SFIT/IQAC/FE-G1-SS/2024-25/R0

Date:20/07/2024

St. Francis Institute of Technology

(Engineering College)

(An Autonomous Institute, Affiliated to University of Mumbai)

S.V.P. Road, Borivli (W), Mumbai

B. E. / B.Tech. First Year Scheme and Syllabus
Common for all Departments

Approved by: - Board of Studies

Approved by: - Academic Council of St. Francis Institute of Technology

w.e.f. Academic Year 2024 – 2025

Table of Contents

Abbreviations xi
1 Course Structure and Curriculum 13
1.1 Definition of Credit: 13
1.2 Range of Credits: 13
1.3 Classification of Departments 13
1.4 Semester-wise Credit Distribution Structure 14
1.5 Subject Allocation 15
1.6 First Year Scheme of the Syllabus 17
1.7 Evaluation and Examination Scheme 19
Section I A. Basic Science Courses (BSC) 22
2 Engineering Chemistry (FE0_BSC_ECH_T001) 23
2.1 Teaching Scheme 23
2.2 Examination and Evaluation Scheme 23
2.3 Course Objectives 23
2.4 Course Outcomes 23
2.5 Course Contents 23
2.6 Suggested Learning Resources 24
3 Engineering Chemistry Lab (FE0_BSC_ECH_L001) 26
3.1 Teaching Scheme 26
3.2 Examination and Evaluation Scheme 26
3.3 Course Objectives 26
3.4 Course Outcomes 26
3.5 Course Contents 26
3.6 Suggested Learning Resources 27
4 Engineering Physics (FE0_BSC_EPH_T002) 28
4.1 Teaching Scheme 28
4.2 Examination and Evaluation Scheme 28
4.3 Course Objectives 28
4.4 Course Outcomes 28
4.5 Course Contents 28
4.6 Suggested Learning Resources: 29
5 Engineering Physics Lab (FE0_BSC_EPH_L002) 31
5.1 Teaching Scheme 31
5.2 Examination and Evaluation Scheme 31

5.3 Course Objectives 31
5.4 Course Outcomes 31
5.5 Course Contents 31
5.6 Suggested Learning Resources: 32
6 Linear Algebra and Calculus (FE0_BSC_LAC_T103) 33
6.1 Teaching Scheme 33
6.2 Examination and Evaluation Scheme 33
6.3 Course Objectives 33
6.4 Course Outcomes 33
6.5 Course Contents 33
6.6 Suggested Learning Resources: 34
7 Probability and Statistics (FE0_BSC_PRS_T204) 36
7.1 Teaching Scheme 36
7.2 Examination and Evaluation Scheme 36
7.3 Course Objectives 36
7.4 Course Outcomes 36
7.5 Course Contents 36
7.6 Suggested Learning Resources 37
Section I B. Engineering Science Courses (ESC) 38
8 Problem Solving with Programming (FE0_ESC_PSP_T101) 39
8.1 Teaching Scheme 39
8.2 Examination and Evaluation Scheme 39
8.3 Course Objectives 39
8.4 Course Outcomes 39
8.5 Course Contents 39
8.6 Suggested Learning Resources 40
9 Problem Solving with Programming Lab (FE0_ESC_PSP_L101) 42
9.1 Teaching Scheme 42
9.2 Examination and Evaluation Scheme 42
9.3 Course Objectives 42
9.4 Course Outcomes 42
9.5 Course Contents 42
9.6 Suggested Learning Resources 43
10 Engineering Graphics and Design (FE0_ESC_EGD_T002) 44
10.1 Teaching Scheme 44
10.2 Examination and Evaluation Scheme 44

10.3 Course Objectives 44
10.4 Course Outcomes 44
10.5 Course Contents 44
10.6 Suggested Learning Resources 45
11 Engineering Graphics and Design Lab (FE0_ESC_EGD_L002) 46
11.1 Teaching Scheme 46
11.2 Examination and Evaluation Scheme 46
11.3 Course Objectives 46
11.4 Course Outcomes 46
11.5 Course Contents 46
11.6 Suggested Learning Resources 47
12 Basic Electrical and Electronics Engineering (FE0_ESC_BEE_T003) 48
12.1 Teaching Scheme 48
12.2 Examination and Evaluation Scheme 48
12.3 Course Objectives 48
12.4 Course Outcomes 48
12.5 Course Contents 48
12.6 Suggested Learning Resources 49
13 Basic Electrical and Electronics Engineering Lab (FE0_ESC_BEE_L003) 51
13.1 Teaching Scheme 51
13.2 Examination and Evaluation Scheme 51
13.3 Course Objectives 51
13.4 Course Outcomes 51
13.5 Course Contents 51
13.6 Suggested Learning Resources 52
14 Engineering Mechanics (FE0_ESC_EME_T004) 53
14.1 Teaching Scheme 53
14.2 Examination and Evaluation Scheme 53
14.3 Course Objectives 53
14.4 Course Outcomes 53
14.5 Course Contents 53
14.6 Suggested Learning Resources 54
15 Engineering Mechanics Lab (FE0_ESC_EME_L004) 56
15.1 Teaching Scheme 56
15.2 Examination and Evaluation Scheme 56
15.3 Course Objectives 56

15.4 Course Outcomes 56
15.5 Course Contents 56
15.6 Suggested Learning Resources 57
Section II. Program Courses (PC) 58
16 Program Core Lab - Data Analytics (FE0_PCC_DAT_L201) 59
16.1 Teaching Scheme 59
16.2 Examination and Evaluation Scheme 59
16.3 Course Objectives 59
16.4 Course Outcomes 59
16.5 Course Contents 59
16.6 Suggested Learning Resources 60
17 Program Core Lab - Web Development (FE0_PCC_WDL_L201) 61
17.1 Teaching Scheme 61
17.2 Examination and Evaluation Scheme 61
17.3 Course Objectives 61
17.4 Course Outcomes 61
17.5 Course Contents 61
17.6 Suggested Learning Resources 62
18 Program Core Lab – Analog and Digital Integrated Circuits Lab (FE0_PCC_ADC_L201) 64
18.1 Teaching Scheme 64
18.2 Examination and Evaluation Scheme 64
18.3 Course Objectives 64
18.4 Course Outcomes 64
18.5 Course Contents 64
18.6 Suggested Learning Resources 65
19 Program Core Lab – Elements of Electrical and Electronics System. (FE0_PCC_EEE_L201) 66
19.1 Teaching Scheme 66
19.2 Examination and Evaluation Scheme 66
19.3 Course Objectives 66
19.4 Course Outcomes 66
19.5 Course Contents 66
19.6 Suggested Learning Resources 67
20 Program Core Lab –Elements of Electronics and Telecommunication Engineering (FE0_PCC_EET_L201) 68
20.1 Teaching Scheme 68

20.2 Examination and Evaluation Scheme 68
20.3 Course Objectives 68
20.4 Course Outcomes 68
20.5 Course Contents 68
20.6 Suggested Learning Resources 69
21 Program Core Lab – Welding (FE0_PCC_WLD_L201) 70
21.1 Teaching Scheme 70
21.2 Examination and Evaluation Scheme 70
21.3 Course Objectives 70
21.4 Course Outcomes 70
21.5 Course Contents 70
21.6 Suggested Learning Resources 71
Section III. Multidisciplinary Courses (MDC) 72
Section IV. Skill Courses (SC) 73
22 Skill Development Lab (FE0_SEC_SDL_L101) 74
22.1 Teaching Scheme 74
22.2 Examination and Evaluation Scheme 74
22.3 Course Objectives 74
22.4 Course Outcomes 74
22.5 Course Contents 74
22.6 Suggested Learning Resources 75
23 Python Programming (FE0_SEC_PYP_T202) 76
23.1 Teaching Scheme 76
23.2 Examination and Evaluation Scheme 76
23.3 Course Objectives 76
23.4 Course Outcomes 76
23.5 Course Contents 76
23.6 Suggested Learning Resources 77
24 Python Programming Lab (FE0_SEC_PYP_L202) 79
24.1 Teaching Scheme 79
24.2 Examination and Evaluation Scheme 79
24.3 Course Objectives 79
24.4 Course Outcomes 79
24.5 Course Contents 79
24.6 Suggested Learning Resources 80
Section V . Humanities Social Science and Management (HSSM) Courses 81

25 Communication Skills and Ethics (FE0_AEC_CSE_T001) 82
25.1 Teaching Scheme 82
25.2 Examination and Evaluation Scheme 82
25.3 Course Objectives 82
25.4 Course Outcomes 82
25.5 Course Contents 82
25.6 Suggested Learning Resources 84
26 Environmental Science and Engineering (FE0_IKS_ESE_T001) 85
26.1 Teaching Scheme 85
26.2 Examination and Evaluation Scheme 85
26.3 Course Objectives 85
26.4 Course Outcomes 85
26.5 Course Contents 85
26.6 Suggested Learning Resources 86
27 Principles of Town Planning and Water Management (FE0_IKS_TPW_T001) 88
27.1 Teaching Scheme 88
27.2 Examination and Evaluation Scheme 88
27.3 Course Objectives 88
27.4 Course Outcomes 88
27.5 Course Contents 88
27.6 Suggested Learning Resources Textbooks 89
28 Trade and Commerce (FE0_IKS_TAC_T001) 91
28.1 Teaching Scheme 91
28.2 Examination and Evaluation Scheme 91
28.3 Course Objectives 91
28.4 Course Outcomes 91
28.5 Course Contents 91
28.6 Suggested Learning Resources 92
Section VI. Experiential Learning Courses (ELC) 93
Section VII. Liberal Learning Courses (LLC) 94
29 Yoga & Wellbeing - I(FE0_CC_YW1_P101) 95
29.1 Teaching Scheme 95
29.2 Examination and Evaluation Scheme 95
29.3 Course Objectives 95
29.4 Course Outcomes 95
29.5 Course Contents 95

29.6 Suggested Learning Resources 96
30 Social Service and Responsibility - I (FE0_CC_SR1_P101) 97
30.1 Teaching Scheme 97
30.2 Examination and Evaluation Scheme 97
30.3 Course Objectives 97
30.4 Course Outcomes 97
30.5 Course Contents 97
30.6 Suggested Learning Resources 98
31 Sports and Physical Fitness I (FE0_CC_SP1_P101) 99
31.1 Teaching Scheme 99
31.2 Examination and Evaluation Scheme 99
31.3 Course Objectives 99
31.4 Course Outcomes 99
31.5 Course Contents 99
31.6 Suggested Learning Resources 100
32 Yoga & Wellbeing - II (FE0_CC_YW2_P202) 101
32.1 Teaching Scheme 101
32.2 Examination and Evaluation Scheme 101
32.3 Course Objectives 101
32.4 Course Outcomes 101
32.5 Course Contents 101
32.6 Suggested Learning Resources 102
33 Social Service and Responsibility - II (FE0_CC_SR2_P202) 103
33.1 Teaching Scheme 103
33.2 Examination and Evaluation Scheme 103
33.3 Course Objectives 103
33.4 Course Outcomes 103
33.5 Course Contents 103
33.6 Suggested Learning Resources 104
34 Sports and Physical Fitness II (FE0_CC_SP2_P202) 105
34.1 Teaching Scheme 105
34.2 Examination and Evaluation Scheme 105
34.3 Course Objectives 105
34.4 Course Outcomes 105
34.5 Course Contents 105
34.6 Suggested Learning Resources 106

List of Tables:

Table 1-1: Credit Allocation 13
Table 1-2: Options for 4 years Bachelor's Engg. / Tech. Degree (As per NEP 2020) 13
Table 1-3: Classification of SFIT departments into two groups 13
Table 1-4: Semester-wise subjects and credit distribution in First Year of B.Tech. 14
Table 1-5: List of courses under Program Core Courses in Semester II 15
Table 1-6: List of courses under Indian Knowledge System 15
Table 1-7: List of courses under Co-Curricular Courses in Semester I 16
Table 1-8: List of courses under Co-Curricular Courses in Semester II 16
Table 1-9: Contact hours and credit distribution of courses for Departments in Group I 17
Table 1-10: Contact hours and credit distribution of courses for Departments in Group II 18
Table 1-11: Marks distribution of courses for Departments in Group I 19
Table 1-12: Marks distribution of courses for Departments in Group II 20

Preamble

Engineering education is essential in contemporary society as it equips individuals with the knowledge, skills, and mindset necessary to propel technological advancements, address intricate global challenges, and promote societal advancement.

St. Francis Institute of Technology (SFIT) in Borivli, Mumbai, stands as a renowned engineering institute offering both undergraduate and postgraduate degree programs in engineering. Acknowledging its commitment to quality education, UGC has conferred an autonomous status to the institute vide letter no. F.2-10/2023 (AC-Policy) dated 24th April, 2024 with effect from the academic year 2024-25. In light of this achievement, SFIT is presenting a distinctive new curriculum for its undergraduate engineering degree program adhering to National Education Policy (NEP) 2020 credit framework as per Government Directive dated 4th July 2023. In line with SFIT's vision, this curriculum aims to nurture bright young minds into technological entrepreneurs and innovative leaders of tomorrow's world, while upholding the Franciscan values of integrity, peace, and love.

The SFIT curriculum prioritizes multidisciplinary learning, flexibility, research, and innovation, integrating soft skills cultivation and ethical principles while leveraging technology for enhanced learning experiences. The undergraduate degree program consists of a total of 160-176 credits. The overall credit distribution and curriculum approach in this revision align with the AICTE model curriculum.

Abbreviations

AEC	Ability Enhancement Courses
AIML	Artificial Intelligence and Machine Learning Engineering
BE	Fourth Year Engineering
BEE	Basic Electrical and Electronics Engineering
BSC	Basic Science Courses
CA	Continuous Assessment
CC	Co-curricular Courses
CEP	Community engagement project:
CMPN	Computer Engineering
DAIML	Department of Artificial Intelligence and Machine Learning
DCMPN	Department of Computer Engineering
DECS	Department of Electronics and Computer Science
DEE	Department of Electrical Engineering
DEXTC	Department of Electronics and Telecommunication Engineering
DINFT	Department of Information Technology
DME	Department of Mechanical Engineering
ECS	Electronics and Computer Science
EE	Electrical Engineering
EEM	Entrepreneurship/Economics/Management
ELC	Experiential Learning Courses
ESC	Engineering Science Courses
ESE	End Semester Examination
EXTC	Electronics and Telecommunication Engineering
FBT	First Year B.Tech.
FP	Field Projects
HSSM	Humanities Social Sciences and Management
IKS	Indian Knowledge System
INFT	Information Technology
ISE	In Semester Evaluation
LLC	Liberal Learning Courses
MDC	Multidisciplinary Courses
MDM	Multidisciplinary Minor
ME	Mechanical Engineering
MSE	Mid Semester Examination
OE	Generic/ Open Electives (other than a particular program)

OrE	Oral Examination
OEC	Open Elective Courses
OJT	On Job Training
PC	Program Courses
PCC	Program Core Courses
PE	Practical Examination
PrE	Project Examination
PEC	Program Elective Courses
RM	Research Methodology
RP	Research Project
SC	Skill Courses
SEC	Skill Enhancement Courses
SE	Second Year Engineering
TE	Third Year Engineering
VEC	Value Education Courses
VSC	Vocational Skill Courses
VSEC	Vocational and Skill Enhancement Course

1 Course Structure and Curriculum

1.1 Definition of Credit:

Table 1-1: Credit Allocation

Schedule	Score
1 Hr. Lecture (L) per week	1 Credit
1 Hr. Tutorial (T) per week	1 Credit
1 Hr. Practical (P) per week	0.5 Credit
2 Hours Practical (P) per week	1 Credit

1.2 Range of Credits:

Table 1-2: Options for 4 years Bachelor's Engg. / Tech. Degree (As per NEP 2020)

Level	Course name	Total Credit assigned
6	Bachelor's degree (B.E / B.Tech.) in Computer Engineering with Multidisciplinary Minor	160-176
6	Bachelor's degree (B.E / B.Tech.) in Computer Engineering with Honors and Multidisciplinary Minor	180-194
6	Bachelor's degree (B.E / B.Tech.) in Computer Engineering Honors with Research and Multidisciplinary Minor	180-194
6	Bachelor's degree (B.E / B.Tech.) in Computer Engineering Major Engineering Discipline with Double Minors (Multidisciplinary and Specialization Minors)	180-194

1.3 Classification of Departments

1.3.1 Group Classification

Classes have been divided into two groups as per departments namely Group I and Group II as shown in the following Table 1-3 . This ensures effective load distribution, a better academic experience, and ease of learning.

Table 1-3: Classification of SFIT departments into two groups

S. No	Group I Departments	No. of Division
1	Computer Engineering	3
2	Information Technology	2

S. No	Group II Departments	No. of Division
1	Artificial Intelligence and Machine Learning	1
2	Electrical Engineering	1
3	Electronics and Computer Science	1
4	Electronics and Telecommunication Engineering	2
5	Mechanical Engineering	1

1.4 Semester-wise Credit Distribution Structure

Table 1-4: Semester-wise subjects and credit distribution in First Year of B.Tech.

S. No.	Course Type	Subject Code	Courses	Group I Semester	Group II Semester	Credits
1	BSC	FE0_BSC_ECH_T001	Engineering Chemistry	I	II	2
2		FE0_BSC_ECH_L001	Engineering Chemistry Lab	I	II	0.5
3		FE0_BSC_EPH_T002	Engineering Physics	II	I	2
4		FE0_BSC_EPH_L002	Engineering Physics Lab	II	I	0.5
5		FE0_BSC_LAC_T103	Linear Algebra and Calculus	I	I	4
6		FE0_BSC_PRS_T204	Probability and Statistics	II	II	4
7	ESC	FE0_ESC_PSP_T101	Problem Solving with Programming	I	I	2
8		FE0_ESC_PSP_L101	Problem Solving with Programming Lab	I	I	1
9		FE0_ESC_EGD_T002	Engineering Graphics and Design	I	II	3
10		FE0_ESC_EGD_L002	Engineering Graphics and Design Lab	I	II	1
11		FE0_ESC_BEE_T003	Basic Electrical and Electronics Engineering	I	II	3
12		FE0_ESC_BEE_L003	Basic Electrical and Electronics Engineering Lab	I	II	1
13		FE0_ESC_EME_T004	Engineering Mechanics	II	I	3
14		FE0_ESC_EME_L004	Engineering Mechanics Lab	II	I	1
I. Total Credits – Basic and Engineering Science Courses (BSC/ESC)						**28**
15	PCC	FE0_PCC_###_L201	Program Core Lab	II	II	2
II. Total Credits – Program Courses (PC)						**2**
-	-	-	-	-	-	-
III. Total Credits – Multidisciplinary Courses (MDC)						-
16	VSEC	FE0_SEC_SDL_L101	Skill Development Lab	I	I	2
17		FE0_SEC_PYP_T202	Python Programming	II	II	2
18		FE0_SEC_PYP_L202	Python Programming Lab	II	II	1
IV. Total Credits – Skill Courses (SC)						**5**
19	AEC	FE0_AEC_CSE_T001	Communication Skills and Ethics	II	I	3
20	IKS	FE0_IKS_***_T001	Indian Knowledge System	II	I	2
V. Total Credits – Humanities Social Science and Management (HSSM)						**5**
-	-	-	-	-	-	-
VI. Total Credits – Experiential Learning Courses (ELC)						-
21	CC	FE0_CC_**1_P101	Co-Curricular Course - I	I	I	1.5
22		FE0_CC_**2_P202	Co-Curricular Course - II	II	II	1.5
VII. Total Credits – Liberal Learning Courses (LLC)						**3**
					Total Credits for First Year	**43**

1.5 Subject Allocation

- Engineering Chemistry, Engineering Physics, Communication Skills and Ethics, Engineering Graphics and Design, Engineering Mechanics, Basic Electrical and Electronics Engineering and all courses under the Indian Knowledge System are offered in different semesters for Group 1 and Group 2.
- Remaining subjects are offered for both groups in the same semester.
- For detailed schedules, contact hours, credits and heads under each subject, kindly refer to Table 1-9 for Group 1 and Table 1-10 for Group 2.

1.5.1 Program Core Courses (PCC)

- In Semester II, students attend program core laboratories to gain domain-specific practical knowledge of their respective department.
- For specifics of each department refer to Table 1-5.

Table 1-5: List of courses under Program Core Courses in Semester II

S. No.	Department	Code	Program Core Course
1	Artificial Intelligence and Machine Learning	FE0_PCC_DAT_L201	Program Core Lab - Data Analytics
2	Computer Engineering	FE0_PCC_WDL_L201	Program Core Lab - Web Development
3	Information Technology		
4	Electronics and Computer Science	FE0_PCC_ADC_L201	Program Core Lab - Analog and Digital Integrated Circuits
5	Electrical Engineering	FE0_PCC_EEE_L201	Program Core Lab – Elements of Electrical and Electronics System.
6	Electronics and Telecommunication Engineering	FE0_PCC_EET_L201	Program Core Lab - Elements of Electronics and Telecommunication Engineering
7	Mechanical Engineering	FE0_PCC_WLD_L201	Program Core Lab - Welding

1.5.2 Indian Knowledge System

- For this mandatory course, students can select any one out of the basket of three courses offered. For details refer to table 1-6.

Table 1-6: List of courses under Indian Knowledge System

S. No.	Code	Title of the Indian Knowledge System Course
1	FE0_IKS_ESE_T001	Environmental Science and Engineering
2	FE0_IKS_TPW_T001	Principles of Town Planning and Water Management
3	FE0_IKS_TAC_T001	Trade and Commerce

1.5.3 Co-Curricular Courses

- For this mandatory course, students can select any one of the five offered under the basket of courses in Semester I, which will continue for the entire first year.

- The Semester I part of the co-curricular course is foundational and a prerequisite for Semester II. So no change of options is allowed in the second semester.
- Refer to table Table 1-7 below and Table 1-8 for enlisted subjects.

Table 1-7: List of courses under Co-Curricular Courses in Semester I

S. No.	Code	Title of the Co-Curricular Course - I
1	FE0_CC_YW1_P101	Yoga and Wellbeing – I
2	FE0_CC_SR1_P101	Social Service and Responsibility - 1
3	FE0_CC_SP1_P101	Sports and Physical Fitness - I

Table 1-8: List of courses under Co-Curricular Courses in Semester II

S. No.	Code	Title of the Co-Curricular Course - II
1	FE0_CC_YW2_P202	Yoga and Wellbeing – II
2	FE0_CC_SR2_P202	Social Service and Responsibility - II
3	FE0_CC_SP2_P202	Sports and Physical Fitness - II

1.6 First Year Scheme of the Syllabus

1.6.1 Departments in Group I (CMPN / INFT)

Table 1-9: Contact hours and credit distribution of courses for Departments in Group I

S. No.	Course	Contact Hours				Credits Assigned			
		Theory (Th)	Practical (P)	Tutorial (T)	Total	Theory (Th)	Practical (P)	Tutorial (T)	Total
Semester I									
1	Engineering Chemistry	2	-	-	2.0	2.0	-	-	2.0
2	Engineering Chemistry Lab	-	1	-	1.0	-	0.5	-	0.5
3	Linear Algebra and Calculus	3	-	1	4.0	3.0	-	1.0	4.0
4	Problem Solving with Programming	2	-	-	2.0	2.0	-	-	2.0
5	Problem Solving with Programming Lab	-	2	-	2.0	-	1.0	-	1.0
6	Engineering Graphics and Design	3	-	-	3.0	3.0	-	-	3.0
7	Engineering Graphics and Design Lab	-	2	-	2.0	-	1.0	-	1.0
8	Basic Electrical and Electronics Engineering	3	-	-	3.0	3.0	-	-	3.0
9	Basic Electrical and Electronics Engineering Lab	-	2	-	2.0	-	1.0	-	1.0
10	Skill Development Lab	-	4	-	4.0	-	2.0	-	2.0
11	Co-Curricular Course - I	-	3	-	3.0	-	1.5	-	1.5
	Total	**13**	**14**	**1**	**28**	**13.0**	**7.0**	**1.0**	**21.0**
Semester II									
1	Engineering Physics	2	-	-	2.0	2.0	-	-	2.0
2	Engineering Physics Lab	-	1	-	1.0	-	0.5	-	0.5
3	Probability and Statistics	3	-	1	4.0	3.0	-	1.0	4.0
4	Engineering Mechanics	3	-	-	3.0	3.0	-	-	3.0
5	Engineering Mechanics Lab	-	2	-	2.0	-	1.0	-	1.0
6	Program Core Lab	-	4	-	4.0	-	2.0	-	2.0
7	Python Programming	2	-	-	2.0	2.0	-	-	2.0
8	Python Programming Lab	-	2	-	2.0	-	1.0	-	1.0
9	Communication Skills and Ethics	2	-	1	3.0	2.0	-	1.0	3.0
10	Indian Knowledge System	2	-	-	2.0	2.0	-	-	2.0
11	Co-Curricular Course- II	-	3	-	3.0	-	1.5	-	1.5
	Total	**14**	**12**	**2**	**28**	**14.0**	**6.0**	**2.0**	**22.0**

1.6.2 Departments in Group II (AI &ML, ECS, EE, EXTC, ME)

Table 1-10: Contact hours and credit distribution of courses for Departments in Group II

S. No.	Course	Contact Hours				Credits Assigned			
		Theory (Th)	Practical (P)	Tutorial (T)	Total	Theory (Th)	Practical (P)	Tutorial (T)	Total
Semester I									
1	Engineering Physics	2	-	-	2.0	2.0	-	-	2.0
2	Engineering Physics Lab	-	1	-	1.0	-	0.5	-	0.5
3	Linear Algebra and Calculus	3	-	1	4.0	3.0	-	1.0	4.0
4	Problem Solving with Programming	2	-	-	2.0	2.0	-	-	2.0
5	Problem Solving with Programming Lab	-	2	-	2.0	-	1.0	-	1.0
6	Engineering Mechanics	3	-	-	3.0	3.0	-	-	3.0
7	Engineering Mechanics Lab	-	2	-	2.0	-	1.0	-	1.0
8	Skill Development Lab	-	4	-	4.0	-	2.0	-	2.0
9	Communication Skills and Ethics	2	-	1	3.0	2.0	-	1.0	3.0
10	Indian Knowledge System	2	-	-	2.0	2.0	-	-	2.0
11	Co-Curricular Course - I	-	3	-	3.0	-	1.5	-	1.5
	Total	**14**	**12**	**2**	**28**	**14.0**	**6.0**	**2.0**	**22.0**
Semester II									
1	Engineering Chemistry	2	-	-	2.0	2.0	-	-	2.0
2	Engineering Chemistry Lab	-	1	-	1.0	-	0.5	-	0.5
3	Probability and Statistics	3	-	1	4.0	3.0	-	1.0	4.0
4	Engineering Graphics and Design	3	-	-	3.0	3.0	-	-	3.0
5	Engineering Graphics and Design Lab	-	2	-	2.0	-	1.0	-	1.0
6	Basic Electrical and Electronics Engineering	3	-	-	3.0	3.0	-	-	3.0
7	Basic Electrical and Electronics Engineering Lab	-	2	-	2.0	-	1.0	-	1.0
8	Program Core Lab	-	4	-	4.0	-	2.0	-	2.0
9	Python Programming	2	-	-	2.0	2.0	-	-	2.0
10	Python Programming Lab	-	2	-	2.0	-	1.0	-	1.0
11	Co-Curricular Course-II	-	3	-	3.0	-	1.5	-	1.5
	Total	**13**	**14**	**1**	**28**	**13.0**	**7.0**	**1.0**	**21.0**

1.7 Evaluation and Examination Scheme

1.7.1 Departments in Group I (CMPN / INFT)

Table 1-11: Marks distribution of courses for Departments in Group I

S.No.	Course Code	Course	ISE	MSE	ESE	PE	Total
Semester I							
1	FE0_BSC_ECH_T001	Engineering Chemistry	15	15	45	-	75
2	FE0_BSC_ECH_L001	Engineering Chemistry Lab	25	-	-	-	25
3	FE0_BSC_LAC_T103	Linear Algebra and Calculus	20	20	60	-	100
4	FE0_ESC_PSP_T101	Problem Solving with Programming	15	15	45	-	75
5	FE0_ESC_PSP_L101	Problem Solving with Programming Lab	25	-	-	25	50
6	FE0_ESC_EGD_L002	Engineering Graphics and Design Lab	25	-	-	-	25
7	FE0_ESC_EGD_T002	Engineering Graphics and Design	20	20	60	-	100
8	FE0_ESC_BEE_T003	Basic Electrical and Electronics Engineering	20	20	60	-	100
9	FE0_ESC_BEE_L003	Basic Electrical and Electronics Engineering Lab	25	-	-	25	50
10	FE0_SEC_SDL_L101	Skill Development Lab	50	-	-	-	50
11	FE0_CC_**1_P101	Co-Curricular Course - I	50	-	-	-	50
		Total	**290**	**90**	**270**	**50**	**700**
Semester II							
1	FE0_BSC_EPH_T002	Engineering Physics	15	15	45	-	75
2	FE0_BSC_EPH_L002	Engineering Physics Lab	25	-	-	-	25
3	FE0_BSC_PRS_T204	Probability and Statistics	20	20	60	-	100
4	FE0_ESC_EME_T004	Engineering Mechanics	20	20	60	-	100
5	FE0_ESC_EME_L004	Engineering Mechanics Lab	25	-	-	25	50
6	FE0_PCC_###_L201	Program Core Lab	50	-	-	25	75
7	FE0_SEC_PYP_T202	Python Programming	15	15	45	-	75
8	FE0_SEC_PYP_L202	Python Programming Lab	25	-	-	25	50
9	FE0_AEC_CSE_T001	Communication Skills and Ethics[#]	20	20	60	-	100
10	FE0_IKS_***_T001	Indian Knowledge System	50	-	-	-	50
11	FE0_CC_**2_P102	Co-Curricular Course - II	50	-	-	-	50
		Total	**315**	**90**	**270**	**75**	**750**

1.7.2 Departments in Group II (AI &ML, ECS, EE, EXTC, ME)

Table 1-12: Marks distribution of courses for Departments in Group II

S.No.	Course Code	Course	ISE	MSE	ESE	PE	Total
Semester I							
1	FE0_BSC_EPH_T002	Engineering Physics	15	15	45	-	75
2	FE0_BSC_EPH_L002	Engineering Physics Lab	25	-	-	-	25
3	FE0_BSC_LAC_T103	Linear Algebra and Calculus	20	20	60	-	100
4	FE0_ESC_PSP_T101	Problem Solving with Programming	15	15	45	-	75
5	FE0_ESC_PSP_L101	Problem Solving with Programming Lab	25	-	-	25	50
6	FE0_ESC_EME_T004	Engineering Mechanics	20	20	60	-	100
7	FE0_ESC_EME_L004	Engineering Mechanics Lab	25	-	-	25	50
8	FE0_SEC_SDL_L101	Skill Development Lab	50	-	-	-	50
9	FE0_AEC_CSE_T001	Communication Skills and Ethics	20	20	60	-	100
10	FE0_IKS_***_T001	Indian Knowledge System	50	-	-	-	50
11	FE0_CC_**1_P101	Co-Curricular Course - I	50	-	-	-	50
		Total	**315**	**90**	**270**	**50**	**725**
Semester II							
1	FE0_BSC_ECH_T001	Engineering Chemistry	15	15	45	-	75
2	FE0_BSC_ECH_L001	Engineering Chemistry Lab	25	-	-	-	25
3	FE0_BSC_PRS_T204	Probability and Statistics	20	20	60	-	100
4	FE0_ESC_EGD_T002	Engineering Graphics and Design	20	20	60	-	100
5	FE0_ESC_EGD_L002	Engineering Graphics and Design Lab	25	-	-	-	25
6	FE0_ESC_BEE_T003	Basic Electrical and Electronics Engineering	20	20	60	-	100
7	FE0_ESC_BEE_L003	Basic Electrical and Electronics Engineering Lab	25	-	-	25	50
8	FE0_PCC_###_L201	Program Core Lab	50	-	-	25	75
9	FE0_SEC_PYP_T202	Python Programming	15	15	45	-	75
10	FE0_SEC_PYP_L202	Python Programming Lab	25	-	-	25	50
11	FE0_CC_**2_P102	Co-Curricular Course - II	50	-	-	-	50
		Total	**290**	**90**	**270**	**75**	**725**

Note:

Evaluations includes In Semester Evaluation (ISE), Mid-Semester Examination (MSE), End Semester Examination (ESE), Practical Examination (PE), Oral Examination (OrE) and Project Examination (PrE). Refer to Table 1-11 for Group 1 and Table 1-12 for Group II for detailed evaluation patterns.

- **ISE** - Includes home assignments, group assignments, quizzes, presentations, experiments, mock tests, tutorials, etc.
- **MSE** - A written assessment covering up to 50% of the syllabus, conducted at mid-semester.
- **ESE** - A written assessment covering 100% of the syllabus, conducted at the end of the semester. Modules covered in the mid-semester exam will have a 30-40 % weightage, with the remaining 60 -70% weightage assigned to the rest of the modules.
- **PE, OrE and PrE** - Practical, oral, project examinations are conducted by a pair of internal and external examiner at the end of the semester

Section I A. Basic Science Courses (BSC)

S. No.	Course Type	Subject Code	Courses	Group I Semester	Group II Semester	Credits
1	BSC	FE0_BSC_ECH_T001	Engineering Chemistry	I	II	2
2		FE0_BSC_ECH_L001	Engineering Chemistry Lab	I	II	0.5
3		FE0_BSC_EPH_T002	Engineering Physics	II	I	2
4		FE0_BSC_EPH_L002	Engineering Physics Lab	II	I	0.5
5		FE0_BSC_LAC_T103	Linear Algebra and Calculus	I	I	4
6		FE0_BSC_PRS_T204	Probability and Statistics	II	II	4
Total Basic Science Credits for First Year						**13**

2 Engineering Chemistry (FE0_BSC_ECH_T001)

2.1 Teaching Scheme

Course Code	Course Name	Contact Hours	Credits
FE0_BSC_ECH_T001	Engineering Chemistry	03	02

2.2 Examination and Evaluation Scheme

Formative Assessment		Summative Assessment				Total Marks
ISE		MSE		ESE		
Marks	Duration	Marks	Duration (Hrs.)	Marks	Duration (Hrs.)	
15	CA	15	1	45	2	75

2.3 Course Objectives

S. No.	Objectives
1	To bring about the awareness of the use of various materials like polymers and alloys and specific applications.
2	To impart knowledge of electrochemical cells. Identify different types of corrosion and suggest control measures in industries.
3	To impart knowledge of quality of fuel and different renewable sources of energy to generate power.
4	To illustrate quality parameters of water, E-waste composition and management.
5	To understand the concept of electromagnetic spectrum in various spectroscopic techniques.

2.4 Course Outcomes

The student will be able to:	
CO1	*acquaint* with synthesis, properties of alloys, advanced polymers, and their applications.
CO2	*illustrate* the concept of electrode potential, Nernst theory, *identify* different types of corrosion and suggest control measures in industries
CO3	*explain* the quality of fuel and different renewable sources of energy to generate power.
CO4	*familiarize* with the composition and handling of e-waste, analysis of water quality and treatment techniques.
CO5	*distinguish* the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques.

2.5 Course Contents

Module	Unit	Detailed Contents	Hours
	Prerequisites		**01**
		A brief introduction to the concept of chemistry in materials science, energy & environmental science to fully grasp the interdisciplinary nature of engineering chemistry and its importance in engineering practices.	
1	**Materials for Engineering Applications**		**05**
	1.1	Alloys: Introduction, classification, composition, properties and applications of stainless steel, solders, brass, alnico and shape memory alloys	
	1.2	Polymers: Introduction, glass transition temperature (Tg), structure and property relationship in polymers, compounding of plastic, conducting	

		polymers - Introduction, synthesis and conducting mechanism, application of polyacetylene as conducting polymer, Liquid Crystals (LC's) - Introduction, classification, properties, and application in Liquid Crystal Displays (LCD's).	
2	**Electrochemistry: Electrode Systems and Corrosion**		**07**
	2.1	Electrodes and cells: Introduction of electrochemical cells, concept of electrode potential, concept of standard electrode, reference electrode, Nernst equation, electrochemical series, galvanic series simple numerical, pH meter	
	2.2	Corrosion: Definition, electrochemical theory of corrosion, types of corrosion - differential metal, differential aeration, and stress corrosion; Factors affecting the rate of corrosion. Methods of corrosion control- (I) Material selection and proper designing, (II) Cathodic protection- i) Sacrificial anodic protection ii) Impressed current method, (III) Metallic coatings- Cathodic coating (tinning) and anodic coatings (Galvanising), Application of corrosion engineering in electronic and photonic devices.	
3	**Energy Sciences**		**05**
	3.1	Chemical fuels: Introduction, calorific value - definition, gross and net calorific values; knocking, Octane number, Cetane number, anti-knocking agents, unleaded petrol, oxygenates (MTBE), catalytic converter.	
	3.2	Sustainable energy sources: Hydrogen as a fuel - advantages, production and storage, biofuels- production of biodiesel and power alcohol.	
	3.3	Electrochemical Energy Systems: Introduction to batteries, classification of batteries, construction, working and applications of Lithium-ion battery.	
4	**Water Technology and E-Waste Management**		**04**
	4.1	Water treatment: introduction, hardness of water, types of hardness, determination of hardness by EDTA method, disadvantages of hard water, removal of hardness by ion exchange method, desalination of water – Electro dialysis. BOD and COD - introduction and their significance in wastewater treatment	
	4.2	E-Waste: Introduction, sources of e-waste, composition, characteristics, and need of e-waste management, toxic materials used in manufacturing electronic and electrical products; recycling and recovery: different approaches of recycling (separation, thermal treatments, hydrometallurgical extraction, pyro metallurgical methods, direct recycling). recycling of Li-Ion batteries, extraction of copper from E-waste.	
5	**Spectroscopic Techniques and Applications**		**04**
	5.1	Spectroscopy: definition, interaction of electromagnetic radiation with matter, classification – atomic and molecular, electromagnetic spectrum, types of spectroscopy and energy changes.	
	5.2	Flame Photometry: principle, instrumentation and applications	
		Total Hours	**26**

2.6 Suggested Learning Resources

2.6.1 Textbooks

1. Wiley's Engineering Chemistry, 2nd Edition, Dr. Shubha Ramesh et al., (Wiley India), 2013.
2. Engineering Chemistry, 1st edition, Satyaprakash & Manisha Agrawal, Khanna Book Publishing, Delhi, 2012.

3. A Text book of Engineering Chemistry, 12th Edition, SS Dara & Dr. SS Umare, S Chand & Company Ltd., 2011.
4. Text Book of Polymer Science, 4th edition, F.W. Billmeyer, John Wiley & Sons, 2007.
5. AText Book of Engineering Chemistry, 17th edition, P. C. Jain and Monica Jain Dhanapat Rai Publications, New Delhi, 2018.
6. A Text Book of Engineering Chemistry, 1st edition, R.V. Gadag and Nithyananda Shetty - Medtech Publishers, 2019.
7. A Text Book of Engineering Chemistry, 4th edition, Shashi Chawla, Dhanpat Rai & Co. (P) Ltd. 2016.
8. Elementary Organic Spectroscopy- 5th edition Y.R.Sharma, S.Chand and Co.,2013

2.6.2 Reference Books

1. Corrosion Engineering, 3rd edition, M.G. Fontana, N. D. Greene, McGraw Hill Publications, New York, 2005.
2. Introduction to E-Waste Management, 1st edition, Lakshmi Raghupathy, TERI press, ISBN: 9789386530196, 2019.
3. Principles of Physical Chemistry, 48th edition, B.R. Puri, L.R. Sharma & M.S. Pathania, - S. Chand & Co., 2019.

2.6.3 Web Resources

1. Polymers
   https://nptel.ac.in/courses/105106205
2. Shape memory alloys
   https://onlinecourses.nptel.ac.in/noc24_mm42/preview
3. Electrochemistry
   https://archive.nptel.ac.in/courses/104/106/104106137/
4. Corrosion
   https://nptel.ac.in/courses/113104082
5. Hydrogen as fuel
   https://archive.nptel.ac.in/courses/103/101/103101215/
6. Fuel
   https://nptel.ac.in/courses/103105110
7. E-waste Management
   E-Waste Management in India: Challenges and Opportunities" by the Energy and Resources Institute (TERI)
   https://www.researchgate.net/publication/258379577_Electronic_Waste_A_Growing_Concern_in_Today's_Environment

3 Engineering Chemistry Lab (FE0_BSC_ECH_L001)

3.1 Teaching Scheme

Course Code	Course Name	Contact Hours	Credits
FE0_BSC_ECH_L001	Engineering Chemistry Lab	01	0.5

3.2 Examination and Evaluation Scheme

Evaluation	ISE	PE	OrE	PrE	Total
Marks	25	-	-	-	25

3.3 Course Objectives

S. No.	Objectives
1	To acquaint the learner with practical knowledge of the basic concepts of chemistry involved in chemical analysis.
2	To provide practical knowledge of handling chemicals and chemical analysis.
3	To equip the learner with practical skills to determine water quality parameters through volumetric and instrumental analysis.
4	To inculcate practical skills through data collection, observation and interpretation of results
5	To promote teamwork and collaborative skills through group experiments as well as improve scientific communication through lab reports and presentations.

3.4 Course Outcomes

The students will be able to:	
CO1	*acquire* knowledge about essential laboratory analytical techniques such as titration, spectrophotometry and other methods.
CO2	*collect, record and interpret* experimental data to derive relevant findings.
CO3	*gain* hands-on experience in chemical synthesis while adhering to safety regulations and established procedures.
CO4	*estimate* water quality to assess compliance with regulatory standards or environmental guidelines.
CO5	*compare* experimental results with theoretical calculations based on Nernst equation and pH values.

3.5 Course Contents

Module	Suggested List of Experiments
1	Determination of total, permanent and temporary hardness of water by EDTA method
2	To determine standard emf and the standard free energy change of Daniel cell.
3	To determine the moisture content of coal through proximate analysis
4	To determine the concentration of alkali and alkaline earth metals in various samples using Flame Photometer
5	To synthesize Bioplastic from plant products
6	Determination of molecular weight of a polymer using Ostwald's viscometer.
7	To estimate copper present in Brass sample.
8	To determine metal ion concentration using colorimeter.
9	Determination of strength of given hydrochloric acid using pH meter.
10	Determination of DO content of water sample by Winkler's method

11	Laboratory synthesis of biodiesel.
12	Preparation of potash alum from scrap aluminium.

Suggested Assignments/Projects

1. To create a project focused on recycling and up cycling plastic waste into useful products.
2. To create a battery using saltwater as the electrolyte and analyze its performance.
3. To construct a basic fuel cell and study its operation and efficiency.
4. To investigate how e-waste is currently managed in your local area and suggest improvements.
5. Analyze the lifecycle of a common electronic devices and understand the environmental impact at each stage.

Note: Lab course shall consist minimum of 08 experiments covering the syllabus of corresponding theory course but not limited to the suggested list.

3.6 Suggested Learning Resources

3.6.1 Textbooks

1. A Textbook of Engineering Chemistry, 17th edition, P. C. Jain and Monica Jain Dhanpat Rai Publications, New Delhi, 2018.
2. A textbook on Experiments and Calculations in Engineering Chemistry, 9th edition, Dara S.S., S. Chand, 2003
3. Laboratory Manual on Engineering Chemistry, 3rd edition, Rani S., Dhanpat Rai, 1998.
4. Vogel's Quantitative Chemical Analysis, 6th edition, J. Mendham,2009

3.6.2 Web Resources:

1. Amrita Virtual Lab (Chemistry) https://vlab.amrita.edu/index.php?sub=2&brch=190
2. Engineering Chemistry lab course (Nptel) https://archive.nptel.ac.in/courses/122/101/122101001/

4 Engineering Physics (FE0_BSC_EPH_T002)

4.1 Teaching Scheme

Course Code	Course Name	Contact Hours	Credits
FE0_BSC_EPH_T002	Engineering Physics	02	02

4.2 Examination and Evaluation Scheme

Formative Assessment		Summative Assessment				Total Marks
ISE		MSE		ESE		
Marks	Duration	Marks	Duration (Hrs.)	Marks	Duration (Hrs.)	
15	CA	15	1	45	2	75

4.3 Course Objectives

S.No.	Objective
1	To impart the knowledge of working principle of laser and optical fibre and study its various applications.
2	To impart knowledge of interference of light from a thin film and use it in various applications.
3	To provide the learner the fundamentals of quantum physics, Schrodinger equations and the basics of quantum computing.
4	To provide the knowledge of nanomaterials and study its applications.
5	To explain the working principle of various sensors and study its applications.

4.4 Course Outcomes

The student will be able to:	
CO1	*demonstrate* the working principle and applications of Laser and *realize* the concepts of optical fibre and its applications.
CO2	*explain* the theory of interference of light from thin film and *apply* it to various engineering applications.
CO3	*relate* the fundamentals of quantum physics towards understanding the basics of quantum computing.
CO4	*discuss* various nanomaterials and *list* its applications.
CO5	*describe* working principle of sensors and their applications.

4.5 Course Contents

Module	Unit	Detailed Contents	Hours
	Prerequisites		01
		Basics of laser, fiber optics, quantum physics and interference of light	
1	**Laser and Fibre Optics**		06
	1.1	Laser: spontaneous emission and stimulated emission, metastable state, population inversion, types of pumping, resonant cavity, Einstein's equations, Helium Neon laser, Nd:YAG laser, semiconductor laser, application of lasers	
	1.2	Fibre optics: Numerical Aperture for step index fiber, critical angle, angle of acceptance, V number, number of modes of propagation, types of optical fibers, application of fibre optics in communication system	
2	**Interference in thin film**		05
	2.1	Thin films: Introduction, interference in thin film of constant	

		thickness due to reflected system, discussion on origin of colours in thin film, wedge shaped film and expression for fringe width	
	2.2	Applications of interference: Determination of thickness of very thin wire or foil, determination of wavelength of incident light, non-destructive testing (testing of flatness of a glass plate), antireflection film	
3	**Quantum Physics**		05
	3.1	de Broglie hypothesis of matter waves, de Broglie wavelength for electron, properties of matter waves, wave function and probability density, mathematical conditions for wave function, Heisenberg's uncertainty principle, Schrödinger's time independent and time dependent equations, need and significance of Schrödinger's equations, energy of a particle enclosed in a rigid box	
	3.2	Introduction to quantum computing, principles of quantum computing and its scope	
4	**Nanotechnology**		04
	4.1	Nanomaterials: Introduction, properties (optical, electrical, magnetic, structural, mechanical), surface to volume ratio, approaches to synthesize nanomaterials	
	4.2	Methods to synthesize nanomaterials: Ball milling method, sol-gel method, sputtering method, vapour deposition method, application of nanomaterials	
5	**Physics of Sensors**		05
	5.1	Piezoelectric transducers: Concept of piezoelectricity, use of piezoelectric transducer as ultrasonic generator and application of ultrasonic transducer for distance measurement, liquid and air velocity measurement	
	5.2	Resistive sensors: Temperature measurement - PT100 construction, calibration, thermocouple sensors and its types, RTD sensors, applications	
	5.3	Optical sensors: Photodiode, construction and working of a photodiode, applications	
	5.4	Pressure sensors: Concept of pressure sensing by capacitive and inductive method, applications	
		Total Hours	26

4.6 Suggested Learning Resources:

4.6.1 Textbooks

1. A Textbook of Engineering Physics, 11th Edition, Avadhanulu & Kshirsagar, S.Chand Publications, 2022.
2. A Textbook of Engineering Physics, 2nd Edition, Singh and Mallik, McGraw Hill Publication, 2017.

4.6.2 Reference Books:

1. Concepts of Modern Physics, 6th Edition, Arther Beiser, Tata McGraw Hill Publication, 2007.
2. Modern Physics, 4th Edition, BVN Rao, New Age International (P) Ltd. Publishers, 1999.
3. Optics, 2nd Edition, Ajoy Ghatak, Tata McGraw Hill, 1999.
4. Fundamentals of optics, 4th Edition, Jenkins and White, McGraw Hill, 1981.

5. Introduction to Nanotechnology, Student Edition, Charles Poole, Wiley India, 2012.

4.6.3 Web Resources

1. Laser and Fibre Optics
   https://nptel.ac.in/courses/115107095
   https://nptel.ac.in/courses/104104085
2. Nanotechnology
   https://nptel.ac.in/courses/118102003
3. Physics of Sensors
   https://onlinecourses.nptel.ac.in/noc24_ee45/preview

5 Engineering Physics Lab (FE0_BSC_EPH_L002)

5.1 Teaching Scheme

Course Code	Course Name	Contact Hours	Credits
FE0_BSC_EPH_L002	Engineering Physics Lab	01	0.5

5.2 Examination and Evaluation Scheme

Evaluation	ISE	PE	ORE	PrE	Total
Marks	25	0	0	0	25

5.3 Course Objectives

S. No.	Objective
1	To enable students to verify fundamental physical laws and principles through direct observation and measurement.
2	To provide students with practical experience in conducting experiments that reinforce theoretical concepts.
3	To foster skills in experimental observation, data collection, analysis, and interpretation.
4	To strengthen the student's capacity for writing effective lab report of the performed experiments.
5	To encourage teamwork and effective communication skills by fostering collaboration among students during experiments, data analysis and reporting of results.

5.4 Course Outcomes

The students will be able to:	
CO1	*recognize* the various components of an optical fibre and *relate* its applications in communication.
CO2	*realize* the application of light in the determination of dimension of a material.
CO3	*determine* the fundamental constant that defines the foundation of quantum physics.
CO4	*create* a 3D model of a nanoparticle using simulation software.
CO5	*apply* the knowledge of sensors in real-life applications.

5.5 Course Contents

S. No.	Suggested List of Experiments
1	Determination of Planck's constant 'h' using photocell.
2	Determination of Planck's constant 'h' using LED.
3	Determination of diameter of wire/hair or thickness of paper using wedge shaped film.
4	Determination of wavelength of a given source of light using wedge shaped film.
5	Determination of divergence of a given laser source.
6	Determination of numerical aperture of a given optical fibre.
7	Determination of modes of a given optical fibre.
8	Simulation experiments based on nanotechnology using open-source simulation software
9	Study of I-V characteristics of a given photo diode.
10	Measurement of distance of the target using ultrasonic distance measuring kit.
11	Calculation of area and volume of the given space like the dark room, the general lab using ultrasonic distance meter.
12	Study of temperature characteristics of PT100 sensors.
13	Determination of Planck's constant 'h' using virtual lab.

14	Determination of divergence of a given laser source using virtual lab.
15	Determination of numerical aperture of a given optical fibre using virtual lab.

Note: Lab course shall consist minimum of 08 experiments covering the syllabus of corresponding theory course but not limited to the suggested list.

5.6 Suggested Learning Resources:

5.6.1 Textbooks

1. A Textbook of Engineering Physics, 11th Edition, Avadhanulu & Kshirsagar, S.Chand Publications, 2022.
2. A Textbook of Engineering Physics, 2nd Edition, Singh and Mallik, McGraw Hill Publication, 2017.

5.6.2 Reference Books

1. Optics, 2nd Edition, Ajoy Ghatak, Tata McGraw Hill, 1999.
2. Experiments in Engineering Physics, 3rd Edition, M.N. Avadhanulu and A.A. Dani, S. Chand Publication, 2003

5.6.3 Web Resources

1. Experimental Physics
   https://onlinecourses.nptel.ac.in/noc22_ph05/preview

6 Linear Algebra and Calculus (FE0_BSC_LAC_T103)

6.1 Teaching Scheme

Course Code	Course Name	Contact Hours	Credits
FE0_BSC_LAC_T103	Linear Algebra and Calculus	04	04

6.2 Examination and Evaluation Scheme

Formative Assessment		Summative Assessment				Total Marks
ISE		MSE		ESE		
Marks	Duration	Marks	Duration (Hrs.)	Marks	Duration (Hrs.)	
20	CA	20	1	60	2.5	100

6.3 Course Objectives

S. No.	Objectives
1	To teach fundamental concepts of matrices and its applications.
2	To prepare the learners to solve linear equations using various methods and modern tools.
3	To build mathematical skills for obtaining and analyzing eigenvalues and eigenvectors.
4	To introduce differentiation of function with several independent variables.
5	To develop formulation and evaluation of integrals over the regions.

6.4 Course Outcomes

The student will be able to:	
CO1	*identify* different types of matrices, use elementary transformations to find the rank and apply the concept of matrices to real world problems.
CO2	*apply* the knowledge of matrices to solve the system of linear equations using rank of a matrix and numerical methods and analyze linear dependency of vectors.
CO3	*implement* the concept of eigenvalue –eigenvectors to diagonalize a matrix and its applications.
CO4	*apply* the knowledge of derivatives to evaluate the partial derivatives and its applications.
CO5	*evaluate* double integrals by identifying the region of integration.

6.5 Course Contents

Module	Unit	Detailed Contents	Hours
		Prerequisite	**02**
		Introduction of matrices, addition, multiplication, transpose and inverse of a matrix.	
		Differentiation of function of one variable, chain rule of differentiation.	
1		**Matrices**	**07**
	1.1	Types of Matrices (symmetric, skew- symmetric, hermitian, skew hermitian, unitary, orthogonal matrices and properties of matrices).	
	1.2	Rank of a matrix using Echelon form, reduction to normal form and PAQ form.	
	1.3	Application of matrices to Coding and De-coding.	

2		**System of Linear Equations**	**08**
	2.1	System of homogeneous and non–homogeneous equations, their consistency and solutions.	
	2.2	Linear dependence and independence of vectors.	
	2.3	Solution of system of linear algebraic equations by (1) Gauss Jacobi iteration method (2) Gauss Seidal iteration method.	
3		**Diagonalization of matrix**	**08**
	3.1	Eigen values, Eigen vectors and its properties (Theorems without proof).	
	3.2	Cayley-Hamilton theorem (without proof) and its applications.	
	3.3	Similar matrices, diagonalizable matrices and functions of square matrix.	
	3.4	Derogatory and non-derogatory matrices.	
4		**Partial differentiation and its application**	**07**
	4.1	Partial Differentiation: Function of several variables, partial derivatives of first and higher order.	
	4.2	Differentiation of composite function.	
	4.3	Maxima and minima of function of two variables	
5		**Multiple Integration**	**07**
	5.1	Evaluation of double integrals (Cartesian and polar)	
	5.2	Tracing of cartesian and polar curves.	
	5.3	Evaluation of integrals over the given region (Cartesian and polar).	
		Total Hours	**39**

6.6 Suggested Learning Resources:

6.6.1 Textbooks

1. Higher Engineering Mathematics, 1st Edition, Dr. B.V. Ramana, Tata McGraw-Hill Publishing Company Limited, 2006.
2. Higher Engineering Mathematics, 12th Edition, HK Dass, S Chand & Company LTD, 2004.
3. Advanced Engineering Mathematics, 9th Edition, Erwin Kreyszig, Wiley Eastern Limited, 2006.
4. Higher Engineering Mathematics, 40th Edition, Dr.B.S.Grewal, Khanna Publication, 2010.

6.6.2 Reference Books:

1. Linear Algebra and Its Applications, 4th Edition, Gilbert Strang, Cengage India Private Limited, 2011.
2. Multivariable Calculus, 8th Edition, James Stewart, Brooks/Cole Publication, 2016.
3. Numerical Methods for Scientific and Engineering Computation, 6th Edition, MK Jain, SRK Iyengar & RK Jain, New Age International Publishers, 2007.

6.6.3 Web Resources

1. Advanced Matrix Theory and Linear Algebra for Engineers
   https://archive.nptel.ac.in/courses/111/108/111108066/
2. Differential Calculus in Several Variables
   https://archive.nptel.ac.in/courses/111/104/111104092/

3. Applications of Methods of Numerical Linear Algebra in Engineering 2016
https://onlinelibrary.wiley.com/doi/10.1155/2016/4854759
4. Applications of Linear Algebra
https://www.math.ucdavis.edu/~daddel/linear_algebra_appl/Applications/applications.html
5. Integral and Vector Calculus
https://archive.nptel.ac.in/courses/111/105/111105122/

7 Probability and Statistics (FE0_BSC_PRS_T204)

7.1 Teaching Scheme

Course Code	Course Name	Contact Hours	Credits
FE0_BSC_PRS_T204	Probability and Statistics	04	04

7.2 Examination and Evaluation Scheme

Formative Assessment		Summative Assessment				Total Marks
ISE		MSE		ESE		
Marks	Duration	Marks	Duration (Hrs.)	Marks	Duration (Hrs.)	
20	CA	20	1	60	2.5	100

7.3 Course Objectives

Sr. No.	Objective
1	To teach fundamental concepts of set theory, relation and counting principle.
2	To develop the concepts of probability and expectation
3	To introduce various probability distributions
4	To prepare the learners to understand statistical averages
5	To build the concept of correlation and regression

7.4 Course Outcomes

The student will be able to:	
CO1	*apply* the concepts of set theory, pigeonhole principle, equivalence and partial order relations
CO2	*explain* the concepts of probability of discrete and continuous random variable
CO3	*analyze* data using various probability distributions and interpret it
CO4	*interpret* the spread of the data using statistical averages
CO5	*compute* the coefficients of correlation and regression and evaluate problems

7.5 Course Contents

Module	Unit	Detailed Contents	Hours
	Prerequisite		**01**
		Basics of probability	
1	**Set Theory**		**08**
	1.1	Definition of sets, Venn diagrams, complements, cartesian products, power sets, counting principle, cardinality and countability (countable and uncountable sets), proofs of some general identities on sets, pigeonhole principle.	
	1.2	Relation: Definition, types of relation, composition of relations, domain and range of a relation, pictorial representation of relation, properties of relation, partial ordering relation.	
	1.3	Permutations and combinations.	
2	**Probability**		**07**
	2.1	Conditional probability, joint probability, total probability and Bayes' theorem	
	2.2	Discrete and continuous random variables, probability mass and	

		density function	
	2.3	Expectation, variance, co-variance.	
3	**Probability Distribution**		**08**
	3.1	Discrete distribution: Bernoulli, binomial, Poisson.	
	3.2	Continuous distribution: uniform, exponential, normal.	
4	**Statistical Averages**		**08**
	4.1	Central tendency: mean, median, mode.	
	4.2	Moments & moment generating functions (first four moments about the origin & about the mean), skewness, kurtosis	
	4.3	Central limit theorem.	
5	**Statistical Techniques**		**07**
	5.1	Karl Pearson's coefficient of correlation, Spearman's Rank correlation coefficient.	
	5.2	Lines of regression, fitting of first and second degree curves.	
		Total Hours	**39**

7.6 Suggested Learning Resources

7.6.1 Textbooks

1. Higher Engineering Mathematics, 1st Edition, Dr. B.V. Ramana, Tata McGraw-Hill Publishing Company Limited, 2006.
2. Higher Engineering Mathematics, 12th Edition, HK Dass, S Chand & Company LTD, 2004.
3. Advanced Engineering Mathematics, 9th Edition, Erwin Kreyszig, Wiley Eastern Limited, 2006.
4. Higher Engineering Mathematics, 40th Edition, Dr.B.S.Grewal, Khanna Publication, 2010

7.6.2 Reference Books

1. Probability, Statistics and Random Processes, 2nd Edition, T. Veerarajan, Tata McGraw-Hill Publishing Company Limited, 2004.
2. Schaum's Outline of Theory and Problems of Probability and Statistics, 2nd Edition, Spigel & Murray, Tata McGraw-Hill Publishing Company Limited, 2000
3. An Introduction to Probability and Statistics, 3rd Edition, Vijay K Rohatgi, A. K. MD. & Ehsanes Saleh, Wilely series in probability and statistics, 2015.

7.6.3 Web Resources

1. Introduction to Probability theory and stochastic process
   https://archive.nptel.ac.in/courses/111/102/111102111/
2. Introduction to Probability and Statistics
   https://www.youtube.com/playlist?list=PLyqSpQzTE6M_JcleDbrVyPnE0PixKs2JE
3. Least-Squares Regression
   https://archive.nptel.ac.in/content/storage2/courses/122104019/numerical-analysis/Rathish-kumar/least-square/r1.htm

Section I B. Engineering Science Courses (ESC)

S. No.	Course Type	Subject Code	Courses	Group I Semester	Group II Semester	Credits
1	ESC	FE0_ESC_PSP_T101	Problem Solving with Programming	I	I	2
2		FE0_ESC_PSP_L101	Problem Solving with Programming Lab	I	I	1
3		FE0_ESC_EGD_T002	Engineering Graphics and Design	I	II	3
4		FE0_ESC_EGD_L002	Engineering Graphics and Design Lab	I	II	1
5		FE0_ESC_BEE_T003	Basic Electrical and Electronics Engineering	I	II	3
6		FE0_ESC_BEE_L003	Basic Electrical and Electronics Engineering Lab	I	II	1
7		FE0_ESC_EME_T004	Engineering Mechanics	II	I	3
8		FE0_ESC_EME_L004	Engineering Mechanics Lab	II	I	1
Total Engineering Science Credits for First Year						**15**

8 Problem Solving with Programming (FE0_ESC_PSP_T101)

8.1 Teaching Scheme

Course Code	Course Name	Contact Hours	Credits
FE0_ESC_PSP_T101	Problem Solving with Programming	02	02

8.2 Examination and Evaluation Scheme

Formative Assessment		Summative Assessment				Total Marks
ISE		MSE		ESE		
Marks	Duration	Marks	Duration (Hrs.)	Marks	Duration (Hrs.)	
15	CA	15	1	45	2	75

8.3 Course Objectives

S. No.	Objective
1	To introduce problem solving techniques using structured programming approach.
2	To teach the use of control structures and functions.
3	To teach how to create and use arrays and strings.
4	To explore the advanced data types such as pointers, structures and unions.
5	To introduce the basic concepts of object-oriented programming.

8.4 Course Outcomes

The student will be able to	
CO1	*design* algorithms and flowcharts for solving problems using structured programming approach.
CO2	*apply* control structures to solve problems that involve decision making and repetition and *demonstrate* the use of modular programming.
CO3	*organize* data by *constructing* arrays and *understand* the concept of strings.
CO4	*implement* programs that use structures and union and *understand* the concept of pointers.
CO5	*compare* structured programming and object-oriented programming approach.

8.5 Course Contents

Module	Unit	Detailed Contents	Hours
	Pre-requisites		**01**
		Basic components of a computer, number systems, logical thinking for problem solving.	
1	**Introduction to Problem-solving using C Programming**		**04**
	1.1	Introduction to structured programming approach, problem solving using algorithms and flowcharts, characteristics of a good algorithm.	
	1.2	Basics of C: Keywords, data types, variables, constants, operators, basic structure of a C program, input and output	

		operations.	
2	**Control Structures and Functions**		**07**
	2.1	Branching structures: if statement, if-else statement, nested if-else statements, switch statement.	
	2.2	Looping structures: for, while and do-while, break, continue, goto statements.	
	2.3	Functions: Function prototype, function definition, function call, parameter passing, return values, scope and lifetime of variables, solving problems using user defined functions, common C library functions, introduction to recursion.	
3	**Arrays and Strings**		**06**
	3.1	Arrays: Declaration, initialization, accessing elements, array manipulation, multi-dimensional arrays.	
	3.2	Strings in C: declaration, initialization, string manipulation, string library functions	
4	**Advanced Data types in C**		**05**
	4.1	Pointers: Understanding pointers, declaration, initialization, and dereferencing using pointers, pointer operations, call by value and call by reference.	
	4.2	Structures and union: Declaration and initialization of structures and union, array of structures.	
5	**Introduction to Object-oriented Programming using C++**		**03**
	5.1	Introduction to object-oriented programming: Introduction to classes and objects, comparing structured programming and object-oriented programming approach.	
	5.2	Basic programs with C++, input and output in C++, creating class and object using C++.	
		Total Hours	**26**

8.6 Suggested Learning Resources

8.6.1 Textbooks

1. Problem Solving with C, 2nd Edition, M. T. Somashekara, D. S. Guru, K. S Manjunatha, PHI Learning, 2018.
2. Structured Programming Approach, First Edition, Pradip Dey & Manas Ghosh, Oxford University Press, 2016.
3. Object Oriented Programming with C++, 8th Edition, E. Balagurusamy, McGraw-Hill, 2020
4. C Programming with Problem Solving, First Edition, Jacqueline A. Jones & Keith Harrow, Dreamtech Press, 2009

8.6.2 Reference Books

1. Let Us C, 18th Edition, Yashwant Kanetkar, BPB Publications, 2022.
2. The Complete Reference C, 4th Edition, Herbert Schildt, McGraw Hill, 2016.
3. The Complete Reference C++, 4th Edition, Herbert Schildt, McGraw Hill, 2017.
4. Practical C++ Programming, 2nd Edition, Steve Oualline, O'Reilly, 2003.

8.6.3 Web Resources

1. C Tutorial
   https://www.w3schools.com/c/
2. C++ Tutorial
   https://www.w3schools.com/cpp/
3. Introduction to Programming in C (Swayam online course)
   https://onlinecourses.nptel.ac.in/noc22_cs40/preview
4. wikibooks- C Programming
   https://en.wikibooks.org/wiki/C_Programming
5. wikibooks- C++ Programming Language
   https://en.wikibooks.org/wiki/Subject:C%2B%2B_programming_language

9 Problem Solving with Programming Lab (FE0_ESC_PSP_L101)

9.1 Teaching Scheme

Course Code	Course Name	Contact Hours	Credits
FE0_ESC_PSP_L101	Problem Solving with Programming Lab	02	01

9.2 Examination and Evaluation Scheme

Evaluation	ISE	PE	OrE	PrE	Total
Marks	25	25	0	0	50

9.3 Course Objectives

S. No.	Objectives
1	To introduce problem solving techniques using structured programming approach.
2	To explore and use control structures and functions.
3	To demonstrate how to create and use arrays and strings.
4	To explore the advanced data types such as pointers, structures and unions.
5	To introduce the basic concepts of object-oriented programming.

9.4 Course Outcomes

The students will be able to:	
CO1	*design* algorithms and flowcharts for solving problems using structured programming approach.
CO2	*apply* control structures to solve problems that involve decision making and repetition and *demonstrate* the use of modular programming.
CO3	*organize* data by *constructing* arrays and *understand* the concept of strings.
CO4	*implement* programs that use structures and union and *understand* the concept of pointers.
CO5	*compare* structured programming and object-oriented programming approach.

9.5 Course Contents

S. No.	Suggested List of Experiments
1	**Fundamentals of C programming language** ithmetic operations on user defined input • Program to demonstrate relational, logical and bitwise operators
2	**Control statements & functions** • Program to use conditional statements • Program to demonstrate use of loops • Program to demonstrate creating functions • Program that uses standard C library functions

3	**Arrays and Strings** • Program to demonstrate a single dimensional array • Program to demonstrate a two-dimensional array • Program to demonstrate use of strings
4	**Advanced Data types of C** • Program to demonstrate the concept of call by value and call by reference • Program to solve a problem by using union / structure
5	**Introduction to C++** • Program to demonstrate solving problems using C++

Note: Lab course shall consist minimum of 08 experiments covering the syllabus of corresponding theory course but not limited to the suggested list.

9.6 Suggested Learning Resources

9.6.1 Textbooks

1. Problem Solving with C, 2nd Edition, M. T. Somashekara, D. S. Guru, K. S Manjunatha, PHI Learning, 2018.
2. Structured Programming Approach, First Edition, Pradip Dey & Manas Ghosh, Oxford University Press, 2016.
3. Object Oriented Programming with C++, 8th Edition, E. Balagurusamy, McGraw-Hill, 2020
4. C Programming with Problem Solving, First Edition, Jacqueline A. Jones & Keith Harrow, Dreamtech Press, 2009

9.6.2 Reference Books

1. Let Us C, 18th Edition, Yashwant Kanetkar, BPB Publications, 2022.
2. The Complete Reference C, 4th Edition, Herbert Schildt, McGraw Hill, 2016.
3. The Complete Reference C++, 4th Edition, Herbert Schildt, McGraw Hill, 2017.
4. Practical C++ Programming, 2nd Edition, Steve Oualline, O'Reilly, 2003.

9.6.3 Web Resources

1. C Tutorial
   https://www.w3schools.com/c/
2. C++ Tutorial
   https://www.w3schools.com/cpp/
3. Introduction to Programming in C (Swayam online course)
   https://onlinecourses.nptel.ac.in/noc22_cs40/preview
4. wikibooks- C Programming
   https://en.wikibooks.org/wiki/C_Programming
5. wikibooks- C++ Programming Language
   https://en.wikibooks.org/wiki/Subject:C%2B%2B_programming_language

10 Engineering Graphics and Design (FE0_ESC_EGD_T002)

10.1 Teaching Scheme

Course Code	Course Name	Contact Hours	Credits
FE0_ESC_EGD_T002	Engineering Graphics and Design	03	03

10.2 Examination and Evaluation Scheme

Formative Assessment		Summative Assessment				Total Marks
ISE		MSE		ESE		
Marks	Duration	Marks	Duration (Hrs.)	Marks	Duration (Hrs.)	
20	CA	20	1	60	2.5	100

10.3 Course Objectives

S. No.	Objectives
1	To impart and inculcate a proper understanding of the theory of projection.
2	To impart the knowledge of reading and understanding technical drawings.
3	To improve the visualization and imagination skills of the students.

10.4 Course Outcomes

The student will be able to:	
CO1	*understand* the types of lines, dimensioning systems as per IS standards, and construct engineering curves.
CO2	*apply* the basic principles of orthographic projections to draw the views of projection of points, lines and planes.
CO3	*apply* the basic principles of orthographic projections to draw the views of projection of solids.
CO4	*read* a pictorial view of an object and *draw* orthographic projections of machine parts as per IS standards.
CO5	*read*, *visualize* and *interpret* an object from orthographic views and *convert* it into an isometric view.

10.5 Course Contents

Module	Unit	Detailed Contents	Hours
	Prerequisites		
		Basic shapes - circle, polygon, triangle, locus	
1	**Introduction to Engineering Graphics**		**08**
	1.1	Principles of engineering graphics and their significance, usage of drawing instruments, types of lines, and dimensioning systems as per IS conventions.	
	1.2	Engineering curves: Construction of cycloid, involutes, and helix (of cylinder) curves only.	
2	**Projection of Points, Lines and Planes**		**08**
	2.1	Projection of points and lines: Projection of points in all four	

		quadrants, lines inclined to both the reference planes (excluding traces of lines)	
	2.2	Projection of planes: Square, pentagonal, hexagonal, and circular planes inclined to one of the reference planes (excluding composite planes)	
3	**Projection of Solids**		**08**
	3.1	Projection of solids (prism, pyramid, cone, and cylinder) inclined to both the reference planes. (excluding spheres, composite, hollow solids, and frustum of solids).	
4	**Orthographic and Sectional Orthographic Projections**		**08**
	4.1	Orthographic views of a simple machine part as per the first angle method of projection recommended by IS.	
	4.2	Full sectional views of the simple machine parts.	
5	**Isometric Views**		**07**
	5.1	Isometric views, conversion of orthographic views to isometric views using natural scale (excluding sphere).	
		Total Hours	**39**

10.6 Suggested Learning Resources

10.6.1 Textbooks

1. Text book on Engineering Drawing, K.L. Narayana and P. Kannaiah, Scitech Publisher, 2008.
2. Engineering Drawing, M.B. Shah and B.C. Rana, Pearson Publications, 2009.
3. Engineering Drawing, 53rd Edition, N.D. Bhatt, Charotar Publication, 2016.

10.6.2 Reference Books

1. Engineering Drawing and Graphics + AutoCAD, 3rd Edition, K. Venugopal, New Age International Publishers, 2007.
2. Engineering Drawing with an Introduction to AutoCAD, 11th Edition, Dhananjay A. Jolhe, Tata McGraw Hill Education Private Limited, 2014.

10.6.3 Web Resources

1. Engineering Drawing
   https://nptel.ac.in/courses/112103019
2. Engineering Drawing and Computer Graphics
   https://archive.nptel.ac.in/courses/112/105/112105294/
3. Engineering Graphics and Design
   https://archive.nptel.ac.in/courses/112/102/112102304/

11 Engineering Graphics and Design Lab (FE0_ESC_EGD_L002)

11.1 Teaching Scheme

Course Code	Course Name	Contact Hours	Credits
FE0_ESC_EGD_L002	Engineering Graphics and Design Lab	02	01

11.2 Examination and Evaluation Scheme

Evaluation	ISE	PE	OrE	PrE	Total
Marks	25	0	0	0	25

11.3 Course Objectives

S. No.	Objectives
1	To inculcate the skill of drawing with the basic concepts.
2	To familiarize the learner to use AutoCAD for general purpose drawings
3	To teach basic utility of Computer Aided Drafting (CAD) tool.

11.4 Course Outcomes

The students will be able to:	
CO1	*apply* the basic principles of projections in 2D drawings using a CAD software.
CO2	*create, annotate, edit* and *plot* drawings using basic AutoCAD commands and features.
CO3	*apply* the concepts of layers to create drawing.
CO4	*use* basic AutoCAD skills to draw orthographic views of a 3D object.
CO5	*construct* the isometric views from the given orthographic views using AutoCAD.

11.5 Course Contents

S. No.	Suggested List of Experiments
1	**Introduction to AutoCAD:** Basic Draw and Modify Commands, Unit Setting, Layer Setting, Dimensioning and dimensioning style setting, Text and text style setting, Hatching, Plotting, and Print Setting.
2	Engineering Curves – Sheet 1
3	Projection of Lines – Sheet 2
4	Projection of Planes – Sheet 3
5	Projection of Solids – Sheet 4
6	Orthographic Projections (without section) – Sheet 5
7	Sectional Orthographic Projections – Sheet 6
8	Isometric Views – Sheet 7

11.6 Suggested Learning Resources

11.6.1 Textbooks

1. Engineering Drawing and Graphics + AutoCAD, 3rd Edition, K. Venugopal, New Age International Publishers, 2007.
2. Engineering Drawing with an Introduction to AutoCAD, 11th Edition, Dhananjay A. Jolhe, Tata McGraw Hill Education Private Limited, 2014.

11.6.2 Reference Books

1. Text book on Engineering Drawing, K.L. Narayana and P. Kannaiah, Scitech Publisher, 2008.
2. Engineering Drawing, 53rd Edition, N.D. Bhatt, Charotar Publication, 2016.

12 Basic Electrical and Electronics Engineering (FE0_ESC_BEE_T003)

12.1 Teaching Scheme

Course Code	Course Name	Contact Hours	Credits
FE0_ESC_BEE_T003	Basic Electrical and Electronics Engineering	03	03

12.2 Examination and Evaluation Scheme

Formative Assessment		Summative Assessment				Total Marks
ISE		MSE		ESE		
Marks	Duration	Marks	Duration (Hrs.)	Marks	Duration (Hrs.)	
20	CA	20	1	60	2.5	100

12.3 Course Objectives

S. No.	Objective
1	To introduce concept of different DC parameters and *calculate* them using various network theorems
2	To impart the concepts of single phase and three phase AC circuits and their variants.
3	To familiarize with different types of transformers, machines and semiconductor devices
4	To acquaint with various number systems, logic gates and Boolean functions

12.4 Course Outcomes

The student will be able to:	
CO1	*apply* fundamental laws and theorems to *analyze* DC circuit parameters
CO2	*understand* the basic concept of AC and *analyze* networks
CO3	*illustrate* the working principle of transformer and rotating machine.
CO4	*comprehend* the characteristics of semiconductor devices and it's applications.
CO5	*differentiate* between number systems and *synthesize* Boolean expressions using logic gates.

12.5 Course Contents

Module	Unit	Detailed Contents	Hours
	Prerequisites		**01**
		Resistance, inductance, capacitance, series and parallel connection of resistance, concept of voltage, current, power and energy and its units, magnetic circuit, mmf, magnetic field strength, reluctance.	
1	**DC Circuits: (Only independent source)**		**09**
	1.1	Introduction to DC sources: Ideal and practical voltage and current sources, source transformation, star to delta / delta to star transformations.	

	1.2	Kirchhoff's laws, mesh and nodal analysis.	
	1.3	Superposition theorem, Thevenin's theorem, Norton's theorem, maximum power transfer theorem.	
2	**AC Circuits**		**10**
	2.1	Generation of alternating voltage and currents, AC terminology, Root Mean Square (RMS), average value, form factor and crest factor.	
	2.2	Single-phase AC series and parallel circuits consisting of R, L, C, RL, RC, RLC combinations, power factor, real, reactive and apparent power.	
	2.3	Series and parallel resonance, Q factor, bandwidth.	
	2.4	Generation of three-phase voltages, voltage & current relationships in star and delta connections.	
3	**Transformers and Machines**		**07**
	3.1	Working principle of single-phase transformer, emf equation of a transformer, transformer losses, actual (practical) and ideal transformer, phasor diagram, equivalent circuit of transformer, efficiency of transformer.	
	3.2	Fundamental principles of rotating machines, construction, working principle and applications of stepper and servo motor	
4	**Introduction to Semiconductor Devices**		**06**
	4.1	Construction, operation and characteristics of PN junction diode, zener diode and bipolar junction transistor.	
	4.2	Application of PN junction diode as rectifier, zener diode as basic regulator and BJT as an amplifier.	
5	**Fundamentals of Digital Systems**		**06**
	5.1	Number System: Binary, octal, decimal, hexadecimal, their conversion, and arithmetic (binary addition, subtraction using 1's & 2's complement)	
	5.2	Logic Gates: AND, OR, NOT, NAND, NOR, EX-OR, EX-NOR universal gates.	
	5.3	Boolean algebra, Demorgan's theorem.	
		Total Hours	**39**

12.6 Suggested Learning Resources

12.6.1 Textbooks

1. Theory and Problems of Basic Electrical Engineering, 13th edition, D P Kothari and I J Nagrath, PHI, 2011
2. Basic Electrical Engineering, 2nd edition, B.R Patil, Oxford Higher Education
3. Digital Fundamental, 8th edition, Floyd and Jain, Pearson Education India, 2005
4. Fundamentals of Digital Circuits,4th edition, Anand Kumar, PHI Learning Pvt. Ltd.
5. Electronic Devices and Circuit Theory, 11th edition, Boylestad, Robert. L, Louis Nashelsky, Pearson Education
6. Power Electronics Mohan Ned, John Wiley & Sons Inc
7. Stepper Motors: Fundamentals, Applications and Design, V. V. Athani, New Age International, 1997.

8. Electric Motors and Drives Fundamentals, Types and Applications, 3rd Edition, Austin Hughes, Newnes Publisher.
9. Brushless Servomotors: Fundamentals and applications, Sakan Kinoshita and Yasuhiko Dote, Oxford University Press,1990.

12.6.2 Reference Books

1. Basic Electrical Engineering, S. N. Singh, PHI, 2011
2. Basic Electrical Engineering, 2nd edition, V. N. Mittal and Arvind Mittal, Tata McGraw Hill
3. Electrical Engineering Fundamentals, Vincent Del Toro, PHI Second edition, 2011
4. Electrical and Electronic Technology, 10th edition Edward Hughes, Pearson Education
5. Theory and Problems of Basic Electrical Engineering, 13th edition, D P Kothari and I J Nagrath, PHI, 2011.
6. Introduction to Electrical Engineering, M. Naidu, S. Kamakshaiah, McGraw-Hill Education, 2004
7. S. N. Singh, "Basic Electrical Engineering" PHI, 2011

12.6.3 Web Resources

1. DC circuits, AC circuits, Transformer
   https://nptel.ac.in/courses/108108076
2. Semiconductor Devices
   https://www.nesoacademy.org/ec/04-analog-electronics
3. AC circuits, Semiconductor devices
   https://onlinecourses.nptel.ac.in/noc21_ee55/preview
4. Transformer and Machines
   https://onlinecourses.nptel.ac.in/noc20_ee60/preview

13 Basic Electrical and Electronics Engineering Lab (FE0_ESC_BEE_L003)

13.1 Teaching Scheme

Course Code	Course Name	Contact Hours	Credits
FE0_ESC_BEE_L003	Basic Electrical and Electronics Engineering Lab	02	01

13.2 Examination and Evaluation Scheme

Evaluation	ISE	PE	OrE	PrE	Total
Marks	25	25	0	0	50

13.3 Course Objectives

S. No.	Objectives
1	To impart the basic concept of network analysis and its application
2	To provide the basic concept of AC circuit analysis and its application.
3	To illustrate the operation of the transformer and machines
4	To explain the characteristics of BJT.
5	To introduce logic gates

13.4 Course Outcomes

Sr No	Outcomes
	The students will be able to:
CO1	*apply* and verify various theorems to DC network
CO2	*identify* the given passive element by analysing frequency-current characteristics
CO3	*implement* and *analyse* half and full wave rectifiers
CO4	*implement* and *analyse* transistor configuration
CO5	*classify* basic logic gates and *implement* them using universal gates

13.5 Course Contents

S. No.	Suggested List of Experiments
1.	To verify various network theorems
2.	To identify passive elements on the basis of their frequency response
3.	To study half wave rectifiers
4.	To plot input/ output characteristics of BJT
5.	To verify the truth table of basic logic gates
6.	To simulate and analyze the performance of single-phase transformer
7.	To simulate and analyze the performance of full wave rectifiers
8.	To simulate the implementation of basic logic gates using universal gates.

Note: Lab course shall consist minimum of 08 experiments covering the syllabus of corresponding theory course but not limited to the suggested list.

13.6 Suggested Learning Resources

13.6.1 Textbooks

1. Theory and Problems of Basic Electrical Engineering, 13th edition, D P Kothari and I J Nagrath, PHI, 2011
2. Basic Electrical Engineering, 2nd edition, B.R Patil, Oxford Higher Education
3. Digital Fundamental, 8th edition, Floyd and Jain, Pearson Education India, 2005
4. Fundamentals of Digital Circuits,4th edition, Anand Kumar, PHI Learning Pvt. Ltd.
5. Electronic Devices and Circuit Theory, 11th edition, Boylestad, Robert. L, Louis Nashelsky, Pearson Education

13.6.2 Reference Books

1. Basic Electrical Engineering, S. N. Singh, PHI, 2011
2. Basic Electrical Engineering, 2nd edition, V. N. Mittal and Arvind Mittal, Tata McGraw Hill
3. Electrical Engineering Fundamentals, Vincent Del Toro, PHI Second edition, 2011
4. Electrical and Electronic Technology, 10th edition Edward Hughes, Pearson Education
5. Theory and Problems of Basic Electrical Engineering, 13th edition, D P Kothari and I J Nagrath, PHI, 2011.
6. Introduction to Electrical Engineering, M. Naidu, S. Kamakshaiah, McGraw-Hill Education, 2004

14 Engineering Mechanics (FE0_ESC_EME_T004)

14.1 Teaching Scheme

Course Code	Course Name	Contact Hours	Credits
FE0_ESC_EME_T004	Engineering Mechanics	03	03

14.2 Examination and Evaluation Scheme

Formative Assessment		Summative Assessment				Total Marks
ISE		MSE		ESE		
Marks	Duration	Marks	Duration (Hrs.)	Marks	Duration (Hrs.)	
20	CA	20	1	60	2.5	100

14.3 Course Objectives

S. No.	Objective
1	To familiarize the concept of different types of force systems.
2	To understand the concept of equilibrium of bodies subjected to different types of loads and supports.
3	To familiarize the concepts of the force of friction and forces induced in Truss members.
4	To familiarize with the different types of robots and its end effectors.
5	To understand concepts of forward and inverse kinematics in robots.

14.4 Course Outcomes

The student will be able to:	
CO1	*apply* the mathematical techniques and physical sciences to *identify* the system of forces and *solve* for their resultant.
CO2	*construct* free-body diagrams for a given physical system, *formulate* equilibrium conditions, and *calculate* the reactive forces.
CO3	*demonstrate* an understanding of the concept of friction and *apply* the same to solve problems related to wedges and ladders as well as will be able to *calculate* the support reactions and internal forces induced in members of a truss.
CO4	*apply* the knowledge of physical sciences and mathematical techniques to *develop* and *interpret* the relationship between the position, velocity, and acceleration of a particle and *analyze* the motion by plotting them, as well as be able to *understand* and classify different types of robots.
CO5	*understand* the concept of the Instantaneous Centre of Rotation for a rigid body in general plane motion and *apply* the same to find velocities of various links of a four-bar mechanism as well as be able to *understand* basic concepts of forward and inverse kinematics in robots.

14.5 Course Contents

Module	Unit	Detailed Contents	Hours
	Prerequisites		**01**
		Basics of algebra, geometry, trigonometry, calculus, Newton's laws	

		of motion.	
1	**Resultant of Various Force Systems**		**07**
	1.1	System of Coplanar Force System: Introduction to Mechanics, resolution of forces, moment of a force about a point, couples, force couple system.	
	1.2	Resultant of Coplanar Force System: Concurrent, Non-concurrent, and Parallel Force System, Varignon's theorem, principle of transmissibility, centroid	
2	**Equilibrium of Coplanar Force Systems**		**08**
	2.1	Equilibrium of System of Coplanar Forces: Conditions of equilibrium for concurrent forces, parallel forces, and non-concurrent non-parallel general forces and Couples. Equilibrium of rigid bodies-free body diagrams.	
	2.2	Equilibrium of Beams: Types of beams, type of supports, and reaction: Determination of reactions at supports for various types of loads on beams. (Excluding problems on internal hinges)	
3	**Friction and Trusses**		**08**
	3.1	Friction: Introduction to Static and Kinetic Friction, Laws of dry friction, Angle of Friction, Angle of repose, concept of Cone of friction. Equilibrium of bodies on an inclined plane. Application to problems involving wedges and ladders.	
	3.2	Truss Analysis: Analysis of forces in members of truss by method of joints and method of sections	
4	**Kinematics and Robotics**		**08**
	4.1	Kinematics of Particles: Motion of particle with variable acceleration. General curvilinear motion, normal and tangential components of acceleration, Motion curves (a-t, v-t, s-t curves).	
	4.2	Introduction to Robotics: Introduction to Robots, Types of Robots, types of joints in Robots, Robot Degrees of Freedom, robot work volume, Robot Configuration, Introduction to End effectors and its types.	
5	**Robot Kinematics**		**07**
	5.1	Robot Kinematics: Translation, Rotation, and General Plane motion of Rigid body, Velocity analysis of rigid body using ICR, Forward and Inverse Kinematics.	
		Total Hours	**39**

14.6 Suggested Learning Resources

14.6.1 Textbooks

1. Mechanics for Engineers (Statics), 4th Edition, Beer &Johnston, Tata McGraw-Hill, 1987.
2. Mechanics for Engineers (Dynamics), 4th Edition, Beer & Johnston, Tata McGraw-Hill, 1987.
3. Engineering Mechanics, 14th Edition, A K Tayal, Umesh Publication, 2012.
4. Automation, Production Systems and Computer Integrated Manufacturing, 4th Edition, M. P. Groover, Pearson Education, New Delhi, 2019.
5. Industrial Robotics Technology Programming and Applications, 6th Edition, M.P. Groover,

M. Weiss, R.N. Nagel, and N.G. Odrey, McGraw-Hill, 2010.

14.6.2 Reference Books

1. Engineering Mechanics, 11th Edition, R. C. Hibbeler, Ashok Gupta, Pearson Publications, 2010
2. Engineering Mechanics, 3rd Edition, F. L. Singer, Harper Collins Publishers India, 1999
3. Engineering Mechanics, 3rd Edition, Mclean & Nelson, McGraw-Hill, 1980
4. Engineering Mechanics, 3rd Edition, K.L. Kumar, Tata McGraw-Hill, 1998
5. Engineering Mechanics, 8th Edition, K.L. Kumar and Veenu Kumar, Tata McGraw-Hill, 2011
6. Engineering Mechanics (Statics), 6th Edition, Meriam and Kraige, Wiley Books, 2012
7. Engineering Mechanics (Dynamics), 6th Edition, Meriam and Kraige, Wiley Books, 2012
8. Robotics for Engineers, Yoram Korean, McGrew Hill Co.

14.6.3 Web Resources

1. Engineering Mechanics Statics and Dynamics
   https://archive.nptel.ac.in/courses/112/106/112106180/
2. Engineering Mechanics
   https://nptel.ac.in/courses/112103108
3. Experiment Simulator
   http://www.roboanalyzer.com/mechanalyzer.html

15 Engineering Mechanics Lab (FE0_ESC_EME_L004)

15.1 Teaching Scheme

Course Code	Course Name	Contact Hours	Credits
FE0_ESC_EME_L004	Engineering Mechanics Lab	02	01

15.2 Examination and Evaluation Scheme

Evaluation	ISE	PE	OrE	PrE	Total
Marks	25	25	0	0	50

15.3 Course Objectives

S. No.	Objective
1	To familiarize the concept of different types of force systems.
2	To understand the concept of equilibrium of bodies subjected to different types of loads and supports.
3	To familiarize the concepts of the force of friction and forces induced in Truss members.
4	To familiarize with the different types of robots and its end effectors.
5	To understand concepts of forward and inverse kinematics in robots.

15.4 Course Outcomes

The students will be able to:	
CO1	*apply* the mathematical techniques and physical sciences to verify the Law of Moments.
CO2	*construct* free-body diagrams for a given physical system, formulate equilibrium conditions, and calculate the reactive forces.
CO3	*demonstrate* the scientific principles of friction and *apply* the concepts of friction to find the coefficient of friction.
CO4	*apply* the physical sciences and mathematical techniques to *develop* and *interpret* the relationship between position, velocity and acceleration of a particle and *analyze* the motion by equating them.
CO5	*apply* the mathematical techniques and concept of the instantaneous center of rotation to find the velocity of links.

15.5 Course Contents

S. No.	Suggested List of Experiments
1	To Verify the Polygon law of forces, using Force Board Apparatus
2	To verify the Law of Moments (Varignon's Theorem) using the Bell Crank Lever Apparatus
3	To verify the conditions of equilibrium of a system of coplanar parallel forces by using a simply supported beam and finding the support reactions.
4	Determination of centroid of different plane laminas
5	Determination of Coefficient of Friction between two surfaces by using horizontal plane method

6	To determine the Coefficient of Friction between two surfaces by using inclined plane method
7	To calculate the final velocity of a body performing the projectile motion.
8	To study the Instantaneous Centre of Rotation (ICR) and to determine the velocity of links by using the ICR method.
	Simulation Experiments
9	To calculate the resultant of Concurrent Force system / Parallel Force system .
10	To determine the support reactions of a simply supported beam.
11	To find the minimum and maximum effort required to move a block kept on rough inclined surface.
12	To calculate the linear velocity and angular velocity of a general plane motion
13	To analyze the forces in a simple roof truss
14	To analyze the motion of robotic arms for different configuration of robots.

Note: Lab course shall consist minimum of 08 experiments covering the syllabus of corresponding theory course but not limited to the suggested list.

15.6 Suggested Learning Resources

15.6.1 Textbooks

1. Engineering Mechanics, 14th Edition, A K Tayal, Umesh Publication, 2012.
2. Industrial Robotics Technology Programming and Applications, 6th Edition, M.P. Groover, M. Weiss, R.N. Nagel, and N.G. Odrey, McGraw-Hill, 2010.

15.6.2 Reference Books

1. Engineering Mechanics, 11th Edition, R. C. Hibbeler, Ashok Gupta, Pearson Publications, 2010
2. Engineering Mechanics, 3rd Edition, F. L. Singer, Harper Collins Publishers India, 1999
3. Engineering Mechanics, 3rd Edition, Mclean & Nelson, McGraw-Hill, 1980
4. Robotics for Engineers, Yoram Korean, McGrew Hill Co.

15.6.3 Web Resources

1. Experiment Simulator
   http://www.roboanalyzer.com/mechanalyzer.html

Section II . Program Courses (PC)

S. No.	Course Type	Subject Code	Courses	Group I Semester	Group II Semester	Credits
1	PCC	FE0_PCC_###_L201	Program Core Lab	II	II	2
II. Total Credits – Program Courses (PC)						**2**

NOTE: program core courses are department specific.

S. No.	Department	Code	Program Core Course
1	Artificial Intelligence and Machine Learning	FE0_PCC_DAT_L201	Program Core Lab - Data Analytics
2	Computer Engineering	FE0_PCC_WDL_L201	Program Core Lab - Web Development
3	Information Technology		
4	Electronics and Computer Science	FE0_PCC_ADC_L201	Program Core Lab - Analog and Digital Integrated Circuits
5	Electrical Engineering	FE0_PCC_EEE_L201	Program Core Lab – Elements of Electrical and Electronics System.
6	Electronics and Telecommunication Engineering	FE0_PCC_EET_L201	Program Core Lab - Elements of Electronics and Telecommunication Engineering
7	Mechanical Engineering	FE0_PCC_WLD_L201	Program Core Lab – Welding

16 Program Core Lab - Data Analytics (FE0_PCC_DAT_L201)

16.1 Teaching Scheme

Course Code	Course Name	Contact Hours	Credits
FE0_PCC_DAT_L201	Program Core Lab - Data Analytics	04	02

16.2 Examination and Evaluation Scheme

Evaluation	ISE	PE	OrE	PrE	Total
Marks	50	25	-	-	75

16.3 Course Objectives

S. No.	Objective
1	To Equip students with foundational data analysis skills using industry-standard tools like Excel, Python, and Power BI.
2	To enable students to apply data analysis techniques across different platforms, understanding the strengths and limitations of each.
3	To teach students essential data cleaning and preprocessing techniques to prepare raw data for analysis in various environments.
4	To introduce students to basic statistical concepts and how to implement them in Excel, Python, and Power BI.
5	To develop students' ability to visualize data effectively, using the specific features of Excel, Python's visualization libraries, and Power BI's interactive capabilities.

16.4 Course Outcomes

The students will be able to:	
CO1	*perform* loading, cleaning, and preprocessing of data in Excel, Python, and Power BI.
CO2	*perform* basic descriptive statistical analysis and interpret the results.
CO3	*create* and customize charts, graphs, and visualizations of data.
CO4	*select* the appropriate tool for specific data analysis needs based on the task requirements and dataset characteristics.
CO5	*perform* end-to-end data analysis starting from raw data in Excel, advanced processing in Python, and final reporting in Power BI.

16.5 Course Contents

S. No.	Suggested List of Experiments
1	To introduce students to basic data handling, including sorting, filtering, and summarizing data using Microsoft Excel
2	To teach students how to visualize data effectively using Microsoft Excel
3	To familiarize students with the importance of data cleaning using Microsoft Excel
4	To introduce the concepts of correlation and covariance using Microsoft Excel
5	To introduce students to the Pandas library for data manipulation and to teach them how

	to aggregate and group data.
6	To teach data cleaning techniques using Python.
7	To introduce students to basic data visualization techniques using Matplotlib library.
8	To perform descriptive statistical analysis on a dataset using Python.
9	To familiarize students with the Power BI interface and how to load data.
10	To teach students how to clean and transform data using Power BI's Query Editor.
11	To introduce students to basic data visualizations in Power BI.
12	To teach students how to interactively explore data using slicers and filters.
13	To teach students how to analyze time series data in Power BI.
14	To introduce students to creating reports with multiple pages in Power BI.
15	To teach students how to use What-If analysis in Power BI.
16	Mini-project on data analysis.

16.6 Suggested Learning Resources

16.6.1 Textbooks

1. Data Analysis Using Microsoft Excel 5.0, Michael R. Middleton, Duxbury Press 2007.
2. Python for Data Analysis" Wes McKinney, O'Reilly Media, Incorporated, 2013.
3. Microsoft Power BI Complete Reference Devin Knight, Brian Knight, Mitchell Pearson, Manuel Quintana, Packt Publishing, 2018.

16.6.2 Reference Books

1. Statistical Analysis: Microsoft Excel 2016 by Conrad Carlberg, Que Publishing, 2018.
2. Think Stats: Exploratory Data Analysis in Python, Allen B. Downey, O'Reilly Media 2014.
3. Mastering Microsoft Power BI: Expert techniques for effective data analytics and business intelligence by Brett Powell, Packt Publishing, 2018.

16.6.3 Web Resources

1. https://www.classcentral.com/course/data-analysis-microsoft-introduction-to-data-anal-6544
2. NPTEL Data Analytics using Python: https://archive.nptel.ac.in/courses/106/107/106107220/
3. https://www.coursera.org/professional-certificates/microsoft-power-bi-data-analyst
4. https://www.coursera.org/learn/data-analysis-and-visualization-with-power-bi
5. https://www.coursera.org/learn/from-excel-to-power-bi
6. NPTEL Introduction to data analytics: https://archive.nptel.ac.in/courses/110/106/110106072/

17 Program Core Lab - Web Development (FE0_PCC_WDL_L201)

17.1 Teaching Scheme

Course Code	Course Name	Contact Hours	Credits
FE0_PCC_WDL_L201	Program Core Lab - Web Development	04	02

17.2 Examination and Evaluation Scheme

Evaluation	ISE	PE	OrE	PrE	Total
Marks	50	25	-	-	75

17.3 Course Objectives

S. No..	Objective
1	To enable learner to develop static webpages using HTML tags.
2	To teach learner styling of webpages using CSS.
3	To guide learner in developing a static website using WordPress.
4	To familiarize learner with client-side verification of forms using JavaScript.
5	To train learner in development of dynamic user interfaces using React.

17.4 Course Outcomes

The learner will be able to:	
CO1	*apply* appropriate HTML tags to *design* a static webpage.
CO2	*develop* styles for webpages using CSS.
CO3	*create* and *publish* a static website using WordPress.
CO4	*design* forms with client-side verification using JavaScript.
CO5	*develop* dynamic user interface using React.

17.5 Course Contents

S. No..	Suggested List of Experiments
1	**To design a static webpage using Hypertext Text markup Language (HTML)**
	a. Understand and apply HTML tags and attributes
	b. Identify and use basic root HTML tags, formatting tags, table tags, list tags, form tags, link tags and multimedia tags
	c. create static webpages (at least 3) using various HTML tags
2	**To style webpages using Cascading Style Sheets (CSS)**
	a. To style webpages using CSS functions
	b. Design responsive webpages
3	**To design static website using WordPress**
	a. Understand various functions of WordPress

	b. Create a static website with the help of WordPress functions
	c. Publish a static website in WordPress
4	**Verification of forms using JavaScript**
	a. Apply basic scripting using JavaScript
	b. Build form for various input types
	c. Implement client-side verification using JavaScript
5	**Development of dynamic user interface using React**
	a. Install and configure React server
	b. Develop a dynamic user interface using React
6	**Server-side programming with Node.js**
	a. Set up a Node.js server
	b. Handle basic GET and POST requests
7	**Database integration with web application**
	a. Connect a Node.js server to a database (e.g., MongoDB or MySQL).
	b. Perform basic CRUD (Create, Read, Update, Delete) operations.
8	**Implementing Web Application Programming Interfaces (APIs)**
	a. Fetch data from a public API and display it on a web page.
	b. Handle API responses and display dynamic content.
9	**Design user interface using wireframing and prototyping**
	a. Create wireframes for a web or mobile application using tools like Figma or Sketch
	b. Develop a clickable prototype to demonstrate user flow and interactions.
10	**Basics of web security**
	a. Implement basic security measures like input sanitization.
	b. Explore common web vulnerabilities (e.g., SQL injection, XSS) and how to prevent them.

17.6 Suggested Learning Resources

17.6.1 Textbooks

1. HTML 5 Black Book, II Ed, DT Editorial Services, 2016
2. HTML, CSS, and JavaScript All in One, Sams Teach Yourself, III Ed., Pearson, 2020
3. React: Up and Running: Building Web Applications, II Ed, O'Reilly, 2021
4. WordPress Complete, VI Ed, Packt, 2017

17.6.2 Reference Books

1. JavaScript: The Good Parts, I Ed., Douglas Crockford, O'Reilly, 2008
2. HTML & CSS: The Complete Reference, V Ed., Thomas A. Powell, McGraw Hill, 2010
3. Professional WordPress: Design and Development, III Ed. Brad Williams, David Damstra, Hal Stem, Wrox- A Wiley Brand, 2015

4. React JS: A Beginner's Guide to Building Dynamic User Interfaces, I Ed., Daniel Tanner, Independent, 2023

17.6.3 Web resources

1. HTML Tutorial
   https://www.tutorialspoint.com/html/index.htm
2. Tutorial: Intro to React
   https://reactjs.org/tutorial/tutorial.html
3. Introduction to Node.js
   https://nodejs.dev/learn
4. Web Development
   https://www.geeksorg/web-development/

18 Program Core Lab – Analog and Digital Integrated Circuits Lab (FE0_PCC_ADC_L201)

18.1 Teaching Scheme

Course Code	Course Name	Contact Hours	Credits
FE0_PCC_ADC_L201	Analog and Digital Integrated Circuits Lab	04	02

18.2 Examination and Evaluation Scheme

Evaluation	ISE	PE	OrE	PrE	Total
Marks	50	25	-	-	75

18.3 Course Objectives

S. No.	Objective
1	To synthesize logic circuits using logic gates.
2	To acquire the knowledge of combinational circuits.
3	To understand the concept of sequential circuits.
4	To explain the applications of operational amplifiers.
5	To describe the mode of operations of IC 555 timer.

18.4 Course Outcomes

The students will be able to:	
CO1	*realize* Boolean expressions using logic gates.
CO2	*construct* and *verify* applications using combinational circuits.
CO3	*design* and *demonstrate* applications of sequential circuits.
CO4	*analyze* and *develop* applications using operational amplifier.
CO5	*design* and *test* applications using IC555 timer.

18.5 Course Contents

S. No.	Suggested List of Experiments
1	To design, simulate and verify the logic circuit for a given logical expression using basic gates.
2	To minimize the given logical expression and design the logic circuit using universal gates.
3	To design, simulate and implement half/full adder and half/full subtractor using basic gates and XOR gate.
4	To design, simulate and implement half/full adder and half/full subtractor using universal gates.
5	To design, simulate and verify 4:1 and 8:1 multiplexer and 1:4 and 1:8 demultiplexer.
6	To design, simulate and verify higher-order multiplexer using lower-order multiplexers.
7	To design, simulate and implement Binary to Gray code converter.
8	To design, simulate and implement BCD to Excess-3 code converter.
9	To design and simulate 4-bit synchronous counter.
10	To design and simulate serial in/serial out shift register.

11	To design and test inverting and non-inverting amplifier using IC 741.
12	To design and test a comparator using IC 741.
13	To design and test zero crossing detector using IC 741.
14	To design and implement a square wave generator using IC 555.
15	To design and implement pulse width modulator using IC 555.

18.6 Suggested Learning Resources

18.6.1 Textbooks

1. Digital Design, 4th Edition, M. Morris Mano and Michael D. Ciletti, Pearson Education, 2008.
2. Digital Logic Applications and Design, 1st Edition, John M. Yarbrough, Thomson Publications, 2006.
3. Op-Amps and Linear Integrated Circuits, 4th Edition, Ram A, Gayakwad, Prentice Hall of India, 2021.
4. Electronic Devices and Circuit Theory, 10th Edition, Robert Boylestead and Louis Nashelsky, Pearson Education, 2009.

18.6.2 Reference Books

1. Digital Design Principles and Practice, 4th Edition, John F. Wakerly, Pearson Publications, 2008.
2. Modern Digital Electronics, 4th Edition, R.P. Jain, Tata McGraw Hill, 2008.
3. Fundamentals of Logic Design, 7th Edition, Roth and Kinney, Cengage Learning, 2013.
4. Linear Integrated Circuits, 4th Edition, D. Roy Choudhury and S. B. Jain, New Age International Publishers, 2017.

18.6.3 Web Resources

1. NPTEL course on Digital Systems, Prof. N.J. Rao, IISc Bangalore
   https://nptel.ac.in/courses/106108099
2. NPTEL course on Digital Systems Design, Prof. D. Roychoudhury, IIT Kharagpur
   https://nptel.ac.in/courses/117105080
3. Digital Electronics and Logic Design Tutorials
   https://www.geeksforgeeks.org/digital-electronics-logic-design-tutorials/
4. Digital Circuits Tutorial
   https://tutorialspoint.com/digital_circuits/index.htm
5. NPTEL course on Integrated Circuits and Applications, Prof. Shaik Rafi Ahamed, IIT Guwahati
   https://nptel.ac.in/courses/108103378
6. Operational Amplifier Basics
   https://www.electronics-tutorials.ws/opamp/opamp_1.html

19 Program Core Lab – Elements of Electrical and Electronics System. (FE0_PCC_EEE_L201)

19.1 Teaching Scheme

Course Code	Course Name	Contact Hours	Credits
FE0_PCC_EEE_L201	Program Core - Elements of Electrical and Electronics System Lab	04	02

19.2 Examination and Evaluation Scheme

Evaluation	ISE	PE	OrE	PrE	Total
Marks	50	25	-	-	75

19.3 Course Objectives

Sr. No.	Objective
1	To enable learners with the knowledge of different conventional and non-conventional energy sources.
2	To elaborate various types of transmission lines
3	To discuss different types of energy storage devices along with their characteristics
4	To familiarize learners with the measurement of various electrical parameters
5	To train learners to use different ICs for specific electrical applications

19.4 Course Outcomes

Sr. No	Outcomes
The students will be able to	
CO1	*illustrate* the basics of solar PV (photovoltaic) cell and plot its characteristics
CO2	*explore* transmission line to calculate receiving end voltage under varying load conditions.
CO3	*perform* experiment to plot the charging and discharging characteristic of energy storage device
CO4	*identify* various methods used for measurement and power factor improvement in AC circuit
CO5	*demonstrate* the effective use of op-amp, voltage regulator circuits, and different ICs for various electrical applications

19.5 Course Contents

S. No.	Suggested List of Experiments
1	To perform and plot VI Characteristics of Solar PV Panel.
2	To study a short transmission line and calculate various transmission line parameters.
3	To study the different types of energy storage and plot characteristics of energy storage device .
4	To perform and measure various electrical quantities in a single phase and three phase circuit.
5	To study the various power factor improvement techniques and calculate the powerfactor using any one power factor improvement method.

6	To study and implement a circuit using op-amp.
7	To implement a voltage regulator circuit to maintain constant DC voltage at the output.
8	To perform speed control of DC Motor using IC LM317.
9	To simulate MPPT characteristics of Solar photovoltaic system using MATLAB.
10	To measure the transmission parameters and quantities for long, medium, and short transmission lines using MATLAB.
11	To simulate and analyze battery characteristics using MATLAB.
12	To perform a case study on calculation of electricity bill for any one installation

Note: Minimum 10 experiments need to be conducted.

19.6 Suggested Learning Resources

19.6.1 Textbooks

1. Mahesh Verma, Power Plant Engineering, Metrolitan Book Co Pvt Ltd
2. RK Rajput, A Text Book of Power System Engineering, Laxmi Publication
3. D. P. Kothari, I. J. Nagrath, Power System Engineering, 3 Edition, Mc GrawHill
4. B.R. Gupta, Power System Analysis And Design, S.Chand
5. Mehta V.K., Principles of Power System, S Chand
6. AK Sawhney, Electrical & Electronic Measurements and Instrumentation, Dhanpat Rai & Sons
7. Dincer I., and Rosen M. A. (2011); Thermal Energy Storage: Systems and Applications, Wiley
8. Robert Boylestad and Louis Nashelsky, Electronic Devices and Circuits, PHI

19.6.2 Reference Books

1. W. D. Stevenson, Elements of Power System, 4 Edition TMH
2. Trevor M. Letcher, Storing Energy with Special Reference to Renewable Energy Source, Elsevier, 2016
3. R.S. Sirohi & Radhakrisnan, Electrical Measurement & Instrumentation, New Age International

19.6.3 Web resources

1. Introduction to Renewable Energy
   https://www.energy.gov/eere/renewable-energy
2. Introduction to Analog Electronics
   https://swayam.gov.in/nd1_noc20_ee45/preview

20 Program Core Lab –Elements of Electronics and Telecommunication Engineering (FE0_PCC_EET_L201)

20.1 Teaching Scheme

Course Code	Course Name	Contact Hours	Credits
FE0_PCC_EET_L201	Program Core Lab - Elements of Electronics and Telecommunication Engineering	04	02

20.2 Examination and Evaluation Scheme

Evaluation	ISE	PE	OrE	PrE	Total
Marks	50	25	-	-	75

20.3 Course Objectives

S. No.	Objective
1	To introduce the fundamentals of transmitter, receiver and channel in basic communication system.
2	To make the learners understand the basic concepts of line codes, modulation and channel codes of digital communication system
3	To introduce fundamental building blocks of digital electronics.
4	To make the learners understand the role of various sensors in IoT applications
5	To teach learners the construction of computer communication network

20.4 Course Outcomes

The students will be able to:	
CO1	*emphasize* the significance of basic building blocks of communication system
CO2	*interpret and analyze* the importance of converting the analog data to digital.
CO3	*learn* the functionality of logical gates in building a digital circuit
CO4	*select* the sensor to gather specific information about their surroundings by detecting physical quantities
CO5	*explore* various networking devices required to construct a computer network.

20.5 Course Contents

S. No.	Suggested List of Experiments
1	To demonstrate the basic communication system.
2	To generate AM wave using MATLAB.
3	To convert an analog signal to digital using pulse code modulation.
4	To setup and observe waveforms for NRZ and RZ line codes.
5	To setup ASK modulation and demodulation block and observe the waveforms.
6	To simulate non-systematic cyclic channel code using Python.
7	To implement the Boolean function using basic logic gates.
8	To implement combinational circuits using logic gates.

9	To understand the functionality of the sensors in IoT applications.
10	To understand the role of IP address using static and dynamic IP addressing.
11	To set-up and simulate local area network (LAN) using Cisco packet tracer.
12	To understand resource sharing in LAN using web server.

20.6 Suggested Learning Resources

20.6.1 Textbooks

1. Kennedy and Davis, "Electronics Communication System", Tata McGraw Hill, Fourth edition.
2. R. P. Jain, “Modern Digital Electronics”, Tata McGraw Hill Education.
3. D. Patranabis – Sensor and Transducers (2e) Prentice Hall, New Delhi, 2003
4. Data Communications and Networking – Behrouz A. Forouzan, Fifth Edition TMH, 2013.

20.6.2 Reference Books

1. Taub, Schilling and Saha, "Taub's Principles of Communication systems", Tata McGraw Hill, Third edition
2. Thomas L. Floyd, “Digital Fundamentals”, Pearson Prentice Hall
3. Arshdeep Bahga and Vijay Madisetti, “Internet of Things: A Hands-on Approach,Universities Press.
4. Data & Computer Communications, William Stallings, Pearson Education, 2014

20.6.3 Web Resources

1. NPTEL Lecture Series: Analog Communication, by Prof. Goutam Das, IIT Kharagpur. https://swayam.gov.in/nd1_noc20_ee69/preview
2. NPTEL Lecture Series: Digital Electronic circuits by Prof. Gautam Saha, IIT Kharagpur https://archive.nptel.ac.in/courses/108/105/108105132/
3. NPTEL Lecture Series: Introduction to Digital Communication by Prof. Bikash Kumar Dey, IIT Delhi https://nptel.ac.in/courses/117101051
4. NPTEL Lecture Series: Introduction to Internet Of Things, Prof Sudeep Mishra, IIT Kharagpur https://archive.nptel.ac.in/courses/106/105/106105166

21 Program Core Lab – Welding (FE0_PCC_WLD_L201)

21.1 Teaching Scheme

Course Code	Course Name	Contact Hours	Credits
FE0_PCC_WLD_L201	Program Core Lab – Welding	04	02

21.2 Examination and Evaluation Scheme

Evaluation	ISE	PE	OrE	PrE	Total
Marks	50	25	-	-	75

21.3 Course Objectives

S. No.	Objective
1	To introduce students to various welding processes and their applications in industry.
2	To ensure students understand and adhere to safety protocols and operational procedures when using welding equipment.
3	To develop skills in executing different welding techniques, including joint preparation and metal fusion.
4	To provide hands-on experience in welding inspection techniques, including visual inspection and non-destructive testing methods.

21.4 Course Outcomes

The students will be able to	
CO1	*develop* the necessary skills required to use different tools of Fitting Shop.
CO2	*classify* the welding processes, analyze the physics of the welding arc, and identify various welding tools.
CO3	*practice* safety measures during different welding operations.
CO4	*understand* and practice different electric arc welding techniques.
CO5	*make use* of some of the Non-destructive testing (NDT) methods for inspecting weld joints.

21.5 Course Contents

Ex. No.	Suggested List of Experiments
1	To demonstrate and use the measuring and marking tools for precision fitting of the workpiece.
2	To demonstrate and practice the sawing and filing operations.
3	To classify various welding processes and demonstrate associated equipment/tools.
4	To understand power sources and heat flow in welding operations.
5	To understand and imbibe safe welding practices.
6	To demonstrate and practice different electric arc welding techniques.
7	To identify different arc welding equipment/tools.
8	To demonstrate the use of arc welding electrodes and operate different welding equipment.

9	To understand different weld joints and practice them on workpieces.
10	To understand and demonstrate various Non-Destructive Testing (NDT) techniques for welding defects.
11	Course Project based on above topics.

21.6 Suggested Learning Resources

21.6.1 Textbook:

1. A Textbook of Welding Technology, Revised Edition, O.P. Khanna, Dhanpat Rai Publishing Co Pvt Ltd, 2021.
2. Manufacturing Technology, Vol. 1, 5th Edition, P. N. Rao, McGraw Hill Education India Private Limited, 2019.
3. Welding Processes and Technology, 2nd Edition, Dr. R.S. Parmar, Khanna Publishers, Delhi (India), 1997

21.6.2 Reference books:

1. Welding Handbook, 9th Edition, American Welding Society, American Welding Society, 2020
2. Metals and How to Weld Them, 2nd Edition, Jefferson Davis, Industrial Press, Inc., 1999

21.6.3 Web Resources

1. Free Online Welding Courses | Alison
   https://alison.com/tag/welding

Section III . Multidisciplinary Courses (MDC)

S. No.	Course Type	Subject Code	Courses	Group I Semester	Group II Semester	Credits
-	MDC	-	-	-	-	-
III. Total Credits – Multidisciplinary Courses (MDC)						0

Section IV . Skill Courses (SC)

S. No.	Course Type	Subject Code	Courses	Group I Semester	Group II Semester	Credits
1	VSEC	FE0_SEC_SDL_L101	Skill Development Lab	I	I	2
2		FE0_SEC_PYP_T202	Python Programming	II	II	2
3		FE0_SEC_PYP_L202	Python Programming Lab	II	II	1
IV. Total Skill Courses (SC) Credits in First Year						**5**

22 Skill Development Lab (FE0_SEC_SDL_L101)

22.1 Teaching Scheme

Course Code	Course Name	Contact Hours	Credits
FE0_VSEC_SDL_L101	Skill Development Lab	04	02

22.2 Examination and Evaluation Scheme

Evaluation	ISE	PE	OrE	PrE	Total
Marks	50	-	-	-	50

22.3 Course Objectives

S.No.	Objectives
1	To understand the fundamentals of Computer Engineering and Information Technology
2	To impart the skills of Electrical and Electronics Engineering
3	To train learner with basic skills of Fitting and Sheet Metal Working

22.4 Course Outcomes

The students will be able to:	
CO1	*perform* basic troubleshooting and maintenance of personal computers.
CO2	*create* and *edit* documents and *analyze* data using suitable tools.
CO3	*practice* safety measures and wiring standards with respect to electrical equipment
CO4	*design* and *fabricate* printed circuit board
CO5	*create* a job using techniques such as fitting and sheet metal working.

22.5 Course Contents

Ex. No.	Suggested List of Experiment
1	To perform basic troubleshooting and maintenance of personal computers and laptops.
2	To design webpages using web technologies such as HTML, CSS, java Script Bootstrap and XML
3	To prepare technical reports using documentation tools.
4	To assemble and test an end-to-end Internet of Things (IoT) system for room temperature control using Arduino
5	To study the earthing system and measure the earth resistance, electrical safety devices, their specifications and applications,
6	To study electrical service connections and electrical wiring techniques
7	To study the circuit simulation software and understand the process of Printed Circuit Board (PCB) fabrication.
8	To design, assemble and test the circuit on PCB.
9	To use various fitting operations to create a male-female joint.
10	To demonstrate sheet metal operations using essential tools with safety precaution to create a job work.

22.6 Suggested Learning Resources

22.6.1 Textbooks

1 Web 2.0 programming, Eric Vist, Wiley India.
2 Getting Started with Arduino, 2nd Edition, Massimo Banzi, O'Reilly, 2011
3 R S Khandpur, “Printed circuit board”, McGraw-Hill Education; 1st edition, 24 February, 2005.
4 Raina Bhattacharya, Electrical Design Estimating and Costing, New Age International.
5 Kraig Mitzner, “Complete PCB Design Using OrCAD Capture and PCB Editor”, Academic Press; 2nd edition, 20 June 2019.
6 Elements of Workshop Technology, Volume 1, Manufacturing Processes, S. K. Hajra Choudhary, A. K. Hajra Choudhary, Nirjhar Roy

22.6.2 Reference book:

1 Internet and world wide web: How to program, 4th Edition, Deitel, P.J. Deitel
2 Internet of Things - A Hands-on Approach, 1st Edition, Arshdeep Bahga, Vijay Madisetti, Universities Press, 2015
3 S.L.Uppal & G.C. Garg, Electrical Wiring Estimating & Costing, Khanna Publishers.
4 J. B. Gupta, Electrical Installation Estimating & Costing, S. K. Kataria & Sons, 2009.
5 BIS SP 30:National Electrical Code, 2020

22.6.3 Web References:

1 Microsoft Excel
https://support.microsoft.com/en-us/excel
2 Microsoft Word
https://support.microsoft.com/en-us/word
3 Web Resources Exp2
www.w3schools.com
4 How To Assemble a Desktop PC
https://www.e-booksdirectory.com/details.php?ebook=1398
5 Computer Repair with Diagnostic Flowcharts
https://www.e-booksdirectory.com/details.php?ebook=12279

23 Python Programming (FE0_SEC_PYP_T202)

23.1 Teaching Scheme

Course Code	Course Name	Contact Hours	Credits
FE0_SEC_PYP_T202	Python Programming	02	02

23.2 Examination and Evaluation Scheme

Formative Assessment		Summative Assessment				Total Marks
ISE		MSE		ESE		
Marks	Duration	Marks	Duration (Hrs.)	Marks	Duration (Hrs.)	
15	CA	15	1	45	2	75

23.3 Course Objectives

S. No.	Objective
1	To introduce basics of Python including data types, operators, input/output.
2	To explain control flow statements, looping statements and functions.
3	To familiarize learners with the basics object-oriented programming concepts.
4	To introduce the concepts of modules, packages, file handling and advanced libraries.
5	To teach the design of Graphical User Interface (GUI) with database connectivity.

23.4 Course Outcomes

The student will be able to:	
CO1	*use* basic structure, syntax and semantics of the Python programming language.
CO2	*apply* different decision-making statements and functions.
CO3	*demonstrate* the knowledge of object-oriented programming in Python.
CO4	*exploit* the tool like modules, packages, file handling and advanced libraries.
CO5	*develop* Graphical User Interface (GUI) along with database connectivity.

23.5 Course Contents

Module	Unit	Detailed Contents	Hours
	Prerequisites		**01**
		Data types, variables, constants, functions, basic object oriented concepts	
1	**Basics of Python:**		**05**
	1.1	Introduction: Features of Python, Comparison of Python with C/C++	
	1.2	Python building blocks: Identifiers, Keywords, Indention, Variables and Comments, Basic data types, Operators, Input-output, string	
	1.3	Sequence data types: List, tuple, set and dictionary	
2	**Control statements & functions:**		**05**
	2.1	Control flow statements: a) Conditional statements (if, if...else, nested if) b) Looping in Python (while loop, for loop, nested loops) c) Loop manipulation using continue, pass, break.	

	2.2	Functions: a) Built -in functions in python b) User defined functions c) Recursive functions d) Anonymous Functions (Lambda, Map, Reduce, Filter)	
3	**Object oriented programming concepts:**		**05**
	3.1	Classes and objects: Creating a class, encapsulation, self variable, constructors	
	3.2	Methods: Types of methods, inner classes, constructors in inheritance, Polymorphism, Abstraction, Interfaces in Python.	
	3.3	Exceptions Handling: Errors in a Python program, exceptions, Exception handling, Types of exceptions.	
4	**Modules, packages and file handling**		**05**
	4.1	Modules: Writing modules, importing objects from modules, Python built-in modules (e.g. Numeric and Mathematical module, Functional Programming module	
	4.2	Packages: creating user defined packages and importing packages.	
	4.3	File handling: Opening file in different modes, closing a file, writing to a file, accessing file contents using standard library functions, reading from a file, Renaming and Deleting a file, File Exceptions.	
5	**Graphical user interface and data handling**		**05**
	5.1	Graphical user interface (GUI): GUI creation in python using Tkinter module, creating Canvas, Frame and Widgets, file operations using Tkinter	
	5.2	Data handling using advanced libraries: Data processing using Pandas (excel/csv files), Data calculation using NumPy, Data visualization using Matplotlib	
		Total Hours	**26**

23.6 Suggested Learning Resources

23.6.1 Textbooks

1. Introduction to Computing and Problem Solving using Python, I Ed, E. Balagurusamy, McGraw Hill Education India Private Limited, 2016
2. Beginning Python, I Ed, James Payne, Wrox Publication, 2011
3. Python: The Complete Reference, Martin C. Brown, McGraw Hill Education, 2018
4. Learning Python, V Ed, 5th Edition, O'Reilly, 2009

23.6.2 Reference Books

1. Introduction to Computing and Programming in Python-Multimedia Approach, IV Ed. Mark J. Guzdial
2. Python Programming Using Problem Solving Approach, I Ed, Reema Thareja, Oxford University Press, 2017
3. Introduction to Computing & Problem Solving with Python, I Ed, Jeeva Jose, P. Sojan Lal, Khanna Computer Book Store, 2019
4. Core Python Applications Programming, III Ed, Wesley J. Chun, Pearsons, 2019

23.6.3 Web Resources

1. Ebook: A Smarter Way to Learn Python: Mark Myers
   https://tinyurl.com/k2zh2vkd
2. NPTEL Lecture Series: Computational Science and Engineering using Python, by Dr. Mahendra Vera, IIT Kanpur
   https://archive.nptel.ac.in/noc/courses/noc17/SEM1/noc17-ph02/

24 Python Programming Lab (FE0_SEC_PYP_L202)

24.1 Teaching Scheme

Course Code	Course Name	Contact Hours	Credits
FE0_SEC_PYP_L202	Python Programming Lab	02	01

24.2 Examination and Evaluation Scheme

Evaluation	ISE	PE	OrE	PrE	Total
Marks	25	25	0	0	50

24.3 Course Objectives

S. No.	Objective
1	To *introduce* basics of Python programming including data types, operators, input/output.
2	To *familiarize* learners with control flow statements, looping statements, function declaration and function calling.
3	To *introduce* object-oriented programming concepts in Python.
4	To make the learners *understand* the concepts of modules, packages, file handling and advanced libraries.
5	To *teach* learners the development of Graphical User Interface (GUI) along with data handling

24.4 Course Outcomes

The students will be able to:	
CO1	*use* basic structure, syntax and semantics of the Python programming language.
CO2	*apply* different decision-making statements and functions.
CO3	*demonstrate* the knowledge of object-oriented programming in Python.
CO4	*explore* the tool like modules, packages, file handling and advanced libraries.
CO5	*develop* GUI along with data handling.

24.5 Course Contents

Ex. No.	Suggested List of Experiments
1	A Python program to use various basic data types, operators and input/output statements
2	A Python program based on strings, lists, dictionaries, sets and tuples
3	A Python program based on conditional statements
4	A Python program to demonstrate the use of looping
5	A Python program based on concepts of functions
6	A Python program based on classes, objects and constructors
7	A Python program based on inheritance, polymorphism and interface
8	A Python program based on exception handling
9	A Python program based on file handling

10	A Python program based on modules and packages
11	A Python program for creating GUI and file operations with excel/csv file
12	A Python program to use NumPy and Pandas libraries
13	A Python program to visualize data using Matplotlib library
14	A mini-project based on real life applications

Note: Lab course shall consist minimum of 08 experiments covering the syllabus of corresponding theory course but not limited to the suggested list.

24.6 Suggested Learning Resources

24.6.1 Textbooks

1. Introduction to Computing and Problem Solving using Python, I Ed, E. Balagurusamy, McGraw Hill Education India Private Limited, 2016
2. Beginning Python, I Ed, James Payne, Wrox Publication, 2011
3. Python: The Complete Reference, Martin C. Brown, McGraw Hill Education, 2018
4. Learning Python, V Ed, 5th Edition, O'Reilly, 2009

24.6.2 Reference Books

1. Introduction to Computing and Programming in Python-Multimedia Approach, IV Ed. Mark J. Guzdial
2. Python Programming Using Problem Solving Approach, I Ed, Reema Thareja, Oxford University Press, 2017
3. Introduction to Computing & Problem Solving with Python, I Ed, Jeeva Jose, P. Sojan Lal, Khanna Computer Book Store, 2019
4. Core Python Applications Programming, III Ed, Wesley J. Chun, Pearsons, 2019

24.6.3 Web Resources

1. Ebook: A Smarter Way to Learn Python: Mark Myers https://tinyurl.com/k2zh2vkd
2. NPTEL Lecture Series: Computational Science and Engineering using Python, by Dr. Mahendra Vera, IIT Kanpurhttps://archive.nptel.ac.in/noc/courses/noc17/SEM1/noc17-ph02/

Section V. Humanities Social Science and Management (HSSM) Courses

S. No.	Course Type	Subject Code	Courses	Group I Semester	Group II Semester	Credits
1	AEC	FE0_AEC_CSE_T001	Communication Skills and Ethics	II	I	3
2	IKS	FE0_IKS_***_T001	Indian Knowledge System	II	I	2
V. Total Humanities Social Science and Management (HSSM) Credits in First Year						**5**

Basket of courses offered under Indian Knowledge System (IKS)

S. No.	Code	Title of the Indian Knowledge System Course
1	FE0_IKS_ESE_T001	Environmental Science and Engineering
2	FE0_IKS_TPW_T001	Principles of Town Planning and Water Management
3	FE0_IKS_TAC_T001	Trade and Commerce

25 Communication Skills and Ethics (FE0_AEC_CSE_T001)

25.1 Teaching Scheme

Course Code	Course Name	Contact Hours	Credits
FE0_AEC_CSE_T001	Communication Skills and Ethics	03	03

25.2 Examination and Evaluation Scheme

Formative Assessment		Summative Assessment				Total Marks
ISE		MSE		ESE		
Marks	Duration	Marks	Duration (Hrs.)	Marks	Duration (Hrs.)	
20	CA	20	1	60	2.5	100

25.3 Course Objectives

S. No.	Objective
1	To improve learners' comprehension skills using effective listening strategies and efficient reading comprehension techniques.
2	To optimize oral communication prowess by refining pronunciation, vocabulary, non-verbal cues, and public speaking.
3	To equip participants with essential skills in professional communication and technical writing, focusing on email etiquette, business correspondence, and drafting project proposals.
4	To equip participants with essential skills in utilizing digital presentation tools to design and deliver engaging presentations
5	To develop an understanding of responsible use of social media and ethical communication practices in professional settings.

25.4 Course Outcomes

The student will be able to:	
CO1	*demonstrate* listening and reading comprehension skills in academic and professional contexts
CO2	*exhibit* oral communication skills by delivering proper public speeches using correct vocabulary, pronunciation and non-verbal cues.
CO3	*draft c*oncise and effective business letters and project proposals
CO4	use digital presentation tools to *create* dynamic presentations and be able to optimize their LinkedIn profile to enhance visibility and networking opportunities.
CO5	*demonstrate* responsible use of social media, apply ethical principles in written communication, and exhibit professional behavior in various workplace scenarios

25.5 Course Contents

Module	Unit	Detailed Contents	Hours
	Prerequisites		

		Basic Knowledge of English language	
1	**Listening and Reading Skills**		**05**
	1.1	Techniques of Effective Listening: Importance of listening as a Skill and its advantages, Strategies for effective listening.	
	1.2	Reading Skills and Note taking: Techniques of effective reading, Exemplifying the concepts: Skimming, Scanning, active reading, speed reading, Survey-Question-Read-Recite-Review (SQ3R) Styles and techniques of Note taking – including graphic organizers.	
	1.3	Methods to develop Listening and Reading Comprehension: Active listening exercises, interactive and Real life practice, reflection and Feedback	
2	**Speaking Skills**		**05**
	2.1	Oral Communication: Stress and intonation, tips and tricks for Practice Vocabulary Common Errors and Fluency: synonyms and antonyms, Homographs, Homophones, Homonyms, Heteronyms, identifying and rectifying errors	
	2.2	Non-verbal Communication: kinesics, proxemics, paralanguage, oculesics, haptics	
	2.3	Art of Public Speaking: types and strategies, effective use of verbal and non-verbal aspects, techniques to overcome public speaking anxiety	
3	**Writing Skills**		**06**
	3.1	Principles and strategies for effective writing: e-mail etiquette Business correspondence in full block format: permission letters, complaint Letters, adjustment letters	
	3.2	Introduction to Technical Writing and Reports: understanding basics of technical writing, difference between technical and other forms of writing, framing definitions and instructions. Drafting Clear and Concise Technical Documents: components, structure and format of project proposal, drafting a project proposal	
4	**Digital tools for Presentation Skills**		**05**
	4.1	Digital Tools for Presentation: introduction to digital presentation tools (Canva, Prezi, Mentimeter, such free AI tools), strategies for designing and delivering presentations confidently	
	4.2	Basics of Digital Marketing Creating Effective LinkedIn profile	
5	**Professional Ethics and Behaviour Management**		**05**
	5.1	Ethics and Etiquette on social media: respect others' privacy, think before you post, be honest and authentic, respect diverse viewpoints give credit where it is due, maintain professionalism, protect yourself and others.	
	5.2	Addressing plagiarism: proper citation and use of images, etc. in written work, use of Plagiarism software	
	5.3	Professional Behaviour Management: ethical decision making, showing respect, accepting criticism, demonstrating flexibility and cooperation Professional Etiquette: dressing etiquette, cubicle etiquette and cell phone etiquette	
		Total Hours	**26**

25.6 Suggested Learning Resources

25.6.1 Reference Books

1. Essential Communication Skills by Shalini Aggarwal, Ane Books Pvt Ltd
2. Effective Business Communication by A. Kaul
3. Technical Communication: Principles and Practices by M. Raman & Sharma, Oxford University Press
4. Communication Skills by Sanjay Kumar and Pushp Lata, Oxford University Press
5. Business Communication: Building Critical Skills by • Locker, Kitty O. Kaczmarek, Stephen Kyo, Tata McGraw-Hill
6. Effective Technical Communication: A guide for Scientists and Engineers by A. M. Rizvi, Tata McGraw-Hill

25.6.2 Web Resources:

1. Technical Writers
   https://www.youtube.com/watch?v=qnnkAWP55Ww,
   https://www.youtube.com/watch?v=biocrCx5T_k
2. Project proposal
   https://www.youtube.com/watch?v=jsGBuu88WE0,
   https://www.youtube.com/watch?v=LCwFmrXSnCs
3. Professional Behavior
   https://www.glassdoor.com/blog/guide/a-guide-to-professionalism-in-the-workplace/,
   https://in.indeed.com/career-advice/career-development/professionalism,
4. Language fluency skills
   https://www.linkedin.com/pulse/10-free-websites-help-improve-your-english-skills-nida-kazmi/

26 Environmental Science and Engineering (FE0_IKS_ESE_T001)

26.1 Teaching Scheme

Course Code	Course Name	Contact Hours	Credits
FE0_IKS_ESE_T001	Environmental Science and Engineering	02	2

26.2 Examination and Evaluation Scheme

Evaluation	ISE	PE	OrE	PrE	Total
Marks	50	0	0	0	50

26.3 Course Objectives

S. No.	Objective
1	To introduce the necessity of natural and ecological resources and their management.
2	To provide overview major environmental pollution related to water, air and land.
3	To learn the various environmental concerns and possible solutions.
4	To provide an overview on national and international laws, treaties and conventions for sustainable environment.

26.4 Course Outcomes

The student will be able to:	
CO1	*explain* the meaning of Environment, Ecosystems, Energy flow and role of Indian culture in conservation of environment.
CO2	*understand* the Basic methodology for water distribution and collection of waste water & treatment
CO3	*identify* the air and Land pollution and justify the use of controlling and treatment methods
CO4	students will be able to *describe* the various Global Environmental Concerns
CO5	students will be able to *explain* major environmental national legislations, international treaties and convention and roles of governmental agencies in the protection of environment

26.5 Course Contents

Module	Unit	Detailed Contents	Hours
1	**Environment, Ecology and Ancient India:**		**05**
	1.1	Introduction and definition of environment, ancient Indian environmental ethics, environmental consciousness in ancient texts, role of Indian culture in environment conservation, scope and importance public awareness and role of engineers	
	1.2	Structure and function of an ecosystem, producers, consumers and decomposers, energy flow in the ecosystem, food chains, food webs and ecological pyramids, ecosystems and interdependence between	

		living organisms, habitats, limiting factors, carrying capacity	
2	**Water & Water Resources**		**06**
	2.1	Classification of water (ground & surface water), water supply and distribution of water, waste water collection, effluent standards	
	2.2	Ancient Indian knowledge in water resources, water shortages in India, water resources and conflicts on its sharing, few case studies in India like Kaveri and Krishna river water disputes, multipurpose river valley projects in India and their environmental and social impacts, case studies of dams - Narmada and Tehri dam issues	
3	**Air Pollution and Solid Waste Management**		**06**
	3.1	Types of pollutants, sources of pollutants, effects on human health, national ambient air quality standards of India	
	3.2	Solid waste terminology, solid waste characteristics, solid waste collection and transportation, solid waste processing and recovery, disposal of solid waste, pollution and its prevention in ancient scriptures	
4	**Role of India in Global Environmental Concerns**		**05**
	4.1	Environmental issues in Indian as well as global context, endangered life-species, loss of biodiversity, global warming, climate change and India	
5	**Indian Environmental Legislations, Authorities & Systems:**		**04**
	5.1	Legislation system in India constitution of India, major international treaties and conventions, national major environmental acts - air (P & CP) act, water (P & CP) act, environment protection act, functions of state / central pollution control boards	
		Total Hours	**26**

26.6 Suggested Learning Resources

26.6.1 Textbooks

1. A text book of environmental studies for under graduate courses 2nd Edition, Erach Bharucha, University Grants Commission, 2021
2. Water management in India, 01st Edition, Bansil, P.C. , Concept Publishing company, India, 2004.
3. Introduction to environmental engineering and science, 03rd Edition,Gilbert M. Masters, and Wendell P. Ela., Pearson India, 2015
4. Perspectives in environmental studies, 06th Edition, Anubha Kaushik and C P Kaushik, New Age International Publishers, New Delhi, 2018
5. Climate change and India, Mitra, A.P., Sharma, S., Bhattacharya, S., Garg, A., Devotta, S. & Sen, K.,Universities Press, India, 2004..

26.6.2 References

1. Sacred Groves of Tamil Nadu: A Survey, first edition,M. Amirthalingam, CPR Environmental Education Centre, Chennai, 1998
2. Earth's Insights: A Survey of Ecological Ethics from the Mediterranean Basin to the Australian Outback, B. Callicott, University of California Press, Berkeley, 1994

3. Environmental Crisis and Hindu Religion, O.P. Dwivedi, Gitanjali Publishing House, Delhi, 1987
4. Religion and Ecology in India and Southeast Asia, David L. Gosling, Routledge, London & New York, 2001
5. Ecology and Religion: Ecological Spirituality in Cross-Cultural Perspective, David R. Kinsley, Prentice-Hall, New Jersey, 1995
6. Tree worship in ancient India, Trilochan Pande, Sankar Sen Gupta, (ed.), Tree Symbol Worship in India, Indian Publications, Calcutta, 1965
7. Conservation of Biodiversity in Manu Samhita, 33(4), Priyadarsan Sensarma, Indian Journal of History of Science, 1998
8. The Human Footprint on Environment: Issues in India, second edition, Vipul Singh, Macmillan India, New Delhi, 2012
9. Situating Environmental History, Chakrabarti and Ranjan, first edition, Manohar Publishers and Distributors, New Delhi: 2007

26.6.3 Web Resources

1. Ministry of Environment, Forest and Climate Change
   https://moef.gov.in/
2. U.S. Environmental Protection Agency
   https://www.epa.gov/

27 Principles of Town Planning and Water Management (FE0_IKS_TPW_T001)

27.1 Teaching Scheme

Course Code	Course Name	Contact Hours	Credits
FE0_IKS_TPW_T001	Principles of Town Planning and Water Management	02	2

27.2 Examination and Evaluation Scheme

Evaluation	ISE	PE	OrE	PrE	Total
Marks	50	0	0	0	50

27.3 Course Objectives

S.No..	Objectives
1	To provide the students an overview of Indian Knowledge System (IKS) and the history of town planning and water management.
2	To impart the knowledge of eco-friendly, robust and scientific planning of town in India.
3	To comprehend the techniques water management
4	To study the impact of climate change on town planning and water management

27.4 Course Outcomes

Students will be able to:	
CO1	*familiarize* with the Indian Knowledge System (IKS) for water management and town planning.
CO2	*acquaint* with concept, principle of town planning in Indian cities.
CO3	*compare* the development of towns in different historical eras.
CO4	*discuss* the importance of water management systems and its technology in India.
CO5	*realize* the impact of climate change on town planning and water management.

27.5 Course Contents

Module	Unit No.	Detailed Contents	Hours
1	**Introduction to IKS, Town planning & water Management**		06
	1.1	Indian Knowledge system (IKS)-an introduction, overview and importance	
	1.2	Town Planning: introduction to ancient text in the context of town planning, necessity, origin, growth of town, principles and objects of zoning, Housing, FSI	
	1.3	Water management: classification of water (ground & surface water), characteristics, water demand, water management in ancient India(timeline , terminologies)	
2	**Concepts of Town Planning**		05

	2.1	Concept of neighborhood planning, walk to work and walk to school concept, streets and road planning' widths of hierarchy and patterns of roads, city planning patterns such as grid iron, spider web, circular zoning, understanding development plan (DP) and regional planning.	
	2.2	Residential layouts, open spaces, amenity spaces, different concepts such as urban sprawl, density, twin cities, suburbs, conurbation	
3	**Indian knowledge systems in town planning, 'Nagara Vaastu Shastra'**		06
	3.1	India cities: ancient (vedic, Harappan etc), medieval (Varanasi, Chola dynasty towns etc), pre-independence (Mughals, Vijayanagara, British and Portuguese towns) and post-independence (Chandigarh, New Delhi, Navi Mumbai etc)	
4	**Water Supply & Sanitation**		06
	4.1	Water supply: historical development of water supply and management, urban water infrastructure for drinking water – challenges planning and management, water harvesting, rainwater harvesting, storm water collection and ground water recharge	
	4.2	Sewage &Sanitation: collection, transportation and treatment of sewage, lowcost sanitation technologies and concepts as related to Indian context, grey water treatment and recycling, low water consuming fixtures.(aerated taps , dry toilets, etc) drip irrigation for gardening, xeriscaping, indigenous tree plantation, macro to micro level reduce and reuse strategies	
5	**Climate Change and its implications on town planning and water management**		
	5.1	Introduction, future demand and supply of water, impact on town planning and water management.	03
		Total Hours	**26**

27.6 Suggested Learning Resources Textbooks

27.6.1 Textbooks

1. Town planning, 32nd Edition, Rangwala, Charotar Publishing House Pvt. Ltd., 2023
2. Fundamentals of town planning, Hiraskar, 17th Edition, G.K., Dhanpat Rai Publication Pvt. Ltd, , New Delhi
3. Planning Theory (Planning, Environment, Cities), 02nd Edition, Philip Allmendinger, Palgrave Macmillan Publisher, London, 2009
4. Planning the Indian city, Mahesh N. Buch, Vikas Publishing, New Delhi, 1987
5. City planning in India, 1947-2017, Kumar, A., Sanjeev, V., and Prakash, P. (2020) New York.
6. Water supply and waste water engineering, B S N Raju, McGraw-Hill Inc. !995

27.6.2 Reference Books:

1. Infrastructure Planning, Engineering, and Economics, 2nd Edition, McGraw-Hill Education,

2015
2. Urban Water Management for Future Cities, S. Koster, S. Koester, M. Reese, J. Zuo, and J. Zuo, " Urban Springer, 2019
3. Infrastructure Planning and Management: An Integrated Approach, Virendra Proag, Springer, 2021

27.6.3 Web Resources

1. Research study series no 88 “status of water supply, sanitation and solid waste management in urban area”, National Institute of Urban Affairs, 2005
https://niua.in/sites/default/files/reserch_paper/RSS-88.pdf
2. Introduction to urban planning
https://archive.nptel.ac.in/courses/124/107/124107158/
3. Urban utilities Planning: Water Supply, Sanitation and Drainage, By Prof. Debapratim Pandit | IIT Kharagpu
https://onlinecourses.nptel.ac.in/noc21_ar13/preview

28 Trade and Commerce (FE0_IKS_TAC_T001)

28.1 Teaching Scheme

Course Code	Course Name	Contact Hours	Credits
FE0_IKS_TAC_T001	Trade and Commerce	02	2

28.2 Examination and Evaluation Scheme

Evaluation	ISE	PE	OrE	PrE	Total
Marks	50	0	0	0	50

28.3 Course Objectives

S. No..	Objective
1	To introduce students to the fundamental concepts and principles of economics and their application in the context of the Indian economy.
2	To provide an overview of the Indian economy, including key economic indicators and their significance in assessing economic performance.
3	To explore the factors influencing economic growth and development, with a focus on the role of technology, innovation, and sustainable development.
4	To familiarize students with the macroeconomic policies, such as monetary and fiscal policies, and their impact on the Indian economy.
5	To encourage the students to be aware of the negative effects of a bad economy.

28.4 Course Outcomes

The student will be able to:	
CO1	*understand* the basic concepts and principles of economics and their relevance to the Indian economy.
CO2	*analyze* and interpret key economic indicators to assess the performance of the Indian economy
CO3	*evaluate* the factors that contribute to economic growth and development, including the role of technology, innovation, and sustainable practices.
CO4	*analyze* the implications of the digital economy and globalization on India's economic landscape.
CO5	*recognize* the significance of different sectors, such as agriculture, industry, services, and infrastructure, in the economic development of India.

28.5 Course Contents

Module	Unit	Detailed Contents	Hours
1	**Introduction to Indian Trade and Commerce:**		**05**
	1.1	History of Trade and Commerce in India: Indigenous Banking System, Rise of Intermediaries, Transport, Trading Communities: Merchant Corporations, Major Trade Centers, Major Imports and Exports, Position of Indian Sub-Continent in the World Economy.	
2	**Historical Trade Routes and Markets:**		**06**

	2.1	Spice Route, Silk Route, Incense Route, Amber Road (Trading beads), Tea Route, Salt Route, Trading across the desert, Bronze Age business (Tin Route), India China and Trade Routes	
3	**Economic Policies and Administration:**		**06**
	3.1	Introduction, Need for Economic Policy in India, Aims of Economic Policy in India, Instruments of Economic Policy in India, Process of Economic Policy Formulation, Planning Commission of India, Central Statistical Organization, ICSSR, Lobbyists, NGOs, International Politics and Multilateral Lending.	
4	**Commodities and Trade Goods:**		**05**
	4.1	Types of Commodities, hard commodities, soft commodities, National Commodity and Derivative Exchange (NCDEX), Multi Commodity Exchange of India (MCX), National Stock Exchange (NSE), Bombay Stock Exchange (BSE), National Multi Commodity Exchange India (NMCE), Indian Commodity Exchange (ICEX)	
5	**International Trade Relations:**		**04**
	5.1	Classification of International Trade, Import Trade, Export Trade, Entrepot Trade, Characteristics of International Trade, Reasons of International Trade, Advantages and Disadvantages of International Trade, Trade as an Engine of Economic Growth, An Overview of the Developing Countries.	
		Total Hours	**26**

28.6 Suggested Learning Resources

28.6.1 Textbooks

1. The Basics of Trade & Commerce: An Introductory Guide to Business Essentials By Jikku Susan Kurian (Author), Vijaya Kittu Manda (Author), Dr Aruna Polisetty (Author), 2020
2. Empires of the Silk Road: A History of Central Eurasia from the Bronze Age to the Present. By Christopher I. Beckwith, Princeton University Press , 2011
3. International Economics | Tenth Edition | By Pearson: Theory and Policy , by Paul R. Krugman, Maurice Obstfeld, and Marc Melitz, 2017

Section VI . Experiential Learning Courses (ELC)

S. No.	Course Type	Subject Code	Courses	Group I Semester	Group II Semester	Credits
VI. Total Experiential Learning Courses (ELC) Credits for First Year						-

Section VII . Liberal Learning Courses (LLC)

S. No.	Course Type	Subject Code	Courses	Group I Semester	Group II Semester	Credits
1	CC	FE0_CC_$$1_P101	Co-Curricular Course - I	I	I	1.5
2		FE0_CC_$$2_P202	Co-Curricular Course - II	II	II	1.5
VII. Total Liberal Learning Courses (LLC) Credits for First Year						**3**

Basket of courses offered under Co-Curricular Courses in Semester I

S. No.	Code	Title of the Co-Curricular Course - I
1	FE0_CC_YW1_P101	Yoga and Wellbeing - I
2	FE0_CC_SR1_P101	Social Service and Responsibility - 1
3	FE0_CC_SP1_P101	Sports and Physical Fitness - I

Basket of courses offered under Co-Curricular Courses in Semester II

S. No.	Code	Title of the Co-Curricular Course - II
1	FE0_CC_YW2_P202	Yoga and Wellbeing - II
2	FE0_CC_SR2_P1202	Social Service and Responsibility - II
3	FE0_CC_SP2_P202	Sports and Physical Fitness - II

29 Yoga & Wellbeing - I(FE0_CC_YW1_P101)

29.1 Teaching Scheme

Course Code	Course Name	Contact Hours	Credits
FE0_CC_YW1_P101	Yoga & Wellbeing - I	03	1.5

29.2 Examination and Evaluation Scheme

Evaluation	ISE	PE	OrE	PrE	Total
Marks	50	-	-	-	50

29.3 Course Objectives

S. No.	Objectives
1	To introduce learner to yoga and its importance.
2	To familiarize learner in basic yoga asanas and relaxation techniques for better mental health.
3	To understand the concept of holistic health and develop personalized health and wellness plans
4	To understand the importance of nutrition and apply healthy habits to reduce stress

29.4 Course Outcomes

The student is able to:	
CO1	*demonstrate* knowledge of principles and practices that contribute to good health.
CO2	*acquire* techniques and habits for maintaining mental well-being, such as stress management, mindfulness practices, and effective time management.
CO3	*analyze* ethical dilemmas relevant to their field of study, develop a personal code of conduct, and apply moral principles in their life.
CO4	*understand* and *build* effective habits, manage stress, optimize sleep, enhance brain health.
CO5	*explain* the importance of nutrition and identify various types of nutrients and develop healthy eating habits

29.5 Course Contents

Module	Detailed Contents		Hours
1	**Introduction to Yoga**		**06**
	1.1	Importance of yoga: History, philosophy, and different paths.	
	1.2	Basic breathing techniques (Pranayama) and their benefits.	
	1.3	Warm-up exercises to prepare the body for yoga practice.	
2	**Yoga Asanas and Relaxation Techniques**		**06**
	2.1	Foundational yoga asanas (poses) with proper alignment and modifications.	
	2.2	Introduction to relaxation techniques and their importance in yoga practice.	
3	**Standing and Balancing Asanas**		**06**
	3.1	Exploring standing and balancing poses to improve stability and focus.	

	3.2	Incorporating dynamic movements and flows to enhance mobility	
4	**Wellness and Mental Health**		**12**
	4.1	Understanding the concept of health and wellness, Building effective habits, habit stacking for better results, sedentary lifestyle	
	4.2	Meditation for stress and memory	
5	**Nutrition & Diet**		**09**
	5.1	Introduction to nutrition, importance, types, healthy eating habits and meal planning	
	5.2	Introduction to diet and different diet plans	
		Total Hours	**39**

29.6 Suggested Learning Resources

29.6.1 Textbook

1. Yoga Instructor Course Handbook published by SVYASA University, Bengaluru, 2024.
2. Yoga for Children –step by step, Yamini Muthanna, Om Books International, 2022.
3. Health: The Basics 13th Edition, Rebecca J. Donatelle, Pearson, 2018.
4. Fitness & Health 7th Edition, Brian J. Sharkey and Steven E. Gaskill, Human Kinetics 2013.
5. Nutrition: Concepts and Controversies 15th Edition, Frances Sizer and Ellie Whitney. Brooks/Cole, 2019.

29.6.2 Reference Books

1. Yoga Pravesha in Kannada, 1st Edition, Ajitha Kumara, Raashtroththaana Saahithya, 2012.
2. Light on Yoga, 1st Edition, BKS Iyengar, Thorsons Classics, 2015.
3. In Defense of Food: An Eater's Manifesto by Michael Pollan.
4. The Diet Myth: The Real Science Behind What We Eat by Tim Spector.

29.6.3 Web Resources

1. Sun Salutation (Surya Namaskar)
   https://youtu.be/aa-TG0Wg1Ls
2. A short film about Yoga
   https://www.youtube.com/watch?v=Bc5UHKO3wWc
3. History of Yoga
   https://www.youtube.com/watch?v=SMqJ59JKBHM

30 Social Service and Responsibility - I (FE0_CC_SR1_P101)

30.1 Teaching Scheme

Course Code	Course Name	Contact Hours	Credits
FE0_CC_SR1_P101	Social Service and Responsibility - I	03	1.5

30.2 Examination and Evaluation Scheme

Evaluation	ISE	PE	OrE	PrE	Total
Marks	50	0	0	0	50

30.3 Course Objectives

S. No.	Objectives
1	To understand the community in which the students work.
2	To identify the needs and problems of the community and involve them in problem-solving
3	To develop among them a sense of social & civic responsibility and utilize their knowledge in finding practical solutions to individual and community problems.
4	To inculcate competence required for group-living and sharing of responsibilities & gain skills in mobilizing community participation to acquire leadership qualities and democratic attitudes
5	To improve their capacity to meet emergencies and natural disasters and practice national integration and social harmony

30.4 Course Outcomes

The student will be able to:	
CO1	*understand* the importance of his / her responsibilities towards society.
CO2	*analyze* the environmental and societal problems/issues and *design* solutions for the same.
CO3	*evaluate* the existing system and *propose* practical solutions for sustainable development.
CO4	*implement* government or self-driven projects effectively in the field.
CO5	*develop* leadership and teamwork skills to collaborate with diverse groups and communities, fostering inclusive and impactful social change.

30.5 Course Contents

Module	Unit	Detailed Contents	Hours
1	**Introduction to National Service Scheme and social responsibilities.**		**06**
	1.1	Origin and history of NSS, objectives, motto, NSS symbol & its relevance.	
	1.2	Orientation for implementation of social service activities, working with individuals, working with groups and NSS parades.	
2	**Concept of Society, Community, and Social Issues**		**09**
	2.1	Society, community mapping, socio-economic survey of the communities, school dropout survey.	

	2.2	Awareness campaigns on social issues such as importance of education, ill effects of addiction and such (e.g. say no to drugs, alcohol, tobacco, no dowry, and gender equality).	
3	**Health and Hygiene, Prevention of Diseases**		**09**
	3.1	Creating awareness on the prevention of various diseases such as dengue, malaria, cancer, HIV AIDS and other diseases through posters, street plays, skits and flash mob and door to door campaigns.	
4	**Environmental Conservation and Swachh Bharat Abhiyan**		**09**
	4.1	Energy conservation through the promotion of solar energy, save electricity campaigns, save water campaigns, use no plastic, plastic recycling campaigns, paper bag making projects.	
	4.2	Tree plantation campaigns, each one plant one campaign, naming the plants of the campus with the botanical names.	
	4.3	Clean up campaigns in various places such as college campus, railway stations, beaches, marketplaces, and such.	
5	**Collaboration with Non-Governmental Organizations and Governmental Organizations**		**06**
	5.1	Visits to children's homes, elderly homes, rehabilitation centers, working for road safety, citizens' rights.	
		Total Hours	**39**

30.6 Suggested Learning Resources

30.6.1 Textbooks

1. Social Problems in India, Ahuja, R., Rawat Publications, 2011.
2. Rashtriya Seva Yojana Sankalpana, Dr. Sankay Chakane, Dr. Pramod Pabrekar, Diamond Publication, Pune, 2021

30.6.2 Reference Books

1. National Service Scheme Manual (Revised). Government of India, Ministry of Youth Affairs & Sports, New Delhi, 2006.
2. Induction Training Module for National Service Scheme (NSS) Program Officers, Rajiv Gandhi National Institute of Youth Development, Ministry of Youth Affairs and Sports, Government of India, Sriperumbudur, Tamil Nadu.
3. National Service Scheme Manual for NSS District Coordinators, National Service Scheme Cell, Department of Higher and Technical Education, Mantralaya, Mumbai.
4. UTKARSHA- Socio and Cultural Guidelines NSS Cell, Department of Higher and Technical Education, Mantralaya, Mumbai.

30.6.3 Web Resources

1. National Service Scheme Manual
   https://nss.gov.in/sites/default/files/manualNss2006.pdf
2. Induction Training Module for National Service Scheme (NSS) Program Officers
   https://shorturl.at/chcCU

31 Sports and Physical Fitness I (FE0_CC_SP1_P101)

31.1 Teaching Scheme

Course Code	Course Name	Contact Hours	Credits
FE0_CC_SP1_P101	Sports and Physical Fitness I	03	1.5

31.2 Examination and Evaluation Scheme

Evaluation	ISE	PE	OrE	PrE	Total
Marks	50	-	-	-	50

31.3 Course Objectives

S. No.	Objective
1	To identify the specific needs, challenges, and opportunities within the local community related to sports and physical activity.
2	To actively participate in planning, implementing, and evaluating sports programs and activities to contribute their skills and knowledge.
3	To ensure that sports programs and facilities are inclusive and accessible to all community members, regardless of physical abilities, socio-economic status or other barriers.
4	To highlight the positive impacts of sports participation on individual well-being, community and overall quality of life
5	To provide a comprehensive education in sports, covering physical, technical, ethical, and theoretical aspects to prepare students for a variety of roles in the sports industry.

31.4 Course Outcomes

The student will be able to:	
CO1	*demonstrate* ability in the fundamental skills and techniques required for a variety of sports, including sport-specific movements and strategies
CO2	*understand* the principles of exercise physiology, and sports psychology and apply this knowledge to improve athletic performance and overall fitness.
CO3	*understand* the rules and regulations of major sports and effectively applying strategies and tactics during competitive play.
CO4	*develop* effective coaching plans and deliver training sessions that enhance individual and team performance.
CO5	*analyze* the specific needs, challenges, and opportunities related to sports and physical activity within the local community and effective sports initiatives.

31.5 Course Contents

Module	Unit	Detailed Contents	Hours
1	**Introduction to Sports and Physical Activity**		06
	1.1	Understanding Sports and Physical Activity: Introduction to sports and their significance. The role of sports in society, Key concepts in exercise physiology, Basic fitness assessments	
	1.2	Basics of Sports Psychology: Introduction to sports psychology. Exercises for mental resilience.	

2	**Skills and Rules in Major Sports.**		**09**
	2.1	Fundamental Skills in Team Sports: Basic skills in Cricket, Football, Basketball, Volleyball, Badminton, and Chess, Skill drills, Overview of rules in major sports.	
	2.2	Advanced Techniques in Sports: Advanced techniques in selected sports, Applying advanced skills.	
3	**Sports Program Planning and Evaluation**		**09**
	3.1	Creating a simple sports program, Steps to plan sports programs. Methods for evaluating sports programs and designing evaluation tools.	
4	**Outreach, and Social Engagement in Sports**		**09**
	4.1	Principles and importance of inclusivity and accessibility, Designing inclusive sports programs. Addressing Barriers to Participation: Identifying common barriers (e.g., physical, socio-economic), Developing strategies to overcome these barriers.	
	4.2	Community Impact and Engagement: The role of sports in community development, Planning a community sports initiative.	
5	**Sports Education and Career Preparation**		**06**
	5.1	Ethics and Leadership in Sports: Ethical issues in sports, leadership qualities, and sportsmanship. Role-playing ethical scenarios. Careers in Sports: Career options in sports, Building a professional portfolio	
		Total Hours	**39**

31.6 Suggested Learning Resources

31.6.1 Textbook

1. Sports in Society: Issues and Controversies 13th Edition, Jay Coakley McGraw Hill 2021.
2. Foundations of Sport and Exercise Psychology, 6th Edition, Robert S. Weinberg and Daniel Gould Human Kinetics Publishers, 2014
3. Exercise Physiology: Theory and Application to Fitness and Performance 10th Edition, Scott K. Powers and Edward T. Howley, McGraw Hill, 2017

31.6.2 Reference Books

1. Sport, Social Development and Peace" by Ramon Spaaij and Jonathan Magee.
2. Anatomy of Sports Injuries: Your Illustrated Guide to Prevention, Diagnosis, and Treatment, 2nd Edition, Brad Walker, Lotus Publisher, 2013

31.6.3 Web Resources

1. Sports Psychology
   https://onlinecourses.nptel.ac.in/noc24_hs83/preview

2. Fundamentals of Sports Training, Load Management and Recovery
   https://onlinecourses.nptel.ac.in/noc24_hs87/preview

32 Yoga & Wellbeing - II (FE0_CC_YW2_P202)

32.1 Teaching Scheme

Course Code	Course Name	Contact Hours	Credits
FE0_CC_YW2_P202	Yoga & Wellbeing - II	03	1.5

32.2 Examination and Evaluation Scheme

Evaluation	ISE	PE	OrE	PrE	Total
Marks	50	0	0	0	50

32.3 Course Objectives

S. No.	Objective
1	To familiarize learner in advanced yoga asanas and relaxation techniques for better health.
2	To train leaner with yoga practices for physical fitness and mental wellbeing.
3	To develop personalized health and wellness plans.
4	To analyze factors affecting health and wellness and to cultivate self-awareness and resilience.

32.4 Course Outcomes

The student is able to:	
CO1	*demonstrate* knowledge of principles and practices that contribute to good health
CO2	*acquire* techniques and habits for maintaining mental well-being
CO3	*learn* strategies to enhance emotional intelligence, manage emotions effectively, and build resilience in facing personal and academic challenges.
CO4	*engage* in reflective exercises and assessments to consolidate and apply knowledge received in this course.
CO5	*analyze* ethical dilemmas relevant to their field of study, develop a personal code of conduct, and apply moral principles in their life.

32.5 Course Contents

Module	Unit	Detailed Contents	Hours
1	**Strength and Stability through Yoga**		**06**
	1.1	Developing core strength and stability for advanced yoga poses	
	1.2	Partner or group practice to explore challenging poses safely	
2	**Refinement through Pranayama and Meditation**		**09**
	2.1	Advanced pranayama techniques for energy regulation and mental clarity.	
	2.2	Introduction to meditation: Different techniques and their benefits.	
	2.3	Cultivating mindfulness and presence in yoga practice.	
3	**Integrating Yoga**		**06**
	3.1	Exploring different yoga styles and finding one's unique	

		practice.	
	3.2	Developing a sustainable and holistic approach to yoga practice. Yoga for daily life: Integrating yoga off the mat.	
4	**Mental Health and Emotional Wellbeing**		**09**
	4.1	Stress management and coping strategies	
	4.2	Anxiety and depression awareness, digital detox and mindfulness practices	
5	**Self-Care and Student-Life Balance**		**09**
	5.1	Importance of self-care and setting boundaries in a digital environment.	
	5.2	Importance and strategies for maintaining student-life balance	
		Total Hours	**39**

32.6 Suggested Learning Resources

32.6.1 Textbooks

1. Yoga Instructor Course hand book published by SVYASA University, Bengaluru, 2024
2. Teaching Methods for Yogic practices, Dr. M L Gharote & Dr. S K Ganguly, Kaivalyadhama, 2001.
3. The Self-Care Solution: A Modern Mother's Essential Guide to Health and Well-Being, Edition I, Julie Burton, She Writes Press, 2016.
4. Healthy by Design: Weight Loss, God's Way, Edition V, Cathy Morenzie, Guilding Light Publishing, 2015.

32.6.2 Reference Books

1. Lost Connections: Uncovering the Real Causes of Depression – and the Unexpected Solutions, Johann Hari.
2. Why We Sleep: Unlocking the Power of Sleep and Dreams, Matthew Walker.
3. Digital Wellness: Managing Your Mental Health in the Digital Age, Jenna Palermo.

32.6.3 Web Resources

1. My Life - My Yoga
   https://youtu.be/KB-TYlgd1wE
2. Yoga to increase concentration
   https://www.youtube.com/shorts/vv9996sOh6s
3. Meaning and Types of Yoga
   https://www.youtube.com/watch?v=5fD5pxzP3bo

33 Social Service and Responsibility - II (FE0_CC_SR2_P202)

33.1 Teaching Scheme

Course Code	Course Name	Contact Hours	Credits
FE0_CC_SR2_P202	Social Service and Responsibility - II	03	1.5

33.2 Examination and Evaluation Scheme

Evaluation	ISE	PE	OrE	PrE	Total
Marks	50	0	0	0	50

33.3 Course Objectives

S. No.	Objectives
1	To understand the community in which they work.
2	To identify the needs and problems of the community and involve them in problem-solving.
3	To develop among themselves a sense of social & civic responsibility & utilize their knowledge in finding practical solutions to individual and community problems.
4	To inculcate competence required for group-living and sharing of responsibilities & gain skills in mobilizing community participation to acquire leadership qualities and democratic attitudes.
5	To improve capacity to meet emergencies and natural disasters & practice national integration and social harmony.

33.4 Course Outcomes

The student will be able to:	
CO1	*understand* the importance of his / her responsibilities towards society.
CO2	*analyze* the environmental and societal problems/issues and *design* solutions for the same.
CO3	*evaluate* the existing system and to *propose* practical solutions for sustainable development.
CO4	*implement* government or self-driven projects effectively in the field.
CO5	*develop* leadership and teamwork skills to collaborate with diverse groups and communities, fostering inclusive and impactful social change.

33.5 Course Contents

Module	Unit	Detailed Contents	Hours
1	**Management of NSS/ Structure/ Hierarchy**		**06**
	1.1	Process of recruitment, Roles, and responsibilities of the volunteers.	
	1.2	Nature of work opportunities for volunteers Humanitarian, Educational, Health and hygiene, Swachh Bharat and environmental.	
2	**Soft Skills and Life skills for NSS Volunteers**		**06**
	2.1	Communication, Personality development, public speaking skills	
	2.2	Team Building, Leadership qualities	

3	**Community connects activities.**		**09**
	3.1	Problems of the society/ community/ attempts to provide solutions. Prevention of Water pollution, Solid waste Management, No plastic campaign.	
	3.2	Awareness campaigns on pollution such as air pollution, water pollution, land pollution.	
4	**Social Entrepreneurship**		**09**
	4.1	Entrepreneurship Definition and meaning; Qualities of a good entrepreneur; Risks; Various policies aiding an entrepreneur	
	4.2	Funding a Venture, Sources of funding social events and activities and formalities	
5	**Organizing Social service activities**		**09**
	5.1	Organizing Social Service activities such as Cloth donation drive, book donation drive, food donation drive	
	5.2	Blood Donation Drive, E waste collection drive, plastic etc	
		Total Hours	**39**

33.6 Suggested Learning Resources

33.6.1 Textbook

1. Social problems in India, Ahuja, R., Rawat Publications; 2011.
2. Rashtriya Seva Yojana Sankalpana, Prof. Dr. Sankay Chakane, Dr. Pramod Pabrekar, Diamond Publication, Pune 2021

33.6.2 Reference Books

1. *National Service Scheme manual (revised)*. Government of India, Ministry of Youth Affairs & Sports, New Delhi. (2006).
2. *Induction training module for National Service Scheme (NSS) program officers*. Rajiv Gandhi National Institute of Youth Development, Ministry of Youth Affairs and Sports, Government of India. (n.d.). Sriperumbudur, Tamil Nadu.
3. National Service Scheme Manual for NSS District Coordinators, National Service Scheme Cell, Dept. of Higher and Technical Education, Mantralaya, Mumbai.
4. NSS Cell, Dept. of Higher and Technical Education, Mantralaya, Mumbai, UTKARSHA-Socio and cultural guidelines.

33.6.3 Web Resources

1. National Service Scheme manual (revised)
   https://shorturl.at/eUtte
2. Rajiv Gandhi National Institute of Youth Development
   https://www.rgniyd.gov.in/

34 Sports and Physical Fitness II (FE0_CC_SP2_P202)

34.1 Teaching Scheme

Course Code	Course Name	Contact Hours	Credits
FE0_CC_SP2_P202	Sports and Physical Fitness II	03	1.5

34.2 Examination and Evaluation Scheme

Evaluation	ISE	PE	OrE	PrE	Total
Marks	50	0	0	0	50

34.3 Course Objectives

S. No.	Objectives
1	To identify the specific needs, challenges, and opportunities within the local community related to sports and physical activity.
2	To actively participate in planning, implementing, and evaluating sports programs and activities to contribute their skills and knowledge.
3	To ensure that sports programs and facilities are inclusive and accessible to all community members, regardless of physical abilities, socio-economic status or other barriers.
4	To highlight the positive impacts of sports participation on individual well-being, community and overall quality of life
5	To provide a comprehensive education in sports, covering physical, technical, ethical, and theoretical aspects to prepare students for a variety of roles in the sports industry.

34.4 Course Outcomes

The student will be able to:	
CO1	*demonstrate* ability in the fundamental skills and techniques required for a variety of sports, including sport-specific movements and strategies
CO2	*understand* the principles of exercise physiology, and sports psychology and apply this knowledge to improve athletic performance and overall fitness.
CO3	*understanding* of the rules and regulations of major sports and effectively applying strategies and tactics during competitive play.
CO4	*develop* effective coaching plans and deliver training sessions that enhance individual and team performance.
CO5	*analyze* the specific needs, challenges, and opportunities related to sports and physical activity within the local community and effective sports initiatives.

34.5 Course Contents

Module	Unit	Detailed Contents	Hours
1	**Importance of Physical Education and Sports**		06
	1.1	Importance of physical education, Physical literacy, Sports, Health and fitness and physical activities	
	1.2	Importance and benefits of participation in any sports or fitness activities	
	1.3	Development of physical health as well as mental health through	

		physical activities.	
2	**Sports and Fitness Activities**		**09**
	2.1	Participation in any choice based physical activities, Students will involve themselves in any physical Activities.	
	2.2	Participation in any Local tournament / Fest /Inter Class / Intra Collegiate / Intercollegiate / State / National etc. competition.	
3	**Advanced Skills & Techniques in Team Sports**		**09**
	3.1	Advanced skills in Team Sports: skills in Cricket, Football, Basketball, Volleyball, Badminton, and Chess, Skill drills, Overview of rules in major sports.	
	3.2	Advanced Techniques in Sports: Advanced techniques in selected sports, Applying advanced skills.	
4	**Sports Program Planning and execution**		**09**
	4.1	Planning for annual sports festival in the college, Organizing intra college, Inter college sports and games meet.	
	4.2	Execution of the annual sports event	
5	**Sports as carrier**		**06**
	5.1	Sports Coach, Sports Journalist, Sports Manager, Sports Director, Sports Physiotherapist, Sports Psychologist.	
	5.2	Visits to sports complexes, National, International sports grounds.	
		Total Hours	**39**

34.6 Suggested Learning Resources

34.6.1 Textbooks

1. Sports in Society: Issues and Controversies, 13th Edition, Jay Coakley McGraw Hill 2021.
2. Foundations of Sport and Exercise Psychology, 6th Edition, Robert S. Weinberg and Daniel Gould Human Kinetics Publishers, 2014.
3. Exercise Physiology: Theory and Application to Fitness and Performance 10th Edition, Scott K. Powers and Edward T. Howley, McGraw Hill, 2017

34.6.2 Reference Books

1. Sport, Social Development and Peace, Ramon Spaaij and Jonathan Magee.
2. Anatomy of Sports Injuries: Your Illustrated Guide to Prevention, Diagnosis, and Treatment, 2nd Edition, Brad Walker, Lotus Publisher, 2013.

34.6.3 Web Resources

1. Introduction to Exercise Psychology & Sport Performance
   https://onlinecourses.nptel.ac.in/noc24_hs86/preview
2. Essentials of Sport Injury Prevention & Rehabilitation
   https://onlinecourses.nptel.ac.in/noc24_hs85/preview