multitenancy in Cloud computing.	**8**	**CO3**
4	**Module-4** **Scaling in Cloud Computing-** Introduction to Scaling & Types of Scaling, Elasticity, How Does Multi-Cloud Differ from A Hybrid Cloud?, Fog computing vs. Cloud computing, Service level agreements in Cloud Computing. **Load Balancing in Cloud Computing-** Introduction to Load Balancing, Types of Load Balancing, Why Cloud Load Balancing Is Important In Cloud Computing?	**8**	**CO4**

5	**Module-5** Principles of Cloud Computing, Roots of Cloud Computing, Data Center in Cloud Computing, Resiliency in Cloud Computing, Cloud Computing Security Architecture.	**8**	**CO5**

NOTE: 1. Questions for CIE and SEE not to be set from Self Study Component.

2. Assignment Questions should be only from Self Study Component.

Module 1: Cloud vulnerabilities

Module 2: Virtual Machines
Module 3: Storage Systems

Module 4: Resource Management

Module 5: The top concern for cloud users

Text Books:

1. Cloud Computing Theory and Practice – Dan C. Marinescu

Reference Books:

1. Rajkumar Buyya, Christian Vecchiola, and Thamarai Selvi Mastering Cloud. Computing McGraw Hill Education
2. John W Rittinghouse, James F Ransome:Cloud Computing Implementation, Management and Security, CRC Press 2013

MOOC's

1. https://www.coursera.org/professional-certificates/gcp-cloud-architect
2. https://www.udemy.com/course/getting-started-with-cloud-computing-level-1/
3. https://www.coursera.org/specializations/aws-fundamentals

APPLIED CHEMISTRY -EE Stream

Course Code: 22CHEE12/22 **Credits 4**

L:P:T:S : 3:2:0:0 **CIE Marks 50**

Exam Hours : 3 **SEE Marks 50**

Course Type (Theory/Practical/Integrated): Integrated

Course objectives

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

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

CO1.	Identify the terms and principles of Chemistry involved in scientific Engineering and Technology
CO2.	Explain the phenomenon of Chemistry to describe the methods of Engineering processes and syntheses
CO3.	Solve the problems of Chemistry that are pertinent in socio-economic and environmental issues.
CO4.	Apply the basic concepts of Chemistry in quantification of industrially relevant parameters.
CO5.	Analyze the structure, properties and processes associated with chemical substances in multidisciplinary situations

Mapping of Course outcomes to Program outcomes:

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

Unit	Course content	Hours	COs
1	**Module-1: Chemistry of Electronic Materials** **Electrical Engineering Materials:** Introduction, principle of conductors, insulators and semiconductors with examples. **Semiconductors:** Introduction, production of electronic grade silicon, Czochralski process (CZ) and Float Zone (FZ) methods. **Polymers:** Introduction, Molecular weight - number average, weight average and numerical problems. Conducting polymers – synthesis and conducting mechanism of polyacetylene. Preparation, properties and commercial applications of graphene oxide. **PCB:** Electroless plating – Introduction, Electroless plating of copper in the manufacture of double-sided PCB.	8	CO1-6
2	**Module-2 : Energy Conversion and Storage** **Batteries:** Introduction, classification of batteries. Components, construction, working and applications of modern batteries; Na-ion battery and Lithium ion batteries **Fuel Cells**: Introduction, construction, working and applications of methanol–oxygen fuel cell . **Solar Energy:** Introduction, importance of solar PV cell, construction and working of solar PV cell, advantages and disadvantages. Introduction, construction and working of organic solar cell (OSC) **Green fuel**: Hydrogen energy- types and method of production of hydrogen, hydrogen-production (Photo catalytic water splitting).	8	CO1-6
3	**Module-3: Corrosion Science and E-waste Management** **Corrosion Chemistry:** Introduction, electrochemical theory of corrosion, types of corrosion-differential metal and differential aeration. Factors affecting the rate of corrosion. Corrosion control - galvanization, anodization and sacrificial anode method. Corrosion Penetration Rate (CPR) - Introduction and numerical problems. **E-waste Management**: Introduction, sources, types, effects of e-waste on environment and human health, methods of disposal, advantages of recycling. Extraction of gold from e-waste.	8	CO1-6
4	**Module-4 Nanomaterials and Display Systems** **Nanomaterials:** Introduction, Classification, types, size dependent properties of nanomaterials (Surface area, Catalytic, Conducting), preparation of nanomaterials by sol-gel and co-precipitation method with example. Introduction, properties and applications –Nanofibers. **Display Systems**: Photoactive and electroactive materials used in optoelectronic devices- organic and nanomaterials. Jablonski Diagram. Liquid crystals (LC's) - Introduction, classification, properties and application in Liquid Crystal Displays (LCD's). Properties and	8	CO1-6

	application of Organic Light Emitting Diodes (OLED's) and Quantum Light emitting diodes (QLED's).		
5	**Module-5 Sensors and Electrode System in Analytical Techniques** **Electrode System**: Introduction, types of electrodes. Ion selective electrode – definition, construction, working and applications of glass electrode. Determination of pH using glass electrode. Concentration cell – Definition, construction, working and Numerical problems. **Sensors:** Introduction, working principle, types and applications of Electrochemical sensors. **Analytical Techniques**: Introduction, principle and instrumentation of Colorimetric sensors; its application in the estimation of copper, Potentiometric sensors; its application in the estimation of iron, Conductometric sensors; its application in the estimation of weak acid.	**8**	**CO1-6**

Prerequisites:

Module 1:

Pre-requisite: Basics of band theory

Module 2:

Pre-requisite: Basics of Electrochemistry

Module 3:

Pre-requisite: Basics of electrochemical theory and waste management

Module 4:

Pre-requisite: Basics of optoelectronics

Module 5:

Pre-requisite: Basics of electrochemical sensing and analytical techniques.

NOTE: 1. Questions for CIE and SEE not to be set from Self Study Component.

2. Assignment Questions should be only from Self Study Component.

Self-study component:
Module 1: Technological importance of metal finishing and distinction between electroplating and electroless plating.
Module 2: Electrodes for electrostatic double layer capacitors, pseudo capacitors, and hybrid capacitor.

Module 3: Recycling of PCB and battery components
Module 4: Properties & electrochemical applications of carbon nanotubes and graphene.
Module 5: IR and UV- Visible spectroscopy.

Text books:
Suggested Learning Resources:

Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)

1. Wiley Engineering Chemistry, Wiley India Pvt. Ltd. New Delhi, 2013- 2nd Edition.
2. Engineering Chemistry, Satyaprakash& Manisha Agrawal, Khanna Book Publishing, Delhi
3. A Text Book of Engg. Chemistry, Shashi Chawla, Dhanpat Rai & Co. (P) Ltd.
4. Essentials of Physical Chemistry, Bahl&Tuli, S.Chand Publishing
5. Applied Chemistry, Sunita Rattan, Kataria 5. Engineering Chemistry, Baskar, Wiley
6. Engineering Chemistry – I, D. GrourKrishana, Vikas Publishing
7. A Text book of Engineering Chemistry, SS Dara & Dr. SS Umare, S Chand & Company Ltd., 12thEdition, 2011.
8. A Text Book of Engineering Chemistry, R.V. Gadag and Nityananda Shetty, I. K. International Publishing house. 2nd Edition, 2016.
9. Text Book of Polymer Science, F.W. Billmeyer, John Wiley & Sons, 4th Edition, 1999.
10. Nanotechnology A Chemical Approach to Nanomaterials, G.A. Ozin& A.C. Arsenault, RSC Publishing, 2005.
11. Corrosion Engineering, M. G. Fontana, N. D. Greene, McGraw Hill Publications, New York, 3rd Edition, 1996.

Reference books:

1. Linden's Handbook of Batteries, Kirby W. Beard, Fifth Edition, McGraw Hill, 2019.
2. Supercapacitors: Materials, Systems, and Applications, Max Lu, Francois Beguin, ElzbietaFrackowiak, Wiley-VCH; 1st edition, 2013.
3. "Handbook on Electroplating with Manufacture of Electrochemicals", ASIA PACIFIC BUSINESS PRESS Inc., 2017. Dr. H. Panda,
4. Expanding the Vision of Sensor Materials. National Research Council 1995, Washington, DC: The National Academies Press. doi: 10.17226/4782.
5. Engineering Chemistry, Edited by Dr. Mahesh B and Dr. Roopashree B, Sunstar Publisher, Bengaluru, ISBN 978-93-85155-70-3, 2022
6. High Performance Metallic Materials for Cost Sensitive Applications, F. H. Froes, et al. John Wiley & Sons, 2010
7. Instrumental Methods of Analysis, Dr. K. R. Mahadik and Dr. L. Sathiyanarayanan, NiraliPrakashan, 2020
8. Principles of Instrumental Analysis, Douglas A. Skoog, F. James Holler, Stanley R. Crouch SeventhEdition, Cengage Learning, 2020
9. Polymer Science, V R Gowariker, N V Viswanathan, Jayadev, Sreedhar, Newage Int. Publishers, 4th Edition, 2021
10. Engineering Chemistry, P C Jain & Monica Jain, Dhanpat Rai Publication, 2015-16th Edition.
11. Nanostructured materials and nanotechnology, Hari Singh, Nalwa, academic press, 1st Edition,2002.
12. Nanotechnology Principles and Practices, Sulabha K Kulkarni, Capital Publishing Company, 3rd

Edition 2014
13. Principles of nanotechnology, Phanikumar, Scitech publications, 2nd Edition, 2010.
14. Chemistry for Engineering Students, B. S. Jai Prakash, R. Venugopal, Sivakumaraiah& Pushpa Iyengar., Subash Publications, 5th Edition, 2014
15. "Engineering Chemistry", O. G. Palanna, Tata McGraw Hill Education Pvt. Ltd. New Delhi, FourthReprint, 2015.
16. Chemistry of Engineering materials, Malini S, K S Anantha Raju, CBS publishers Pvt Ltd.,
17. Laboratory Manual Engg. Chemistry, Anupma Rajput, Dhanpat Rai & Co.

Web links and Video Lectures (e-Resources):

- http://libgen.rs/
- https://nptel.ac.in/downloads/122101001/
- https://nptel.ac.in/courses/104/103/104103019/
- https://ndl.iitkgp.ac.in/
- https://www.youtube.com/watch?v=faESCxAWR9k
- https://www.youtube.com/watch?v=TBqXMWaxZYM&list=PLyhmwFtznRhuz8L1bb3X-9IbHrDMjHWWh
- https://www.youtube.com/watch?v=j5Hml6KN4TI
- https://www.youtube.com/watch?v=X9GHBdyYcyo
- https://www.youtube.com/watch?v=1xWBPZnEJk8
- https://www.youtube.com/watch?v=wRAo-M8xBHM

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

- https://www.vlab.co.in/broad-area-chemical-sciences
- https://demonstrations.wolfram.com/topics.php
- https://interestingengineering.com/science

APPLIED CHEMISTRY -ME Stream

Course Code : 22CHEM12/22 **Credits 4**

L:P:T:S : 3:2:0:0 **CIE Marks 50**

Exam Hours : 3 **SEE Marks 50**

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

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

CO1.	Identify the terms and principles of Chemistry involved in scientific Engineering and Technology
CO2.	Explain the phenomenon of Chemistry to describe the methods of Engineering processes and syntheses
CO3.	Solve the problems of Chemistry that are pertinent in socio-economic and environmental issues.
CO4.	Apply the basic concepts of Chemistry in quantification of industrially relevant parameters.
CO5.	Analyze the structure, properties and processes associated with chemical substances in multidisciplinary situations

Mapping of Course outcomes to Program outcomes:

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

Unit	Course content	Hours	COs
1	**Module-1: Energy; Source, Conversion and Storage** **Fuels:** Introduction, calorific value, determination of calorific value using bomb calorimeter, numerical problems on GCV and NCV. **Green fuels:** Introduction, power alcohol, synthesis and applications of biodiesel. **High energy fuels:** Introduction, hydrogen energy- types**,** production of hydrogen by electrolysis of water, its advantages and disadvantages. **Energy Conversion devices:** Introduction, construction, working and applications of Photovoltaic cells, Li-ion battery and methanol-oxygen fuel cell.	**8**	**CO1-6**
2	**Module-2 : Corrosion Science and Engineering** **Corrosion:** Introduction, electrochemical theory of corrosion, types of corrosion- differential metal, differential aeration (waterline and pitting), stress corrosion (caustic embrittlement). **Corrosion control:** Metal coating-galvanization, surface conversion coating- anodization of Al. Cathodic protection-sacrificial anode method. Corrosion testing by weight loss method. Corrosion penetration rate (CPR)- introduction, numerical problems. **Metal finishing:** Introduction, technological importance. Electroplating: Introduction, Electroplating of chromium (hard and decorative). Electroless plating: Introduction, electroless plating of nickel.	**8**	**CO1-6**
3	**Module-3: Macromolecules for Engineering Applications** **Polymers**: Introduction, methods of polymerization (condensation and addition), molecular weight; number average and weight average, numerical problems. Synthesis, properties and industrial applications of polyvinylchloride (PVC) and polystyrene. **Fibers:** Introduction, synthesis, properties and industrial applications of Kevlar and Polyester. **Adhesives:** Synthesis, properties and application of epoxy resin. **Polymer composites:** Introduction, properties and applications of fiber reinforced polymers composites (FRPC) **Elastomers**: Introduction synthesis properties and applications of silicone rubber. **Lubricants**: Introduction, classification, properties and applications of lubricants.	**8**	**CO1-6**
4	**Module-4 Phase Rule and Analytical Techniques** **Phase rule:** Introduction, Definition of terms: phase, components, degree of freedom, phase rule equation. Phase diagram: Two component lead-silver system. **Analytical techniques**: Introduction, principle and instrumentation of Colorimetric sensors; its application in the estimation of copper,	**8**	**CO1-6**

	Potentiometric; its application in the estimation of iron, Conductometric; its application in the estimation of weak acid.		
5	**Module-5 Materials for Engineering Applications** **Alloys**: Introduction, classification, composition, properties and applications of Stainless Steel, Solders, Brass and Alnico. **Ceramics**: Introduction, classification based on chemical composition, properties and applications. **Nanochemistry:** Introduction, size-dependent properties of nanomaterial (surface area, optical and electrical), synthesis of nanoparticles by sol-gel, and co-precipitation method. **Nanomaterials:** Introduction, properties and engineering applications of carbon nanotubes and graphene.	**8**	**CO1-6**

Prerequisites:

Module 1:

Pre-requisite: Electrochemistry

Module 2:

Pre-requisite: Basics of Electrochemical theory of corrosion

Module 3:

Pre-requisite: Basics of polymer chemistry

Module 4:

Pre-requisite: Basics of physical chemistry and analytical techniques

Module 5:

Pre-requisite: Basics of material chemistry

NOTE: 1. Questions for CIE and SEE not to be set from Self Study Component.

2. Assignment Questions should be only from Self Study Component.

Self-study component:
Module 1: Plastic recycling to fuels and its monomers or other useful products.
Module 2: Factors affecting the rate of corrosion, factors influencing the nature and quality of electrodeposit (Current density, concentration of metal ion, pH and temperature)**. Module 3:** Biodegradable polymer: Introduction, synthesis, properties and applications of polylactic acid (PLA).
Module 4: Determination of viscosity of biofuel and its correlation with temperature.

Module 5: Abrasives: Introduction, classification, properties and applications of silicon carbide (carborundum).

Text books:
Suggested Learning Resources:

Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)

1. Wiley Engineering Chemistry, Wiley India Pvt. Ltd. New Delhi, 2013- 2nd Edition.
2. Engineering Chemistry, Satyaprakash & Manisha Agrawal, Khanna Book Publishing, Delhi
3. A Text Book of Engg. Chemistry, Shashi Chawla, Dhanpat Rai & Co. (P) Ltd.
4. Essentials of Physical Chemistry, Bahl&Tuli, S.Chand Publishing
5. Applied Chemistry, Sunita Rattan, Kataria 5. Engineering Chemistry, Baskar, Wiley
6. Engineering Chemistry – I, D. Grour Krishana, Vikas Publishing
7. A Text book of Engineering Chemistry, SS Dara & Dr. SS Umare, S Chand & Company Ltd., 12th Edition, 2011.
8. A Text Book of Engineering Chemistry, R.V. Gadag and Nityananda Shetty, I. K. International Publishing house. 2nd Edition, 2016.
9. Text Book of Polymer Science, F.W. Billmeyer, John Wiley & Sons, 4th Edition, 1999.
10. Nanotechnology A Chemical Approach to Nanomaterials, G.A. Ozin & A.C. Arsenault, RSCPublishing, 2005.

Reference books:

1. Corrosion Engineering, M. G. Fontana, N. D. Greene, McGraw Hill Publications, New York, 3rd Edition, 1996.
2. Linden's Handbook of Batteries, Kirby W. Beard, Fifth Edition, McGraw Hill, 2019.
3. OLED Display Fundamentals and Applications, Takatoshi Tsujimura, Wiley–Blackwell , 2012
4. Supercapacitors: Materials, Systems, and Applications, Max Lu, Francois Beguin, Elzbieta Frackowiak, Wiley-VCH; 1st edition, 2013.
5. “Handbook on Electroplating with Manufacture of Electrochemicals”, ASIA PACIFIC BUSINESSPRESS Inc., 2017. Dr. H. Panda,
6. Expanding the Vision of Sensor Materials. National Research Council 1995, Washington, DC: TheNational 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. High Performance Metallic Materials for Cost Sensitive Applications, F. H. Froes, et al. John Wiley & Sons, 2010
9. Instrumental Methods of Analysis, Dr. K. R. Mahadik and Dr. L. Sathiyanarayanan, Nirali Prakashan, 2020
10. Principles of Instrumental Analysis, Douglas A. Skoog, F. James Holler, Stanley R. Crouch Seventh Edition, Cengage Learning, 2020
11. Polymer Science, V R Gowariker, N V Viswanathan, Jayadev, Sreedhar, Newage Int.

Publishers, 4th Edition, 2021
12. Engineering Chemistry, P C Jain & Monica Jain, Dhanpat Rai Publication, 2015-16th Edition.
13. Nanostructured materials and nanotechnology, Hari Singh, Nalwa, academic press, 1st Edition, 2002.
14. Nanotechnology Principles and Practices, Sulabha K Kulkarni, Capital Publishing Company, 3rd Edition 2014
15. Principles of nanotechnology, Phanikumar, Scitech publications, 2nd Edition, 2010.
16. Chemistry for Engineering Students, B. S. Jai Prakash, R. Venugopal, Sivakumaraiah & Pushpa Iyengar., Subash Publications, 5th Edition, 2014
17. "Engineering Chemistry", O. G. Palanna, Tata McGraw Hill Education Pvt. Ltd. New Delhi, Fourth Reprint, 2015.
18. Chemistry of Engineering materials, Malini S, K S Anantha Raju, CBS publishers Pvt Ltd.,
19. Laboratory Manual Engg. Chemistry, Anupma Rajput, Dhanpat Rai & Co.

Web links and Video Lectures (e-Resources):

- http://libgen.rs/
- https://nptel.ac.in/downloads/122101001/
- https://nptel.ac.in/courses/104/103/104103019/
- https://ndl.iitkgp.ac.in/
- https://www.youtube.com/watch?v=faESCxAWR9k
- https://www.youtube.com/watch?v=TBqXMWaxZYM&list=PLyhmwFtznRhuz8L1bb3X- 9IbHrDMjHWWh
- https://www.youtube.com/watch?v=j5Hml6KN4TI
- https://www.youtube.com/watch?v=X9GHBdyYcyo
- https://www.youtube.com/watch?v=1xWBPZnEJk8
- https://www.youtube.com/watch?v=wRAo-M8xBHM

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

- https://www.vlab.co.in/broad-area-chemical-sciences
- https://demonstrations.wolfram.com/topics.php
- https://interestingengineering.com/science

APPLIED CHEMISTRY-CIVIL Stream

Course Code: 22CHEC12/22 **Credits 4**

L:P:T:S : 3:2:0:0 **CIE Marks 50**

Exam Hours : 3 **SEE Marks 50**

Course Type (Theory/Practical/Integrated): Integrated

Course objectives

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

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

CO1.	Identify the terms and principles of Chemistry involved in scientific Engineering and Technology
CO2.	Explain the phenomenon of Chemistry to describe the methods of Engineering processes and syntheses
CO3.	Solve the problems of Chemistry that are pertinent in socio-economic and environmental issues.
CO4.	Apply the basic concepts of Chemistry in quantification of industrially relevant parameters.
CO5.	Analyze the structure, properties and processes associated with chemical substances in multidisciplinary situations

Mapping of Course outcomes to Program outcomes:

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

Unit	Course content	Hours	COs
1	**Module-1: Energy Conversion and Storage, Corrosion** **Energy conversion**: Introduction, construction, working, and applications of Photovoltaic cells, methanol-oxygen fuel cell. **Storage devices**: Introduction, construction and working of Li-ion battery. **Corrosion:** Introduction, electrochemical corrosion of steel in concrete, types (differential metal and aeration), Stress corrosion in civil structures. Factors that affect the rate of corrosion- Nature of metal, Nature of corrosion product, Relative areas of anode and cathode, pH of the medium and Temperature. Corrosion control (galvanization, anodization and sacrificial anode method, Impressed current method.).	8	CO1-6
2	**Module-2 : Water Technology and Nanotechnology** **Water technology:** Introduction, water parameters, hardness of water, determination of total hardness by EDTA method, softening of water by ion exchange method, desalination of water by electrodialysis and reverse osmosis, BOD and COD- introduction and their significance in waste water treatment, determination of COD, numerical problems. **Nanotechnology:** Introduction, size dependent properties of nanomaterial (surface area, optical and electrical), Synthesis of nanomaterial by sol-gel method. **Nano materials:** Introduction, properties and engineering applications of carbon nanotubes, graphene and nanomaterials for water treatment (Metal oxide).	8	CO1-6
3	**Module-3: Phase Rule and Analytical Techniques** **Phase rule:** Introduction, definition of terms: phase, components, degree of freedom, phase rule equation. Phase diagram: Two component-lead-silver system. **Analytical techniques:** Introduction, principle and instrumentation of Colorimetric sensors; its application in the estimation of copper, Potentiometric sensors; its application in the estimation of iron, Conductometric sensors; its application in the estimation of weak acid.	8	CO1-6
4	**Module-4 Polymer and Composites** **Polymer:** Introduction, methods of polymerization, molecular weight of polymers, numerical problems. Glass transition temperature (T_g); Structure and property relationship in polymers; synthesis, properties and engineering applications of polyethylene (PE) and polyvinyl chloride (PVC). **Fibers**: Synthesis, properties and applications of polypropylene and nylon fibers. **Polymer composites:** Introduction, properties and applications of fiber reinforced polymers composites (FRPC) **Adhesives**: Introduction, properties and applications of epoxy resin.	8	CO1-6

	Biodegradable polymers: Synthesis of polylactic acid (PLA) and their applications.		
5	**Module-5 Structural Materials** **Metals and Alloys:** Introduction, properties and application of iron and its alloys, aluminium and its alloys **Cement:** Introduction, composition, properties, classification, manufacturing process of cement, process of setting and hardening of cement, additives for cement and testing of cement. **Refractories:** Introduction, classification based on chemical composition, properties and application of refractory materials. **Glass:** Introduction, composition, types, preparation of soda-lime glass, properties and applications of glass.	**8**	**CO1-6**

Prerequisites:

Module 1: Pre-requisite: Electrochemistry

Module 2: Pre-requisite: Water parameters, basics of nanomaterials

Module 3: Pre-requisite: Basics of thermodynamics and analytical techniques

Module 4: Pre-requisite: Basics of polymer chemistry

Module 5: Pre-requisite: Basics of material chemistry

NOTE: 1. Questions for CIE and SEE not to be set from Self Study Component.

2. Assignment Questions should be only from Self Study Component.

Self-study component:

Module 1: Chemistry of reinforced concrete from various sources of water (seawater, groundwater, treated water).
Module 2: Corrosion inhibitors
Module 3: Sewage treatment (Primary, secondary and tertiary)
Module 4: Biopolymer: Introduction, structural properties, and applications of cellulose and lignin.
Module 5: Chromatographic technique, application of chromatography (column and thin-layered chromatography) in the separation of components.

Text books:

Suggested Learning Resources:

Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)

1. Wiley Engineering Chemistry, Wiley India Pvt. Ltd. New Delhi, 2013- 2nd Edition.
2. Engineering Chemistry, Satyaprakash& Manisha Agrawal, Khanna Book Publishing, Delhi
3. A Text Book of Engg. Chemistry, Shashi Chawla, Dhanpat Rai & Co. (P) Ltd.
4. Essentials of Physical Chemistry, Bahl&Tuli, S.Chand Publishing
5. Applied Chemistry, Sunita Rattan, Kataria 5. Engineering Chemistry, Baskar, Wiley
6. Engineering Chemistry – I, D. GrourKrishana, Vikas Publishing
7. A Text book of Engineering Chemistry, SS Dara & Dr. SS Umare, S Chand & Company Ltd., 12thEdition, 2011.
8. A Text Book of Engineering Chemistry, R.V. Gadag and Nityananda Shetty, I. K. International Publishing house. 2nd Edition, 2016.
9. Text Book of Polymer Science, F.W. Billmeyer, John Wiley & Sons, 4th Edition, 1999.
10. Nanotechnology A Chemical Approach to Nanomaterials, G.A. Ozin& A.C. Arsenault, RSC Publishing, 2005.

Reference books:

1. Corrosion Engineering, M. G. Fontana, N. D. Greene, McGraw Hill Publications, New York, 3rd Edition, 1996.
2. Linden's Handbook of Batteries, Kirby W. Beard, Fifth Edition, McGraw Hill, 2019.
3. OLED Display Fundamentals and Applications, TakatoshiTsujimura, Wiley–Blackwell , 2012
4. PRESS Inc., 2017. Dr. H. Panda,
5. Expanding the Vision of Sensor Materials. National Research Council 1995, Washington, DC: The National Academies Press. doi: 10.17226/4782.
6. Supercapacitors: Materials, Systems, and Applications, Max Lu, Francois Beguin, ElzbietaFrackowiak, Wiley-VCH; 1st edition, 2013.
7. “Handbook on Electroplating with Manufacture of Electrochemicals”, ASIA PACIFIC BUSINESS
8. Engineering Chemistry, Edited by Dr. Mahesh B and Dr. Roopashree B, Sunstar Publisher, Bengaluru, ISBN 978-93-85155-70-3, 2022
9. High Performance Metallic Materials for Cost Sensitive Applications, F. H. Froes, et al. John Wiley & Sons, 2010
10. Instrumental Methods of Analysis, Dr. K. R. Mahadik and Dr. L. Sathiyanarayanan, NiraliPrakashan, 2020
11. Principles of Instrumental Analysis, Douglas A. Skoog, F. James Holler, Stanley R. Crouch Seventh Edition, Cengage Learning, 2020
12. Polymer Science, V R Gowariker, N V Viswanathan, Jayadev, Sreedhar, Newage Int. Publishers, 4th Edition, 2021
13. Engineering Chemistry, P C Jain & Monica Jain, Dhanpat Rai Publication, 2015-16th Edition.
14. Nanostructured materials and nanotechnology, Hari Singh, Nalwa, academic press, 1st Edition, 2002.

15. Nanotechnology Principles and Practices, Sulabha K Kulkarni, Capital Publishing Company, 3rd Edition 2014
16. Principles of nanotechnology, Phanikumar, Scitech publications, 2nd Edition, 2010.
17. Chemistry for Engineering Students, B. S. Jai Prakash, R. Venugopal, Sivakumaraiah& Pushpa Iyengar., Subash Publications, 5th Edition, 2014
18. "Engineering Chemistry", O. G. Palanna, Tata McGraw Hill Education Pvt. Ltd. New Delhi, Fourth Reprint, 2015.
19. Chemistry of Engineering materials, Malini S, K S Anantha Raju, CBS publishers Pvt Ltd.,
20. Laboratory Manual Engg. Chemistry, Anupma Rajput, Dhanpat Rai & Co.

Web links and Video Lectures (e-Resources):

- http://libgen.rs/
- https://nptel.ac.in/downloads/122101001/
- https://nptel.ac.in/courses/104/103/104103019/
- https://ndl.iitkgp.ac.in/
- https://www.youtube.com/watch?v=faESCxAWR9k
- https://www.youtube.com/watch?v=TBqXMWaxZYM&list=PLyhmwFtznRhuz8L1bb3X-9IbHrDMjHWWh
- https://www.youtube.com/watch?v=j5Hml6KN4TI
- https://www.youtube.com/watch?v=X9GHBdyYcyo
- https://www.youtube.com/watch?v=1xWBPZnEJk8
- https://www.youtube.com/watch?v=wRAo-M8xBHM

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

- https://www.vlab.co.in/broad-area-chemical-sciences
- https://demonstrations.wolfram.com/topics.php
- https://interestingengineering.com/science

COMPUTER AIDED ENGINEERING DRAWING

Course Code: 22CED13/22CED23 **Credits: 03**
L:P:T:S: 2:2:0:0 **CIE Marks: 50**
Exam Hours: 03 **SIE Marks: 50**

Course Objective

1. Familiarize the students with the concepts of orthographic projection

2. Know about different types of projections

3. Enable the students to appreciate the importance of engineering drawing as a means of communication for engineers.

4. Help the students to improve visualization skills.

5. Impart knowledge of drafting software and drafting tools

6. Equip the students to understand the importance of computers in drawing

Course Outcomes: At the end of the semester Students will be able to

CO1	Make use of drafting tools in creating engineering drawing.
CO2	Know and understand the conventions and the methods of engineering drawing.
CO3	Identify the position of the object and draw the views using orthographic projection technique in their respective quadrants.
CO4	Construct the appropriate drawing satisfying the constraints given.
CO5	Apply the knowledge of isometric projection to show pictorial view of an object
CO6S	Improve their visualization skills so that they can apply these skills in design and developing new products.

Mapping of Course Outcomes to Program Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO.1	3	3	1	-	3	-	-	-			-	
CO.2	3	3	1	-	3	-		-			-	
CO.3	3	3	1	-	3	-		-			-	
CO.4	3	3	3	-	3	-		-			-	
CO.5	3	3	3	-	3	-		-			-	
CO.6	3	3	3	-	3	-		-			-	

UNIT	COURSE CONTENT	HOURS	CO'S
1	**Introduction to Computer Aided Sketching** Introduction, Drawing Instruments and their uses, BIS conventions, Lettering, Dimensioning and free hand practicing. Computer screen, layout of the software, standard tool bar/menus and description of most commonly used tool bars, navigational tools. Co-ordinate system and reference planes. Definitions of HP, VP, RPP & LPP. Creation of 2D/3D environment. Selection of drawing size and scale. Commands and creation of Lines, Co-ordinate points, axes, poly-lines, square, rectangle, polygons, splines, circles, ellipse, text, move, copy, off-set, mirror, rotate, trim, extend, break, chamfer, fillet, curves, constraints viz. tangency, parallelism, inclination and perpendicularity. Dimensioning, line conventions, material conventions and lettering. **Introduction**, Definitions - Planes of projection, reference line and conventions employed. **Projections of points**: Projection in all the four quadrants. **Projections of straight lines**: (located in First quadrant/first angle only), True and apparent lengths, True and apparent inclinations to reference planes (No application problems). **Orthographic Projections of Plane Surfaces:** (First Angle Projection Only) Introduction, Definitions–projections of plane surfaces–triangle, square, rectangle, pentagon, hexagon and circle, planes in different positions by change of position method only (No problems on punched plates and composite plates).	12	CO1 CO2 CO3 CO4
2	**Projections of Solids**: (First angle Projection only) Introduction, Definitions – Projections of right regular prisms, pyramids, cylinders and cones in different positions (No problems on tetrahedron, cube, octahedron, combination of solids and suspended solids).	12	CO1 CO2 CO3 CO4 CO6
3	**Isometric Projection**: Introduction, Isometric scale, Isometric projection of simple plane figures, Isometric projection of tetrahedron, hexahedron(cube), right regular prisms, pyramids, cylinders, cones, spheres, cut spheres and combination of solids (Maximum of two solids).	10	CO1 CO2 CO4 CO5
4	**Sections and Development of Lateral Surfaces of Solids:** Introduction, Section planes, Sections, Sections of right regular prisms, pyramids, cylinders and cones resting with base on HP. (No problems on sections of solids) Development of lateral surfaces of above solids, their frustums and truncations. (No problems on lateral surfaces of trays, tetrahedrons, spheres and transition pieces).	10	CO1 CO2 CO4 CO6
5	**Multidisciplinary Applications & Practice** (For CIE Only): **Free hand Sketching**; True free hand, Guided Free hand, Roads, Buildings, Utensils, Hand tools & Furniture's etc **Drawing Simple Mechanisms**; Bicycles, Tricycles, Gear trains, Ratchets, two wheeler cart & Four wheeler carts to dimensions etc **Electric Wiring and lighting diagrams**; Like, Automatic fire alarm, Call bell system, UPS system, Basic power distribution system using suitable software **Basic Building Drawing**; Like, Architectural floor plan, basic foundation drawing, steel structures- Frames, bridges, trusses using Auto CAD or	6	CO1 CO2

	suitable software, **Electronics Engineering Drawings**- Like, Simple Electronics Circuit Drawings. **Graphs & Charts**: Like, Column chart, Pie chart, Line charts, Gantt charts, etc. using Microsoft Excel or any suitable software.		

Text Books:

1) N.D. Bhatt & V.M. Panchal, **Engineering Drawing**, Charotar Publishing House, Gujarat, 48th edition, 2005.

2) A Primer on **Computer Aided Engineering Drawing**, Published by VTU, Belgaum, 2006

Reference Books:

1) K.R. Gopalakrishna, **Engineering Graphics,** Subash Publishers Bangalore, 32nd edition, 2005.

2) Primer Solution Book, Published by VTU, Belgaum, 2006

CIE for 50 marks

1. Assignment/sketch book/Print out	25 Marks
2. Surprise test/Mid semester test	10 Marks
3. Test conducted towards the end of semester	15 Marks

Question paper pattern for SEE:

1. Question paper for each batch of students will be set separately by the examination authority. The answer sheets will have to be jointly evaluated by the Internal & External examiners.

2. A maximum of FOUR questions will be set as per the following pattern (No mixing of questions from different Units).

Q. No.	Unit	Marks Allotted
1	Unit 1 (1 Question on projection of points and lines) OR (1 Question on projection of plane surfaces)	20
2	Unit 2 (2 question out of which 1 has to be attempted)	30
3	Unit 3	25
4	Unit 4	25
Total		**100**

Q. No.	Solutions and Sketching in the Graph Book	Computer Display and Printout	Total Marks
1	20	--	20
2	--	30	30
3	--	25	25
4	25	--	25
Total Marks	**45**	**55**	**100**

Students have to submit the computer printouts and the sketches drawn on the graph sheets at the end of the examination. Both Internal & External examiners have to jointly evaluate the solutions (sketches) and computer display & printouts of each student for 100 marks and submit the marks list along with the solution (sketches) on graph sheets & computer printouts in separate covers.

4. Each batch must consist of a minimum of 10 students and a maximum of 12 students.

Samskruthika Kannada (Only for Karnataka students)

Subject Code: 22KSK17/17 **Credit: 1**

L:P:T:S : 1:0:0:0 **CIE Marks:50**

SIEMarks:50

Course Objectives:

1. To initiate the importance of the Kannada Literary works.
2. To introduce the rich and cultural heritage of Karnataka.
3. To gain knowledge of a novel language and use it effectively.

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

CO1	Make use of Kannada words in regular context.
CO2	Identify Karnataka as a source of rich culture and heritage.
CO3	Recognize the importance of Kannada poets and writers.

Mapping of Course outcomes to Program outcomes:

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

Course content	Hours	COs
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. ಎ. ಕೇಶವಮೂರ್ತಿ	4	**CO1**
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	
ಘಟಕ -3 ಆಧುನಿಕ ಕಾವ್ಯಭಾಗ 1. ಡಿವಿಜಿ ರವರ ಮಂಕುತಿಮ್ಮನ ಕಗ್ಗದಿಂದ ಆಯ್ದ ಕೆಲವು ಭಾಗಗಳು 2. ಕುರುಡು ಕಾಂಚಾಣ : ದಾ.ರಾ. ಬೇಂದ್ರೆ	3	**CO2**
ಘಟಕ - 4 ತಾಂತ್ರಿಕ ವ್ಯಕ್ತಿಗಳ ಪರಿಚಯ 1. ಡಾ. ಸರ್. ಎಂ. ವಿಶ್ವೇಶ್ವರಯ್ಯ : ವ್ಯಕ್ತಿ ಮತ್ತು ಐತಿಹ್ಯ – ಎ. ಎಸ್. ಮೂರ್ತಿರಾವ್ 2. ಕರಕುಶಲ ಕಲೆಗಳು ಮತ್ತು ಪರಂಪರೆಯ ವಿಜ್ಞಾನ : ಕರಿಗೌಡ ಬೀಚನಹಳ್ಳಿ	3	
ಘಟಕ - 5 ಸಾಂಸ್ಕೃತಿಕ, ಜನಪದ ಕಥೆ ಮತ್ತು ಪ್ರವಾಸ ಕಥನ 1. ಯುಗಾದಿ : ವಸುಧೇಂದ್ರ 2. ಮೈಗಾನಿ ಎಂಬ ಗಿರಿಜನ ಪರ್ವತ : ಹಿ.ಚಿ. ಬೋರಲಿಂಗಯ್ಯ	2	**CO3**

Text books:

1. Hi chi boralingaiah karimane & Dr.L Thimmesh
2. H.K Lakkappa Gowda, Sahithya:Bahumuka Chinthane, IBH Prakashana.
3. Vivek Rai , Kannada Nudinadeya Barahagulu, Sapna Books

Reference books:

1. K V Narayana, kannada Adunudiya Sollarimi, Pragathi Publishers.
2. Rahamath Tharikeri,Maradolagana Kichchu, Abhinava Publishers.

BALAKE KANNADA (Only for Non-Karnataka Students)

Course Code : 22KBK17/27 **Credits : 1**

L:P:T:S :1:0:0:0 **CIE Marks : 50**

Exam Hours : 1hr 30 min **SEE Marks : 50**

Course objectives:

1. To initiate the importance of the Kannada literary works.
2. To express thoughts and ideas in the local language.
3. To train the learners for correct and polite conservation.

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

CO1	make use of Kannada words in regular context.
CO2	demonstrate effective communication skills with the local language.
CO3	appraise the moral values and social behaviour in Karnataka.

Mapping of Course outcomes to Program outcomes:

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

Unit	Course content	Hours	COs
1	**Usage:** Introducing each other – 1. Personal Pronouns, Possessive forms, Interrogative words. Introducing each other – 2. Personal Pronouns, Possessive forms, Yes/No Type Interrogation Enquiring about a room for rent. Qualitative and quantitative adjectives.	3	CO1
2	**Communication:** Enquiring about the college. Predicative forms, locative case. In a hotel-dative case defective verbs. Planning for a picnic. Imperative, Permissive, hortative.	3	CO1
3	**Conversation:** Conversation between Doctor and the patient. Verb- iru, negation – illa, non – past tense. Comparative, relationship, Identification and Negation Words.	3	CO2
4	**Activities:** About routine activities of a student. Verbal Participle, reflexive form, negation. Telephone conversation. Past and present perfect past continuous and their negation. About Halebidu, Belur. Relative, principle, negation.	2	CO2 CO3
5	**Lessons for reading:** Different types of Tense, Time and Verbs-Formation of Past, Future and Present Tense sentences with Verb Forms- Kannada vocabulary List-kannada words in Conversation.	3	CO3

UNIT 1: Self study component: About Ramayana. Possessive forms of nouns, dubitive question, Relative nouns.

UNIT 2: Self study component: To speak, and write Kannada language as per requirement.

UNIT 3: Self study component: To communicate (converse) in kannada language in their daily life with kannada speakers.

UNIT 4: Self study component: Discussing about examination and future plan. Simple conditional and negative.

UNIT 5: Self study component: To speak in polite conversation.

Text books:

1. H K Lakappa Gowda, Sahitya: Bahumukha Chintane, IBH Prakashana.
2. Vivek Rai, Kannada Nudinadeya Barahagalu, Sapna Books.

Reference books:

1. K V Narayana, Kannada Adunudiya Sollarime, Pragathi Publishers.
2. Rahamath Tharikeri, Maradolagana Kichchu, Abhinava Publishers.
3. Dr.L Thimmesha, Balake Kannada, Prakatane:Prasaraanga.

Assessment Pattern:

CIE –Continuous Internal Evaluation Theory

Bloom's Category	**Tests**
Marks	**50**
Remember	10
Understand	20
Apply	20

SEE–Semester End Examinations (Theory)

Bloom's Category	**Marks**
Marks	**50**
Remember	15
Understand	15
Apply	10
Analyze	10

Introduction to Electrical Engineering

Course Code for the stream: 22ESC142 **Credits: 3**

L:P:T:S: 3:0:0:0 **CIE Marks: 50**

Exam Hours: 3 **SEE Marks : 50**

Course Type (Theory/Practical/Integrated): Theory

Course Objectives:

1. To explain the laws used in the analysis of DC and AC circuits.
2. To explain the behavior of circuit elements in single-phase circuits.
3. To explain the construction and operation of transformers, DC generators and motors and induction motors.
4. To introduce concepts of circuit protecting devices and earthing.
5. To explain electric power generation, transmission and distribution, electricity billing, equipment and personal safety measures.

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

CO1	Understand the concepts of various energy sources and Electric circuits.
CO2	Apply the basic Electrical laws to solve circuits.
CO3	Discuss the construction and operation of various Electrical Machines.
CO4	Identify suitable Electrical machine for practical implementation.
CO5	Explain the concepts of electric power transmission and distribution, electricity billing, circuit protective devices and personal safety measures.

Mapping of Course outcomes to Program outcomes:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2	1	0	1	1	1	1	0	0	0	1
CO2	3	3	2	1	1	1	0	0	0	0	0	1
CO3	3	2	1	1	1	1	1	1	0	0	0	1
CO4	3	2	2	1	0	1	1	1	0	0	0	1
CO5	3	1	2	0	1	2	1	1	0	0	1	1

Unit	Course content	Hours	COs
1	**Module-1:** **Introduction:** Conventional and non-conventional energy resources; General structure of electrical power systems using single line diagram approach. **Power Generation:** Hydel, Nuclear, Solar & wind power generation (Block Diagram approach). **DC Circuits:** Ohm's Law and its limitations. KCL & KVL, series, parallel, series-parallel circuits. Simple Numerical.	8	CO1
2	**Module-2:** **A.C. Fundamentals:** Equation of AC Voltage and current, waveform, time period, frequency, amplitude, phase, phase difference, average value, RMS value, form factor, peak factor. (Only definitions) Voltage and current relationship with phasor diagrams in R, L, and C circuits. Concept of Impedance. Analysis of R-L, R-C, R-L-C Series circuits. Active power, reactive power and apparent power. Concept of power factor. (Simple Numerical). **Three Phase Circuits:** Generation of Three phase AC quantity, advantages and limitations; star and delta connection, relationship between line and phase quantities (excluding proof).	8	CO1 CO2
3	**Module-3: DC Machines:** **DC Generator:** Faraday's law, Principle of operation, constructional details, induced emf expression, Relation between induced emf and terminal voltage. Simple numerical. **DC Motor:** Principle of operation, back emf and its significance. Torque equation, types of motors, characteristics and speed control (armature & field) of DC motors (series & shunt only). Applications of DC motors. Simple numerical.	8	CO3 CO4
4	**Module-4:** **Transformers:** Necessity of transformer, principle of operation, Types and construction of single- phase transformers, EMF equation, losses, variation of losses with respect to load. Efficiency and simple numerical. **Three-phase induction Motors:** Concept of rotating magnetic field, Principle of operation, constructional features of motor, types – squirrel cage and wound rotor. Slip and its significance simple numerical.	8	CO3 CO4

5	**Module-5:** **Domestic Wiring:** Requirements, Types of wiring: conduit wiring. Two way and three-way control of load. **Electricity Bill:** Power rating of household appliances including air conditioners, PCs, laptops, printers, etc. Definition of "unit" used for consumption of electrical energy, two-part electricity tariff, calculation of electricity bill for domestic consumers. **Equipment Safety measures:** Working principle of Fuse and Miniature circuit breaker (MCB), merits and demerits. **Personal safety measures:** Electric Shock, Earthing and its types, Safety Precautions to avoid shock.	**8**	**CO5**

NOTE: 1. Questions for CIE and SEE not to be set from Self Study Component.

2. Assignment Questions should be only from Self Study Component.

Module 1: Self-study component: Environmental consequences of fossil fuel use, Importance of renewable sources of energy.

Module 2: Self-study component: phasor representation of alternating quantities, Measurement of power by two-wattmeter method (both star and delta connection).

Module 3: Self-study component: Basic laws of magnetic circuits- Faradays laws of electromagnetic induction, Lenz's law, Fleming's rules and its applications.

Module 4: Self-study component: Phasor diagram of Single-phase Transformer on no-load. Star -Delta starter.

Module 5: Self-study component: Concept of extension of range of ammeter, voltmeter (shunt and multiplier). Service mains, meter board and distribution board.

Text books:

1. Basic Electrical Engineering by D C Kulshreshtha, Tata McGraw Hill, First Edition 2019.

2. A text book of Electrical Technology by B.L. Theraja, S Chand and Company, reprint edition 2014.

Reference Books:

1. Basic Electrical Engineering, D. P. Kothari and I. J. Nagrath, Tata McGraw Hill 4th edition, 2019.

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

3. Fundamentals of Electrical Engineering by Rajendra Prasad, PHI, 3rd edition, 2014.

Web links and Video Lectures (e-Resources):

- www.nptel.ac.in

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

- Application-based report writing on electrical devices or machines

Introduction to C Programming

Course Code for the stream: 22ETC15J **Credits** 3

L:P:T:S : 3-0-0-0 **CIE Marks: 50**

Exam Hours: 3 **SEE Marks: 50**

Course Type: Theory

Course Objectives:

CLO 1. Elucidate the basic architecture and functionalities of a Computer

CLO 2. Apply programming constructs of C language to solve the real-world problems

CLO 3. Explore user-defined data structures like arrays, structures and pointers in implementing solutions to problems

CLO 4. Design and Develop Solutions to problems using structured programming constructs such as functions and procedures

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

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

Mapping of Course outcomes to Program outcomes:

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

Unit	Course content	Hours	COs
1	**Module-1:** **Introduction to Computer-** Introduction to Computer, Functional Units of a Computer, Software types. **Introduction to C-** Introduction to C language, Algorithm & Flowchart, Structure of C program, C Tokens and Data types, Input/output statements in C.	**8**	**CO1**
2	**Module-2 :** **Operators and Expression-** Operators in C, Precedence and Associativity, Evaluation of Expression, Type conversion and typecasting. **Decision control and Looping statements:** Introduction to decision control, Conditional branching statements, iterative statements, nested loops, break and continue statements, goto statement.	**8**	**CO2**
3	**Module-3:** **Functions:** Introduction to functions, function declaration, function call, return statement, Categories of Functions, passing parameters to functions, recursive functions. **1D Arrays:** Introduction to 1D array, Declaration & Initialization of 1D array, accessing the elements of an array, applications of 1D arrays - Searching and sorting techniques.	**8**	**CO3**

4	**Module-4:** **2D Arrays:** Introduction to 2D array, Declaration & Initialization of 2D array, applications of 2D arrays- Matrix operations **Introduction to strings:** Declaration & Initialization of String, programs on Various String Handling functions.	**8**	**CO4**
5	**Module-5:** **Structures:** Introduction to Structures, declaration and Initialization of structures, accessing members of structure. **Pointers:** Introduction to Pointers, Declaring Pointer Variables, pointer arithmetic.	**8**	**CO5**

NOTE: 1. Questions for CIE and SEE not to be set from Self Study Component.

2. Assignment Questions should be only from Self Study Component.

Module 1: Types of Computer

Module 2: Evaluation of Expression

Module 3: Actual & Formal Parameters

Module 4: String Operation without Using String Built In Function

Module 5: Real Time Implementation of Pointer

Textbooks

1. Computer fundamentals and programming in c, “Reema Thareja”, Oxford University, Second edition,2017.

Reference Books:

1. E. Balaguruswamy, Programming in ANSI C, 7th Edition, Tata McGraw-Hill.
2. Brian W. Kernighan and Dennis M. Ritchie, the ‘C’ Programming Language, Prentice Hall of India.

Web links and Video Lectures (e-Resources):

1. elearning.vtu.ac.in/econtent/courses/video/BS/15PCD23.html
2. https://nptel.ac.in/courses/106/105/106105171/ MOOC courses can be adopted for more clarity inunderstanding the topics and verities of problem solving methods.
3. https://tinyurl.com/4xmrexre

Lab Assignments

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

INTRODUCTION TO CIVIL ENGINEERING

Course Code for the stream : 22ESC141 **Credits 4**

L:P:T:S : 2:2:0:0 **CIE Marks 50**

Exam Hours : 3 **SEE Marks 50**

Course Type (Theory/Practical/Integrated): Theory

Course Objectives:

1. To make students learn the scope of various specializations of civil engineering. To analyze.
2. To make students learn the concepts of sustainable infrastructure
3. To develop students' ability to analyze the problems involving forces, moments with their applications.
4. To make the students learn about kinematics

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

CO1	Understand the various disciplines of civil engineering
CO2	Understand the infrastructure requirement for sustainable development
CO3	Compute the resultant and equilibrium of force systems.
CO4	Locate the centroid of plane and built-up sections
CO5	Compute the moment of inertia of plane and built-up sections.

Mapping of Course outcomes to Program outcomes:

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

Unit	Course content	Hours	COs
1	**Module-1: Civil Engineering Disciplines and Building Science** **Introduction to Civil Engineering:** Surveying, Structural Engineering, Geotechnical Engineering, Hydraulics & Water Resources, Transportation Engineering, Environmental Engineering, Construction planning & Project management. **Basic Materials of Construction:** Bricks, Cement & mortars, Plain, Reinforced & Pre-stressed Concrete, Structural steel, Construction Chemicals. **Structural elements of a building:** foundation, plinth, lintel, chejja, Masonry wall, column, beam, slab and staircase	**10**	**CO1**
2	**Module-2: Societal and Global Impact of Infrastructure** **Infrastructure:** Introduction to sustainable development goals, Smart city concept, clean city **Environment:** Water Supply and Sanitary systems, urban air pollution management, Solid waste management, identification of Landfill sites, urban flood control **Built-environment**: Energy efficient buildings, recycling, Temperature and Sound control in buildings, Security systems; Smart buildings.	**10**	**CO1** **CO2**
3	**Module-3 Analysis of force systems:** Concept of idealization, system of forces, principles of superposition and transmissibility, Resolution and composition of forces, Law of Parallelogram of forces, Resultant of concurrent and non-concurrent coplanar force systems, moment of forces, couple, Varignon's theorem, free body diagram, equations of equilibrium, equilibrium of concurrent and non-concurrent coplanar force systems	**10**	**CO1** **CO3**
4	**Module-4 Centroid:** Importance of centroid and centre of gravity, methods of determining the centroid, locating the centroid of plane laminae from first principles, centroid of built-up sections. Numerical examples.	**10**	**CO2** **CO3**

5	**Module-5 Moment of inertia:** Importance of Moment of Inertia, method of determining the second moment of area (moment of inertia) of plane sections from first principles, parallel axis theorem and perpendicular axis theorem, section modulus, radius of gyration, moment of inertia of built-up sections, Numerical Examples.	**10**	**CO2** **CO3**

Prerequisites:

Module 1:

Pre-requisite: Basic Concepts of buildings

Module 2:

Pre-requisite: Basic concepts of infrastructure and build environment

Module 3:

Pre-requisite: Force and Force Systems

Module 4:

Pre-requisite: Basics of Centre of gravity

Module 5:

Pre-requisite: Areas of different shapes, Moment.

NOTE: 1. Questions for CIE and SEE not to be set from Self Study Component.

2. Assignment Questions should be only from Self Study Component.

Module 1: Properties of Fresh and hardened concrete

Module 2: LEED, IGBC

Module 3: 3 dimensional force systems

Module 4: Centroid of cutout section, composite sections

Module 5: Moment of inertia of cutout section, composite sections

Text books:

1. Bansal R. K., Rakesh Ranjan Beohar and Ahmad Ali Khan, Basic Civil Engineering and Engineering Mechanics, 2015, Laxmi Publications.
2. Kolhapure B K, Elements of Civil Engineering and Engineering Mechanics, 2014, EBPB

Reference books:

1. Beer F.P. and Johnston E. R., Mechanics for Engineers, Statics and Dynamics, 1987, McGraw Hill.
2. Irving H. Shames, Engineering Mechanics, 2019, Prentice-Hall.
3. Hibbler R. C., Engineering Mechanics: Principles of Statics and Dynamics, 2017, Pearson Press.
4. Timoshenko S, Young D. H., Rao J. V., Engineering Mechanics, 5th Edition, 2017, Pearson Press.
5. Reddy Vijaykumar K and Suresh Kumar K, Engineering Mechanics, 2011, BS publication

Web links and Video Lectures (e-Resources):

- **https://www.youtube.com/watch?v=nGfVTNfNwnk&list=PLOSWwFV98rfKXq2KBphJz95rao7q8PpwT**
- **https://www.youtube.com/watch?v=nkg7VNW9UCc&list=PLOSWwFV98rfKXq2KBphJz95rao7q8PpwT&index=2**
- **https://www.youtube.com/watch?v=ljDIIMvxeg&list=PLOSWwFV98rfKXq2KBphJz95rao7q8PpwT&index=5**
- **https://www.youtube.com/watch?v=VQRcChR9IkU&list=PLOSWwFV98rfKXq2KBphJz95rao7q8PpwT&index=18**
- **https://www.youtube.com/watch?v=3YBXteL-qY4**
- **https://www.youtube.com/watch?v=z95UW4wwzSc&list=PLOSWwFV98rfKXq2KBphJz95rao7q8PpwT&index=10**
- **https://www.youtube.com/watch?v=lheoBL2QaqU&list=PLOSWwFV98rfKXq2KBphJz95rao7q8PpwT&index=7**
- **https://www.youtube.com/watch?v=atoP5_DeTPE**
- **https://www.youtube.com/watch?v=ksmsp9OzAsI**
- **https://www.youtube.com/watch?v=x1ef048b3CE**
- **https://www.youtube.com/watch?v=l_Nck-X49qc**
- **https://play.google.com/store/apps/details?id=appinventor.ai_jgarc322.Resultant_Force**
- **https://www.youtube.com/watch?v=RIBeeW1DSZg**
- **https://www.youtube.com/watch?v=R8wKV0UQtlo**

- **https://www.youtube.com/watch?v=0RZHHgL8m_A**
- **https://www.youtube.com/watch?v=Bls5KnQOWkY**

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

- https://www.youtube.com/watch?v=Zrc_gB1YYS0
- https://play.google.com/store/apps/details?id=vn.edu.best4u.com.bieudonoiluc
- https://www.youtube.com/watch?v=Hn_iozUo9m4
- https://play.google.com/store/apps/details?id=com.teobou
- https://www.youtube.com/watch?v=WOHRp3V-QA0

Introduction to Mechanical Engineering
Subject code: 22ESC144/22ESC244

Course and Course Code		Course Title			Teaching Hours /Week			Examination				Credits
					L	T	P	Duration inhours	CIE Marks	SEE Marks	Total Marks	
ESC	22ESC144/ 22ESC244	Elements of Mechanical Engineering	ME	Mechanical Engineering	3	0	--	03	**50**	**50**	**100**	**3**

Course Objectives:

CO.1	Understand modern manufacturing systems, working of basic machine tools, and their specifications.
CO.2	Understand additive manufacturing and various metal joining processes.
CO.3	Understand the process of steam generation & application in various engineering systems and also comprehend the working of hydraulic turbines.
CO.4	Understand the working of Internal combustion engines .
CO.5	Understand the working of various refrigeration cycles.
CO.6	Understand the fundamentals of various power transmission systems,IOT & HVET.

Unit	Contents	Hours	COs
1	**Introduction:** Role of Mechanical Engineering in Industries and Society- Emerging Trends and Technologies in different sectors such as Energy, Manufacturing, Automotive, Aerospace, and Marine sectors. **Machine Tool Operations:** Working Principle of lathe, Lathe operations: Turning, facing, knurling. Working principles of Drilling Machine, drilling operations: drilling, boring, reaming. Working of Milling Machine, Milling operations: plane milling and slot milling. (No sketches of machine tools, sketches to be used only for explaining the operations). **Computer Numerical Control (CNC):** Introduction, Components of CNC, open loop and closed loop systems, advantages and disadvantages of CNC. **Robotics:** Introduction, Classification based on robot configuration: Polar, Cylindrical, Cartesian and jointed arm configuration. Application, Advantages and disadvantages of robots.	**7**	**1**
	Demonstration of Lathe operations(Turning, Taper Turning) and Drilling operations(Drilling), C.N.C machine in Machine shop Laboratory and R &D Centre respectively	**1**	

2	**Joining Process** **Soldering:** Principle of soldering, Surface preparation, Methods of soldering, Applications **Brazing:** Principle of brazing, methods of brazing, Applications **Welding:** Definition, Classification, Applications of welding, Flux and its functions, Description of arc welding, Electrodes used in arc welding, Description of oxyacetylene welding, Types of flames produced in gas welding, Comparison between welding, soldering and Brazing, Welding Defects. **Additive Manufacturing:** Basic principle, need and advantages of additive manufacturing, Procedure for product development in additive manufacturing, Difference between Additive and Subtractive Manufacturing, Classification of additive manufacturing process, Materials and software used, Applications and Limitations, Principle and Applications of 3D Printing	**7**	**2**
	Demonstration on welding, soldering and 3D Printing in the Workshop Practice Laboratory	**1**	
3	**Steam:** Formation of steam, Types of steam, Steam properties-Enthalpy, dryness fraction, wetness fraction, latent heat, sensible heat, Internal energy, Specific volume, External work of evaporation, degree of superheat, amount of superheat, saturated and superheated temperature. **Boilers:** Classification of Boilers, Babcock and Wilcox Boiler, Lancashire Boiler, Boiler mountings and accessories (no sketches) **Steam Turbines:** Classification, Principle operation of Impulse and reaction turbines, Delaval's turbine, Parson's turbine **Water turbines:** Classification, Principles and operations of Pelton wheel, Francis turbine, Kaplan turbine.	**7**	**3**
	Demonstration of Boiler models and working of Water Turbines in Heat Transfer Laboratory and Fluid Machinery Laboratory	**1**	
4	**Internal combustion (I.C) engines:** I.C. Engines parts, 2 Stroke and 4 stroke petrol engines, 4 stroke diesel engines. P-V diagrams of Otto and Diesel cycles, Numerical on indicated power, brake power, indicated thermal efficiency, brake thermal efficiency, mechanical efficiency and specific fuel consumption. **Refrigeration**: Definitions –Refrigeration, Ton of Refrigeration, Unit of Refrigeration, Refrigerating effect, Ice making capacity, COP, Relative COP, Properties of refrigerants, list of commonly used refrigerants, Principle and working of Vapour Compression Refrigeration and Vapour Absorption Refrigeration	**7**	**4,5**
	Demonstration of working of I.C Engines and Vapour Compression Refrigeration test rig in Energy Conversion and Heat Transfer Laboratory	**1**	
5	**Power Transmission** **Belt drives**-Terminology of a belt drive, open and cross belt drives, **Gear Drives:** Types of Gears and applications, Advantages and disadvantages of gear drive, Gear Tooth Velocity ratio of simple and compound gear train. technologies, components of EV's, challenges and Key aspects of EV. EV's, Basics of EV, Basics of HEV, Basics of Plug-In Hybrid Electric vehicle (PHEV), Basics of Fuel Cell Vehicle (FCV). Hybrid Electric Vehicles: Classification, Micro, Mild, Full, Plug in, EV. **Introduction to IOT:** Definition and Characteristics, Physical design, protocols, Logical design of IoT, Functional blocks, and communication models.	**7**	**6**

	Demonstration of Belt & Gear drives in the Machine shop Laboratory.		

Course outcomes: At the end of the semester, students will be able to

CO.1	Understand various machine tools, their specifications and modern manufacturing systems
CO.2	Understand various metal joining and additive manufacturing processes
CO.3	Understand the generation & application of steam in various engineering systems and also comprehend the working of hydraulic turbines
CO.4	Understand the working of Internal combustion engines
CO.5	Understand the working of various refrigeration cycles
CO.6	Understand the fundamentals of various power transmission systems, IOT & HVET

Note:

1. **Questions for CIE and SEE not to be set from self-study topics**
2. **Assignment questions should be from self-study component only**

Self-study topics

Unit 1: Principle of Casting, forging, extrusion, rolling, Grinding and milling

Unit 2: Advanced joining Processes: Ultrasonic welding & Electron beam welding

Unit 3: Clutches & Differentials

Unit 4: Solar energy, wind energy, bio energy

Unit 5: Room Air-conditioner, Rating of fuels, Knocking in SI and CI engines, Emission standards- Bharat and Euro norms

Text Books

1. Elements of Mechanical Engineering, K. R. Gopalakrishna, Subhas Publications, Bangalore, 2008.
2. Elements of Mechanical Engineering, Vol.-1 & 2, Hajra Choudhury, Media Promoters, New Delhi, 2001.

Reference Books

1. Mikell P. Groover, "Fundamentals of Modern Manufacturing" Fourth Edition, John Wiley & Sons, Inc.
2. Bharat Vinjamuri, Manjunath Shettar, "Computer Integrated Manufacturing" Sunstar Publisher, 2016.

DAYANANDA SAGAR COLLEGE OF ENGINEERING

Accredited by National Assessment & Accreditation Council (NAAC) with 'A' Grade

(An Autonomous Institute Affiliated to VTU, Belagavi)

Semester II

Course: Professional Writing Skills in English **Credit: 01**
Course Code: 22ENG26 **CIE Marks: 50**
L: T: P: S: 1:0:0:0 **SEE Marks: 50**
Teaching Hours: 15 Hours **Exam Hours: 2 Hours**

Course Objectives:

1. To identify the common errors while speaking and writing in English.

2. To develop language skills for greater accuracy and precision

3. To read and write the Technical proposals and Technical reports properly.

4. To acquire professional writing skills.

5. To enhance Intra and Interpersonal communication skills through group activities for better workplace communication.

Course Outcomes:

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

CO1	Understand and identity the common errors while speaking and writing in English.
CO2	Acquire the basic proficiency in English Language skills (LSRW) for accuracy.
CO3	Achieve better Technical communication skills and to read and write Technical Proposals and Reports properly.
CO4	Acquire Employment and Workplace communication skills.

Mapping of Course outcomes to Program outcomes:

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

Module	Course Content	Hours	CO's
1	**Language Skills** **Listening Skills:** Listening Comprehension, Types, Barriers, and Tips to improve Listening Skills. **Writing Skills: Nature and Style of sensible writing** Organizing Principles of Paragraphs in Documents, Writing Introduction and Conclusion, Importance of Proper Punctuation, Techniques in Essay writing, Sentence arrangements and Corrections activities. **Grammar:** Common errors identification in Parts of Speech, use of verbs and phrasal verbs, Auxiliary verbs and their forms.	3	CO1 CO2
2	**Technical Communication:** Introduction, Difference between General and Technical communication, Skills required for Technical Writer, and Organisations in Technical communication. **Grammar:** Subject Verb Agreement (Concord Rules), Common errors in subject-verb agreement, Sequence of Tenses and errors identification in Tenses.	3	CO1 CO3
3	**Technical writing process** **Reports**: Introduction, Purpose, Significance, and Types of Reports. **Technical Proposals:** Introduction, Types, Characteristics of Technical Proposals. Scientific Writing Process. **Grammar:** Words Confused/ Misused, Misplaced modifiers, Contractions, Collocations, Word Order, Errors due to the Confusion of words.	3	CO1 CO3
4	**Professional Communication for Employment** **Job Applications:** Types of official/ employment/ business letters, Résumé vs. Bio Data, Curriculum Vitae', Emails, Blogs and Memos. **Grammar:** Voices and Reported Speech, Spotting Error & Sentence Improvement.	3	CO1 CO4
5	**Professional Communication at Workplace** **Group Discussion and Professional Interviews:** Characteristics and Strategies of Group Discussion and Interviews, Intrapersonal and Interpersonal Communication Skills at workplace, Non-Verbal Communication Skills and its importance in Group Discussion and Interview.	3	CO4

**** Note: No descriptive questions from grammar only MCQ's.**

Assessment Details (both CIE and SEE)

The weight age of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks 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:

Textbook:

1. "Professional Writing Skills in English" published by Fillip Learning – Education (ILS), Bangalore – 2022.
2. "Functional English" (As per AICTE 2018 Model Curriculum) (ISBN-978-93-5350-047-4) Cengage learning India Pvt Limited [Latest Edition 2019].

Reference Books:

1. English for Engineers by N.P. Sudharshana and C. Savitha, Cambridge University Press – 2018.
2. Technical Communication by Gajendra Singh Chauhan and Et al, (ISBN-978-93-5350-050-4), Cengage learning India Pvt. Limited [Latest Revised Edition] - 2019.
3. Technical Communication – Principles and Practice, Third Edition by Meenakshi Raman and Sangeetha Sharma, Oxford University Press 2017.
4. High School English Grammar & Composition by Wren and Martin, S Chand & Company Ltd – 2015.
5. Effective Technical Communication – Second Edition by M Ashraf Rizvi, McGraw Hill Education (India) Private.

Basic Electronics (For ECE and Allied Branches)

Course Code for the stream: 22BEE23 **Credits : 3**

L:P:T:S : 3:0:0:0 **CIE Marks : 50**

Exam Hours: 3 **SEE Marks: 50**

Course Type (Theory/Practical/Integrated): Theory

Course Objectives:

- Operation of Semiconductor diode and their applications.
- Transistor operation and it's biasing.
- Study of linear Op-amps and its applications.
- Logic circuits and their optimization.
- Principles of Communication Systems.
- Applications of Electronics.

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

CO1	Develop competence knowledge to Identify the different building blocks in digital electronics and construct basic digital circuitry by using logic gates and realize simple logic functions.
CO2	Understand the fundamental concepts and operation of different semiconductor based elementary electronic components – its construction, operation and characteristics and their biasing techniques.
CO3	Apply the acquired knowledge of semiconductor devices to design simple circuits like rectifiers, power supply.
CO4	Study the operation and characteristics of an ideal op amp, design of commonly used single-op amp circuits that perform useful functions such as amplifying signals, combining signals, integrating and differentiating signals.
CO5	Describe the functioning of a communication system, and different modulation techniques
CO6	Understand the concepts of electronic devices and circuits and appreciate the Applications of Electronic devices in Interdisciplinary Engineering Domains

Mapping of Course outcomes to Program outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	-	-	-	-	-	-	-	-	1	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO3	3	2	2	-	-	-	-	-	-	-	-	-	-	-
CO4	3	2	2	-	-	-	-	-	-	-	-	-	1	-
CO5	3	1	-	-	-	-	-	-	-	-	-	-	-	-
CO6	3	2	-	-	-	-	-	-	-	-	-	1	1	-

Unit	Course content	Hours	COs
1	**Digital Electronics 1 :** Introduction to Number Systems, Binary Number System, Decimal Number System, Octal Number System, Hexadecimal Number System. Conversion from one number system to another number system, 1's and 2's complement method and their arithmetic. **Digital Electronics 2:** Binary logic functions, Boolean algebra, De-Morgan's Theorem, Logic gates, Canonical and Standard Forms, Realization of Boolean functions using basic gates, Implementation of logic gates as half & full adder using gates.	8	CO1
2	**Introduction to Diodes and Rectifiers:** P-N Junction Diode – Working principle and Characteristics. Half Wave, Full Wave and Bridge Wave Rectifiers without filter – derivations (PIV, Average values of Output Voltage and Load Current, RMS value of Load Current, Ripple factor, Efficiency) and numerical. With filter only concepts. **Bipolar Junction Transistors:** BJT - Construction, Working & Operation principle of BJT, Common Base, Common Emitter and Common Collector Characteristics, Numerical examples.	8	CO2 CO3
3	**Transistor Biasing-** Fixed and Voltage Divider biasing techniques. **Field Effect Transistor (FET):** Construction, Operation, Transfer Characteristics of n channel JFET. n channel - Depletion and Enhancement type MOSFET – Construction, Operation and characteristics, SCR - Construction, Operation and characteristics.	8	CO2

4	**Operational Amplifiers:** Introduction, Block diagram representation of OPAMP, Schematic symbol and pin configuration, Voltage Transfer Characteristics, Op Amp Parameters, Ideal and Practical Characteristics of OPAMP, Equivalent circuit of Op Amp, Single ended and double ended operation, Virtual ground concepts. **OPAMP applications:** Inverting and Non-Inverting amplifiers, voltage Follower, Summer, Differentiator, Integrator, Numerical.	**8**	**CO4**
5	**Communication Systems :** Introduction, Elements of Communication Systems, Concept of modulation, need for modulation, methods of modulation - principles of AM, FM, PM, AM transmitter& Super heterodyne receiver (block diagram description only) **Applications of Electronics:** Principles and Operation of Mobile Phone, GSM architecture, Block diagram and working of ECG and EEG signals, Design of 5V power supply using IC7805.	**8**	**CO5** **CO6**

Prerequisites:

Module 1:
Basics of number systems
Module 2:

Diode Characteristics
Module 3:

Integration and Differentiation basics
Module 4:

Different blocks in a communication system
Module 5:
How electronics is an important aspect in any engineering application

NOTE: 1. Questions for CIE and SEE not to be set from Self Study Component.

2. Assignment Questions should be only from Self Study Component.

Module 1: Digital – 9's & 10's Compliment methods, Universal gates.
Module 2: Applications of Diodes and transistors.
Module 3: Applications of CMOS Circuits, SCR, UJT.
Module 4: Applications of OPAMPs – Oscillators, Schmitt Trigger
Module 5: Satellite Communication, ISDN, Cloud computing, Electrical & Electronic Instruments, Multimeters

Text books:

1. Electronic Devices and Circuits, David A Bell, 5th Edition, Oxford,2016
2. Op-amps and Linear Integrated Circuits, Ramakanth A Gayakwad, Pearson Education, 4th Edition
3. Digital Logic and Computer Design, M. Morris Mano, PHI Learning, 2008 ISBN: 978-81-203-0417-8
4. Dr T C Manjunath et. al, "Basic Electronics", 2017, 1st edition, Subhash Publications.
5. Electronic Instrumentation and Measurements (3rd Edition)– David A. Bell, Oxford University Press, 2013 Electronic Communication Systems, George Kennedy, 4th Edition, TMH.

Reference books:

1. Mike Tooley, 'Electronic Circuits, Fundamentals & Applications', 4th Edition, Elsevier, 2015. DOI: https://doi.org/10.4324/9781315737980. eBook ISBN9781315737980.

2.D P Kothari, I J Nagrath, 'Basic Electronics', 2nd edition, McGraw Hill Education (India),PrivateLimited,2018.

Web links and Video Lectures (e-Resources):

- https://nptel.ac.in/courses/122106025
- https://nptel.ac.in/courses/108105132
- https://nptel.ac.in/courses/117104072
- https://www.rfwireless-world.com
- https://en.wikipedia.org/wiki/Anti-lock_braking_system
- https://en.wikipedia.org/wiki/Internet_of_things
- https://www.synergy.ac.in

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

http://nptel.ac.in
https://swayam.gov.in
https://www.electronics-notes.com/articles/basic_concepts/
https://www.vssut.ac.in/lecture_notes/lecture1423726156.pdf

ENGINEERING MECHANICS

Course Code : 22CIV23 **Credits : 03**

L:P:T:S : 2:0:1:0 **CIE Marks : 50**

Exam Hours : 03 **SEE Marks : 50**

Course Objectives:

1. To make students learn the scope of various specializations of civil engineering.
2. To make students learn the concepts of sustainable infrastructure.
3. To develop students' ability to analyze the problems involving forces, moments with their applications.
4. To make the students learn about stress and strain.

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

CO1	Understand the various disciplines of civil engineering
CO2	Understand the infrastructure requirement for sustainable development
CO3	Compute the resultant and equilibrium of force systems.
CO4	Compute the reactions with varying types of loads and supports.
CO5	Locate the centroid and moment of inertia of plane figures.
CO6	Compute the stress and strain of uniform sections

Mapping of Course outcomes to Program outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	-	-	-	-	1	-	-	-	-	-	-
CO2	1	-	-	-	-	1	1	-	-	-	-	-
CO3	2	3	-	-	-	-	-	-	-	-	-	-
CO4	2	3	-	-	-	-	-	-	-	-	-	-
CO5	2	3	-	-	-	-	-	-	-	-	-	-
CO6	2	3	-	-	-	-	-	-	-	-	-	-

Unit	Course content	Hours	COs
1	**Introduction to Civil Engineering** Scope of different fields of Civil Engineering, Role of Civil Engineer in development of Infrastructure. Building materials and components – Properties and Engineering applications of Stones, Bricks, Construction materials - Cement, Concrete, concept of Reinforced Cement Concrete (RCC). Concept of Sub Structure Components- Masonry Foundation; Isolated RCC footing; End bearing piles and friction piles. Concept of Super structure components– Components and types of walls, Roofs, Flooring.	10	CO1
2	**Introduction to Engineering Mechanics:** Force and its characteristics, Classification of force systems, Laws of mechanics. Couple, Moment of a force, Equivalent force - couple system. Numerical problems. **Concurrent & Non-Concurrent force system:** Definitions, Composition and resolution of forces, Resultant, Composition of coplanar concurrent & non-concurrent force system. Varignon's principle of moments. Numerical problems.	10	CO1, CO2
3	**Equilibrium of forces** **Equilibrium of concurrent and non-concurrent forces:** Definition of Equilibrant; Conditions of static equilibrium for different force systems, Free Body Diagrams, Lami's theorem; Numerical problems **Support Reactions:** Beams, Types of Loads and Supports, support reactions for statically determinate beams with point loads and uniformly distributed loads.	10	CO3, CO4
4	**Centroid and Moment of Inertia** Centroid of triangle, semi-circle, sector of a circle, computing centroid for I, T, L and composite sections Numerical problems. **Moment of Inertia:** Parallel axis theorem, Perpendicular axis theorem, Moment of Inertia of simple and compound sections. Radius of gyration, Numerical problems.	10	CO5
5	**Friction, stress and strain:** Definitions, Types of friction, Laws of static friction, Limiting friction, Angle of friction, Angle of repose; Impending motion on horizontal and inclined planes, Ladder friction; Numerical Problems on single planes. Hooke's law, Stress Strain behaviour of mild steel; Analysis of bars of uniform sections - Numerical problems	10	CO6

Pre-requisites:

Module 1:
Pre-requisite: Basic knowledge of civil engineering.

Module 2:
Pre-requisite: Basics of an infrastructure.

Module 3:
Pre-requisite: Force, classification and resolution

Module 4:
Pre-requisite: Concept of Centroid of plane figures

Module 5:
Pre-requisite: Concept of moment of inertia

Self Study Component:

NOTE: 1. Questions for CIE and SEE not to be set from Self Study Component.

2. Assignment Questions should be only from Self Study Component.

UNIT 1: Raft Foundation, Doors, Windows, stairs
UNIT 2: Force system concept in 3D
UNIT 3: Numerical Problems on moving loads.
UNIT 4: Centroid and moment of inertia for punched out sections
UNIT 5: Friction on two inclined planes. Analysis of bars Tapering and stepped bars

Text books:

1. Bansal R. K., Rakesh Ranjan Beohar and Ahmad Ali Khan, Basic Civil Engineering and Engineering Mechanics, 2015,Laxmi Publications.
2. Kolhapure B K, Elements of Civil Engineering and Engineering Mechanics, 2014, EBPB

Reference books:

1. Beer F.P. and Johnston E. R., Mechanics for Engineers, Statics and Dynamics, 1987, McGraw Hill.

2. Irving H. Shames, Engineering Mechanics, 2019, Prentice-Hall.

3. Hibbler R. C., Engineering Mechanics: Principles of Statics and Dynamics, 2017, Pearson Press.

4. Timoshenko S, Young D. H., Rao J. V., Engineering Mechanics, 5th Edition, 2017, Pearson Press.

5. Reddy Vijaykumar K and Suresh Kumar K, Engineering Mechanics, 2011, BS publication

Web links and Video Lectures (e-Resources):

- https://www.youtube.com/watch?v=nGfVTNfNwnk&list=PLOSWwFV98rfKXq2KBphJz95rao7q8PpwT
- https://www.youtube.com/watch?v=nkg7VNW9UCc&list=PLOSWwFV98rfKXq2KBphJz95rao7q8PpwT&index=2
- https://www.youtube.com/watch?v=ljDIIMvxeg&list=PLOSWwFV98rfKXq2KBphJz95rao7q8PpwT&index=5
- https://www.youtube.com/watch?v=VQRcChR9IkU&list=PLOSWwFV98rfKXq2KBphJz95rao7q8PpwT&index=18
- https://www.youtube.com/watch?v=3YBXteL-qY4
- https://www.youtube.com/watch?v=z95UW4wwzSc&list=PLOSWwFV98rfKXq2KBphJz95rao7q8PpwT&index=10
- https://www.youtube.com/watch?v=lheoBL2QaqU&list=PLOSWwFV98rfKXq2KBphJz95rao7q8PpwT&index=7
- https://www.youtube.com/watch?v=atoP5_DeTPE
- https://www.youtube.com/watch?v=ksmsp9OzAsI
- https://www.youtube.com/watch?v=x1ef048b3CE
- https://www.youtube.com/watch?v=l_Nck-X49qc
- https://play.google.com/store/apps/details?id=appinventor.ai_jgarc322.Resultant_Force
- https://www.youtube.com/watch?v=RIBeeW1DSZg
- https://www.youtube.com/watch?v=R8wKV0UQtlo
- https://www.youtube.com/watch?v=0RZHHgL8m_A
- https://www.youtube.com/watch?v=Bls5KnQOWkY

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

- https://www.youtube.com/watch?v=Zrc_gB1YYS0
- https://play.google.com/store/apps/details?id=vn.edu.best4u.com.bieudonoiluc
- https://www.youtube.com/watch?v=Hn_iozUo9m4
- https://play.google.com/store/apps/details?id=com.teobou
- https://www.youtube.com/watch?v=WOHRp3V-QA0

Elements of Electrical Engineering

Course Code for the stream: 22EEE13/22EEE23 **Credits: 03**

L:P:T:S: 2:2:0:0 **CIE Marks: 50**

Exam Hours: 3 **SEE Marks: 50**

Course Type (Theory/Practical/Integrated): Theory

Course Objectives:

1. To explain the basic laws used in the analysis of DC circuits, electromagnetism.
2. To explain the behavior of circuit elements in single-phase circuits.
3. To explain three phase circuits, balanced loads and measurement of three phase power.
4. To explain the measuring techniques, measuring instruments and domestic wiring.
5. To explain electricity billing, equipment and personal safety measures.

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

CO1	Understand the concepts of DC circuits and Electromagnetism.
CO2	Understand the concepts of single phase and Three phase AC circuits.
CO3	Apply the basic Electrical laws to solve circuits.
CO4	Understand the concepts of measurements and measuring Instruments.
CO5	Explain the concepts of domestic wiring, electricity billing, circuit protective devices and personal safety measures.

Mapping of Course outcomes to Program outcomes:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2	1	0	1	1	1	1	0	0	0	1
CO2	3	3	2	1	1	1	0	0	0	0	0	1
CO3	3	2	1	1	1	1	1	1	0	0	0	1
CO4	3	2	2	1	0	1	1	1	0	0	0	1
CO5	3	1	2	0	1	2	1	1	0	0	1	1

Unit	Course content	Hours	COs
1	**Module-1:** **DC circuits:** Ohm's law and Kirchhoff's laws, analysis of series, parallel and series-parallel circuits. Power and energy. **Electromagnetism:** Faraday's Laws of Electromagnetic Induction, Lenz's Law, Flemings rules, statically and dynamically induced EMF; concepts of self and mutual inductance. Coefficient of Coupling. Energy stored in magnetic field. Simple Numerical.	8	CO1 CO3
2	**Module-2:** **Single-phase AC circuits:** Generation of sinusoidal voltage, frequency of generated voltage, average value, RMS value, form factor and peak factor of sinusoidal voltage and currents. Phasor representation of alternating quantities. Analysis of R, L, C, R-L, R-C and R-L-C circuits with phasor diagrams, Real power, reactive power, apparent power, and Power factor. Series, Parallel and Series-Parallel circuits. Simple Numerical.	8	CO2 CO3
3	**Module-3:** **Three-phase AC circuits:** Necessity and advantage of 3-phase system. Generation of 3-phase power. Definition of phase sequence. Balanced supply and balanced load. Relationship between line and phase values of balanced star and delta connections. Power in balanced 3-phase circuits. Measurement of 3-phase power by 2-wattmeter method. Simple Numerical. ***Demonstration of measurement of three phase power by two wattmeter method.**	8	CO2 CO3
4	**Module-4:** **Measuring instruments:** construction and working principle of whetstone's bridge, Kelvin's double bridge, Megger, Maxwell's bridge for inductance, Schering's bridge for capacitance, Simple Numerical. (Only balance equations and Excluding Vector diagram approach) **Domestic Wiring:** Requirements, Types of wiring. Two way and three-way control of load. ***Demonstration of two-way and three-way control of a lamp**	8	CO4 CO3

5	**Module-5:** **Electricity bill:** Power rating of household appliances including air conditioners, PCs, laptops, printers, etc. Definition of "unit" used for consumption of electrical energy, two-part electricity tariff, calculation of electricity bill for domestic consumers. **Equipment Safety measures:** Working principle of Fuse and Miniature circuit breaker (MCB), merits and demerits. **Personal safety measures:** Electric Shock, Earthing and its types, Safety Precautions to avoid shock, and Residual Current Circuit Breaker (RCCB) and Earth Leakage Circuit Breaker (ELCB). * **Demonstration of Power and energy measurement of different lighting loads.**	**8**	**CO5**

NOTE: 1. Questions for CIE and SEE not to be set from Self Study Component.

2. Assignment Questions should be only from Self Study Component.

Module 1: Self-study component: Magnetic circuits. Thevenin's theorem, super position theorem

Module 2: Self-study component: Examples of various R, L, C real time loads and problems on it.

Module 3: Self-study component: wattmeter method of power measurement.
Module 4: Self-study component: Concept of extension of range of ammeter, voltmeter (shunt and multiplier). Service mains, meter board and distribution board.

Module 5: Self-study component: Tariff and its Types.

Text books:

1. Basic Electrical Engineering by D C Kulshreshtha, Tata McGraw Hill, First Edition 2019.
2.A text book of Electrical Technology by B.L. Theraja, S Chand and Company, reprint edition 2014.

Reference Books:

1. Basic Electrical Engineering, D. P. Kothari and I. J. Nagrath, Tata McGraw Hill 4th edition, 2019.
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. Electrical and electronic measurements and instrumentation by A K Sawhney, Dhanapat Rai and Co. edition, January 2015

Web links and Video Lectures (e-Resources):

- www.nptel.ac.in

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

- Wherever required, faculty shall demonstrate the concepts through laboratory experiments.

INTRODUCTION TO CIVIL ENGINEERING

Course Code : 22ESC241 **Credits : 03**

L:P:T:S : 2:0:1:0 **CIE Marks : 50**

Exam Hours : 03 **SEE Marks : 50**

Course Objectives:

1. To make students learn the scope of various specializations of civil engineering. To analyze.
2. To make students learn the concepts of sustainable infrastructure.
3. To develop students' ability to analyze the problems involving forces, moments with their applications.
4. To make the students learn about kinematics

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

CO1	Understand the various disciplines of civil engineering
CO2	Understand the infrastructure requirement for sustainable development
CO3	Compute the resultant and equilibrium of force systems.
CO4	Compute the reactions with varying types of loads and supports.
CO5	Locate the centroid of plane and built-up sections
CO6	Compute the moment of inertia of plane and built-up sections.

Mapping of Course outcomes to Program outcomes:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	1	-	-	-	-	1	-	-	-	-	-	-
CO2	1	-	-	-	-	1	1	-	-	-	-	-
CO3	2	3	-	-	-	-	-	-	-	-	-	-
CO4	2	3	-	-	-	-	-	-	-	-	-	-
CO5	2	3	-	-	-	-	-	-	-	-	-	-
CO6	2	3	-	-	-	-	-	-	-	-	-	-

Unit	Course content	Hours	COs
1	**Module-1: Civil Engineering Disciplines and Building Science** Introduction to Civil Engineering: Surveying, Structural Engineering, Geotechnical Engineering, Hydraulics & Water Resources, Transportation Engineering, Environmental Engineering, Construction planning & Project management. Basic Materials of Construction: Bricks, Cement & mortars, Plain, Reinforced & Pre-stressed Concrete, Structural steel, Construction Chemicals. Structural elements of a building: foundation, plinth, lintel, chejja, Masonry wall, column, beam, slab and staircase	**10**	**CO1**
2	**Module-2: Societal and Global Impact of Infrastructure** Infrastructure: Introduction to sustainable development goals, Smart city concept, clean city Environment: Water Supply and Sanitary systems, urban air pollution management, Solid waste management, identification of Landfill sites, urban flood control Built-environment: Energy efficient buildings, recycling, Temperature and Sound control in buildings, Security systems; Smart buildings.	**10**	**CO1, CO2**
3	**Module-3 Analysis of force systems:** Concept of idealization, system of forces, principles of superposition and transmissibility, Resolution and composition of forces, Law of Parallelogram of forces, Resultant of concurrent and non-concurrent coplanar force systems, moment of forces, couple, Varignon's theorem, free body diagram, equations of equilibrium, equilibrium of concurrent and non-concurrent coplanar force systems.	**10**	**CO3, CO4**
4	**Module-4 Centroid:** Importance of centroid and centre of gravity, methods of determining the centroid, locating the centroid of plane laminae from first principles, centroid of built-up sections. Numerical examples.	**10**	**CO5**
5	**Module-5 Moment of inertia:** Importance of Moment of Inertia, method of determining the second moment of area (moment of inertia) of plane sections from first principles, parallel axis theorem and perpendicular axis theorem, section modulus, radius of gyration, moment of inertia of built-up sections, Numerical Examples.	**10**	**CO6**

Pre-requisites:

Module 1:
Pre-requisite: Basic knowledge of civil engineering.

Module 2:
Pre-requisite: Basics of an infrastructure.

Module 3:
Pre-requisite: Force, classification and resolution

Module 4:
Pre-requisite: Concept of Centroid of plane figures

Module 5:
Pre-requisite: Concept of moment of inertia

Self Study Component:

NOTE: 1. Questions for CIE and SEE not to be set from Self Study Component.

2. Assignment Questions should be only from Self Study Component.

UNIT 1: Properties of Fresh and hardened concrete
UNIT 2: LEED, IGBC
UNIT 3: Resolving three-dimension force system
UNIT 4: Centroid of cut out and composite sections
UNIT 5: Moment of inertia of cut out and composite sections

Text books:

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

2. Kolhapure B K, Elements of Civil Engineering and Engineering Mechanics, 2014, EBPB

Reference books:

1. Beer F.P. and Johnston E. R., Mechanics for Engineers, Statics and Dynamics, 1987, McGraw Hill.

2. Irving H. Shames, Engineering Mechanics, 2019, Prentice-Hall.

3. Hibbler R. C., Engineering Mechanics: Principles of Statics and Dynamics, 2017, Pearson Press.

4. Timoshenko S, Young D. H., Rao J. V., Engineering Mechanics, 5th Edition, 2017, Pearson Press.

5. **Reddy Vijaykumar K and Suresh Kumar K, Engineering Mechanics, 2011, BS publication**

Web links and Video Lectures (e-Resources):

- https://www.youtube.com/watch?v=nGfVTNfNwnk&list=PLOSWwFV98rfKXq2KBphJz95rao7q8PpwT
- https://www.youtube.com/watch?v=nkg7VNW9UCc&list=PLOSWwFV98rfKXq2KBphJz95rao7q8PpwT&index=2
- https://www.youtube.com/watch?v=ljDIIMvxeg&list=PLOSWwFV98rfKXq2KBphJz95rao7q8PpwT&index=5
- https://www.youtube.com/watch?v=VQRcChR9IkU&list=PLOSWwFV98rfKXq2KBphJz95rao7q8PpwT&index=18
- https://www.youtube.com/watch?v=3YBXteL-qY4
- https://www.youtube.com/watch?v=z95UW4wwzSc&list=PLOSWwFV98rfKXq2KBphJz95rao7q8PpwT&index=10
- https://www.youtube.com/watch?v=lheoBL2QaqU&list=PLOSWwFV98rfKXq2KBphJz95rao7q8PpwT&index=7
- https://www.youtube.com/watch?v=atoP5_DeTPE
- https://www.youtube.com/watch?v=ksmsp9OzAsI
- https://www.youtube.com/watch?v=x1ef048b3CE
- https://www.youtube.com/watch?v=l_Nck-X49qc
- https://play.google.com/store/apps/details?id=appinventor.ai_jgarc322.Resultant_Force
- https://www.youtube.com/watch?v=RIBeeW1DSZg
- https://www.youtube.com/watch?v=R8wKV0UQtlo
- https://www.youtube.com/watch?v=0RZHHgL8m_A
- https://www.youtube.com/watch?v=Bls5KnQOWkY

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

- https://www.youtube.com/watch?v=Zrc_gB1YYS0
- https://play.google.com/store/apps/details?id=vn.edu.best4u.com.bieudonoiluc
- https://www.youtube.com/watch?v=Hn_iozUo9m4
- https://play.google.com/store/apps/details?id=com.teobou
- https://www.youtube.com/watch?v=WOHRp3V-QA0

Introduction to Electrical Engineering

Course Code for the stream: 22ESC142/22ESC242 **Credits: 03**

L:P:T:S: 3:0:0:0 **CIE Marks: 50**

Exam Hours: 3 **SEE Marks: 50**

Course Type (Theory/Practical/Integrated): Theory

Course Objectives:

1. To explain the laws used in the analysis of DC and AC circuits.
2. To explain the behavior of circuit elements in single-phase circuits.
3. To explain the construction and operation of transformers, DC generators and motors and induction motors.
4. To introduce concepts of circuit protecting devices and earthing.
5. To explain electric power generation, transmission and distribution, electricity billing, equipment and personal safety measures.

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

CO1	Understand the concepts of various energy sources and Electric circuits.
CO2	Apply the basic Electrical laws to solve circuits.
CO3	Discuss the construction and operation of various Electrical Machines.
CO4	Identify suitable Electrical machine for practical implementation.
CO5	Explain the concepts of electric power transmission and distribution, electricity billing, circuit protective devices and personal safety measures.

Mapping of Course outcomes to Program outcomes:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2	1	0	1	1	1	1	0	0	0	1
CO2	3	3	2	1	1	1	0	0	0	0	0	1
CO3	3	2	1	1	1	1	1	1	0	0	0	1
CO4	3	2	2	1	0	1	1	1	0	0	0	1
CO5	3	1	2	0	1	2	1	1	0	0	1	1

Unit	Course content	Hours	COs
1	**Module-1:** **Introduction:** Conventional and non-conventional energy resources; General structure of electrical power systems using single line diagram approach. **Power Generation:** Hydel, Nuclear, Solar & wind power generation (Block Diagram approach). **DC Circuits:** Ohm's Law and its limitations. KCL & KVL, series, parallel, series-parallel circuits. Simple Numerical.	8	CO1
2	**Module-2:** **A.C. Fundamentals:** Equation of AC Voltage and current, waveform, time period, frequency, amplitude, phase, phase difference, average value, RMS value, form factor, peak factor. (Only definitions) Voltage and current relationship with phasor diagrams in R, L, and C circuits. Concept of Impedance. Analysis of R-L, R-C, R-L-C Series circuits. Active power, reactive power and apparent power. Concept of power factor. (Simple Numerical). **Three Phase Circuits:** Generation of Three phase AC quantity, advantages and limitations; star and delta connection, relationship between line and phase quantities (excluding proof).	8	CO1 CO2
3	**Module-3: DC Machines:** **DC Generator:** Faraday's law, Principle of operation, constructional details, induced emf expression, Relation between induced emf and terminal voltage. Simple numerical. **DC Motor:** Principle of operation, back emf and its significance. Torque equation, types of motors, characteristics and speed control (armature & field) of DC motors (series & shunt only). Applications of DC motors. Simple numerical.	8	CO3 CO4
4	**Module-4:** **Transformers:** Necessity of transformer, principle of operation, Types and construction of single- phase transformers, EMF equation, losses, variation of losses with respect to load. Efficiency and simple numerical. **Three-phase induction Motors:** Concept of rotating magnetic field, Principle of operation, constructional features of motor, types – squirrel cage and wound rotor. Slip and its significance simple numerical.	8	CO3 CO4

5	**Module-5:** **Domestic Wiring:** Requirements, Types of wiring: conduit wiring. Two way and three-way control of load. **Electricity Bill:** Power rating of household appliances including air conditioners, PCs, laptops, printers, etc. Definition of "unit" used for consumption of electrical energy, two-part electricity tariff, calculation of electricity bill for domestic consumers. **Equipment Safety measures:** Working principle of Fuse and Miniature circuit breaker (MCB), merits and demerits. **Personal safety measures:** Electric Shock, Earthing and its types, Safety Precautions to avoid shock.	**8**	**CO5**

NOTE: 1. Questions for CIE and SEE not to be set from Self Study Component.

2. Assignment Questions should be only from Self Study Component.

Module 1: Self-study component: Environmental consequences of fossil fuel use, Importance of renewable sources of energy.

Module 2: Self-study component: phasor representation of alternating quantities, Measurement of power by two-wattmeter method (both star and delta connection).

Module 3: Self-study component: Basic laws of magnetic circuits- Faradays laws of electromagnetic induction, Lenz's law, Fleming's rules and its applications.

Module 4: Self-study component: Phasor diagram of Single-phase Transformer on no-load. Star -Delta starter.

Module 5: Self-study component: Concept of extension of range of ammeter, voltmeter (shunt and multiplier). Service mains, meter board and distribution board.

Text books:

1. Basic Electrical Engineering by D C Kulshreshtha, Tata McGraw Hill, First Edition 2019.

2. A text book of Electrical Technology by B.L. Theraja, S Chand and Company, reprint edition 2014.

Reference Books:

1. Basic Electrical Engineering, D. P. Kothari and I. J. Nagrath, Tata McGraw Hill 4th edition, 2019.

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

3. Fundamentals of Electrical Engineering by Rajendra Prasad, PHI, 3rd edition, 2014.

Web links and Video Lectures (e-Resources):

- www.nptel.ac.in

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

- Application-based report writing on electrical devices or machines

Introduction to Electronics Engineering

Course Code for the stream:22ESC143/22ESC243 **Credits : 3**

L:P:T:S : 3:0:0:0 **CIE Marks : 50**

Exam Hours: 3 **SEE Marks: 50**

Course Type (Theory/Practical/Integrated): Theory

Course Objectives:

- Operation of Semiconductor diode and their applications.
- Transistor operation, its biasing.
- Study of linear Op-amps and its applications.
- Logic circuits and their optimization.
- Principles of Communication Systems.

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

CO1	Identify the different building blocks in digital electronics using logic gates and realize simple logic functions
CO2	Understand the fundamental concepts and operation of different basic electronic components and devices
CO3	Apply the concept of transistors and design simple circuits like amplifiers (inverting and non-inverting), adders, integrator and differentiator using OPAMPS.
CO4	Describe the functioning of a communication system, and different modulation techniques
CO5	Appreciate electronic devices and their significance in different applications.
CO6	Understand the concepts of electronic devices and circuits and realize the Applications of Electronics in Interdisciplinary Engineering Domains

Mapping of Course outcomes to Program outcomes:

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

CO3	**3**	2	**2**	-	-	-	-	-	-	-	-	-
CO4	**3**	1	-	-	-	-	-	-	-	-	-	-
CO5	**3**	1	**1**	-	-	-	-	-	-	-	-	-
CO6	**3**	2	**2**	-	-	-	-	-	-	-	-	-

Unit	Course content	Hours	COs
1	**Digital Electronics 1 :** Introduction to Number Systems, Binary Number System, Decimal Number System, Octal Number System, Hexadecimal Number System. Conversion from one number system to another number system, 1's and 2's complement method and their arithmetic. **Digital Electronics 2 :** Binary logic functions, Boolean algebra, De-Morgan's Theorem, Logic gates, Realization of Boolean functions using basic gates, Implementation of logic gates as half & full adder.	**8**	**CO1**
2	**Bipolar Junction Transistors:** P-N Junction Diode – Working principle and Characteristics, BJT - Construction, Operation, Common Base, Common Emitter and Common Collector Characteristics, Numerical examples. **Field Effect Transistor (FET):** Construction, Operation, Transfer Characteristics, p-channel FET - construction, operation and drain characteristics.	**8**	**CO2** **CO3**
3	**Operational Amplifiers :** Introduction, Block diagram representation of OPAMP, Schematic symbol and pin configuration, Ideal and Practical Characteristics of OPAMP, Virtual ground concepts, **OPAMP applications:** Inverting and Non-Inverting amplifiers, Voltage Follower, Summer, Differentiator, Integrator, Numerical.	**8**	**CO3** **CO5**
4	**Communication Systems 1:** Introduction, Elements of Communication Systems, Concept of modulation, methods of modulation - principles of AM, FM. AM / FM transmitters & receivers (block diagram description only). **Communication Systems 2:** Block diagram and Principle of Optical Fiber Communication, Advantages and Applications of Optical Fiber communication.	**8**	**CO4** **CO5**

5	**Applications of Electronics:** Principle of operation of Mobile Phone, GSM Architecture, Generations of Communications, Anti-Lock Braking System (ABS) : Introduction and Block Diagram, Internet of Things (IoT): Introduction, Applications: Smart Home Automation System, IC voltage regulators, Introduction to Microcontroller & Microprocessors& its differences, AI & ML, Robots & Robotics, Applications of AI/ML/Robots/Robotics	**8**	**CO2 CO5 CO6**

Prerequisites:

Module 1:

Basics of number systems

Module 2:

Diode Characteristics

Module 3:

Integration and Differentiation basics

Module 4:

Different blocks in a communication system

Module 5:

How electronics is an important aspect in any engineering application

NOTE: 1. Questions for CIE and SEE not to be set from Self Study Component.

2. Assignment Questions should be only from Self Study Component.

Module 1: Digital – 9's & 10's Compliment methods, Universal gates.
Module 2: Applications of Diodes and transistors.
Module 3: Applications of CMOS Circuits, SCR, UJT.
Module 4: Applications of OPAMPs – Oscillators, Schmitt Trigger
Module 5: Satellite Communication, ISDN, Cloud computing, Electrical & Electronic Instruments, Multimeters

Text books:

1. Electronic Devices and Circuits, David A Bell,5th Edition,Oxford,2016
2. Op-amps and Linear Integrated Circuits, Ramakanth A Gayakwad, Pearson Education,4thEdition

3. Digital Logic and Computer Design, M. Morris Mano, PHI Learning,2008ISBN-978-81-203-0417-8
4. Dr T C Manjunath et. al, "Basic Electronics", 2017, 1st edition, Subhash Publications
5. Electronic Instrumentation and Measurements (3rdEdition)– David A. Bell, Oxford UniversityPress,2013 Electronic Communication Systems, George Kennedy,4th Edition, TMH

Reference books:

1. Mike Tooley, 'Electronic Circuits, Fundamentals & Applications',4th Edition, Elsevier, 2015.DOIhttps://doi.org/10.4324/9781315737980. eBookISBN9781315737980.
2.D P Kothari, I J Nagrath, 'Basic Electronics', 2nd edition, McGraw Hill Education (India),PrivateLimited,2018.

Web links and Video Lectures (e-Resources):

- https://nptel.ac.in/courses/122106025
- https://nptel.ac.in/courses/108105132
- https://nptel.ac.in/courses/117104072
- https://www.rfwireless-world.com
- https://en.wikipedia.org/wiki/Anti-lock_braking_system
- https://en.wikipedia.org/wiki/Internet_of_things
- https://www.synergy.ac.in

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

http://nptel.ac.in
https://swayam.gov.in
https://www.electronics-notes.com/articles/basic_concepts/
https://www.vssut.ac.in/lecture_notes/lecture1423726156.pdf

Essential Mathematics – II for Civil Stream

Course Code for the stream : 22MATC21 **Credits 4**

L:P:T:S : 2:2:2:0 **CIE Marks 50**

Exam Hours : 3 **SEE Marks 50**

Course Type (Theory/Practical/Integrated): Integrated

Course Objectives:

1. To explain the importance of Integral calculus and Vector calculus essential for Civil engineering
2. To introduce methods for Solving Ordinary Differential Equations to Civil Engineering problems
3. To develop the knowledge of solving Civil Engineering problem numerically

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

CO1	Acquire knowledge of Integral & Vector Calculus, classify differential equations and their general structure of solutions and learn Numerical techniques to obtain approximate solution to Civil Engineering problems
CO2	Solve differential equations, differentiate vector fields evaluate Surface, Volume Integral and apply numerical methods to solve real life problems
CO3	Determine solutions of differential equations, calculate work, flux using vector calculus and evaluate the accuracy of common numerical methods.
CO4	Interpret solutions of differential equations in physical context, evaluate line, surface & volume integrals, analyze numerical results in an informative way.
CO5	Demonstrate various physical models and Engineering Phenomena through Differential Equations, Vector calculus, PDE and Numerical Methods analytically and also using WXMAXIMA software

Mapping of Course outcomes to Program outcomes:

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

Unit	Course content	Hours	COs
1	**Module – 1: Integral Calculus** **Multiple integrals:** Evaluation of double integrals, changing the order of integration and changing into polar co-ordinates. Evaluation of triple integrals. **Beta and Gamma functions**- Relation between Beta and Gamma Integral, Duplication formula proof – Problems. **Applications:** Applications to mathematical quantities (Area, Surface area, Volume). **(RBT Levels: L1, L2 and L3)**	**8**	**CO1 – CO5**
2	**Module – 2 : Vector Calculus** **Vector Differentiation:** Scalar and Vector fields, Gradient, Directional Derivative; Curl and Divergence-physical interpretation; Solenoidal and Irrotational vector fields-problems. **Vector Integration:** Line integrals, Surface integrals. Applications to work done by a force and flux. Statement of Green's theorem, Stoke's theorem and Gauss divergence theorem. Problems. **Applications**: Analysis of velocity and acceleration of a moving particle. **(RBT Levels: L1, L2 and L3)**	**8**	**CO1 – CO5**
3	**Module – 3: Linear Differential Equations** **Linear Differential Equations with Constant Coefficients:** Second and higher order linear Ordinary Differential Equations with Constant coefficients- General solution of Homogeneous Equations, Method of finding Particular Solution- Inverse Differential operator Method. **Linear Differential Equations with variable Coefficients:** Legendre Differential Equations and Cauchy differential equations. **Applications:** Free oscillations of a spring and L-C-R circuits **(RBT Levels: L1, L2 and L3)**	**8**	**CO1 – CO5**
4	**Module – 4: Partial Differential Equations:** Formation of PDE by Elimination of arbitrary constants and arbitrary functions. Solution of Homogenous PDE. Solution of Lagrange's linear PDE. Solution of PDE by Variable Separable Method. **Application:** Solution of one-dimensional heat and wave equations. **(RBT Levels: L1, L2 and L3)**	**8**	**CO1 – CO5**
5	**Module – 5: Numerical Methods – II** Finite differences, Interpolation/extrapolation using Newton's forward and backward difference formulae, Newton's divided difference and Lagrange's formulae (All formulae without proof). **Numerical integration:** Simpson's (1/3)rd and (3/8)th rules, Weddle's rule (without proof)– Problems **Applications:** Finding approximate solutions to electrical & electronics engineering problems. **(RBT Levels: L1, L2 and L3)**	**8**	**CO1 – CO5**

Prerequisites:

Module 1: Pre-requisite: Evaluation of definite Integrals
Module 2: Pre-requisite: Vector Algebra
Module 3: Pre-requisite: Basic Calculus
Module 4: Pre-requisite: Multi Variable functions
Module 5: Pre-requisite: Shifting Operator

NOTE: 1. Questions for CIE and SEE not to be set from Self Study Component.

2. Assignment Questions should be only from Self Study Component.

Module 1: Self-study component: Orthogonal Curvilinear Coordinates – Spherical Coordinates.
Module 2: Self-study component: Gauss divergence and Stoke's theorem – Proof.
Module 3: Self-study component: Method of Variation of Parameters.
Module 4: Self-study component: Solution by method of Direct Integration
Module 5: Self-study component: Numerical Differentiation.

Text books:

1. B.S. Grewal, "Higher Engineering Mathematics" Khanna Publishers, 44th Edition, 2021 June, ISBN: 9788193328491.
2. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons, 9th Edition, 2007, ISBN: 9788126531356.
3. C Ray Wylie, "Advanced Engineering Mathematics", Tata McGraw Hill Education publishers, 1975, ISBN 13: 9780071135436.
4. Schaum's Outline of Advanced Mathematics for Engineers and Scientists, Tata McGraw Hill Education publishers, 1971, (Revised) ISBN-13:9780070606142.
5. M. K. Jain, S. R. K. Iyengar & R. K. Jain "Numerical Methods: For Scientific & Engineering Computation", New Age International Publications, 6th Ed, 2012, ISBN: 9788122433234

Reference books:

1. H. K. Dass and Er. Rajnish Verma, "Higher Engineering Mathematics", Third Edition, 2014, ISBN: 9788121938907.
2. N.P. Bali and Manish Goyal, "A text book of Engineering Mathematics", Laxmi Publications, 8thEdition, 2011, ISBN: 9788131808320.
3. R.K. Jain and S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publishing House, 2002, ISBN: 8173194203.
4. Murray Speigel, Schaum's Outline of "Advanced Mathematics for Engineers and Scientists" McGraw-Hill, 1971; ISBN: 9780070602168.
5. B. V. Ramana, "Higher Engineering Mathematics", Tata McGraw-Hill, 2006; ISBN: 9780070634190.

Web links and Video Lectures (e-Resources):

- https://nptel.ac.in/courses/111105122
- https://nptel.ac.in/courses/111105122
- https://nptel.ac.in/courses/111108081
- https://nptel.ac.in/courses/111103021
- https://nptel.ac.in/courses/111106101

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

- https://www.mb.uni-siegen.de/kobelev/maxima.pdf
- https://www.ms.uky.edu/
- https://www.youtube.com/playlist?list=PLEDEE2F7C6750729F

Essential Mathematics II - EE Stream

Course Code for the stream: 22MATE21 **Credits 4**

L:P:T:S : 2:2:2:0 **CIE Marks 50**

Exam Hours : 3 **SEE Marks 50**

Course Type (Theory/Practical/Integrated): Integrated

Course Objectives:

1. To explain the importance of Integral calculus and Vector calculus essential for Electrical engineering
2. To introduce methods for Solving Ordinary Differential Equations to Electrical Engineering problems
3. To familiarize Numerical methods to Solve Equation, Interpolate and evaluate Integration numerically

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

CO1	Acquire knowledge of Integral Vector Calculus, classify differential equations and their general structure of solutions and learn Numerical techniques to obtain approximate solution
CO2	Solve differential equations, differentiate vector fields evaluate Surface, Volume Integral and apply numerical methods to solve real life problems
CO3	Determine solutions of differential equations, calculate work, flux using vector calculus and evaluate the accuracy of common numerical methods.
CO4	Interpret solutions of differential equations in physical context, evaluate line, surface & volume integrals, and analyze numerical results in an informative way.
CO5	Demonstrate various physical models and Engineering Phenomena through Differential Equations, Vector calculus analytically and numerically using WXMAXIMA software

Mapping of Course outcomes to Program outcomes:

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

Unit	Course content	Hours	COs
1	**Module – 1: Integral Calculus** **Multiple integrals:** Evaluation of double integrals, changing the order of integration and changing into polar co-ordinates. Evaluation of triple integrals. **Beta and Gamma functions**- Relation between Beta and Gamma Integral, Duplication formula proof – Problems. **Applications:** Applications to mathematical quantities (Area, Surface area, Volume). **(RBT Levels: L1, L2 and L3)**	8	CO1 – CO5
2	**Module – 2 : Vector Calculus** **Vector Differentiation:** Scalar and Vector fields, Gradient, Directional Derivative; Curl and Divergence-physical interpretation; Solenoidal and Irrotational vector fields-problems. **Vector Integration:** Line integrals, Surface integrals. Applications to work done by a force and flux. Statement of Green's theorem, Stoke's theorem and Gauss divergence theorem. Problems. **Applications**: Analysis of velocity and acceleration of a moving particle. **(RBT Levels: L1, L2 and L3)**	8	CO1 – CO5
3	**Module – 3: Linear Differential Equations** **Linear Differential Equations with Constant Coefficients:** Second and higher order linear Ordinary Differential Equations with Constant coefficients- General solution of Homogeneous Equations, Method of finding Particular Solution- Inverse Differential operator Method. **Linear Differential Equations with variable Coefficients:** Legendre Differential Equations and Cauchy differential equations. **Applications:** Free oscillations of a spring and L-C-R circuits **(RBT Levels: L1, L2 and L3)**	8	CO1 – CO5
4	**Module – 4: Numerical Methods – I** **Roots of an Equation:** Solution of Algebraic and Transcendental Equations – Newton-Raphson and Regula-Falsi Methods (only formulae)-Problems **Solution of System of Non-homogeneous Equations:** Solution of Linear Simultaneous Equations - Iteration methods: Gauss Jacobi's method, Gauss-Seidal method. **Applications:** Eigen values and Eigen vectors-Rayleigh's power method **(RBT Levels: L1, L2 and L3)**	8	CO1 – CO5
5	**Module – 5: Numerical Methods – II** Finite differences, Interpolation/extrapolation using Newton's forward and backward difference formulae, Newton's divided difference and Lagrange's formulae (All formulae without proof). **Numerical integration:** Simpson's (1/3)rd and (3/8)th rules, Weddle's rule (without proof)– Problems **Applications:** Finding approximate solutions to electrical & electronics engineering problems. **(RBT Levels: L1, L2 and L3)**	8	CO1 – CO5

Prerequisites:

Module 1: Pre-requisite: Evaluation of definite Integrals

Module 2: Pre-requisite: Vector Algebra

Module 3: Pre-requisite: Basic Calculus

Module 4: Pre-requisite: Analytical Methods to solve equations.

Module 5: Pre-requisite: Shifting Operator

NOTE: 1. Questions for CIE and SEE not to be set from Self Study Component.

2. Assignment Questions should be only from Self Study Component.

Module 1: Self-study component: Orthogonal Curvilinear Coordinates – Spherical Coordinates.

Module 2: Self-study component: Gauss divergence and Stoke's theorem – Proof.

Module 3: Self-study component: Method of Variation of Parameters.

Module 4: Self-study component: Bisection Method & Trapezoidal rule.

Module 5: Self-study component: Numerical Differentiation.

Text books:

1. B.S. Grewal, "Higher Engineering Mathematics" Khanna Publishers, 44th Edition, 2021 June, ISBN: 9788193328491.
2. Erwin Kreyszig; Advanced Engineering Mathematics; John Wiley & Sons, 9th Edition, 2007, ISBN: 9788126531356.
3. H. K. Dass and Er. Rajnish Verma: Higher Engineering Mathematics; S. Chand Publication, 3rd Ed., 2014, ISBN:9788121938907.
4. Srimanta Pal and Subobh C. Bhunia, Engineering Mathematics: Oxford University press, 3rd Edition,2016: 9780198070894.
5. R.K. Jain and S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publishing House, 2002, ISBN: 8173194203.

Reference books:

1. N.P. Bali and Manish Goyal, "A text book of Engineering Mathematics", Laxmi Publications, 8thEdition, 2011, ISBN: 9788131808320.
2. Schaum's Outline of Advanced Mathematics for Engineers and Scientists, Tata McGraw Hill Education publishers, 1971, (Revised) ISBN-13:9780070606142
3. B. V. Ramana, "Higher Engineering Mathematics", Tata McGraw-Hill, 2006; ISBN: 9780070634190.
4. Murray Speigel, Schaum's Outline of "Advanced Mathematics for Engineers and Scientists" McGraw-Hill, 1971; ISBN: 9780070602168.
5. M. K. Jain, S. R. K. Iyengar, and R. K. Jain "Numerical Methods: For Scientific and Engineering Computation", New Age International Publications, 6 th Edition, 2012, ISBN: 9788122433234

Web links and Video Lectures (e-Resources):

- https://nptel.ac.in/courses/111106146
- https://onlinecourses.nptel.ac.in/noc22_ma03/preview
- https://nptel.ac.in/courses/111106100
- https://archive.nptel.ac.in/courses/111/107/111107105/
- https://www.digimat.in/nptel/courses/video/111107105/L18.html

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

- https://www.mb.uni-siegen.de/kobelev/maxima.pdf
- https://www.ms.uky.edu/ lee/amspalg05/MaximaTutorial.pdf
- https://www.youtube.com/playlist?list=PLEDEE2F7C6750729F

Essential Mathematics II - ME Stream

Course Code for the stream : 22MATM21 **Credits 4**

L:P:T:S : 2:2:2:0 **CIE Marks 50**

Exam Hours : 3 **SEE Marks 50**

Course Type (Theory/Practical/Integrated): Integrated

Course Objectives:

1. To explain the importance of Integral calculus and Vector calculus essential for Mechanical engineering
2. To Introduce methods for Solving Ordinary and Partial Differential Equations to Mechanical Engineering problems
3. To Familiarize Numerical methods to Solve Equation, Interpolate and evaluate Integration numerically

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

CO1	Acquire knowledge of Integral &Vector Calculus, classify differential equations and their general structure of solutions and learn Numerical techniques to obtain approximate solution to Mechanical Engineering problems
CO2	Solve differential equations, differentiate vector fields evaluate Surface, Volume Integral and apply numerical methods to solve real life problems
CO3	Determine solutions of differential equations, calculate work, flux using vector calculus and evaluate the accuracy of common numerical methods.
CO4	Interpret solutions of differential equations in physical context, evaluate line, surface & volume integrals, analyze numerical results in an informative way.
CO5	Demonstrate various Flow models and Engineering Phenomena through Differential Equations, Vector calculus, PDE and Numerical Methods analytically and also using WXMAXIMA software

Mapping of Course outcomes to Program outcomes:

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

Unit	Course content	Hours	COs
1	**Module – 1: Integral Calculus** **Multiple integrals:** Evaluation of double integrals, changing the order of integration and changing into polar co-ordinates. Evaluation of triple integrals. **Beta and Gamma functions**- Relation between Beta and Gamma Integral, Duplication formula proof – Problems. **Applications:** Applications to mathematical quantities (Area, Surface area, Volume). **(RBT Levels: L1, L2 and L3)**	**8**	**CO1 – CO5**
2	**Module – 2: Vector Calculus** **Vector Differentiation:** Scalar and Vector fields, Gradient, Directional Derivative; Curl and Divergence-physical interpretation; Solenoidal and Irrotational vector fields-problems. **Vector Integration:** Line integrals, Surface integrals. Applications to work done by a force and flux. Statement of Green's theorem, Stoke's theorem and Gauss divergence theorem. Problems. **Applications**: Analysis of velocity and acceleration of a moving particle. **(RBT Levels: L1, L2 and L3)**	**8**	**CO1 – CO5**
3	**Module – 3: Linear Differential Equations** **Linear Differential Equations with Constant Coefficients:** Second and higher order linear Ordinary Differential Equations with Constant coefficients- General solution of Homogeneous Equations, Method of finding Particular Solution- Inverse Differential operator Method. **Linear Differential Equations with variable Coefficients:** Legendre Differential Equations and Cauchy differential equations. **Applications:** Free oscillations of a spring and L-C-R circuits **(RBT Levels: L1, L2 and L3)**	**8**	**CO1 – CO5**
4	**Module – 4: Partial Differential Equations:** Formation of PDE by Elimination of arbitrary constants and arbitrary functions. Solution by method of Direct Integration. Solution of Lagrange's linear PDE. Solution of PDE by Variable Separable Method. **Application:** Solution of one-dimensional heat and wave equations. **(RBT Levels: L1, L2 and L3)**	**8**	**CO1 – CO5**
5	**Module – 5: Numerical Methods – II** Finite differences, Interpolation/extrapolation using Newton's forward and backward difference formulae, Newton's divided difference and Lagrange's formulae (All formulae without proof). **Numerical integration:** Simpson's (1/3)rd and (3/8)th rules, Weddle's rule (without proof)– Problems **Applications:** Finding approximate solutions to electrical & electronics engineering problems. **(RBT Levels: L1, L2 and L3)**	**8**	**CO1 – CO5**

Prerequisites:

Module 1: Pre-requisite: Evaluation of definite Integrals
Module 2: Pre-requisite: Vector Algebra
Module 3: Pre-requisite: Basic Calculus
Module 4: Pre-requisite: Multi Variable functions
Module 5: Pre-requisite: Shifting Operator

NOTE: 1. Questions for CIE and SEE not to be set from Self Study Component.

2. Assignment Questions should be only from Self Study Component.

Module 1: Self-study component: Orthogonal Curvilinear Coordinates – Spherical Coordinates.
Module 2: Self-study component: Gauss divergence and Stoke's theorem – Proof.
Module 3: Self-study component: Method of Variation of Parameters.
Module 4: Self-study component: Solution of Homogenous PDE
Module 5: Self-study component: Numerical Differentiation.

Text books:

1. B.S. Grewal, "Higher Engineering Mathematics" Khanna Publishers, 44th Edition, 2021 June, ISBN: 9788193328491.
2. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons, 9th Edition, 2007, ISBN: 9788126531356.
3. C Ray Wylie, "Advanced Engineering Mathematics", Tata McGraw Hill Education publishers, 1975, ISBN 13: 9780071135436.
4. Schaum's Outline of Advanced Mathematics for Engineers and Scientists, Tata McGraw Hill Education publishers, 1971, (Revised) ISBN-13:9780070606142.
5. M. K. Jain, S. R. K. Iyengar & R. K. Jain "Numerical Methods: For Scientific & Engineering Computation", New Age International Publications, 6th Ed, 2012, ISBN: 9788122433234

Reference books:

1. H. K. Dass and Er. Rajnish Verma, "Higher Engineering Mathematics", Third Edition, 2014, ISBN: 9788121938907.
2. N.P. Bali and Manish Goyal, "A textbook of Engineering Mathematics", Laxmi Publications, 8th Edition, 2011, ISBN: 9788131808320.
3. R.K. Jain and S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publishing House, 2002, ISBN: 8173194203.
4. Murray Speigel, Schaum's Outline of "Advanced Mathematics for Engineers and Scientists "Mc Graw-Hill, 1971; ISBN: 9780070602168.
5. B. V. Ramana, "Higher Engineering Mathematics", Tata McGraw-Hill, 2006; ISBN: 9780070634190.

Web links and Video Lectures (e-Resources):

- https://nptel.ac.in/courses/111105122
- https://nptel.ac.in/courses/111105122
- https://nptel.ac.in/courses/111108081
- https://nptel.ac.in/courses/111103021
- https://nptel.ac.in/courses/111106101
- http://academicearth.org/

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

- https://www.mb.uni-siegen.de/kobelev/maxima.pdf
- https://www.ms.uky.edu/
- https://www.youtube.com/playlist?list=PLEDEE2F7C6750729F

Essential Mathematics II-CSE stream

Course Code for the stream: 22MATS21 **Credits 4**

L:P:T:S : 2:2:2:0 **CIE Marks 50**

Exam Hours : 3 **SEE Marks 50**

Course Type (Theory/Practical/Integrated): Integrated

Course Objectives:

1. To explain the importance of Integral calculus and Vector calculus essential for Computer Science engineering.
2. To introduce methods for fitting a curve and methods to Solve Ordinary Differential Equations.
3. To familiarize Numerical methods to Solve Equation, Interpolate and evaluate Integration numerically

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

CO1	Acquire knowledge of Integral &Vector Calculus, classify differential equations, learn descriptive statistics & Numerical techniques to obtain approximate solution
CO2	Analyze data, solve differential equations, evaluate Surface, Volume Integral and apply numerical methods to solve real life problems
CO3	Determine solutions of differential equations, calculate work, flux using vector calculus, fit a best fit curve and evaluate the accuracy of common numerical methods.
CO4	Interpret data and solutions of differential equations in physical context, evaluate line, surface & volume integrals, and analyze numerical results in an informative way.
CO5	Apply data analysis using Statistics, Model and solve Engineering Phenomena through Differential Equations, Vector calculus analytically and numerically using WXMAXIMA software

Mapping of Course outcomes to Program outcomes:

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

Unit	Course content	Hours	COs
1	**Module – 1: Integral Calculus** **Multiple integrals:** Evaluation of double integrals, changing the order of integration and changing into polar co-ordinates. Evaluation of triple integrals. **Beta and Gamma functions**- Relation between Beta and Gamma Integral, Duplication formula proof – Problems. **Applications:** Applications to mathematical quantities (Area, Surface area, Volume). **(RBT Levels: L1, L2 and L3)**	**8**	**CO1 – CO5**
2	**Module – 2 : Vector Calculus** **Vector Differentiation:** Scalar and Vector fields, Gradient, Directional Derivative; Curl and Divergence-physical interpretation; Solenoidal and Irrotational vector fields-problems. **Vector Integration:** Line integrals, Surface integrals. Applications to work done by a force and flux. Statement of Green's theorem, Stoke's theorem and Gauss divergence theorem. Problems. **Applications**: Analysis of velocity and acceleration of a moving particle. **(RBT Levels: L1, L2 and L3)**	**8**	**CO1 – CO5**
3	**Module – 3: Linear Differential Equations** **Linear Differential Equations with Constant Coefficients:** Second and higher order linear Ordinary Differential Equations with Constant coefficients- General solution of Homogeneous Equations, Method of finding Particular Solution- Inverse Differential operator Method.. **Linear Differential Equations with variable Coefficients:** Legendre Differential Equations and Cauchy differential equations. **Applications:** Free oscillations of a spring and L-C-R circuits **(RBT Levels: L1, L2 and L3)**	**8**	**CO1 – CO5**
4	**Module – 4: Statistics** **Statistics Modeling:** Analyzing a data - Mean, Standard deviation-Combination of two groups. Correlation – Coefficient of Correlation, Linear Regression. **Curve Fitting**: Curve fitting by the method of least squares, Fitting a straight line and parabola. **Application**: Case Study. **(RBT Levels: L1, L2 and L3)**	**8**	**CO1 – CO5**
5	**Module – 5: Numerical Methods – II** Finite differences, Interpolation/extrapolation using Newton's forward and backward difference formulae, Newton's divided difference and Lagrange's formulae (All formulae without proof). **Numerical integration:** Simpson's (1/3)rd and (3/8)th rules, Weddle's rule (without proof)– Problems **Applications:** Finding approximate solutions to electrical & electronics engineering problems. **(RBT Levels: L1, L2 and L3)**	**8**	**CO1 – CO5**

Prerequisites:

Module 1: Pre-requisite: Evaluation of definite Integrals
Module 2: Pre-requisite: Vector Algebra
Module 3: Pre-requisite: Basic Calculus
Module 4: Pre-requisite: Classification of data.
Module 5: Pre-requisite: Shifting Operator

NOTE: 1. Questions for CIE and SEE not to be set from Self Study Component.

2. Assignment Questions should be only from Self Study Component.

Module 1: Self-study component: Orthogonal Curvilinear Coordinates – Spherical Coordinates.
Module 2: Self-study component: Gauss divergence and Stoke's theorem – Proof.
Module 3: Self-study component: Method of Variation of Parameters.
Module 4: Self-study component: Fitting of Exponential Curve, Covariance
Module 5: Self-study component: Numerical Differentiation.

Text books:

1. B.S. Grewal, "Higher Engineering Mathematics" Khanna Publishers, 44th Edition, 2021 June, ISBN: 9788193328491.
2. Erwin Kreyszig; Advanced Engineering Mathematics; John Wiley & Sons, 9th Edition, 2007, ISBN: 9788126531356.
3. H. K. Dass and Er. Rajnish Verma: Higher Engineering Mathematics; S. Chand Publication, 3rd Ed., 2014, ISBN: 9788121938907.
4. Srimanta Pal and Subobh C. Bhunia, Engineering Mathematics: Oxford University press, 3rd Edition, 2016: 9780198070894.
5. R.K. Jain and S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publishing House, 2002, ISBN: 8173194203.

Reference books:

1. N.P. Bali and Manish Goyal, "A text book of Engineering Mathematics", Laxmi Publications, 8thEdition, 2011, ISBN: 9788131808320.
2. Schaum's Outline of Advanced Mathematics for Engineers and Scientists, Tata McGraw Hill Education publishers, 1971, (Revised) ISBN-13:9780070606142
3. B. V. Ramana, "Higher Engineering Mathematics", Tata McGraw-Hill, 2006; ISBN: 9780070634190.
4. Murray Speigel, Schaum's Outline of "Advanced Mathematics for Engineers and Scientists" McGraw-Hill, 1971; ISBN: 9780070602168.
5. M. K. Jain, S. R. K. Iyengar, and R. K. Jain "Numerical Methods: For Scientific and Engineering Computation", New Age International Publications, 6 th Edition, 2012, ISBN: 9788122433234

Web links and Video Lectures (e-Resources):

- https://nptel.ac.in/courses/111106146
- https://onlinecourses.nptel.ac.in/noc22_ma03/preview
- https://nptel.ac.in/courses/111106100
- https://nptel.ac.in/courses/111105042
- https://www.digimat.in/nptel/courses/video/111107105/L18.html

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

- https://www.mb.uni-siegen.de/kobelev/maxima.pdf
- https://www.ms.uky.edu/ lee/amspalg05/MaximaTutorial.pdf
- https://www.youtube.com/playlist?list=PLEDEE2F7C6750729F

APPLIED CHEMISTRY -CS Stream

Course Code: 22CHES12/22 **Credits : 4**

L:P:T:S : 3:2:0:0 **CIE Marks : 50**

Exam Hours : 3 **SEE Marks : 50**

Course Type (Theory/Practical/Integrated): Integrated

Course objectives

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

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

CO1.	Identify the terms and principles of Chemistry involved in scientific Engineering and Technology
CO2.	Explain the phenomenon of Chemistry to describe the methods of Engineering processes and syntheses
CO3.	Solve the problems of Chemistry that are pertinent in socio-economic and environmental issues.
CO4.	Apply the basic concepts of Chemistry in quantification of industrially relevant parameters.
CO5.	Analyze the structure, properties and processes associated with chemical substances in multidisciplinary situations

Mapping of Course outcomes to Program outcomes:

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

Unit	Course content	Hours	COs
1	**MODULE 1: Corrosion and Electrode system** **Corrosion chemistry:** Introduction, electrochemical theory of corrosion, types-differential metal, differential aeration, Factor affecting rate of corrosion, corrosion control-galvanization, sacrificial anode method and impressed current method. Corrosion penetration rate (CPR) - introduction and numerical problem. **Electrode system:** Introduction, types of electrodes, Ion selective electrode – definition, construction, working and applications of glass electrode. Determination of pH using glass electrode. Reference electrode: Introduction, calomel electrode – construction, working and applications of calomel electrode. Concentration cell – Definition, construction and Numerical problems.	8	CO1-5
2	**MODULE 2: Polymers and Green Energy** **Polymers:** Introduction, Molecular weight - Number average, weight average and numerical problems, Conducting polymers – synthesis and conducting mechanism of polyacetylene and commercial applications. Preparation, properties, and commercial applications of graphene oxide. **Green energy:** Introduction, construction and working of solar photovoltaic cell, advantages and disadvantages. Production of solar grade silicon (Union carbide process), zone refining. Introduction, construction and working of organic solar cell (OSC), Quantum dots sensitized solar cells (QDSSC's)- principle, properties and Applications **Hydrogen energy**- types and method of production of hydrogen, Generation of energy (green hydrogen) from water electrolysis, advantages and disadvantages.	8	CO1-5
3	**MODULE 3: E-Waste Management, Water and Nano-technology** **E-Waste:** Introduction, sources, types, effects of e-waste on environment and human health, methods of disposal, advantages of recycling. Extraction of gold from e-waste. **Water technology:** Introduction, hardness of water, types, determination of hardness by EDTA method, disadvantages of hard water, removal of hardness by ion exchange method. BOD and COD - introduction and their significance in waste water treatment, experimental determination of COD of waste water - numericals on COD. **Nanomaterials:** Introduction, Classification, types, size dependent properties of nanomaterials (Surface area, optical, electrical), preparation of nanomaterials by sol-gel and solution combustion method.	8	CO1-5
4	**MODULE 4: Sensors and Energy Systems** **Sensors:** Introduction, working principle and applications of Electrochemical sensors: Conductometric sensors, Thermometric sensors, Optical sensors. Gas sensor- sensing for NOx. **Analytical techniques:** Introduction, principle and instrumentation: Conductometry – estimation of weak acid, Potentiometry – estimation of iron, Colorimetry-estimation of Copper.	8	CO1-5

	Energy Systems: Introduction, classification and components of batteries. Construction, working and applications of Lithium ion and Sodium ion batteries. **Fuel Cells:** Introduction, construction, working and applications of methanol–oxygen fuel cell.		
5	**MODULE 5: Materials for Memory and Display Systems** **Introduction:** Basic concepts of electronic memory, Classification of electronic memory devices, types of organic memory devices (organic molecules, polymeric materials, organic-inorganic hybrid materials). **Display Systems:** Photoactive and electroactive materials, Nanomaterials, organic materials used in optoelectronic devices. Jablonski Diagram. Liquid crystals (LC's) - Introduction, classification, properties and application in Liquid Crystal Displays systems (LCD's). Organic Light Emitting Diodes (OLED's) - properties and applications. Quantum Dot Light emitting diodes (QLED's) - properties and applications. Light emitting electrochemical cells- properties and applications.	**8**	**CO1-5**

PRACTICAL MODULE

A – Demonstration (any two) offline/virtual:

A1. Chemical Structure drawing using software: ChemDraw or ACD/ChemSketch

A2: Synthesis of Iron-oxide Nanoparticles

B – Exercise (compulsorily any 3 to be conducted):

B1. Conductometric estimation of acid mixture

B2. Potentiometric estimation of FAS using $K_2Cr_2O_7$

B3. Determination of pKa of vinegar using pH sensor (Glass electrode)

B4. Determination of rate of corrosion of mild steel by weight loss method

C – Structured Enquiry (compulsorily any 3 to be conducted): **24** **CO4-5**

C1. Estimation of Copper present in electroplating effluent by optical sensor (colorimetry) C2. Determination of Viscosity coefficient of lubricant (Ostwald's viscometer)

C3. Estimation of iron in TMT bar by diphenyl amine method

C4. Estimation of Sodium present in soil/effluent sample using flame photometer

D– Open Ended Experiments (any two):

D1: Evaluation of acid content in beverages by using pH sensors and simulation.

D2. Design an experiment to Identify the presence of proteins in given sample.

Prerequisites:

Module 1:

Pre-requisite: Basics of electrochemical theory

Module 2:

Pre-requisite: Basics of polymers and semiconductors

Module 3:

Pre-requisite: Basics of waste management and water parameters

Module 4:

Pre-requisite: Basics of electrochemical sensing and analytical techniques.

Module 5:

Pre-requisite: Basics of optoelectronics.

NOTE: 1. Questions for CIE and SEE not to be set from Self Study Component.

2. Assignment Questions should be only from Self Study Component.

Self-study component:

Module 1: Impact of heavy metals on environment and human health.

Module 2: Properties and functions of Silicon (Si), Germanium (Ge), Copper (Cu), Aluminum (Al), and Brominated flame retardants in computers **Module 3:** Recycling of PCB and battery components

Module 4: Regenerative fuel cells

Module 5: Type of electrochemical sensors. Gas sensor- O_2 sensor, biosensor- Glucose sensors.

Text books:

Suggested Learning Resources:

Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)

1. Wiley Engineering Chemistry, Wiley India Pvt. Ltd. New Delhi, 2013- 2nd Edition.
2. Engineering Chemistry, Satyaprakash & Manisha Agrawal, Khanna Book Publishing, Delhi
3. A Text Book of Engg. Chemistry, Shashi Chawla, Dhanpat Rai & Co. (P) Ltd.
4. Essentials of Physical Chemistry, Bahl&Tuli, S.Chand Publishing
5. Applied Chemistry, Sunita Rattan, Kataria 5. Engineering Chemistry, Baskar, Wiley
6. Engineering Chemistry – I, D. Grour Krishana, Vikas Publishing
7. A Text book of Engineering Chemistry, SS Dara & Dr. SS Umare, S Chand & Company Ltd., 12th Edition, 2011.
8. A Text Book of Engineering Chemistry, R.V. Gadag and Nityananda Shetty, I. K. International Publishing house. 2nd Edition, 2016.
9. Text Book of Polymer Science, F.W. Billmeyer, John Wiley & Sons, 4th Edition, 1999.
10. Nanotechnology A Chemical Approach to Nanomaterials, G.A. Ozin & A.C. Arsenault, RSC Publishing, 2005.
11. Corrosion Engineering, M. G. Fontana, N. D. Greene, McGraw Hill Publications, New York, 3rd Edition, 1996.

Reference books:

1. Linden's Handbook of Batteries, Kirby W. Beard, Fifth Edition, McGraw Hill, 2019.
2. OLED Display Fundamentals and Applications, Takatoshi Tsujimura, Wiley–Blackwell , 2012

3. Supercapacitors: Materials, Systems, and Applications, Max Lu, Francois Beguin, Elzbieta Frackowiak, Wiley-VCH; 1st edition, 2013.
4. "Handbook on Electroplating with Manufacture of Electrochemicals", ASIA PACIFIC BUSINESS PRESS Inc., 2017. Dr. H. Panda,
5. Expanding the Vision of Sensor Materials. National Research Council 1995, Washington, DC: The National Academies Press. doi: 10.17226/4782.
6. Engineering Chemistry, Edited by Dr. Mahesh B and Dr. Roopashree B, Sunstar Publisher, Bengaluru, ISBN 978-93-85155-70-3, 2022
7. High Performance Metallic Materials for Cost Sensitive Applications, F. H. Froes, et al. John Wiley & Sons, 2010
8. Instrumental Methods of Analysis, Dr. K. R. Mahadik and Dr. L. Sathiyanarayanan, Nirali Prakashan, 2020
9. Principles of Instrumental Analysis, Douglas A. Skoog, F. James Holler, Stanley R. Crouch Seventh Edition, Cengage Learning, 2020
10. Polymer Science, V R Gowariker, N V Viswanathan, Jayadev, Sreedhar, Newage Int. Publishers, 4th Edition, 2021
11. Engineering Chemistry, P C Jain & Monica Jain, Dhanpat Rai Publication, 2015-16th Edition.
12. Nanostructured materials and nanotechnology, Hari Singh, Nalwa, academic press, 1st Edition, 2002.
13. Nanotechnology Principles and Practices, Sulabha K Kulkarni, Capital Publishing Company, 3rd Edition 2014
14. Principles of nanotechnology, Phanikumar, Scitech publications, 2nd Edition, 2010.
15. Chemistry for Engineering Students, B. S. Jai Prakash, R. Venugopal, Sivakumaraiah & Pushpa Iyengar., Subash Publications, 5th Edition, 2014"Engineering Chemistry", O. G. Palanna, Tata McGraw Hill Education Pvt. Ltd. New Delhi, Fourth Reprint, 2015

Web links and Video Lectures (e-Resources):

- http://libgen.rs/
- https://nptel.ac.in/downloads/122101001/
- https://nptel.ac.in/courses/104/103/104103019/
- https://ndl.iitkgp.ac.in/
- https://www.youtube.com/watch?v=faESCxAWR9k
- https://www.youtube.com/watch?v=TBqXMWaxZYM&list=PLyhmwFtznRhuz8L1bb3X-9IbHrDMjHWWh
- https://www.youtube.com/watch?v=j5Hml6KN4TI
- https://www.youtube.com/watch?v=X9GHBdyYcyo
- https://www.youtube.com/watch?v=1xWBPZnEJk8
- https://www.youtube.com/watch?v=wRAo-M8xBHM

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

- https://www.vlab.co.in/broad-area-chemical-sciences
- https://demonstrations.wolfram.com/topics.php
- https://interestingengineering.com/science

APPLIED PHYSICS - CIVIL stream

Course Code : 22PHYC22 **Credits : 3**

L:P:T:S : 3:0:0:0 **CIE Marks : 50**

Exam Hours : 3 **SEE Marks : 50**

Course objectives:

1. To give hands on experience on various experiments.
2. To acquire knowledge in various techniques and working principles in Physics.
3. To impart knowledge in the field of semiconductors and their applications.
4. To train students in techniques and principles related to various devices orcomponents.
5. To acquire ability to use measuring instruments.
6. To assess the importance of Optics, Modern Physics and Engineering.

Course Outcomes: After completion of the course, the graduates will be able to

CO1	Distinguish the principles of Classical Physics and Modern Physics.
CO2	Analyze different materials for various scientific applications.
CO3	Apply the acquired knowledge in Physics, Nano science and Quantum computing for future applications.
CO4	Develop the ability to use concepts of Physics for the working components like capacitors, diodes and transistors and various measuring instruments like ammeters, voltmeters and signal generators.

Mapping of Course outcomes to Program outcomes:

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

Unit	Course content	Hours	COs
1	**Modern Physics:** Black body radiation spectrum, Weins law, Rayleigh Jeans law, Planck's Law, Derivation of Weins law and Rayleigh Jeans law from Planck's law, Wave Particle dualism, de-Broglie hypothesis, Compton effect and its Physical significance. Matter waves and its characteristics - Problems. **Quantum Mechanics:** Heisenberg's Uncertainty Principle and its applications (mention 4 significances no derivations), Wave function, properties and physical significance of wave function, Probability density and Normalization of wave function. Setting up of one-dimensional time independent Schrodinger wave equation. Eigen values and Eigen functions. Application of Schrodinger wave equation: Energy Eigen values for a particle in a potential well of infinite depth. Problems.	8	CO1
2	**LASERS:** Basic properties of a LASER beam, Interaction of radiation with matter, Requisites of a laser system: Population Inversion, Metastable State, pumping. Einstein's coefficients; Expression for energy density (derivation). Principle, construction and working of Semiconductor Laser and explanation based on energy level diagram. Applications of LASER: LASER Range Finder, LIDAR. **Optical Fibers:** Propagation mechanism in optical fibers. Angle of acceptance and Numerical aperture (derivation), Types of optical fibers and modes of propagation, Absorption coefficient (qualitative), Application of optical fiber: Discussion of Block Diagram of Point to Point Communication. Three advantages of optical fiber communication. Numerical Problems.	8	CO1 CO2
3	**Oscillation:** Terminologies: Amplitude, displacement, Frequency, Angular frequency, Period, Simple Harmonic Motion, derive: Relation between γ and T, ω and T, Equation of SHM with initial phase, Restoring force and force constant**,** Problems. **Elasticity:** Stress and strain, Hook's law and stress-strain diagram, Failures of engineering materials (qualitative). Young's modulus (Y) Bulk modulus (K), Rigidity modulus (n), Poisson Ratio (σ), (derivations): Relation between elastic constants, Relation between shearing strain, Elongated strain and compression strain, Relation between Y, n and σ, Relation between K, Y and σ, Relation between K, n and Y Relation between K, n and σ, Problems.	8	CO1

4	**Acoustics:** Introduction to acoustics, Types of Acoustics, reverberation and reverberation time, absorption power and absorption coefficient, Requisites for acoustics in auditorium, Mention Sabine's formula (No derivation), Applications of Acoustics, measurement of absorption coefficient, factors affecting the acoustics and remedial measures, Noise and its Measurements, Sound Insulation and its measurements. Impact of Noise in Multi-storied buildings. **Radiometry and Photometry:** Radiation Quantities, Spectral Quantities, Derivation: Relation between Luminance and Radiant quantities, Reflectance and Transmittance (Qualitative-No derivation), Photometry (cosine law and inverse square law: Statement and discussion), problems.	**8**	**CO1** **CO2**
5	**Natural hazards and Safety:** Introduction, Earthquake: General characteristics, Physics of earthquake, Richter scale of measurement and earthquake resistant measures. **Tsunami:** Causes for tsunami, characteristics, adverse effects of Tsunami, risk reduction measures, engineering structures to withstand tsunami. **Landslide:** Causes such as excess rain fall, geological structure, human excavation etc, types of land slide **Forest Fires and detection using remote sensing:** Fire hazards and fire protection, fire-proofing materials, fire safety regulations and fire fighting equipment - Prevention and safety measures.	**8**	**CO1** **CO3**

Self Study Component:

NOTE: 1. Questions for CIE and SEE not to be set from Self Study Component.

2. Assignment Questions should be only from Self Study Component.

UNIT 1: Self-study component: Davisson-Germer Experiment, Group and phase velocity.

UNIT 2: Self-study component: Other applications of LASER: Road profiling, Bridge Deflection, atmospheric pollutant analysis, Types of attenuation, Fiber optic displacement and temperature sensors.

UNIT 3: Self-study components: Shock waves and Applications of Shock Waves, Bending moment of beams.

UNIT 4: Self-study component: Sabine's formula derivation

UNIT 5: Self-study component: Eengineering solution for Earth quake, landslides and forest fires.

Text books:

Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)

1. Materials Science and Engineering by R Balasubramaniam, second edition, Wiley India Pvt. Ltd. Ansari Road, Daryaganj, New Delhi-110002.

2. A Textbook of Engineering Physics by M .N. Avadhanulu, P G. Kshirsagar and T V S Arun Murthy, Eleventh edition, S Chand and Company Ltd. New Delhi-110055.

3. Engineering Physics by R. K. Gaur and S. L. Gupta, 2010 edition, Dhanpat Rai Publications Ltd., New Delhi-110002.

Reference books:

1. Building Acoustics: Tor Eric Vigran, Taylor and Francis, 2008 Edition.
2. Photometry Radiometry and Measurements of Optical Losses, Micheal Bukshtab, Springer, 2nd edition.
3. Lasers and Non Linear Optics, B B Loud, New Age Internationals, 2011 edition
4. Natural Hazards, Edward Bryant, Cambridge University, Press, 2nd Edition
5. Disaster Education and Management, Rajendra Kumar Bhandari, Springer, India 2014
6. Principles of Fire Safety Engineering Understanding Fire & Fire Protection, Akhil Kumar Das, PHI Learning, II edition.

Web links:

1. Simple Harmonic motion: https://www.youtube.com/watch?v=k2FvSzWeVxQ
2. Stress-strain curves: https://web.mit.edu/course/3/3.11/www/modules/ss.pdf
3. Stress curves: https://www.youtube.com/watch?v=f08Y39UiC-o
4. Oscillations: https://openstax.org › books › college-physics-2e
5. Earthquakes: www.asc-india.org
6. Earthquakes and Hazards: http://quake.usgs.gov/tsunami
7. Landslide hazards: http://landslides.usgs.gov
8. Acoustics: https://www.youtube.com/watch?v=fHBPvMDFyO8

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

1. http://nptel.ac.in
2. https://swayam.gov.in
3. https://virtuallabs.merlot.org/vl_physics.html
4. https://phet.colorado.edu
5. https://www.myphysicslab.com

Course Title: **APPLIED PHYSICS – EE STREAM**

Course Code: **22PHYE12/22** CIE Marks 50
Course Type (Theory/Practical/Integrated) Integrated SEE Marks 50
Total Marks 100
Teaching Hours/Week (L:T:P: S) 2:2:2:0 Exam Hours 03+02
Total Hours of Pedagogy 40 hours + 10-12 Lab Slots Credits 04

Course objectives:

1. To give hands on experience on various experiments.
2. To acquire knowledge in various techniques and working principles in Physics.
3. To impart knowledge in the field of semiconductors and their applications.
4. To train students in techniques and principles related to various devices orcomponents.
5. To acquire ability to use measuring instruments.
6. To assess the importance of Optics, Modern Physics and Engineering.

Course Outcomes: After completion of the course, the graduates will be able to

CO1	Distinguish the principles of Classical Physics and Modern Physics.
CO2	Analyze different materials for various scientific applications.
CO3	Apply the acquired knowledge in Physics, Nano science and Quantum computing for future applications.
CO4	Develop the ability to use concepts of Physics for the working components like capacitors, diodes and transistors and various measuring instruments like ammeters, voltmeters and signal generators.

Mapping of Course outcomes to Program outcomes:

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

Unit	Course content	Hours	COs
1	**Modern Physics:** Black body radiation spectrum, Weins law, Rayleigh Jeans law, Planck's Law, Derivation of Weins law and Rayleigh Jeans law from Planck's law, Wave Particle dualism, de-Broglie hypothesis, Compton effect and its Physical significance. Matter waves and its characteristics - Problems. **Quantum Mechanics:** Heisenberg's Uncertainty Principle and its applications (mention 4 significances no derivations), Wave function, properties and physical significance of wave function, Probability density and Normalization of wave function. Setting up of one-dimensional time independent Schrodinger wave equation. Eigen values and Eigen functions. Application of Schrodinger wave equation: Energy Eigen values for a particle in a potential well of infinite depth. Problems. **Pre requisite: Wave–Particle dualism**	**8**	**CO1**
2	**LASERS:** Basic properties of a LASER beam, Interaction of radiation with matter, Requisites of a laser system: Population Inversion, Metastable State, pumping. Einstein's coefficients; Expression for energy density (derivation). Principle, construction and working of Semiconductor Laser and explanation based on energy level diagram. Applications of LASER: LASER Range Finder, LIDAR. **Optical Fibers:** Propagation mechanism in optical fibers. Angle of acceptance and Numerical aperture (derivation), Types of optical fibers and modes of propagation, Absorption coefficient (qualitative), Application of optical fiber: Discussion of Block Diagram of Point to Point Communication. Three advantages of optical fiber communication. Numerical Problems. **Pre requisites:** : Properties of light, Total Internal Reflection	**8**	**CO1** **CO2**
3	**Dielectric Properties:** Polar and non-polar dielectrics, Types of Polarization, internal fields in solid (Derivation), Clausius-Mossotti equation (Derivation), solid, liquid and gaseous dielectrics. Application of dielectrics in transformers, Capacitors, Electrical Insulation. Numerical Problems. **Superconductivity :** Introduction to Superconductors, Temperature dependence of resistivity, Meissner Effect, Critical Current, Types of Super Conductors with examples, Temperature dependence of Critical field, BCS theory (Qualitative), High Temperature superconductivity, Applications; Magnetic Resonance Imaging (MRI), MAGLEV vehicles. **Pre requisites:** Difference between Insulators & Dielectrics. Basics of super conductors.	**8**	**CO1**

4	**Electromagnetic Theory:** Charge density, Linear, surface and volume, Divergence, Curl, Gradient, Gauss or Greens divergence Theorem, Stoke's theorem, Superposition principle, Poisson's and Laplace equation, Gauss theorem in differential form (derivation), Ampere's circuital Law(derivation), Maxwell's equations in differential forms, derivation: first, second, third and fourth equation for differential form. Significances of Maxwell's equation. Numerical problems. **Pre requisite:** Electricity & Magnetism, Fundamentals of vector calculus.	**8**	**CO1** **CO2**
5	**Semiconductors**: Fermi energy and Fermi level, Fermi level in intrinsic semiconductors, Expression for concentration of electrons in conduction band & holes concentration in valence band (derivation). Law of mass action. Hall effect, Hall coefficient (derivation). Numerical Problems. **Nanoscience**: Introduction to Nanoscience, Mesoscopic state, Density of states in 0D, 1D, 2D and 3D structures. Synthesis: Top–down and Bottom–up approach examples: Ball Milling and Sol–Gel methods explanations with diagrams. Carbon nano tubes: Types, properties and applications. **Pre requisite:** Basics of Semiconductors, doping and nano materials. Intrinsic & extrinsic semiconductors. Band theory of solids. PN junctions:	**8**	**CO1** **CO3**

Self Study Component:

NOTE: 1. Questions for CIE and SEE not to be set from Self Study Component.

2. Assignment Questions should be only from Self Study Component.

UNIT 1: Self study component: Davisson Germer Experiment, Group velocity and phase velocity.

UNIT 2: Self study component: Other applications of LASER: atmospheric pollutant analysis, Types of attenuation.

UNIT 3: Self-study component: classification of capacitors, dielectric polarization, electrical dipole, Other applications of dielectrics. Prospects and Challenges of superconductivity. Recent developments in Superconductivity. Other applications of superconductors.

UNIT 4: Self study component: Electrostatic boundary conditions, Maxwell's displacement current, Electromagnetic energy density. Maxwell's equation in integral form.

UNIT 5: Self-study component: Classification of semiconducting materials. Synthesis of Carbon nano tubes, Applications of Nano materials.

Text books:

1. S P Basavaraju, Engineering Physics, Subhas Publications, India.
2. B V Narayana Rao, Engineering Physics, Wiley Eastern Ltd., India
3. Hitendra K Malik and A K Singh, Engineering Physics, Tata McGraw Hill, India.

Referebnce books:

1. A Text book of Engineering Physics- M.N. Avadhanulu and P.G. Kshirsagar, 10th revised Ed, S. Chand. & Company Ltd, New Delhi.
2. An Introduction to Lasers theory and applications by M.N.Avadhanulu and P.S.Hemne revised Edition 2012 . S. Chand and company Ltd -New Delhi.
3. Engineering Physics-Gaur and Gupta-Dhanpat Rai Publications-2017.
4. Concepts of Modern Physics-Arthur Beiser: 6th Ed;Tata McGraw Hill Edu Pvt Ltd- New Delhi 2006.
5. Fundamentals of Fiber Optics in Telecommunication & Sensor Systems, B.P. Pal, New Age International Publishers.
6. Introduction to Electrodynamics, David Griffith, 4th Edition, Cambridge University press 2017.
7. Lasers and Non Linear Optics – B.B. Laud, 3rd Ed, New Age International Publishers 2011.
8. LASERS Principles, Types and Applications by K.R. Nambiar-New Age International Publishers.
9. Solid State Physics-S O Pillai, 8th Ed- New Age International Publishers-2018.

Web links and Video Lectures (e-Resources):

1. **Laser:** https://www.britannica.com/technology/laser,k
2. **Laser:**https://nptel.ac.in/courses/115/102/115102124/
3. **Quantum mechanics:** https://nptel.ac.in/courses/115/104/115104096/
4. **Physics:**http://hyperphysics.phy-astr.gsu.edu/hbase/hframe.html
5. **Numerical Aperture of fiber:**https://bop-iitk.vlabs.ac.in/exp/numerical-aperture-measurement

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

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

APPLIED PHYSICS - Mechanical stream

Course Code : 22PHYM22 **Credits : 3**

L:P:T:S : 3:0:0:0 **CIE Marks : 50**

Exam Hours : 3 **SEE Marks : 50**

Course objectives:

1. To give hands on experience on various experiments.
2. To acquire knowledge in various techniques and working principles in Physics.
3. To impart knowledge in the field of semiconductors and their applications.
4. To train students in techniques and principles related to various devices orcomponents.
5. To acquire ability to use measuring instruments.
6. To assess the importance of Optics, Modern Physics and Engineering.

Course Outcomes: After completion of the course, the graduates will be able to

CO1	Distinguish the principles of Classical Physics and Modern Physics.
CO2	Analyze different materials for various scientific applications.
CO3	Apply the acquired knowledge in Physics, Nano science and Quantum computing for future applications.
CO4	Develop the ability to use concepts of Physics for the working components like capacitors, diodes and transistors and various measuring instruments like ammeters, voltmeters and signal generators.

Mapping of Course outcomes to Program outcomes:

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

Unit	Course content	Hours	COs
1	**Modern Physics:** Black body radiation spectrum, Weins law, Rayleigh Jeans law, Planck's Law, Derivation of Weins law and Rayleigh Jeans law from Planck's law, Wave Particle dualism, de-Broglie hypothesis, Compton effect and its Physical significance. Matter waves and its characteristics - Problems. **Quantum Mechanics:** Heisenberg's Uncertainty Principle and its applications (mention 4 significances no derivations), Wave function, properties and physical significance of wave function, Probability density and Normalization of wave function. Setting up of one-dimensional time independent Schrodinger wave equation. Eigen values and Eigen functions. Application of Schrodinger wave equation: Energy Eigen values for a particle in a potential well of infinite depth. Problems.	8	CO1
2	**Oscillation:** Terminologies: Amplitude, displacement, Frequency, Angular frequency, Period, Simple Harmonic Motion, Relation between ν and T, ω and T, Equation of SHM with initial phase (derivation), Restoring force and force constant**,** Problems. **Elasticity:** Stress and strain, Hook's law and stress-strain diagram, Failures of engineering materials (qualitative). Young's modulus (Y) Bulk modulus (K), Rigidity modulus (n), Poisson Ratio (σ), Derivations: Relation between elastic constants, Relation between shearing strain, Elongated strain and compression strain, Relation between Y, n and σ, Relation between K, Y and σ, Relation between K, n and Y Relation between K, n and σ, Problems.	8	CO1 CO2
3	**Thermoelectric materials and devices:** Thermo emf and thermo current, Seebeck effect, Peltier effect, Seebeck and Peltier coefficients, figure of merit (Mention Expression), laws of thermoelectricity. Expression for thermo emf in terms of T1 and T2 (Derivation), 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 Numerical Problems.	8	CO1
4	**Cryogenics:** Production of low temperature - Joule Thomson effect (Derivation with 3 cases), Porous plug experiment with theory, Thermodynamical analysis of Joule Thomson effect (Derivation), Liquefaction of Oxygen by cascade process, Lindey's air liquefier, Liquefaction of Helium and its properties, Platinum Resistance Thermometer, Applications of Cryogenics in Aerospace, Numerical Problems.	8	CO1 CO2

5	**Material Characterization and Instrumentation Techniques:** Introduction to nano materials, Nano material and nano composites, Principle, construction and working of X-ray Diffractometer, Crystallite size determination by Scherrer equation, Principle, construction, working and applications: Atomic Force Microscopy (AFM), Scanning electron microscopy (SEM), Transmission electron microscopy (TEM), Numerical Problems.	**8**	**CO1 CO3**

Prerequisites:

UNIT 1: Wave–Particle dualism

UNIT 2: Basics of oscillation, elasticity, stress and strain

UNIT 3: Basics of thermal and electrical conductivity

UNIT 4: Basics of heat and thermodynamics

UNIT 5: Principle and working of optical microscope.

Self Study Component:

NOTE: 1. Questions for CIE and SEE not to be set from Self Study Component.

2. Assignment Questions should be only from Self Study Component.

UNIT 1: Self-study component: Davisson Germer Experiment.

UNIT 2: Self-study component: Engineering applications of Damped oscillations, and Bending moment of beams.

UNIT 3: Self-study component: Refrigerator, Space Program (RTG).

UNIT 4: Self-study component: Tribology and Food processing.

UNIT 5: Self-study component: Synthesis of Carbon nano tubes, X-ray photoelectron spectroscopy (XPS).

Text books:

1. Concepts of Modern Physics, Arthur Beiser, Mc Graw hill, 6th Edition, 2009.
2. Hitendra K Malik and A K Singh, Engineering Physics, Tata McGraw Hill, India.
3. B V Narayana Rao, Engineering Physics, Wiley Eastern Ltd., India.
4. Heat and Thermodynamics, Brijlal & Subramanyam, S. Chand & Company Ltd., New-Delhi.
5. Physics of Cryogenics by Bahman Zohuri, Elsevier, 2018.
6. Materials Characterization Techniques-Sam Zhang, Lin Li, Ashok Kumar, CRC Press, First Edition, 2008.

Reference books:

1. QM (to be included)
2. Vibrations and Waves (MIT introductory Physics Series), A P French, CBS, 2003 Edition.
3. Timoshenko, S. and Goodier J.N. "Theory of Elasticity", 2nd Edition, McGraw Hill Book Co, 2001.
4. Sadhu Singh, "Theory of Elasticity", Khanna Publishers, 1997.
5. Mechanical Properties of Engineered Materials by Wole Soboyejo, CRC Press; 1st edition, 2002.
6. Heat & Thermodynamics and Statistical Physics (XVIII-Edition) – Singhal, Agarwal & Satyaprakash – Pragati Prakashan, Meerut, 2006.
7. Heat and Thermodynamics (I-Edition) – D. S. Mathur - S. Chand & Company Ltd., New-Delhi, 1991.
8. Characterization of Materials- Mitra P. K. Prentice Hall India Learning Private Limited.
9. Nanoscience and Nanotechnology: Fundamentals to Frontiers – M.S.Ramachandra Rao & Shubra Singh, Wiley India Pvt Ltd.
10. Nano Composite Materials-Synthesis, Properties and Applications, J. Parameswaranpillai, N.Hameed, T.Kurian, Y. Yu, CRC Press.

Links (10)

Quantum Mechanics : https://www.youtube.com/watch?v=p7bzE1E5PMY&t=136s
Simple Harmonic motion: https://www.youtube.com/watch?v=k2FvSzWeVxQ
Stress- strain curves: https://web.mit.edu/course/3/3.11/www/modules/ss.pdf
Stress curves: https://www.youtube.com/watch?v=f08Y39UiC-o
Fracture in materials: https://www.youtube.com/watch?v=x47nky4MbK8
Thermoelecticity:
https://www.youtube.com/watch?v=2w7NBuu5w9c&list=PLtkeUZItwHK5y6qy1GFxa4Z4Rc mzUaaz6
Thermoelectric generator and coolers: https://www.youtube.com/watch?v=NruYdb31xk8
Cryogenics: https://cevgroup.org/cryogenics-basics-applications/
Liquefaction of gases: https://www.youtube.com/watch?v=aMelwOsGpIs
Virtual lab: https://www.vlab.co.in/participating-institute-amrita-vishwa-vidyapeetham
Material characterization: https://onlinecourses.nptel.ac.in/noc20_mm14/preview
https://www.encyclopedia.com/science-and-technology/physics/physics/cryogenics
https://www.usna.edu/NAOE/_files/documents/Courses/EN380/Course_Notes/Ch10_Deformation.pdf

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

http://nptel.ac.in
https://swayam.gov.in
https://virtuallabs.merlot.org/vl_physics.html
https://phet.colorado.edu
https://www.myphysicslab.com

BALAKE KANNADA (Only for Non-Karnataka Students)

Course Code : 22KBK27 **Credits : 1**

L:P:T:S :1:0:0:0 **CIE Marks : 50**

Exam Hours : 1hr 30 min **SEE Marks : 50**

Course objectives:

1. To initiate the importance of the Kannada literary works.
2. To express thoughts and ideas in the local language.
3. To train the learners for correct and polite conservation.

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

CO1	Make use of Kannada words in regular context.
CO2	Demonstrate effective communication skills with the local language.
CO3	Appraise the moral values and social behaviour in Karnataka.

Mapping of Course outcomes to Program outcomes:

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

Unit	Course content	Hours	COs
1	**Usage:** Introducing each other – 1. Personal Pronouns, Possessive forms, Interrogative words. Introducing each other – 2. Personal Pronouns, Possessive forms, Yes/No Type Interrogation Enquiring about a room for rent. Qualitative and quantitative adjectives.	3	CO1
2	**Communication:** Enquiring about the college. Predicative forms, locative case. In a hotel-dative case defective verbs. Planning for a picnic. Imperative, Permissive, hortative.	3	CO1
3	**Conversation:** Conversation between Doctor and the patient. Verb- iru, negation – illa, non – past tense. Comparative, relationship, Identification and Negation Words.	3	CO2
4	**Activities:** About routine activities of a student. Verbal Participle, reflexive form, negation. Telephone conversation. Past and present perfect past continuous and their negation. About Halebidu, Belur. Relative, principle, negation.	3	CO2 CO3
5	**Lessons for reading:** Different types of Tense, Time and Verbs-Formation of Past, Future and Present Tense sentences with Verb Forms- Kannada vocabulary List-Kannada words in Conversation.	3	CO3

UNIT 1: Self study component: About Ramayana. Possessive forms of nouns, dubitive question, Relative nouns.

UNIT 2: Self study component: To speak, and write Kannada language as per requirement.

UNIT 3: Self study component: To communicate (converse) in Kannada language in their daily life with Kannada speakers.

UNIT 4: Self study component: Discussing about examination and future plan. Simple conditional and negative.

UNIT 5: Self study component: To speak in polite conversation.

Text books:

1. H K Lakappa Gowda, Sahitya: Bahumukha Chintane, IBH Prakashana.
2. Vivek Rai, Kannada Nudinadeya Barahagalu, Sapna Books.

Reference books:

1. K V Narayana, Kannada Adunudiya Sollarime, Pragathi Publishers.
2. Rahamath Tharikeri, Maradolagana Kichchu, Abhinava Publishers.
3. Dr.L Thimmesha, Balake Kannada, Prakatane:Prasaraanga.

Assessment Pattern:

CIE –Continuous Internal Evaluation Theory

Bloom's Category	**Tests**
Marks	**50**
Remember	10
Understand	20
Apply	20

SEE–Semester End Examinations (Theory)

Bloom's Category	**Marks**
Marks	**50**
Remember	15
Understand	15
Apply	10
Analyze	10

Samskruthika Kannada (Only for Karnataka students)

Subject Code: 22KSK27 **Credit: 1**

L:P:T:S : 1:0:0:0 **CIE Marks:50**

SIEMarks:50

Course Objectives:

1. To initiate the importance of the Kannada Literary works.
2. To introduce the rich and cultural heritage of Karnataka.
3. To gain knowledge of a novel language and use it effectively.

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

CO1	Make use of Kannada words in regular context.
CO2	Identify Karnataka as a source of rich culture and heritage.
CO3	Recognize the importance of Kannada poets and writers.

Mapping of Course outcomes to Program outcomes:

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

Course content	Hours	COs
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 ಪ್ರೊ. ಎ. ಕೇಶವಮೂರ್ತಿ	4	CO1
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	
ಘಟಕ -3 ಆಧುನಿಕ ಕಾವ್ಯಭಾಗ 1. ಡಿವಿಜಿ ರವರ ಮಂಕುತಿಮ್ಮನ ಕಗ್ಗದಿಂದ ಆಯ್ದ ಕೆಲವು ಭಾಗಗಳು 2. ಕುರುಡು ಕಾಂಚಾಣ : ದಾ.ರಾ. ಬೇಂದ್ರೆ	3	CO2
ಘಟಕ - 4 ತಾಂತ್ರಿಕ ವ್ಯಕ್ತಿಗಳ ಪರಿಚಯ 1. ಡಾ. ಸರ್. ಎಂ. ವಿಶ್ವೇಶ್ವರಯ್ಯ : ವ್ಯಕ್ತಿ ಮತ್ತು ಐತಿಹ್ಯ – ಎ. ಎನ್. ಮೂರ್ತಿರಾವ್ 2. ಕರಕುಶಲ ಕಲೆಗಳು ಮತ್ತು ಪರಂಪರೆಯ ವಿಜ್ಞಾನ : ಕರಿಗೌಡ ಬೀಚನಹಳ್ಳಿ	3	
ಘಟಕ - 5 ಸಾಂಸ್ಕೃತಿಕ, ಜನಪದ ಕಥೆ ಮತ್ತು ಪ್ರವಾಸ ಕಥನ 1. ಯುಗಾದಿ : ವಸುಧೇಂದ್ರ 2. ಮೆಗಾನೆ ಎಂಬ ಗಿರಿಜನ ಪರ್ವತ : ಹಿ.ಚಿ. ಬೋರಲಿಂಗಯ್ಯ	2	CO3

. **Text books:**

1. Hi chi boralingaiah karimane & Dr.L Thimmesh

2. H.K Lakkappa Gowda, Sahithya:Bahumuka Chinthane, IBH Prakashana.
3. Vivek Rai , Kannada Nudinadeya Barahagulu, Sapna Books

.

Reference books:

1. K V Narayana, kannada Adunudiya Sollarimi, Pragathi Publishers.
2. Rahamath Tharikeri,Maradolagana Kichchu, Abhinava Publishers.

INDIAN CONSTITUTION

Course Code for the stream: 22ICO17/ 27 **Credits : 1**

L:P:T:S : 1:0:0:0 **CIE Marks : 50**

Exam Hours: 2 **SEE Marks: 50**

Course Type (Theory/Practical/Integrated): Theory

Course Objectives:

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

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

CO1	Analyse the basic structure of Indian Constitution
CO2	Remember their Fundamental Rights. DPSP's & Fundamental Duties(FD's) of our Constitution.
CO3	Know about our Union Government, political structure & code, procedures.
CO4	Understand our State Executive & Elections system of India.
CO5	Remember the Amendments and Emergency Provisions, other important provisions given by the Constitution.

Mapping of Course outcomes to Program outcomes:

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

Unit	Course content	Hours	COs
1	Module-1: Indian Constitution: Necessity of the Constitution, Societies before and after the Constitution adoption. Introduction to the Indian Constitution. Making of the Constitution, Role of the Constituent Assembly.	3	CO1
2	Module-2 : Salient features of the Indian Constitution. Preamble of Indian Constitution & Key concepts of the Preamble. Fundamental Rights (FR's) and its Restriction and limitations in different Complex Situations. Building. Special provision to SC, ST, OBC and women and children under Indian Constitution.	3	CO1 CO2
3	Module-3: Directive Principles of State Policy (DPSP's) and its present relevance in Indian society. Fundamental Duties and its Scope and significance in Nation. Union Executive: Parliamentary System, Union Executive –President, Vice-President, Prime Minister, Union Cabinet. Emergency Provisions and types.	3	CO1 CO3
4	Module-4: Parliament – LS and RS, Parliamentary Committees, Important Parliamentary Terminologies. Judicial System in India, Supreme Court of India and other Courts, Judicial Reviews and Judicial Activism.	3	CO2 CO3
5	Module-5: State Executive and Governor, CM, State Cabinet, Legislature – VS & VP , State High Court, Writs, Election Commission, Elections & Electoral Process. Amendment to Constitution, and Important Constitutional Amendments till today. Human Rights National Human Rights Commission and Protection of Human Rights Act 1993 and 2006 amendment.	3	CO2 CO3

Text books:

1. "Constitution of India" (for Competitive Exams) - Published by Naidhruva

Edutech Learning Solutions, Bengaluru. – 2022.

2. "**Introduction to the Constitution of India**", (Students Edition.) by Durga Das Basu (**DD Basu**): Prentice –Hall, 2008.

Reference books:

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

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks that is 20 marks. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination (SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE and SEE taken together

Continuous Internal Evaluation:

CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination:

SEE will be conducted by College as per the scheduled timetable, with common question papers for the subject. The question paper will have 25 MCQs (each question is set for 01 mark) and five questions will have descriptive pattern. (5x5=25) total 50 marks. Duration of the examination is 02 hours.

CIE –Continuous Internal Evaluation

Bloom's Category	Test	Assignments
Marks	**50**	
Remember	20	
Understand	30	
Apply		

Introduction to Web Programming

Course Code : 22PLC25A **Credits 3**

L: P: T: S : 2:2:0:0 **CIE Marks: 50**

Exam Hours: 3 **SEE Marks: 50**

Course Type: Integrated

Course objectives

- To use the syntax and semantics of HTML and XHTML.
- To develop different parts of a web page.
- To understand how CSS can enhance the design of a webpage.
- To create and apply CSS styling to a webpage.

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

CO1	Create Websites using HTML, CSS and Java script
CO2	Apply multimedia content in web pages for improved look and feel
CO3	Develop responsive web pages that adapt seamlessly to various devices
CO4	Design web pages using advanced CSS
CO5	Design form based application using HTML, CSS and Java script

Mapping of Course outcomes to Program outcomes:

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

Unit	Course content	Hours	COs
1	**Module-1:** **Traditional HTML and XHTML:** Introduction to HTML and XHTML, Hello HTML and XHTML World, HTML and XHTML: Version History, HTML, (X)HTML Document Structure, The Rules of (X)HTML, Major Themes of (X)HTML, HTML tags.	8	CO1
2	**Module-2:** **HTML5:** Hello HTML5, Loose Syntax Returns, XHTML5, HTML5: Embracing the Reality of Web Markup, Presentational Markup Removed and Redefined, HTML5 Document Structure Changes, Adding Semantics, HTML5's Open Media Effort, Client-Side Graphics with <canvas>, HTML5 Form Changes, Emerging Elements and Attributes to Support Web Applications, HTML table, HTML form.	8	CO1 CO2
3	**Module-3:** **Cascading Style Sheets (CSS)** Introduction to CSS, What is CSS, CSS Syntax, Location of Styles, Selectors, The Cascade: How Styles Interact, The Box Model, CSS Text Styling.	8	CO1
4	**Module-4:** **Tables and Forms** HTML Tables and Forms, Introducing Tables, Styling Tables, Introducing Forms, Form Control Elements, Table and Form Accessibility, Micro formats, Advanced CSS: Layout, Normal Flow, Positioning Elements, Floating Elements, Constructing Multicolumn Layouts, Approaches to CSS Layout, Responsive Design, CSS Frameworks.	8	CO1 CO3 CO4
5	**Module-5:** **JavaScript:** JavaScript: Client-Side Scripting, What is JavaScript and What can it do?, JavaScript Design Principles, Where does JavaScript Go?, Syntax, JavaScript Objects, The Document Object Model (DOM), JavaScript Events, Forms	8	CO1 CO5

NOTE: 1. Questions for CIE and SEE not to be set from Self Study Component.
2. Assignment Questions should be only from Self Study Component.

Module 1: Building blocks of HTML, W3 principles on web design.

Module 2: HTML File Paths

Module 3: HTML Image

Module 4: Responsive Web Design, Relative and absolute designs,

Module 5: HTML JavaScript, RESTful API principles & HTTP methods (GET, POST, PATCH, DELETE), Javascript for handling web documents and dynamic design.

Textbook

1. HTML & CSS: The Complete Reference Thomas A. Powell, Fifth Edition, Tata McGraw Hill,
2. Randy Connolly, Ricardo Hoar, "Fundamentals of Web Development", 1st Edition, Pearson Education India. (ISBN:978-9332575271)

Reference Books:

1. Nicholas C Zakas, "Professional JavaScript for Web Developers", 3rd Edition, Wrox/Wiley India, 2012. (ISBN:978-8126535088)
2. WEB PROGRAMMING with HTML5, CSS and JavaScript, John Dean, Jones & Bartlett Learning, First Edition

Web links and Video Lectures

1. https://onlinecourses.swayam2.ac.in/aic20_sp11/preview

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

1. http://nptel.ac.in

2. https://swayam.gov.in

3. https://phet.colorado.edu/

Lab Assignments

1. Create an XHTML page using tags to accomplish the following:
   a. A paragraph containing text "All that glitters is not gold". Bold face and italicize this text
   b. Create equation:
   $$= 1/3(\ ^{2}_{1} + ^{2}_{1}$$
   c. Put a background image to a page and demonstrate all attributes of background image

   Create unordered list of 5 fruits and ordered list of 3 flowers

2. Design web page using CSS which includes the fallowing
   i) Use different font and text styles
   ii) Set Background image for both the page and single element in the page Define the styles for links

3. Create following table using XHTML tags. Properly align cells, give suitable cell padding and cell spacing, and apply background color, bold and emphasis necessary

Department	Sem 1	*SubjectA*
		SubjectB
		SubjectC
	Sem 2	*SubjectE*
		SubjectF
		SubjectG
	Sem 3	*SubjectH*
		SubjectI
		SubjectJ

4. Write an XML file which will display the book information which includes the fallowing title of the book, Author name, ISBN number, Publisher name, Edition and Price validate the above document using DTD and XML Schema.

5. Using **li** tag do the following changes:
   - A display status of inline
   - A medium, double-lined, black border
   - No list style type
   - Margin of 5px
   - Padding of 10px to the top, 20px to the right, 10px to the bottom, and 20px to the left

   Also demonstrate list style type with user defined image logos

6.	Create following web page using HTML and CSS with tabular layout 
7.	i) Write a Java Script to validate the fields of the Registration Page ii) Write a Java Script to validate the fields of the Login Page
8.	Write a Java Script program that on clicking a button, displays scrolling text which moves from left to right with a small delay
9.	Write a JavaScript that calculates the squares and cubes of the numbers from 0 to 10 and Outputs HTML text that displays the resulting values in an HTML table format.
10.	Create a webpage containing 3 overlapping images using HTML, CSS and JS. Further when the mouse is over any image, it should be on the top and fully displayed

Introduction to Python Programming

Course Code : 22PLC25B **Credits 3**

L: P: T: S: 2:2:0:0 **CIE Marks: 50**

Exam Hours: 3 **SEE Marks: 50**

Course Type: Integrated

Course objectives

- Learn the syntax and semantics of the Python programming language.
- Illustrate the process of structuring the data using lists, tuples.
- Appraise the need for working with Arrays and Strings.
- Demonstrate the use of built-in functions to navigate the file system.
- Implement the Object-Oriented Programming concepts in Python.

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

CO1	Develop programs in python to address real life problems
CO2	Design solutions using appropriate Data Structure [arrays/strings/tuple/list/dictionaries/ sets]
CO3	Implement programs which read input from files and write output onto files.
CO4	Program solutions using Object-Oriented principles and libraries
CO5	Debug python programs by tracing the flow for specific input

Mapping of CO PO

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

Unit	Course content	Hours	COs
1	**Module-1:** **Python Basics :** **Getting Started:** Introduction to Python, Setting Up Python in windows, Installing the packages, introducing IDLE Types, Writing and Executing first Python Program, Keywords and Variables, Data types, Typecasting, Operators. **Simple I/O:** Output Statements, Input Statements, Command Line Arguments.	8	CO1
2	**Module-2:** **Branching and Loops:** **Branching :** Using the If statement, Using the else Clause, Using the elif clause, Nested if, if-elif-else ladder. **Loops :** while Loops, for Loops, Nested Loops, break, continue and return statements.	8	CO2
3	**Module-3:** **Data Structures:** **Arrays, Strings:** Basics of Arrays, Types of Arrays, Operations on Arrays, Basics of Strings, String Manipulation. **Tuple, Lists and Dictionaries, Sets:** Using Lists, Using List Methods, using tuple instead of Lists, Dictionaries, Sets.	8	CO3
4	**Module-4:** **Functions and Files Handling:** **Functions:** Basics of Functions, Returning results and multiple values from a functions, Function Arguments, Global Variables, Recursion **Files and Exceptions:** Definition, Types of Files in Python, Opening a file, Closing a file, Working with Text files, Exception Handling, Types of Exception.	8	CO4
5	**Module-5:** **Object-Oriented Programming:** **Classes and objects:** Problems in Procedure Oriented Approach, Features of OOPS, Creating a Class, Constructor, Methods, Passing members of one class to another class, Inheritance, Types of Inheritance, Polymorphism, Method Overloading, Method Overriding.	8	CO5

	Packages: numpy, pandas, pytorch, matplotlib		

NOTE: 1. Questions for CIE and SEE not to be set from Self Study Component.

2. Assignment Questions should be only from Self Study Component.

Self-Study Component:

Module 1: Python Literals

Module 2: Pass and Assert Statements

Module 3: Ordered Dictionaries

Module 4: Abstract Classes and Interfaces

Module 5: asyncio (event-based), HDFS.

Textbooks:

1. Dr. R Nageswara Rao, **"Core Python Programming",** 3rd Edition (Revised and Upgraded), dreamtech Press, 2022. (Chapters 1 to 17).

Reference Books:

1. Allen B. Downey, **"Think Python: How to Think Like a Computer Scientist",** 2nd Edition, Green Tea Press, 2015. (Available under CC-BY-NC license at http://greenteapress.com/thinkpython2/thinkpython2.pdf (Chapters 13, 15, 16, 17, 18) (Download pdf/html files from the above link)

Web links:

1. https://www.w3schools.com/python/

Lab Assignments

1	a) Write a program to compute the distance between two points taking input from the user (Pythagorean Theorem) b) Write a program add.py that takes two numbers as command line arguments and prints its sum.
2	Write a program to take a sequence of numbers and print a duplicate and non-duplicate list using that numbers.
3	a) Find the sum of all the primes below two million. Each new term in the Fibonacci sequence is generated by adding the previous two terms. By starting with 1 and 2, the first 10 terms will be: 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, … b) By considering the terms in the Fibonacci sequence whose values do not exceed four million, find the sum of the even-valued terms.

4	a) Implement a python program to check the element is in the list or not by using linear search & Binary search for 1-D Array. b) Implement a python program to arrange the elements in sorted order using Bubble, Selection, Insertion and Merge sorting techniques 1-D Array.
5	a) Write a program that defines a matrix and prints b) Write a program to perform addition of two square matrices c) Write a program to perform multiplication of two square matrices
6	a) Write a program to use split and join methods in the string and trace a birthday with a dictionary data structure. b) Write a program to count frequency of characters in a given file.
7	a) Write a program combine lists that combines these lists into a dictionary. b) Write a program to count the numbers of characters in the string and store them in a dictionary data structure.
8	Write a function ball_collide that takes two balls as parameters and computes if they are colliding. Your function should return a Boolean representing whether or not the balls are colliding. Hint: Represent a ball on a plane as a tuple of (x, y, r), r being the radius If (distance between two balls centers) <= (sum of their radii) then (they are colliding)
9	Write a function nearly_equal to test whether two strings are nearly equal. Two strings a and b are nearly equal when a can be generated by a single mutation on b.
10	Write a python program to manage a bank account detail of a customer

Basics of Java Programming

Course Code : 22PLC25C **Credits 3**

L: P: T: S: 2:2:0:0 **CIE Marks: 50**

Exam Hours: 3 **SEE Marks: 50**

Course Type: Integrated

Course objectives

- Learn fundamental features of object-oriented language and JAVA
- Set up Java JDK environment to create, debug and run simple Java programs.
- Learn object-oriented concepts using programming examples.
- Study the concepts of importing of packages and exception handling mechanism.
- Course Outcomes: At the end of the course, students will be able to:

CO1	Program solutions for real life problems using OO principles in java.
CO2	Debug java programs by tracing towards specific inputs.
CO3	Develop programs using the concept of inheritance.
CO4	Organize the code base using packages.
CO5	Incorporate exception handling in java programs.

Mapping of Course outcomes to Program outcomes:

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

Unit	Course content	Hours	COs
1	**Module-1:** **An Overview of Java**: Object-Oriented Programming- OOPS concepts, History of Java, Features of Java, Java virtual machine, A First Simple Program, Keywords, Data Types- Primitive Types, Integers, Floating-Point Types, Characters, Booleans, Variables, Literals **Control Statements**: Selection Statements, Iteration Statements, Jump Statements, Type Conversion and Casting	8	CO1
2	**Module-2:** **Operators**: Arithmetic Operators, The Bitwise Operators, Relational Operators, Boolean Logical Operators, The Assignment Operator, The ? Operator, Operator Precedence, Using Parentheses **Arrays**- Types of Array in java, Declaration, Instantiation and Initialization of single dimensional Java Array, Strings	8	CO2
3	**Module-3:** **Introducing Classes**: Class Fundamentals, Declaring Objects, Assigning Object Reference Variables, Introducing Methods, Using Objects as Parameters, Constructors, The this keyword, Overloading Methods and Constructors, Static fields and Methods, Garbage Collection, The finalize( ) Method, Recursion	8	CO3
4	**Module-4:** **Inheritance**: Inheritance Basics, Types of inheritance, Using super, When Constructors Are Called, Method Overriding, Using Abstract Classes, Using final with Inheritance	8	CO4
5	**Module-5:** **Packages and Interfaces**: Packages, Access Protection, Importing Packages, Interfaces, **Exception Handling**: Exception-Handling Fundamentals, Exception Types, Uncaught Exceptions, Using try and catch, Multiple catch Clauses, throw, throws, Using Exceptions, Collections.	8	CO5

Pre-requisites:

Module 1:

Pre-requisite: No Pre-requisites required

Module 2:

Pre-requisite: Basic syntax knowledge

Module 3:

Pre-requisite: Looping statements

Module 4:

Pre-requisite: OOPS concepts

Module 5:

Pre-requisite: Class and objects

NOTE: 1. Questions for CIE and SEE not to be set from Self Study Component.

2. **Assignment Questions should be only from Self Study**

Component. Module 1: JDK, JRE and JVM

Module 2: Access Specifiers

Module 3: Method Overriding

Module 4: Aggregation

Module 5: Multithreading

Textbooks:

1. Herbert Schildt, **Java The Complete Reference**, 7th Edition, Tata McGraw Hill, 2007.

Reference Books:

1. **Introduction to Java Programming**, Y Daniel Liang, 10th Edition , 2014, Comprehensive Version Pearson education, ISBN 10: 0-13-376131-2, ISBN 13: 978-0-13-376131-3

Web links and Video Lectures (e-Resources):

1. **https://www.youtube.com/watch?v=wdkP056q0Nc**
2. **https://www.tutorialspoint.com/java/index.html**
3. **https://goalkicker.com/JavaBook/**

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

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

Lab Assignments

1	Write a Java program that works as a simple calculator for +, -, *, /, % operations and display the result.
2	Design and develop a JAVA program that prints all real solutions to the quadratic equation ax2+bx+c=0. Read in a, b, c and use the quadratic formula.
3	Design and develop a Java program that prompts the user for an integer and then prints out all prime numbers up to that integer.
4	Design and develop a Java program that reads two matrices A (m x n) and B(p x q) and Compute product of matrices A and B. Print both the input matrices and resultant matrix appropriately.
5	Given is a 2-dimensional integer array [0..m-1, 0..n-1], each row and column of which is in ascending order, write a Java program to find the row, column position of a specified number (row, column position) in a given 2- dimensional array.
6	Design and develop a Java program that checks whether a given string is a palindrome or not. Ex: MADAM is a palindrome.
7	Create a JAVA class called Student with the following details as variables within it. USN NAME BRANCH PHONE PERCENTAGE Write a JAVA program to create n Student objects and print the USN, Name, Branch, Phone, and percentage of these objects with suitable headings.
8	The Fibonacci sequence is defined by the following rule. The first 2 values in the sequence are 1, 1. Every subsequent value is the sum of the 2 values preceding it. Write a Java program that uses both recursive and nonrecursive functions to print the nth value of the Fibonacci sequence?
9	Design a super class called Staff with details as StaffId, Name, Phone, Salary. Extend this class by writing three subclasses namely Teaching (domain, publications), Technical (skills), and Contract (period). Write a JAVA program to read and display at least 3 staff objects of all three categories.
10	Write a JAVA program to read two integers a and b. Compute a/b and print, when b is not zero. Raise an exception when b is equal to zero. Also demonstrate working of ArrayIndexOutOfBoundException.

Introduction to C++ Programming

Course Code: 22PLC25D **Credits: 3**

L:P:T:S 2:2:0:0 **CIE Marks: 50**

Exam Hours: 3 **SEE Marks: 50**

Course Type: Integrated

Course Objectives:

1. Understanding about the fundamental programming concepts and methodologies which are essential for building good C/C++ programs.
2. Understand how to design C++ classes for code reuse.
3. Understand how to implement constructors, encapsulation, overloading function, inheritance file handling and exception handling.
4. Understand how to use exception handling in C++ programs.

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

CO1	Program solutions for real life problems using OO principles in C++.
CO2	Create UML class diagrams for given application scenarios.
CO3	Debug C++ programs by tracing through specific outputs.
CO4	Incorporate exception handling in C++ programs.
CO5	Implement Input/output operations using streams.

Mapping of Course outcomes to Program outcomes:

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

Unit	Course content	Hours	COs
1	**Module-1:** **Introduction to Object Oriented Programming:** Computer programming background- C++ overview. First C++ Program - Basic C++ syntax, Tokens – Keywords – Identifiers and constants – Operators in C++ – Scope resolution operator – Expressions and their types – Special assignment expressions, what is an Object & Classes.	5	**CO1** **CO2**
2	**Module-2:** **Control Statements:** if-else, switch, Looping statement: while, Do-while, for. **Functions in C++:** Function prototyping – Call by reference – Return by reference – Inline functions -Default arguments, Objects &Classes, Constructors & destructor, this pointer, static keyword, friend function.	8	**CO1** **CO2**
3	**Module-3:** **Inheritance:** Defining Derived classes & base classes, Single Inheritance, Multiple, Hierarchical Inheritance, Hybrid Inheritance. **Polymorphism:** Function Overloading & overriding and virtual functions.	9	**CO1** **CO2** **CO3**
4	**Module-4:** **Exception Handling:** Introduction to Exception - Benefits of Exception handling- Try and catch block Throw statement- Pre-defined exceptions in C++.	9	**CO1** **CO2** **CO4**
5	**Module-5:** **I/O Stream:** C++ Class Hierarchy- File Stream-Text File Handling-Binary File Handling during file operations.	9	**CO4** **CO5**

Pre-requisites:

Module 1: NO Pre-requisite required

Module 2: Basic knowledge of keywords, identifiers and operators.

Module 3: Knowledge about control statements, and function types.

Module 4: Knowledge about Inheritance and polymorphism.

Module 5: Knowledge about exception handling.

Self-Study Component:

NOTE: 1. Questions for CIE and SEE not to be set from Self Study Component.

2. Assignment Questions should be only from Self Study

Component. Module 1: Namespaces, strings

Module 2: Pointers

Module 3: Arrays

Module 4: Abstraction

Module 5: Signal Handling

Textbooks

1. Balagurusamy E, Object Oriented Programming with C++, Tata McGraw Hill Education Pvt.Ltd, Fourth Edition 2010.
2. Bhushan Trivedi, "Programming with ANSI C++", Oxford Press, Second Edition, 2012.

Reference Books:

1. E. Balaguruswamy, Object Oriented Programming With C++, McGraw-Hill Education (India) Pvt Limited, 2008.

Web links and Video Lectures (e-Resources):

1. Basics of C++ - https://www.youtube.com/watch?v=BClS40yzssA
2. Functions of C++ - https://www.youtube.com/watch?v=p8ehAjZWjPw Tutorial Link:
1. https://www.w3schools.com/cpp/cpp_intro.asp
2. https://www.edx.org/course/introduction-to-c-3

Lab Assignments

1.	Write a C++ program to read two numbers from the keyboard and display the larger value on the screen.
2.	Write a C++ program to find the sum of all the natural numbers from 1 to n.
3.	Write a C++ program to swap 2 values by writing a function that uses call by reference technique.
4.	Write a C++ program to demonstrate function overloading for the following prototypes. add(int a, int b) add(double a, double b).
5.	Create a class named Shape with a function that prints "This is a shape". Create another class named Polygon inheriting the Shape class with the same function that prints "Polygon is a shape". Create two other classes named Rectangle and Triangle having the same function which prints "Rectangle is a polygon" and "Triangle is a polygon" respectively. Again, make another class named Square having the same function which prints "Square is a rectangle". Now, try calling the function by the object of each of these classes.
6.	Suppose we have three classes Vehicle, Four-Wheeler, and Car. The class Vehicle is the base class, the class Four-Wheeler is derived from it and the class Car is derived from the class Four-Wheeler. Class Vehicle has a method 'vehicle' that prints 'I am a vehicle', class Four-Wheeler has a method 'four-Wheeler' that prints 'I have four wheels', and class Car has a method 'car' that prints 'I am a car'. So, as this is a multi-level inheritance; we can have access to all the other classes methods from the object of the class Car. We invoke all the methods

	from a Car object and print the corresponding outputs of the methods. So, if we invoke the methods in this order, car(), four Wheeler(), and vehicle(), then the output will be I am a car I have four wheels I am a vehicle Write a C++ program to demonstrate multilevel inheritance using this.
7.	Write a C++ program to create a text file, check file created or not, if created it will write some text into the file and then read the text from the file.
8.	Write a C++ program to write and read time in/from binary file using fstream.
9.	Write a function which throws a division by zero exception and catch it in catch block. Write a C++ program to demonstrate usage of try, catch and throw to handle exception.
10.	Write a C++ program function which handles array of bounds exception using C++.

COMPUTER AIDED ENGINEERING DRAWING

Course Code: **22CED13/22CED23** Credits: 03
L: P: T: S: 2:2:0:0 CIE Marks: 50
Exam Hours: 03 SIE Marks: 50

Course Objective

C13.1	Familiarise the students with the concepts of orthographic projection
C13.2	Know about different types of projections
C13.3	Enable the students to appreciate the importance of engineering drawing as a means of communication for engineers.
C13.4	Help the students to improve visualization skills.
C13.5	Impart knowledge of drafting software and drafting tools
C13.6	Equip the students to understand the importance of computers in drawing

Course Outcomes: At the end of the semester Students will be able to

CO1	Make use of drafting tools in creating engineering drawing.
CO2	Know and understand the conventions and the methods of engineering drawing.
CO3	Identify the position of the object and draw the views using orthographic projection technique in their respective quadrants.
CO4	Construct the appropriate drawing satisfying the constraints given.
CO5	Apply the knowledge of isometric projection to show pictorial view of an object
CO6S	Improve their visualization skills so that they can apply these skills in design and developing new products.

Mapping of Course Outcomes to Program Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO.1	3	3	1	-	3	-	-	-			-	
CO.2	3	3	1	-	3	-		-			-	
CO.3	3	3	1	-	3	-		-			-	
CO.4	3	3	3	-	3	-		-			-	
CO.5	3	3	3	-	3	-		-			-	
CO.6	3	3	3	-	3	-		-			-	

UNIT	COURSE CONTENT	HOURS	CO'S
1	**Introduction to Computer Aided Sketching** Introduction, Drawing Instruments and their uses, BIS conventions, Lettering, Dimensioning and free hand practicing. Computer screen, layout of the software, standard tool bar/menus and description of most commonly used tool bars, navigational tools. Co-ordinate system and reference planes. Definitions of HP, VP, RPP & LPP. Creation of 2D/3D environment. Selection of drawing size and scale.	12	CO1 CO2 CO3 CO4

	Commands and creation of Lines, Co-ordinate points, axes, poly-lines, square, rectangle, polygons, splines, circles, ellipse, text, move, copy, off-set, mirror, rotate, trim, extend, break, chamfer, fillet, curves, constraints viz. tangency, parallelism, inclination and perpendicularity. Dimensioning, line conventions, material conventions and lettering. **Introduction**, Definitions - Planes of projection, reference line and conventions employed. **Projections of points**: Projection in all the four quadrants. **Projections of straight lines**: (located in First quadrant/first angle only), True and apparent lengths, True and apparent inclinations to reference planes (No application problems). **Orthographic Projections of Plane Surfaces:** (First Angle Projection Only) Introduction, Definitions–projections of plane surfaces–triangle, square, rectangle, pentagon, hexagon and circle, planes in different positions by change of position method only (No problems on punched plates and composite plates).		
2	**Projections of Solids**: (First angle Projection only) Introduction, Definitions – Projections of right regular prisms, pyramids, cylinders and cones in different positions (No problems on tetrahedron, cube, octahedron, combination of solids and suspended solids).	12	CO1 CO2 CO3 CO4 CO6
3	**Isometric Projection**: Introduction, Isometric scale, Isometric projection of simple plane figures, Isometric projection of tetrahedron, hexahedron(cube), right regular prisms, pyramids, cylinders, cones, spheres, cut spheres and combination of solids (Maximum of two solids).	10	CO1 CO2 CO4 CO5
4	**Sections and Development of Lateral Surfaces of Solids:** Introduction, Section planes, Sections, Sections of right regular prisms, pyramids, cylinders and cones resting with base on HP. (No problems on sections of solids) Development of lateral surfaces of above solids, their frustums and truncations. (No problems on lateral surfaces of trays, tetrahedrons, spheres and transition pieces).	10	CO1 CO2 CO4 CO6
5	**Multidisciplinary Applications & Practice** (For CIE Only): **Free hand Sketching**; True free hand, Guided Free hand, Roads, Buildings, Utensils, Hand tools & Furniture's etc **Drawing Simple Mechanisms**; Bicycles, Tricycles, Gear trains, Ratchets, two wheeler cart & Four wheeler carts to dimensions etc **Electric Wiring and lighting diagrams**; Like, Automatic fire alarm, Call bell system, UPS system, Basic power distribution system using suitable software **Basic Building Drawing**; Like, Architectural floor plan, basic foundation drawing, steel structures- Frames, bridges, trusses using Auto CAD or suitable software, **Electronics Engineering Drawings**- Like, Simple Electronics Circuit Drawings. **Graphs & Charts**: Like, Column chart, Pie chart, Line charts, Gantt charts, etc. using Microsoft Excel or any suitable software.	6	CO1 CO2

Text Books:

1) N.D. Bhatt & V.M. Panchal, **Engineering Drawing**, Charotar Publishing House, Gujarat, 48th edition, 2005.

2) A Primer on **Computer Aided Engineering Drawing**, Published by VTU, Belgaum, 2006

Reference Books:

1) K.R. Gopalakrishna, **Engineering Graphics,** Subash Publishers Bangalore, 32nd edition, 2005.

2) Primer Solution Book, Published by VTU, Belgaum, 2006

CIE for 50 marks

1. Assignment/sketch book/Print out	25 Marks
2. Surprise test/Mid semester test	10 Marks
3. Test conducted towards the end of semester	15Marks

Question paper pattern for SEE:

1. Question paper for each batch of students will be set separately by the examination authority. The answer sheets will have to be jointly evaluated by the Internal & External examiners.

2. A maximum of THREE questions will be set as per the following pattern (No mixing of questions from different Units).

Q. No.	Unit	Marks Allotted
1	Unit 1 (1 Question on projection of points and lines) OR (1 Question on projection of plane surfaces)	30
2	Unit 2 (2 question out of which 1 has to be attempted)	40
3	Unit 3 (1 Question to be set from Isometric Projection) OR Unit 4 (1 Question to be set from Development of Lateral Surfaces of Solids)	30
	Total	**100**

Q. No.	Solutions and Sketching in the Graph Book	Computer Display and Printout	Total Marks
1	30	--	30
2	--	40	40
3	15	15	30
Total Marks	**45**	**55**	**100**

Students have to submit the computer printouts and the sketches drawn on the graph sheets at the end of the examination. Both Internal & External examiners have to jointly evaluate the solutions (sketches) and computer display & printouts of each student for 100 marks and submit the marks list along with the solution (sketches) on graph sheets & computer printouts in separate covers.

4. Each batch must consist of a minimum of 10 students and a maximum of 12 students.

5. Examination can be conducted in parallel batches, if necessary.

Elements of Mechanical Engineering

Subject code: 22ME23

Course and Course Code	Course Title			Teaching Hours /Week			Examination				Credits
				Lecture	Tutorial						
22EME23	Elements of Mechanical Engineering	ME	Mechanical Engineering	3	0	--	03	50	50	00	3

Course Objectives:

CO.1	Understand modern manufacturing systems, working of basic machine tools and their specifications.
CO.2	Understand additive manufacturing and various metal joining processes.
CO.3	Understand the process of steam generation & application in various engineering systems and also comprehend the working of hydraulic turbines.
CO.4	Understand the working of Internal combustion engines .
CO.5	Understand the working of various refrigeration cycles.
CO.6	Understand the fundamentals of various power transmission systems, IOT& HVET.

Unit	Contents	Hours	COs
1	**Introduction to Mechanical Engineering:** Role of Mechanical Engineering in Industries and Society- Emerging Trends and Technologies in different sectors such as Energy, Manufacturing, Automotive, Aerospace, and Marine sectors. **Lathe:** Classification, Principle of operation, Parts of a centre Lathe, lathe specification, Lathe operations: Turning, facing, knurling, thread cutting, Taper Turning by swivelling compound rest. **Drilling machine:** Principle and Classification of drilling machines, Bench drilling machine,	7	1

	Radial drilling machine, Operations on drilling machine-Drilling, Boring, Reaming, Tapping, Counter Sinking, Counter boring and Spot facing. **Computer Numerical Control (CNC):** Introduction, Components of CNC, open loop and closed loop systems, advantages and disadvantages of CNC. **Robotics:** Introduction, Classification based on robot configuration: Polar, Cylindrical, Cartesian and jointed arm configuration. Application, Advantages and disadvantages of robots.		
	Demonstration of Lathe operations(Turning, Taper Turning) and Drilling operations(Drilling), C.N.C machine in Machine shop Laboratory and R &D Centre respectively	**1**	
2	**Joining Process** **Soldering:** Principle of soldering, Surface preparation, Methods of soldering, Applications **Brazing:** Principle of brazing, methods of brazing, Applications **Welding:** Definition, Classification, Applications of welding, Flux and its functions, Description of arc welding, Electrodes used in arc welding, Description of oxyacetylene welding, Types of flames produced in gas welding, Comparison between welding, soldering and Brazing, Welding Defects. **Additive Manufacturing:** Basic principle, need and advantages of additive manufacturing, Procedure for product development in additive manufacturing, Difference between Additive and Subtractive Manufacturing, Classification of additive manufacturing process, Materials and softwares used, Applications and Limitations, Principle and Applications of 3D Printing	**7**	**2**
	Demonstration on welding, soldering and 3D Printing in the Workshop Practice Laboratory	**1**	
3	**Steam:** Formation of steam, Types of steam, Steam properties-Enthalpy, dryness fraction, wetness fraction, latent heat, sensible heat, Internal energy, Specific volume, External work of evaporation, degree of superheat, amount of superheat, saturated and superheated temperature, Numericals on steam. **Boilers:** Classification of Boilers, Babcock and Wilcox Boiler, Lancashire Boiler, Boiler mountings and accessories (no sketches) Steam Turbines: Classification, Principle operation of Impulse and reaction turbines, Delaval's turbine, Parson's turbine **Water turbines:** Classification, Principles and operations of Pelton wheel, Francis turbine, Kaplan turbine.	**7**	**3**

	Demonstration of Boiler models and working of Water Turbines in Heat Transfer Laboratory and Fluid Machinery Laboratory	**1**	
4	**Internal combustion (I.C) engines:** I.C. Engines parts, 2 Stroke and 4 stroke petrol engines, 4 stroke diesel engines. P-V diagrams of Otto and Diesel cycles, Numerical on indicated power, brake power, indicated thermal efficiency, brake thermal efficiency, mechanical efficiency and specific fuel consumption. **Refrigeration**: Definitions –Refrigeration, Ton of Refrigeration, Unit of Refrigeration, Refrigerating effect, Ice making capacity, COP, Relative COP, Properties of refrigerants, list of commonly used refrigerants, Principle and working of Vapour Compression Refrigeration and Vapour Absorption Refrigeration	**7**	**4,5**
	Demonstration of working of I.C Engines and Vapour Compression Refrigeration test rig in Energy Conversion and Heat Transfer Laboratory	**1**	
5	**Power Transmission** **Belt drives**-Terminology of a belt drive, open and cross belt drives, **Gear Drives:** Types of Gears and applications, Advantages and disadvantages of gear drive, Gear Tooth Nomenclature, Classification of Gear train: Simple, Compound, Reverted &Epicyclic, Velocity ratio of simple and compound gear train, Numerical on Gear drives (only simple and compound gear train). **Hybrid & Electric vehicles Technology (HEVT)-** Comparison with conventional vehicle technologies, components of EV's, challenges and Key aspects of EV. EV's, Basics of EV, Basics of HEV, Basics of Plug-In Hybrid Electric vehicle (PHEV), Basics of Fuel Cell Vehicle (FCV). Hybrid Electric Vehicles: Classification, Micro, Mild, Full, Plug in, EV.	**7**	**6**
	Demonstration of Belt & Gear drives in the Machine shop Laboratory	**1**	

Course outcomes: At the end of the semester, students will be able to

CO.1	Understand various machine tools, their specifications and modern manufacturing systems
CO.2	Understand various metal joining and additive manufacturing processes
CO.3	Understand the generation & application of steam in various engineering systems and also comprehend the working of hydraulic turbines
CO.4	Understand the working of Internal combustion engines
CO.5	Understand the working of various refrigeration cycles
CO.6	Understand the fundamentals of various power transmission systems, IOT& HVET

Note:

1. **Questions for CIE and SEE not to be set from self-study topics**
2. **Assignment questions should be from self-study component only**

Self-study topics

Unit 1: Principle of Casting, forging, extrusion, rolling, Grinding and milling

Unit 2: Advanced joining Processes: Ultrasonic welding & Electron beam welding

Unit 3: Clutches & Differentials

Unit 4: Solar energy, wind energy, bio energy

Unit 5: Room Air-conditioner, Rating of fuels, Knocking in SI and CI engines, Emission standards-Bharat and Euro norms

Text Books

1. Elements of Mechanical Engineering, K. R. Gopalakrishna, Subhas Publications, Bangalore, 2008.
2. Elements of Mechanical Engineering, Vol.-1 & 2, Hajra Choudhury, Media Promoters, New Delhi, 2001.

Reference Books

1. Mikell P. Groover, “Fundamentals of Modern Manufacturing” Fourth Edition, John Wiley & Sons, Inc.
2. Bharat Vinjamuri, Manjunath Shettar, “Computer Integrated Manufacturing” Sunstar Publisher, 2016.

Introduction to Mechanical Engineering

Subject code: 22ESC244

Course Objectives:

CO.1	Understand modern manufacturing systems, working of basic machine tools and their specifications.
CO.2	Understand additive manufacturing and various metal joining processes.
CO.3	Understand the process of steam generation & application in various engineering systems and also comprehend the working of hydraulic turbines.
CO.4	Understand the working of Internal combustion engines .
CO.5	Understand the working of various refrigeration cycles.
CO.6	Understand the fundamentals of various power transmission systems, IOT& HVET.

Unit	Contents	Hours	COs
1	**Introduction:** Role of Mechanical Engineering in Industries and Society- Emerging Trends and Technologies in different sectors such as Energy, Manufacturing, Automotive, Aerospace, and Marine sectors.	**7**	**1**

	Machine Tool Operations: Working Principle of lathe, Lathe operations: Turning, facing, knurling. Working principles Of Drilling Machine, drilling operations: drilling, boring, reaming. Working of Milling Machine, Milling operations: plane milling and slot milling. (No sketches of machine tools, sketches to be used only for explaining the operations). **Computer Numerical Control (CNC):** Introduction, Components of CNC, open loop and closed loop systems, advantages and disadvantages of CNC. **Robotics:** Introduction, Classification based on robot configuration: Polar, Cylindrical, Cartesian and jointed arm configuration. Application, Advantages and disadvantages of robots.		
	Demonstration of Lathe operations(Turning, Taper Turning) and Drilling operations(Drilling), C.N.C machine in Machine shop Laboratory and R &D Centre respectively	**1**	
2	**Joining Process** **Soldering:** Principle of soldering, Surface preparation, Methods of soldering, Applications **Brazing:** Principle of brazing, methods of brazing, Applications **Welding:** Definition, Classification, Applications of welding, Flux and its functions, Description of arc welding, Electrodes used in arc welding, Description of oxyacetylene welding, Types of flames produced in gas welding, Comparison between welding, soldering and Brazing, Welding Defects. **Additive Manufacturing:** Basic principle, need and advantages of additive manufacturing, Procedure for product development in additive manufacturing, Difference between Additive and Subtractive Manufacturing, Classification of additive manufacturing process, Materials and softwares used, Applications and Limitations, Principle and Applications of 3D Printing	**7**	**2**
	Demonstration on welding, soldering and 3D Printing in the Workshop Practice Laboratory	**1**	
3	**Steam:** Formation of steam, Types of steam, Steam properties-Enthalpy, dryness fraction, wetness fraction, latent heat, sensible heat, Internal energy, Specific volume, External work of evaporation, degree of superheat, amount of superheat, saturated and superheated temperature. **Boilers:** Classification of Boilers, Babcock and Wilcox Boiler, Lancashire Boiler, Boiler mountings and accessories (no sketches) **Steam Turbines:** Classification, Principle operation of Impulse and reaction turbines, Delaval's turbine, Parson's turbine	**7**	**3**

	Water turbines: Classification, Principles and operations of Pelton wheel, Francis turbine, Kaplan turbine.		
	Demonstration of Boiler models and working of Water Turbines in Heat Transfer Laboratory and Fluid Machinery Laboratory	**1**	
4	**Internal combustion (I.C) engines:** I.C. Engines parts, 2 Stroke and 4 stroke petrol engines, 4 stroke diesel engines. P-V diagrams of Otto and Diesel cycles, Numerical on indicated power, brake power, indicated thermal efficiency, brake thermal efficiency, mechanical efficiency and specific fuel consumption. **Refrigeration**: Definitions –Refrigeration, Ton of Refrigeration, Unit of Refrigeration, Refrigerating effect, Ice making capacity, COP, Relative COP, Properties of refrigerants, list of commonly used refrigerants, Principle and working of Vapour Compression Refrigeration and Vapour Absorption Refrigeration	**7**	**4,5**
	Demonstration of working of I.C Engines and Vapour Compression Refrigeration test rig in Energy Conversion and Heat Transfer Laboratory	**1**	
5	**Power Transmission** **Belt drives**-Terminology of a belt drive, open and cross belt drives, **Gear Drives:** Types of Gears and applications, Advantages and disadvantages of gear drive, Gear Tooth Nomenclature, Classification of Gear train: Simple, Compound, Reverted &Epicyclic, Velocity ratio of simple and compound gear train. **Hybrid & Electric vehicles Technology (HEVT)-** Comparison with conventional vehicle technologies, components of EV's, challenges and Key aspects of EV. EV's, Basics of EV, Basics of HEV, Basics of Plug-In Hybrid Electric vehicle (PHEV), Basics of Fuel Cell Vehicle (FCV). Hybrid Electric Vehicles: Classification, Micro, Mild, Full, Plug in, EV. **Introduction to IOT:** Definition and Characteristics, Physical design, protocols, Logical design of IoT, Functional blocks, and communication models.	**7**	**6**
	Demonstration of Belt & Gear drives in the Machine shop Laboratory.	**1**	

Course outcomes: At the end of the semester, students will be able to

CO.1	Understand various machine tools, their specifications and modern manufacturing systems
CO.2	Understand various metal joining and additive manufacturing processes
CO.3	Understand the generation & application of steam in various engineering systems and also comprehend the working of hydraulic turbines
CO.4	Understand the working of Internal combustion engines
CO.5	Understand the working of various refrigeration cycles

CO.6	Understand the fundamentals of various power transmission systems, IOT& HVET

Note:

1. **Questions for CIE and SEE not to be set from self-study topics**
2. **Assignment questions should be from self-study component only**

Self-study topics

Unit 1: Principle of Casting, forging, extrusion, rolling, Grinding and milling

Unit 2: Advanced joining Processes: Ultrasonic welding & Electron beam welding

Unit 3: Clutches & Differentials

Unit 4: Solar energy, wind energy, bio energy

Unit 5: Room Air-conditioner, Rating of fuels, Knocking in SI and CI engines, Emission standards-Bharat and Euro norms

Text Books

1. Elements of Mechanical Engineering, K. R. Gopalakrishna, Subhas Publications, Bangalore, 2008.
2. Elements of Mechanical Engineering, Vol.-1 & 2, Hajra Choudhury, Media Promoters, New Delhi, 2001.

Reference Books

1. Mikell P. Groover, “Fundamentals of Modern Manufacturing” Fourth Edition, John Wiley & Sons, Inc.
2. Bharat Vinjamuri, Manjunath Shettar, “Computer Integrated Manufacturing” Sunstar Publisher, 2016.