



APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

(A State Government University)

B. Tech

Curriculum (2024)- Semester I to VIII

Group C

Ambady Nagar

Thiruvananthapuram- 695016

1. Grouping

APJ Abdul Kalam Technological University offers various engineering branches that can be grouped into four broad categories based on their specialization.

Group	Branches	
A Computer and Information Science	<ul style="list-style-type: none"> ▪ Computer Science and Engineering ▪ Artificial Intelligence ▪ Computer Science and Engineering (Artificial Intelligence) ▪ Computer Science and Engineering (Artificial Intelligence and Machine Learning) ▪ AI and Machine Learning ▪ Artificial Intelligence and Data Science ▪ CS and Business Systems ▪ CS and Design ▪ Cyber Security 	<ul style="list-style-type: none"> ▪ Information Technology ▪ Computer Science and Engineering and Business Systems ▪ CSE (Data Science) ▪ CSE (Artificial Intelligence and Data Science) ▪ CSE (Internet of Things), CSE(IoT) ▪ CSE (Block Chain) ▪ CSE (Cyber Security) ▪ CSE (IoT and CS including Block Chain Technology)
B Electrical Science	<ul style="list-style-type: none"> ▪ Electronics & Communication Engineering ▪ Electrical and Electronics Engineering ▪ Electronics and Biomedical Engineering ▪ Biomedical Engineering ▪ Electronics & Instrumentation Engineering ▪ Instrumentation and Control Engineering ▪ Applied Electronics & Instrumentation Engineering 	<ul style="list-style-type: none"> ▪ Cyber Physical System. ▪ Electronics and Computer Engineering ▪ Electrical and Computer Engineering ▪ Electronics and Communication (Advanced Communication Technology) ▪ Electronics Engineering (VLSI Design and Technology) ▪ Robotics and Artificial Intelligence ▪ Robotics and Automation
C Physical Science	<ul style="list-style-type: none"> ▪ Civil Engineering ▪ Chemical Engineering ▪ Civil and Environmental Engineering ▪ Mechanical Engineering ▪ Mechanical Engineering (Auto) ▪ Mechanical Engineering (Automobile) ▪ Automobile Engineering ▪ Mechatronics Engineering ▪ Production Engineering 	<ul style="list-style-type: none"> ▪ Aeronautical Engineering ▪ Agriculture Engineering ▪ Industrial Engineering ▪ Metallurgical & Materials Engineering ▪ Naval Architecture & Ship Building Engineering ▪ Polymer Engineering. ▪ Safety and Fire Engineering
D Life Science	<ul style="list-style-type: none"> ▪ Biotechnology ▪ Food Technology 	<ul style="list-style-type: none"> ▪ Biotechnology and Biochemical Engineering

2. Course Category

- **University Core (UC):** The university core is a compulsory set of courses for all B. Tech students, which includes basic courses in Humanities and Computer Science.
- **University Elective (UE):** These are elective courses from a basket of courses in the Humanities and Social Sciences.
- **Group Core (GC):** Courses listed under Group Core of a curriculum are group specific. These courses ensure that students gain specialized knowledge and skills in their chosen field of study.

FIRST SEMESTER (July-December): Group C														
10 Days Compulsory Induction Program and UHV														
Sl. No:	Slot	Course Code	Course Type	Course Category	Course Title (Course Name)	Credit Structure				SS	Total Marks		Credits	Hrs./Week
						L	T	P	R		CIA	ESE		
1	A	GYMAT101	BSC	GC	Mathematics for Physical Science-1	3	0	0	0	4.5	40	60	3	3
2	B S1/ S2	GZPHT121	BSC	GC	Physics for Physical Science	3	0	2	0	5.5	40	60	4	5
		GCCYT122			Chemistry for Physical Science									
3	C	GCEST103	ESC	GC	Engineering Mechanics	3	0	0	0	4.5	40	60	3	3
4	D	GCEST104	ESC	GC	Introduction to Mechanical Engineering & Civil Engineering (Part1: Mechanical Engineering)	2	0	0	0	3	20	30	2+2=4	4
					(Part 2: Civil Engineering)	2	0	0	0	3	20	30		
5	F	UCEST105	ESC	UC	Algorithmic Thinking with Python	3	0	2	0	5.5	40	60	4	5
6	L	GCESL106	ESC	GC	Engineering Workshop	0	0	2	0	1	50	50	1	2
7	I* S1/ S2	UCPWT127	PW	UC	Health and Wellness	1	0	1	0	0	0	0	1	2/3
		UCHUT128	HMC		Life Skills and Professional Communication	2	0	1	0	3.5	50	50		
8	S1/ S2	UCSEM129	SEC	UC	Skill Enhancement Course: Digital 101(NASSCOM)	MOOC				2			-	
Total									30/ 32			20	24/ 25	
Bridge Course (Mathematics or Introduction to Computer Science) *:											Total 15 Hrs.			

*Valuation for HMC courses will be done at college level, Question papers will be provided by the University.

*No Grade Points will be awarded for the MOOC course and I slot course.

- L-T-P-R: Lecture-Tutorial-Practical-Project
- SS (Self Study) Hours= 1.5L+0.5 T+0.5P+R
- CIA: Continuous Internal Assessment, ESE: End Semester Examination

Digital 101 (NASSCOM)		
Sl. No:	Technologies Covered	Hours
1	Artificial intelligence and Big Data Analytics (AI/BDA)	11
2	Internet of Things (IoT)	2.5
3	Cyber Security	2.5
4	Block Chain	2.5
5	Robotic Process Automation	1.5
6	Augmented Reality and Virtual Reality (AR and VR)	2.5
7	Cloud Computing	2.5
8	3 D Printing and Modelling	2
9	Web, Mobile Dev and Marketing	2
10	Responsible AI	1
Total Hours		30

Note: Physics, Chemistry, Health and Wellness & Life Skill and Professional Communication can be offered in both Semester 1 (S1) and Semester 2 (S2). Institutions are encouraged to guide approximately 50% of their branches to choose between Physics or Chemistry (Slot B) and Health and Wellness or Life Skill and Professional Communication (Slot I) in Semester 1.

SECOND SEMESTER (January-June): Group C

Sl. No:	Slot	Course Code	Course Type	Course Category	Course Title (Course Name)	Credit Structure				SS	Total Marks		Credits	Hrs./Week
						L	T	P	R		CIA	ESE		
1	A	GYMAT201	BSC	GC	Mathematics for Physical Science-2	3	0	0	0	4.5	40	60	3	3
2	B S1/ S2	GZPHT121	BSC	GC	Physics for Physical Science	3	0	2	0	5.5	40	60	4	5
		GCCYT122			Chemistry for Physical Science									
3	C	GCEST203	ESC	GC	Engineering Graphics and Computer Aided Drawing	2	0	2	0	4	40	60	3	4
4	D	GCEST204	ESC	GC	Basic Electrical & Electronics Engineering (Part 1: Electrical Engineering)	2	0	0	0	3	20	30	2+2=4	4
					(Part 2: Electronics Engineering)									
5	E	PCXXT205	PC	PC	Programme Core-1	3	1	0	0	5	40	60	4	4
6	F	UCEST206	ESC	UC	Engineering Entrepreneurship & IPR	3	0	0	0	4.5	40	60	3	3
7	I* S1/ S2	UCPWT127	PW	UC	Health and Wellness	1	0	1	0	0	0	0	1	2/3
		UCHUT128	HMC		Life Skills and Professional Communication	2	0	1	0	3.5	50	50		
8	L	GZESL208	ESC	GC	Basic Electrical and Electronics Engineering workshop	0	0	2	0	1	50	50	1	2
		GCESL218			Civil Engineering Drafting Lab(CE,CV)									
	S1/ S2	UCSEM129	SEC	UC	Skill Enhancement Course: Digital 101(NASSCOM)	MOOC						1		
Total										34			24	27/ 28

***No Grade Points will be awarded for the MOOC course and I slot course.**

Skill Enhancement Course: Digital 101 is an introductory Massive Open Online Course (MOOC) offered by NASSCOM. It is designed to provide students with foundational knowledge and skills in digital technologies, preparing them for further studies and careers in the digital domain. By incorporating the Digital 101 course into the curriculum, KTU ensures that all students gain valuable digital skills early in their academic journey, enhancing their readiness for advanced courses and future careers in technology.

Course Registration and Completion:

- Students have the flexibility to register and complete the Digital 101 course either in their first semester (S1) or second semester (S2).
- The credit for this course (1 credit) will be officially recorded in the second semester grade card.

THIRD SEMESTER (July-December)														
Sl. No:	Slot	Course Code	Course Type	Course Category	Course Title (Course Name)	Credit Structure				SS	Total Marks		Credits	Hrs./Week
						L	T	P	R		CIA	ESE		
1	A	GYMAT301	BSC	GC	Mathematics for Physical Science -3	3	0	0	0	4.5	40	60	3	3
2	B	PCXXT302	PC	PC	Programme Core-2	3	1	0	0	5	40	60	4	4
3	C	PCXXT303	PC	PC	Programme Core-3	3	1	0	0	5	40	60	4	4
4	D	PBXXT304	PC-PBL	PB	Programme Core-PBL-1	3	0	0	1	5.5	60	40	4	4
5	F	GNEST305	ESC	GC	Group A: Digital Electronics & Logic Design Group B, C and D: Introduction to Artificial Intelligence and Data Science	3	1	0		5	40	60	4	4
6	G S3/S4	UCHUT346	HMC	UC	Engineering Economics	2	0	0	0	3	50	50	2	2
		UCHUT347			Engineering Ethics and Sustainable Development									
7	L	PCXXL307	PCL	PC	Lab-1	0	0	3	0	1.5	50	50	2	3
8	Q	PCXXL308	PCL	PC	Lab-2	0	0	3	0	1.5	50	50	2	3
9	R/M		VAC		Remedial/Minor Course	3	1	0	0	5			4*	4*
Total									31/36			25/29*	27/31*	

Bridge Course for Lateral Entry Students: Total 15 Hrs.

FOURTH SEMESTER (January-June)														
Sl. No:	Slot	Course Code	Course Type	Course Category	Course Title (Course Name)	Credit Structure				SS	Total Marks		Credits	Hrs./Week
						L	T	P	R		CIA	ESE		
1	A	GYMAT401	BSC	GC	Mathematics for Physical Science -4	3	0	0	0	4.5	40	60	3	3
2	B	PCXXT402	PC	PC	Programme Core-4	3	1	0	0	5	40	60	4	4
3	C	PCXXT403	PC	PC	Programme Core-5	3	1	0	0	5	40	60	4	4
4	D	PBXXT404	PC-PBL	PB	Programme Core-PBL-2	3	0	0	1	5.5	60	40	4	4
5	E	PEXXT41N	PE	PE	PE-1	3	0	0	0	4.5	40	60	3	3
6	G S3/S4	UCHUT346	HMC	UC	Engineering Economics	2	0	0	0	3	50	50	2	2
		UCHUT347			Engineering Ethics and Sustainable Development									
7	L	PCXXL407	PCL	PC	Lab-3	0	0	3	0	1.5	50	50	2	3
8	Q	PCXXL408	PCL	PC	Lab-4	0	0	3	0	1.5	50	50	2	3
9	R/M/ H		VAC		Remedial/Minor/Honours Course	3	1	0	0	5			4*	4*
Total									31/36			24/28*	26/30*	

Note: Engineering Economics and Engineering Ethics and Sustainable Development shall be offered in both S3 and S4. Institutions can advise students belonging to about 50% of the number of branches in the Institution to opt for Engineering Economics in S3 and Engineering Ethics & Sustainable Development in S4 and vice versa.

PROGRAM ELECTIVE I: PEXXT 41N

SLOT	COURSE CODE	COURSES	L-T-P-R	HOURS	CREDIT
E	PEXXT 411			3	3
	PEXXT 412				3
	PEXXT 413				3
	PEXXT 414				3
	PEXXT 416				3
	PEXXT 417				3
	PEXXT 418				3
	PEXXT 415				5

FIFTH SEMESTER (July-December)														
Sl. No:	Slot	Course Code	Course Type	Course Category	Course Title (Course Name)	Credit Structure				SS	Total Marks		Credits	Hrs./Week
						L	T	P	R		CIA	ESE		
1	A	PCXXT501	PC	PC	Programme Core-6	3	1	0	0	5	40	60	4	4
2	B	PCXXT502	PC	PC	Programme Core-7	3	1	0	0	5	40	60	4	4
3	C	PCXXT503	PC	PC	Programme Core-8	3	0	0	0	4.5	40	60	3	3
4	D	PBXXT504	PC-PBL	PB	Programme Core-PBL-3	3	0	0	1	5.5	60	40	4	4
5	E	PEXXT52N	PE	PE	PE-2	3	0	0	0	4.5	40	60	3	3
6	I*	UCHUM506	HMC	UC	Constitution Of India (MOOC)	-	-	-	-	2	-	-	1	-
7	L	PCXXL507	PCL	PC	Lab-5	0	0	3	0	1.5	50	50	2	3
8	Q	PCXXL508	PCL	PC	Lab-6	0	0	3	0	1.5	50	50	2	3
9	R/M/H		VAC		Remedial/Minor/Honours Course	3	1	0	0	5			4*	4*
	S ₅ /S ₆	Industrial Visit (Maximum 12 Days are permitted, Not Exceeding more than 6 Working Days) /Industrial Training												
Total										30/35			23/27*	24/28*

**No Grade Points will be awarded for the MOOC course and I slot course.*

Industrial Training:

Students who are not participating in the industrial visit must attend industrial training during that period.

PROGRAM ELECTIVE 2: PEXXT 52N

SLOT	COURSE CODE	COURSES	L-T-P-R	HOURS	CREDIT
E	PEXXT 521			3	3
	PEXXT 522				3
	PEXXT 523				3
	PEXX T524				3
	PEXXT 526				3
	PEXXT 527				3
	PEXXT 528				3
	PEXXT 525				5

SIXTH SEMESTER (January-June)

Sl. No:	Slot	Course Code	Course Type	Course Category	Course Title (Course Name)	Credit Structure					SS	Total Marks		Credits	Hrs/ Week
						L	T	P	R	CIA		ESE			
1	A	PCXXT601	PC	PC	Programme Core-9	3	1	0	0	5	40	60	4	4	
2	B	PCXXT602	PC	PC	Programme Core-10	3	0	0	0	4.5	40	60	3	3	
3	C	PEXXT63N	PE	PE	PE-3	3	0	0	0	4.5	40	60	3	3	
4	D	PBXXT604	PC-PBL	PB	Core-PBL-4	3	0	0	1	5.5	60	40	4	4	
5	F	GYEST605	ESC	GC	Design Thinking and Product Development (Group Specific Syllabus)	2	0	0	0	3	40	60	2	2	
6	O	OEXXT61N /IEXXT61N	OE/ILE	OE/IE	OE/ILE-1	3	0	0	0	4.5	40	60	3	3	
7	L	PCXXL607	PCL	PC	Lab-7	0	0	3	0	1.5	50	50	2	3	
8	P	PCXXP608	PWS	PC	Mini Project: Socially Relevant Project	0	0	3	0	1.5	50	50	2	3	
9	R/ M/ H		VAC		Remedial/Minor/Honours Course	3	0	0	0	4.5			3*	3*	
	S5/ S6	Industrial Visit (Maximum of 12 Days are permitted, Not Exceeding more than 6 Working Days) /Industrial Training													
Total										30/ 35			23/26*	25/28*	

SIXTH SEMESTER (January-June) (CE EE ME)

Sl. No:	Slot	Course Code	Course Type	Course Category	Course Title (Course Name)	Credit Structure				SS	Total Marks		Credits	Hrs/Week
						L	T	P	R		CIA	ESE		
1	A	PCXXT601	PC	PC	Programme Core-9	3	0	0	0	4.5	40	60	3	3
2	B	PCXXT602	PC	PC	Programme Core-10	3	0	0	0	4.5	40	60	3	3
3	C	PEXXT63N	PE	PE	PE-3	3	0	0	0	4.5	40	60	3	3
4	D	PBXXT604	PC-PBL	PB	Core-PBL-4	3	0	0	1	5.5	60	40	4	4
5	F	GYEST605	ESC	GC	Design Thinking and Product Development (Group Specific Syllabus)	2	0	0	0	3	40	60	2	2
6	O	OEXXT61N /IEXXT61N	OE/ILE	OE/IE	OE/ILE-1	3	0	0	0	4.5	40	60	3	3
7	L	PCXXL607	PCL	PC	Lab-7	0	0	3	0	1.5	50	50	2	3
8	P	PCXXP608	PWS	PC	Mini Project: Socially Relevant Project	0	0	3	0	1.5	50	50	2	3
9	Q*	PCXXL609	PCL	PC	Lab-8	0	0	2	0	1	50	50	1	2
10	R/ M/ H		VAC		Remedial/Minor/Honours Course	3	0	0	0	5			3*	3*
	S5/ S6	Industrial Visit (Maximum of 12 Days are permitted, Not Exceeding more than 6 Working Days) /Industrial Training												
Total										29/ 34			23/26*	26/29*

Note: Open Electives are such courses which will be offered by other departments. Like CSE department students have to opt open electives from ECE/ME/EEE etc. departments.

Industrial Training:

Students who are not participating in the industrial visit must attend industrial training during that period.

***The LAB-8 course is included in the curriculum of the following branches:**

- | |
|---|
| <ul style="list-style-type: none"> Civil Engineering Electrical and Electronics Engineering Mechanical Engineering |
|---|

PROGRAM ELECTIVE 3: PEXXT 63N

SLOT	COURSE CODE	COURSES	L-T-P-R	HOURS	CREDIT
C	PEXXT 631			3	3
	PEXXT 632				3
	PEXXT 633				3
	PEXXT 634				3
	PEXXT 636				3
	PEXXT 637				3
	PEXXT 638				3
	PEXXT 635				5

OPEN ELECTIVE 1: OEXXT 61N

SLOT	COURSE CODE	COURSES	L-T-P-R	HOURS	CREDIT
0	OEXXT 611			3	3
	OEXXT 612				3
	OEXXT 613				3
	OEXXT 614				3
	OEXXT 615				3
	OEXXT 616				3
	OEXXT 617				3

SEVENTH SEMESTER (July-December)														
Sl. No:	Slot	Course Code	Course Type	Course Category	Course Title (Course Name)	Credit Structure				SS	Total Marks		Credits	Hrs/Week
						L	T	P	R		CIA	ESE		
1	A	PEXXT74N /PEXXM74N	PE	PE	PE-4 (Internship Students: Self Study/MOOC Approved by the University/Online Classes)	3	0	0	0	4.5	40	60	3	3
2	B	PEXXT75N/ PEXXM75N	PE	PE	PE-5 (Internship Students: Self Study/MOOC Approved by the University/Online Classes)	3	0	0	0	4.5	40	60	3	3
3	O	OEXXT72N /IEXXT72N/ OEXXM72N	OE/ ILE	OE/IE	OE/ILE-2 (Internship Students: Self Study/MOOC Approved by the University/Online Classes)	3	0	0	0	4.5	40	60	3	3
4	I*	UEHUT704 /UEHUM70N	HMC	UE	Elective (Internship Students: Self Study/MOOC Approved by the University/Online Classes)	2	0	0	0	3	50	50	2	2
5	S	PCXXS705	PWS	PC	Seminar	0	0	3	0	1.5	50	0	2	3
6	P	PCXXP706/ PCXXI706	PWS	PC	Option 1: Major Project Option 2: Internship (4-6 Months)	0	0	0	8	8	100	0	4	8
Total										26			17	22

*No Grade Points will be awarded for the I slot courses

*Students can opt for the internship either in the 7th or 8th semester.

* Option 1: Work on a Project in the institute/department under the mentorship of faculty members.

Option 2: Full semester Internship in an Industry/organization (7th or 8th semester)

Note: Open Electives are such courses which will be offered by other departments.

PROGRAM ELECTIVE 4: PEXXT 74N

SLOT	COURSE CODE	COURSES	L-T-P-R	HOURS	CREDIT
A	PEXXT 741			3	3
	PEXXT 742				3
	PEXXT 743				3
	PEXXT 744				3
	PEXXT 746				3
	PEXXT 747				3
	PEXXT 748				3
	PEXXT 745				5

PROGRAM ELECTIVE 5: PEXXT 75N

SLOT	COURSE CODE	COURSES	L-T-P-R	HOURS	CREDIT
B	PEXXT 751			3	3
	PEXXT 752				3
	PEXXT 753				3
	PEXXT 754				3
	PEXXT 756				3
	PEXXT 757				3
	PEXXT 758				3
	PEXXT 755				5

OPEN ELECTIVE 2: OEXXT 72N

SLOT	COURSE CODE	COURSES	L-T-P-R	HOURS	CREDIT
O	OEXXT 721			3	3
	OEXXT 722				3
	OEXXT 723				3
	OEXXT 724				3
	OEXXT 725				3
	OEXXT 726				3
	OEXXT 727				3

SL. No	Course Code	Slot I: HMC Elective
1	UEHUT704	Project Management: Planning, Execution, Evaluation and Control
2	UEHUM701	Proficiency course in French. (MOOC) (B1 level)
3	UEHUM702	Proficiency Course in German (B1 Level). (MOOC)
4	UEHUM703	Proficiency Course in Spanish (B1 Level) (MOOC)
5	UEHUM704	Introduction to Japanese Language and Culture (N5 level). (MOOC)

EIGHTH SEMESTER (January-June)														
Sl. No:	Slot	Course Code	Course Type	Course Category	Course Title (Course Name)	Credit Structure				SS	Total Marks		Credits	Hrs/Week
						L	T	P	R		CIA	ESE		
1	A	PEXXT86N / PEXXM86N	PE	PE	PE-6 (Internship Students: Self Study/MOOC Approved by the University/Online Classes)	3	0	0	0	4.5	40	60	3	3
2	O	OEXXT82N /IEXXT82N / OEXXM82N	OE/ILE	OE/IE	OE/ILE-3 (Internship Students: Self Study/MOOC Approved by the University/Online Classes)	3	0	0	0	4.5	40	60	3	3
3	I*	UEHUT803 / UEHUM803	HMC	UC	Organizational Behavior and Business Communication (Internship Students: Self Study/MOOC Approved by the University/Online Classes)	2	0	0	0	3	50	50	1	2
4	P	PCXXP806/ PCXXI806/ PCXXJ806	PWS	PC	Option 1: Major Project Option 2: Internship (4-6 Months) Option 3: Major Project Phase -II (For the students who have not opted for internship in S7/S8)	0	0	0	8	8	100	0	4	8
Total										20			11	16

*No Grade Points will be awarded for the I slot courses

* Option 2: Full semester Internship in Industry/organization (7th or 8th semester)

PROGRAM ELECTIVE 6: PEXXT 86N

SLOT	COURSE CODE	COURSES	L-T-P-R	HOURS	CREDIT
A	PEXXT 861			3	3
	PEXXT 862				3
	PEXXT 863				3
	PEXXT 864				3
	PEXXT 866				3
	PEXXT 867				3
	PEXXT 868				3
	PEXXT 865				5

OPEN ELECTIVE 3: OEXXT 83N

SLOT	COURSE CODE	COURSES	L-T-P-R	HOURS	CREDIT
O	OEXXT 831			3	3
	OEXXT 832				3
	OEXXT 833				3
	OEXXT 834				3
	OEXXT 835				3
	OEXXT 836				3
	OEXXT 837				3

HMC Courses			
Sl. No:	Semester	Course Area	Credits
1	S1/S2	Life Skills and Professional Communication	1
2	S3 /S4	Engineering Economics	2
3		Engineering Ethics and Sustainable Development	2
4	S5	Constitution Of India. (MOOC)	1
5	S7	Elective (Project Management/Foreign Languages)	2
6	S8	Organizational Behavior and Business Communication	1
Total Credits			9

BSC Courses			
Sl. No:	Semester	Course Area	Credits
1	S1	Mathematics for Physical Science-1	3
2	S1/S2	Physics for Physical Science	4
3		Chemistry for Physical Science	4
4	S2	Mathematics for Physical Science-2	3
5	S3	Mathematics for Physical Science-3	3
6	S4	Mathematics for Physical Science-4	3
Total Credits			20

ESC Courses (Group C)			
Sl. No:	Semester	Course Area	Credits
1	S1	Engineering Mechanics	3
2		Introduction to Mechanical Engineering/ Civil Engineering	4
3		Algorithmic Thinking with Python	4
4		Engineering Workshop	1
5	S2	Engineering Graphics and Computer Aided Drawing	3
6		Basic Electrical and Electronics Engineering	4
7		Engineering Entrepreneurship and IPR	3
8		Basic Electrical and Electronics Engineering Workshop	1
9	S3	Introduction to Artificial Intelligence and Data Science	4
10	S6	Design Thinking and Product Development	2
Total Credits			29

Programme Core Courses (PC)			
Sl. No:	Semester	Course Area	Credits
1	S2	Core 1	4
2	S3	Core 2	4
3		Core 3	4
4		Lab-1	2
5		Lab-2	2
6		S4	Core 4
7	Core 5		4
8	Lab-3		2
9	Lab-4		2
10	S5	Core 6	4
11		Core 7	4
12		Core 8	3
13		Lab-5	2
14	S6	Lab-6	2
15		Core 9	4
16		Core 10	3
17		Lab-7	2
18		Mini Project	2
Total Credits (Theory -10, Lab-7, Mini Project-1)			54

Programme Core Courses (CE, EE, ME Branches)			
Sl. No:	Semester	Course Area	Credits
1	S2	Core 1	4
2	S3	Core 2	4
3		Core 3	4
4		Lab-1	2
5		Lab-2	2
6		S4	Core 4
7	Core 5		4
8	Lab-3		2
9	Lab-4		2
10	S5	Core 6	4
11		Core 7	4
12		Core 8	3
13		Lab-5	2
14	S6	Lab-6	2
15		Core 9	3
16		Core 10	3
17		Lab-7	2
18		Mini Project	2
19		Lab-8	1
Total Credits (Theory -10, Lab-8, Mini Project-1)			54

Programme Core-Project Based Learning (PBL)			
Sl. No:	Semester	Course Area	Credits
1	S3	Core PBL-1	4
2	S4	Core PBL-2	4
3	S5	Core PBL-3	4
4	S6	Core PBL-4	4
Total Credits			16

Programme Elective Courses (PE)			
Sl. No:	Semester	Course Type	Credits
1	S4	PE-1	3
2	S5	PE-2	3
3	S6	PE-3	3
4	S7	PE-4	3
5		PE-5	3
6	S8	PE-6	3
Total Credits			18

Open Elective Courses/Industry Elective(OE/IEL)			
Sl. No:	Semester	Course Type	Credits
1	S6	OE/ILE-1	3
2	S7	OE/ILE-2	3
3	S8	OE/ILE-3	3
Total Credits			9

Project/Seminar			
Sl. No:	Semester	Course Type	Credits
1	S7	Seminar	2
2		Major Project/Internship	4
3	S8	Major Project/Internship/Research Project	4
Total Credits			10

Activity Points

Sl. No	Group	Courses	Credits	Minimum Credit Requirements
1	I	NSS, NCC, NSO (National Sports Organization)	1 (40 Points)	3 Credits (One credit from each Group)
2		Arts/Sports/Games		
3		Union/Club Activities		
4	II	English Proficiency Certification (TOFEL, IELTS, BEC etc)	1 (40 Points)	
5		Aptitude Proficiency Certification (GRE, CAT, GMAT etc)/Valid Gate Score		
6		Short Term Internship (Minimum 2 weeks), Clinical Exposure/Training (Minimum 2 weeks), Conferences/Paper Presentation/ Workshop Activities/ Professional Body Activities, Participation in University level/State Level/ National Level Hackathons		
7	III	Journal Publication, Patents, Start-Up, Innovation, Winners of National/ International Level Hackathons	1 (40 Points)	
8		Skilling Certificates (Approved by the University)		

**30 Points/group for B. Tech Lateral Entry Students*

- A minimum of 120 Activity points are to be acquired for obtaining the 3 Activity Credits required in the curriculum.*

▪ *Table : Course classifications of the B. Tech Programmes and Overall Credit Structure*

Sl. No	Category	Code	Credits
1	Humanities and Social Sciences including Management Courses	HMC	9
2	Basic Science Courses	BSC	20
3	Engineering Science Courses	ESC	29
4	Programme (Professional) Core Courses	PCC	54
5	Programme (Professional) Core Courses-Project Based Learning	PBL	16
6	Program Elective Courses	PEC	18
7	Open Elective Courses/Industry Linked Elective	OEC/ILE	9
8	Project Work/Internship and Seminar	PWS	10
9	Health and Wellness	PW	1
10	Skill Enhancement Courses (Digital 101)	SEC	1
11	Mandatory Student Activities.	MSA	3
	Total Mandatory Credits		170

Draft

SEMESTER S1/S2

COURSE NAME: Mathematics for Electrical Science and Physical Science - 1 (Groups B & C)

Course Code	GYMAT101	CIE Marks	40
Teaching Hours/Week (L: T:P: R)	3:0:0:0	ESE Marks	60
Credits	3	Exam Hours	2Hr. 30 Min.
Prerequisites (if any)	Basic knowledge in single variable calculus and matrix operations.	Course Type	Theory

Course Objectives:

To provide a comprehensive understanding and basic techniques of matrix theory to analyze linear systems and to provide advanced knowledge and practical skills in solving second-order ordinary differential equations, applying Laplace transforms, and understanding Fourier series, enabling them to analyze and model dynamic systems come across in engineering disciplines effectively.

SYLLABUS

Module No.	Syllabus Description	Contact Hours
1	Linear systems of equations: Gauss elimination, Row echelon form, Linear Independence: rank of a matrix, Solutions of linear systems: Existence, Uniqueness (without proof), The matrix Eigen Value Problem, Determining Eigen values and Eigen vector, Diagonalization of matrices. (Text 1: Relevant topics from sections 7.3, 7.4, 7.5, 8.1, 8.4)	9
2	Homogeneous linear ODEs of second order, Superposition principle, General solution, Homogeneous linear ODEs of second order with constant coefficients (Method to find general solution, solution of linear Initial Value Problem). Non homogenous ODEs (with constant coefficients) - General solution, Particular solution by the method of undetermined coefficients (Particular solutions for the functions ke^{yx} , kx^n , $k\cos\omega x$, $k\sin\omega x$, $ke^{\alpha x}\cos\omega x$, $ke^{\alpha x}\sin\omega x$), Initial value Problem for Non-Homogeneous Second order linear ODE(with constant coefficients), Solution by variation of parameters (Second Order). (Text 1: Relevant topics from sections 2.1, 2.2, 2.7, 2.10)	9
3	Laplace Transform, Inverse Laplace Transform, Linearity property, First shifting theorem, Transform of derivatives, Solution of Initial value problems by Laplace transform (Second order linear ODE with constant coefficients with initial conditions at $t=0$ only), Unit step function, Second shifting theorem, Dirac delta function and its transform (Initial value problems involving unit step function and Dirac delta function are excluded), Convolution theorem (without proof) and its application to finding inverse Laplace transform of products of functions. (Text 1: Relevant topics from sections 6.1, 6.2, 6.3, 6.4, 6.5)	9

4	<p>Taylor series representation (without proof, assuming the possibility of power series expansion in appropriate domains), Maclaurin series representation, Fourier series, Euler formulas, Convergence of Fourier series (Dirichlet's conditions), Fourier series of 2π periodic functions, Fourier series of $2l$ periodic functions, Half range sine series expansion, Half range cosine series expansion.</p> <p>(Text 1: Relevant topics from sections 11.1, 11.2, Text 2: Relevant topics from section 10.8)</p>	9
----------	--	----------

Course Assessment Method
(CIE: 40 marks , ESE: 60 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Assignment/ Microproject	Internal Examination-1 (Written)	Internal Examination- 2 (Written)	Total
5	15	10	10	40

End Semester Examination Marks (ESE)

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions

Part A	Part B	Total
<ul style="list-style-type: none"> ● 2 Questions from each module. ● Total of 8 Questions, each carrying 3 marks <p style="text-align: center;">(8x3 =24marks)</p>	<ul style="list-style-type: none"> ● Each question carries 9 marks. ● Two questions will be given from each module, out of which 1 question should be answered. ● Each question can have a maximum of 3 sub divisions. <p style="text-align: center;">(4x9 = 36 marks)</p>	60

Course Outcomes (COs)

At the end of the course students should be able to:

Course Outcome		Bloom's Knowledge Level (KL)
CO1	Solve systems of linear equations and diagonalize matrices.	K3
CO2	Solve homogeneous and non-homogeneous linear differential equation with constant coefficients.	K3
CO3	Compute Laplace transform and apply it to solve ODEs arising in engineering.	K3
CO4	Determine the Taylor series and evaluate Fourier series expansion for different periodic functions.	K3

Note: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create

CO-PO Mapping Table:

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

Text Books				
Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Advanced Engineering Mathematics	Erwin Kreyszig	John Wiley & Sons	10 th edition, 2016
2	Calculus	H.Anton,I.Biven,S.Davis	Wiley	12 th edition, 2024

Reference Books				
Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Thomas' Calculus	Maurice D. Weir, Joel Hass, Christopher Heil, Przemyslaw Bogacki	Pearson	15 th edition, 2023
2	Essential Calculus	J. Stewart	Cengage	2 nd edition, 2017
3	Elementary Linear Algebra	Howard Anton, Chris Rorres	Wiley	11 th edition, 2019
4	Bird's Higher Engineering Mathematics	John Bird	Taylor & Francis	9 th edition, 2021
5	Higher Engineering Mathematics	B. V. Ramana	McGraw-Hill Education	39 th edition, 2023
6	Calculus	H. Anton, I. Biven, S.Davis	Wiley	12 th edition, 2024
7	Signals and Systems	Simon Haykin, Barry Van Veen	Wiley	2 nd edition, 2002

Video Links (NPTEL, SWAYAM...)	
Module No.	Link ID
1	https://archive.nptel.ac.in/courses/111/107/111107164/
2	NPTEL :: Mathematics - Ordinary Differential Equations
3	NPTEL :: Mathematics - NOC:Laplace Transform
4	https://archive.nptel.ac.in/courses/111/101/111101164/

SEMESTER S1/S2

COURSE NAME: Physics for Physical Science & Life Science

(Groups C & D)

Course Code	GZPHT121	CIE Marks	40
Teaching Hours/Week (L: T:P: R)	3:0:2:0	ESE Marks	60
Credits	4	Exam Hours	2Hr. 30Mns.
Prerequisites (if any)	None	Course Type	Theory + Lab

Course Objectives:

1. To provide students a solid background in the fundamentals of Physics and to impart that knowledge in Physical Science & Life Science disciplines. The course is designed to develop scientific attitudes and enable the students to correlate the concepts of Physics with the core programmes.
2. To make the students gain practical knowledge to correlate the theoretical studies and to develop practical applications of engineering.

SYLLABUS

Module No.	Syllabus Description	Contact Hours
1	Laser & Fibre Optics Optical processes – Absorption-Spontaneous emission and stimulated emission, Principle of laser - conditions for sustained lasing – Population inversion- Pumping- Metastable states, Basic components of laser - Active medium - Optical resonant cavity, Construction and working of Ruby laser and CO ₂ laser, Construction and working Semiconductor laser (qualitative), Properties of laser, Applications of laser. Optic fibre-Principle of propagation of light, Types of fibres-Step index and Graded index fibres - Multimode and single mode fibers, Acceptance angle, Numerical aperture –Derivation, Applications of optical fibres - Fibre optic communication system (block diagram)	9
2	Interference and Diffraction Introduction, Principle of super position, Constructive and destructive interference, Optical path, Phase difference and path difference, Cosine law- reflected system- Condition for constructive and destructive	9

	<p>interference, Colours in thin films, Newton's Rings-Determination of refractive index of transparent liquids and wavelength, Air wedge-Measurement of thickness of thin sheets.</p> <p>Diffraction-types of diffraction, Diffraction due to a single slit, Diffraction grating – Construction - grating equation, Dispersive and Resolving Power (qualitative).</p>	
3	<p>Quantum Mechanics</p> <p>Introduction, Concept of uncertainty and conjugate observables (qualitative), Uncertainty principle (statement only), Application of uncertainty principle- Absence of electron inside nucleus - Natural line broadening, Wave function – properties - physical interpretation, Formulation of time dependent and time independent Schrodinger equations, Particle in a one- dimensional box - Derivation of energy eigen values and normalized wave function, Quantum Mechanical Tunnelling (qualitative)</p>	9
4	<p>Waves & Acoustics</p> <p>Waves- transverse and longitudinal waves, Concept of frequency, wavelength and time period (no derivation), Transverse vibrations in a stretched string- derivation of velocity and frequency - laws of transverse vibration.</p> <p>Acoustics- Reverberation and echo, Reverberation time and its significance - Sabine's Formula, Factors affecting acoustics of a building. Ultrasonics- Piezoelectric oscillator, Ultrasonic diffractometer, SONAR, NDT-Pulse echo method, medical application-Ultrasound scanning (qualitative)</p>	9

Course Assessment Method
(CIE: 40 marks , ESE: 60 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Continuous Assessment	Internal Examination-1 (Written)	Internal Examination-2 (Written)	Internal Examination- 3 (Lab Examination)	Total
5	10	10	10	5	40

End Semester Examination Marks (ESE)

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions

Part A	Part B	Total
<ul style="list-style-type: none"> • 2 Questions from each module. • Total of 8 Questions, each carrying 3 marks <p style="text-align: center;">(8x3 =24marks)</p>	<ul style="list-style-type: none"> • Each question carries 9 marks. • Two questions will be given from each module, out of which 1 question should be answered. • Each question can have a maximum of 3 sub divisions. <p style="text-align: center;">(4x9 = 36 marks)</p>	60

Course Outcomes (COs)

At the end of the course students should be able to:

Course Outcome		Bloom's Knowledge Level (KL)
CO1	Describe the basic principles and properties of laser and optic fibers.	K2
CO2	Describe the phenomena of interference and diffraction of light.	K2
CO3	Describe the behaviour of matter in the atomic and subatomic level through the principles of quantum mechanics.	K2
CO4	Apply the knowledge of waves and acoustics in non-destructive testing and in acoustic design of buildings.	K3
CO5	Apply basic knowledge of principles and theories in physics to conduct experiments.	K3

Note: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create

CO-PO Mapping Table:

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

Text Books				
Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	A Textbook of Engineering Physics	M N Avadhanulu, P G Kshirsagar & TVS Arun Murthy	S Chand & Co.	2 nd Edition, 2019
2	Engineering Physics	H K Malik , A.K. Singh,	McGraw Hill Education	2 nd Edition, 2017
3	Optics	Ajoy Ghatak	Mc Graw Hill Education	6 th Edition, 2017

Reference Books				
Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Engineering Physics	G Vijayakumari	Vikas Publications	8 th Edition, 2014
2	Concepts of Modern Physics	Arthur Beiser	Tata McGraw Hill Publications	6 th Edition 2003
3	Engineering Physics	Aruldas G.	PHI Pvt. Ltd	2 nd Edition, 2015
4	Fiber Optic Communications	Gerd Keiser	Springer	2021
5	A Text Book of Engineering physics	I. Dominic, A. Nahari	OWL Publications	2 nd Edition, 2016
6	Advanced Engineering Physics	Premlet B	Phasor Books	
7	Engineering Physics	Rakesh Dogra	Katson Books	1 st Edition, 2019

Video Links (NPTEL, SWAYAM...)

Module No	Link ID
1	https://nptel.ac.in/courses/115102124 https://nptel.ac.in/courses/104104085
2	https://nptel.ac.in/courses/115105537
3	https://nptel.ac.in/courses/115102023 https://nptel.ac.in/courses/115101107
4	https://nptel.ac.in/courses/112104212 https://nptel.ac.in/courses/124105004

1. Continuous Assessment (10 Marks)

i. Preparation and Pre-Lab Work (2 Marks)

- Pre-Lab Assignments: Assessment of pre-lab assignments or quizzes that test understanding of the upcoming experiment.
- Understanding of Theory: Evaluation based on students' preparation and understanding of the theoretical background related to the experiments.

ii. Conduct of Experiments (2 Marks)

- Procedure and Execution: Adherence to correct procedures, accurate execution of experiments, and following safety protocols.
- Skill Proficiency: Proficiency in handling equipment, accuracy in observations, and troubleshooting skills during the experiments.
- Teamwork: Collaboration and participation in group experiments.

iii. Lab Reports and Record Keeping (3 Marks)

- Quality of Reports: Clarity, completeness and accuracy of lab reports. Proper documentation of experiments, data analysis and conclusions.
- Timely Submission: Adhering to deadlines for submitting lab reports/rough record and maintaining a well-organized fair record.

iv. Viva Voce (3 Marks)

- Oral Examination: Ability to explain the experiment, results and underlying principles during a viva voce session.

Final Marks Averaging: The final marks for preparation, conduct of experiments, viva, and record are the average of all the specified experiments in the syllabus.

2. Evaluation Pattern for Lab Examination (5 Marks)

1. Procedure/Preliminary Work/Conduct of Experiments (2 Marks)

- Procedure Understanding and Description: Clarity in explaining the procedure and understanding each step involved.
- Preliminary Work and Planning: Thoroughness in planning and organizing materials/equipment.
- Setup and Execution: Proper setup and accurate execution of the experiment or programming task

2. Result (2 Marks)

- Accuracy of Results: Precision and correctness of the obtained results.

3. Viva Voce (1 Marks)

- Proficiency in answering questions related to theoretical and practical aspects of the subject.

Experiment List

Experiment No.	Experiment
1	Optical fiber characteristics- Measurement of Numerical aperture.
2	Determination of wavelength of Laser using diffraction grating.
3	Measure the wavelength of Laser using a millimetre scale as a grating.
4	Determination of wavelength of a monochromatic light using Newton's Rings method.
5	Determination of diameter of wire or thickness of thin sheet using Air wedge method.
6	Determination of slit width (diffraction due to a single slit).
7	Measure wavelength of light source using diffraction grating.
8	Determination of resolving power and dispersive power of grating.
9	Characteristics of LED.
10	CRO basics-Measurement of frequency and amplitude of wave forms.
11	Solar Cell- I V and Intensity Characteristics.
12	Melde's experiment- Frequency calculation in Transverse and Longitudinal Mode.
13	LCR circuit –forced and damped harmonic oscillations.
14	Determination of wavelength and velocity of ultrasonic waves using ultrasonic diffractometer.
15	Determination of particle size of lycopodium powder.

SEMESTER S1/S2

COURSE NAME: Chemistry for Physical Science

(Group C)

Course Code	GCCYT122	CIE Marks	40
Teaching Hours/Week (L: T:P: R)	3:0:2:0	ESE Marks	60
Credits	4	Exam Hours	2Hr. 30Mns.
Prerequisites (if any)	None	Course Type	Theory

Course Objectives:

1. To equip students with a thorough understanding of chemistry concepts relevant to engineering applications.
2. Additionally, to familiarize students with applied topics such as spectroscopy, electrochemistry, and instrumental methods.
3. To raise awareness among students about environmental issues such as climate change, pollution, and waste management, which impact quality of life.

SYLLABUS

Module No.	Syllabus Description	Contact Hours
1	<p>Engineering Materials</p> <p>Fuels: Calorific value – HCV and LCV – Experimental determination of calorific value of solid fuels. Analysis of coal – Proximate analysis- Octane & Cetane Number. Biofuels- Biodiesel-Green Hydrogen.</p> <p>Lubricants: Classification - Solid, Semisolid and Liquid lubricants. Properties of lubricants - Viscosity Index, Flash point, Fire point, Cloud Point, Pour Point & Aniline Point.</p> <p>Cement: Manufacture of Portland cement – Theory of setting and hardening of cement.</p> <p>Nanomaterials: Classification based on Dimension & Materials- Synthesis – Sol gel & Chemical Reduction - Applications of nanomaterials –</p>	9

	<p>Supercapacitor Materials - Carbon Nanotubes, Fullerenes & Graphene – structure, properties & application.</p> <p>Polymers: ABS & Kevlar -Synthesis, properties and applications. Conducting Polymers- Classification – Application.</p>	
2	<p>Electrochemistry and Corrosion Science</p> <p>Electrochemical Cell- Electrode potential- Nernst equation for single electrode and cell (Numerical problems)- Reference electrodes – SHE & Calomel electrode –Construction and Working - Electrochemical series - Applications – Glass Electrode & pH Measurement-Conductivity-Measurement using Digital conductivity meter. Li-ion battery & H₂-O₂ fuel cell (acid electrolyte only) construction and working.</p> <p>Corrosion –Electrochemical corrosion mechanism (acidic & alkaline medium). - Galvanic series - Corrosion control methods - Cathodic Protection - Sacrificial anodic protection and impressed current cathodic protection –Electroplating of copper - Electroless plating of Copper</p>	9
3	<p>Instrumental Methods of Analysis</p> <p>Molecular Spectroscopy: Types of spectra- Molecular energy levels - Beer Lambert's law – Numerical problems - Electronic Spectroscopy – Principle, Types of electronic transitions –Role of Conjugation in absorption maxima - Instrumentation-Applications – Vibrational spectroscopy – Principle-Number of vibrational modes - Vibrational modes of CO₂ and H₂O – Applications</p> <p>Thermal analysis: –TGA- Principle, instrumentation (block diagram) and applications – TGA of CaC₂O₄.H₂O and polymers. DTA-Principle, instrumentation (block diagram) and applications - DTA of CaC₂O₄.H₂O.</p> <p>Chromatography- Gas Chromatography- Principle-Instrumentation-Application – Analysis of chemical composition of exhaust gases.</p> <p>Electron Microscopic Techniques: SEM - Principle, instrumentation and Applications.</p>	9
4	<p>Environmental Chemistry</p> <p>Water characteristics - Hardness - Types of hardness- Temporary and Permanent - Disadvantages of hard water -Degree of hardness (Numericals) Water softening methods-Ion exchange process-Principle, procedure and advantages. Reverse osmosis – principle, process and advantages. – Water disinfection methods – chlorination-Break point chlorination, ozone and UV irradiation. Dissolved oxygen (DO), BOD and COD- Definition & Significance</p> <p>Waste Management: Air Pollution- Sources & Effects- Greenhouse Gases- Ozone depletion. Control methods. Sewage water treatment- Primary, Secondary and Tertiary - Flow diagram -Trickling filter and UASB process. Solid waste-disposal methods- Composting, Landfill & Incineration.</p>	9

Course Assessment Method
(CIE: 40 marks, ESE: 60 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Continuous Assessment	Internal Examination-1 (Written)	Internal Examination-2 (Written)	Internal Examination- 3 (Lab Examination)	Total
5	10	10	10	5	40

End Semester Examination Marks (ESE)

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions

Part A	Part B	Total
<ul style="list-style-type: none"> • 2 Questions from each module. • Total of 8 Questions, each carrying 3 marks <p style="text-align: center;">(8x3 =24marks)</p>	<ul style="list-style-type: none"> • Each question carries 9 marks. • Two questions will be given from each module, out of which 1 question should be answered. • Each question can have a maximum of 3 sub divisions. <p style="text-align: center;">(4x9 = 36 marks)</p>	60

Course Outcomes (COs)

At the end of the course students should be able to:

Course Outcome		Bloom's Knowledge Level (KL)
CO1	Describe the use of various engineering materials in different industries.	K2
CO2	Explain the Basic Concepts of Electrochemistry and Corrosion to Explore the Possible Applications in Various Engineering Fields.	K2
CO3	Use appropriate analytical techniques for different engineering materials	K3
CO4	Outline various water treatment and waste management methods	K2

Note: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create

CO-PO Mapping Table:

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

Text Books				
Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Engineering Chemistry	B. L. Tembe, Kamaluddin, M. S. Krishnan	NPTEL Web-book	2018
2	Physical Chemistry	P. W. Atkins	Oxford University Press	International Edition- 2018
3	Instrumental Methods of Analysis	H. H. Willard, L. L. Merritt	CBS Publishers	7th Edition- 2005
4	Engineering Chemistry	Jain & Jain	Dhanpath Rai Publishing Company	17 th Edition - 2015

Reference Books				
Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Fundamentals of Molecular Spectroscopy	C. N. Banwell	McGraw-Hill	4 th edn., 1995
2	Principles of Physical Chemistry	B. R. Puri, L. R. Sharma, M. S. Pathania	Vishal Publishing Co	47th Edition, 2017
3	Introduction to Spectroscopy	Donald L. Pavia	Cengage Learning India Pvt. Ltd	2015
4	Polymer Chemistry: An Introduction	Raymond B. Seymour, Charles E. Carraher	Marcel Dekker Inc	4th Revised Edition, 1996

5	The Chemistry of Nanomaterials: Synthesis, Properties and Applications	Prof. Dr. C. N. R. Rao, Prof. Dr. h.c. mult. Achim Müller, Prof. Dr. A. K. Cheetham	Wiley-VCH Verlag GmbH & Co. KGaA	2014
6	Organic Electronics Materials and Devices	Shuichiro Ogawa	Springer Tokyo	2024
7	Principles and Applications of Thermal Analysis	Gabbot, P	Oxford: Blackwell Publishing	2008

Video Links (NPTEL, SWAYAM...)	
Module No.	Link ID
1	https://archive.nptel.ac.in/courses/104/106/104106137/ https://archive.nptel.ac.in/courses/113/105/113105102/ https://archive.nptel.ac.in/courses/113/104/113104082/ https://www.youtube.com/watch?v=BeSxFLvk1h0
2	https://archive.nptel.ac.in/courses/113/104/113104102/ https://archive.nptel.ac.in/courses/104/105/104105124/ https://archive.nptel.ac.in/courses/105/104/105104157/

Continuous Assessment (10 Marks)

Continuous assessment evaluations are conducted based on laboratory associated with the theory.

Mark distribution

1. Preparation and Pre-Lab Work (2 Marks)

- Pre-Lab Assignments: Assessment of pre-lab assignments or quizzes that test understanding of the upcoming experiment.
- Understanding of Theory: Evaluation based on students' preparation and understanding of the theoretical background related to the experiments.

2. Conduct of Experiments (2 Marks)

- Procedure and Execution: Adherence to correct procedures, accurate execution of experiments, and following safety protocols.
- Skill Proficiency: Proficiency in handling equipment, accuracy in observations, and troubleshooting skills during the experiments.
- Teamwork: Collaboration and participation in group experiments.

3. Lab Reports and Record Keeping (3 Marks)

- Quality of Reports: Clarity, completeness and accuracy of lab reports. Proper documentation of experiments, data analysis and conclusions.
- Timely Submission: Adhering to deadlines for submitting lab reports/rough record and maintaining a well-organized fair record.

2. Viva Voce (3 Marks)

- Oral Examination: Ability to explain the experiment, results and underlying principles during a viva voce session.

Final Marks Averaging: The final marks for preparation, conduct of experiments, viva, and record are the average of all the specified experiments in the syllabus.

Evaluation Pattern for Lab Examination (5 Marks)

1. Procedure/Preliminary Work/Conduct of Experiments (2 Marks)

- Procedure Understanding and Description: Clarity in explaining the procedure and understanding each step involved.
- Preliminary Work and Planning: Thoroughness in planning and organizing materials/equipment.
- Setup and Execution: Proper setup and accurate execution of the experiment or programming task.

2. Result (2 Marks)

- Accuracy of Results: Precision and correctness of the obtained results.

3. Viva Voce (1 Marks)

- Proficiency in answering questions related to theoretical and practical aspects of the subject.

List of Experiments

*Any 8 Experiments Mandatory

Expt. Nos.	Experiment
1	Estimation of iron in iron ore
2	Estimation of copper in brass
3	Determination of cell constant and conductance of solutions
4	Calibration of pH meter and determination of pH of a solution
5	Synthesis of polymers (a) Urea-formaldehyde resin (b) Phenol-formaldehyde resin
6	Determination of wavelength of absorption maximum and colorimetric estimation of Fe^{3+} in solution
7	Determination of molar absorptivity of a compound (KMnO_4 or any water-soluble food colorant)
8	Analysis of IR spectra
9	Identification of drugs using TLC
10	Estimation of total hardness of water-EDTA method
11	Estimation of dissolved oxygen by Winkler's method
12	Determination of calorific value using Bomb calorimeter
13	Determination of saponification value of a given vegetable oil
14	Determination of acid value of a given vegetable oil
15	Verification of Nernst equation for electrochemical cell.

SEMESTER 1

Dr

SEMESTER S1

COURSE NAME: ENGINEERING MECHANICS

Course Code	GCEST103	CIE Marks	40
Teaching Hours/Week (L: T:P: R)	3-0-0-0	ESE Marks	60
Credits	3	Exam Hours	2.30
Prerequisites (if any)	None	Course Type	Theory

Course Objectives:

1. The course aims to enable students to analyse and solve fundamental mechanics problems

SYLLABUS

Module No.	Syllabus Description	Contact Hours
1	Introduction to statics: introduction to branches of mechanics, concept of rigid body scalars and vectors, vector operations, forces in space. Support reactions of beams (point load and UDL only) Force systems: rectangular components in 2D and 3D, moment and couple, resultants Equilibrium: system isolation and the free-body diagram, equilibrium conditions 2D and 3D	10
2	Friction: -laws of friction – analysis of blocks and ladder Centroid of composite areas- – moment of inertia- parallel axis and perpendicular axis theorems. Polar moment of inertia, radius of gyration, mass moment of inertia-ring and disc	10
3	Dynamics – rectilinear translation - equations of motion in kinematics and kinetics – D’Alembert’s principle. – motion on horizontal and inclined surfaces, motion of connected bodies	8
4	Curvilinear translation - equations of kinematics –projectile motion (solution starting from differential equations) Rotation – kinematics of rotation- equation of motion for a rigid body rotating about a fixed axis –rotation under a constant moment	8

Course Assessment Method
(CIE: 40 marks , ESE: 60 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Assignment/ Microproject	Internal Examination-1 (Written)	Internal Examination- 2 (Written)	Total
5	15	10	10	40

End Semester Examination Marks (ESE)

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions

Part A	Part B	Total
<ul style="list-style-type: none"> • 2 Questions from each module. • Total of 8 Questions, each carrying 3 marks <p style="text-align: center;">(8x3 =24marks)</p>	<ul style="list-style-type: none"> • Each question carries 9 marks. • Two questions will be given from each module, out of which 1 question should be answered. • Each question can have a maximum of 3 sub divisions. <p style="text-align: center;">(4x9 = 36 marks)</p>	60

Course Outcomes (COs)

At the end of the course students should be able to:

Course Outcome		Bloom's Knowledge Level (KL)
CO1	Understand the vector representation of forces and moments	K1,K2
CO2	Identify and describe the components of system of forces acting on the rigid body	K2,K3
CO3	Apply the conditions of equilibrium to different force system.	K3
CO4	Identify appropriate principles to solve problems of mechanics.	K2, K3
CO5	Develop the understanding of fundamental principles of rigid body dynamics	K3

Note: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create

CO-PO Mapping Table:

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

Text Books				
Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Engineering Mechanics	Timoshenko and Young	McGraw Hill Publishers	5 th Edition 2017
2	Engineering Mechanics: Combined Statics and Dynamics	Russell C. Hibbeler	Pearson Education,	14 th Edition 2015
3	Engineering Mechanics - Statics and Dynamics,	Shames, I. H.	Prentice Hall of India.	4 th Edition 2008
4	Textbook of Engineering Mechanics	R. K. Bansal	Laxmi publications pvt ltd.	4 th Edition 2016

Reference Books				
Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Engineering Mechanics Statics	J. L. Meriam, L. G. Kraige	Wiley	9 th Edition 2020
2	Engineering Mechanics	Chandramouli	PHI Learning	2011

Video Links (NPTEL, SWAYAM...)	
	Link ID
1	https://nptel.ac.in/courses/112106286

SEMESTER S1

COURSE NAME: INTRODUCTION TO MECHANICAL ENGINEERING & CIVIL ENGINEERING

Course Code	GCEST104	CIE Marks	40
Teaching Hours/Week (L: T:P: R)	4-0-0-0	ESE Marks	60
Credits	4	Exam Hours	2.30
Prerequisites (if any)	None	Course Type	Theory

Course Objectives:

1. Understand thermodynamic cycles and working of IC engines.
2. Understand the refrigeration cycles and psychrometric concepts.
3. Understand the relevance of civil engineering and its various disciplines.
4. Describe the relevance of various building codes and types of buildings as per NBC.
5. Understand different building components and building materials.

SYLLABUS

Module No.	Syllabus Description	Contact Hours
1	General introduction to Mechanical Engineering Thermodynamic cycles -Carnot Cycle -Derivation of efficiency (problems on efficiency) Otto, Diesel cycles (no derivation of efficiency and problems). IC Engines: CI & SI Engines, working of 2-Stroke & 4-Stroke engines. Listing the parts of IC Engines. Concept of CRDI, MPFI and hybrid engines. Refrigeration: Unit of refrigeration, reversed Carnot cycle, COP, vapour compression cycle (only description and no problems); Definitions of dry, wet & dew point temperatures, specific humidity and relative humidity, Psychrometric chart, Cooling and dehumidification, Layout of central air conditioning systems.	11
2	Classification of pumps, Description about working with sketches of: Reciprocating pump, Centrifugal pump. Classification of Hydraulic Turbines. Different type of gears and its applications (spur, helical, bevel, worm and worm wheel), List types of clutches and their use, Bearings and their classification (Journal bearing and ball bearing) Manufacturing Process: Sand Casting, Forging, Rolling, Extrusion. Metal Joining Processes: List types of welding, Description with sketches of Arc	11

	Welding, SMAW, Soldering and Brazing and their applications. Machining processes: Description and operations performed on Lathe, Drilling machine, Milling machine, CNC machine, 3D printing.	
3	General Introduction to Civil Engineering: Relevance of Civil Engineering in the overall infrastructural development of the country. Brief introduction to major disciplines of Civil Engineering like Structural Engineering, Geo-technical Engineering, Transportation Engineering, Water Resources Engineering and Environmental Engineering. Introduction to buildings: Types of buildings according to character of occupancy as per NBC, Load bearing and non-load bearing building structures, components of a residential building and their functions (concept only). Selection of site for a residential building. Building Area Definitions: Built up area, Plinth area, Floor area, Carpet area and Floor area ratio of a building as per KBR. Building rules and regulations: Relevance of NBC, KBR & CRZ norms (brief discussion of relevance only).	11
4	Conventional construction materials: Brick, stone, sand, cement and timber- Classifications, Qualities, Tests and Uses of construction materials. Cement concrete: Constituent materials, properties and types. Tests on fresh and hardened concrete - slump test, cube compressive strength as per IS Codes. Steel: Structural steel sections and steel reinforcements – types and uses. Soil- Origin of soil-weathering of rocks, types of weathering	11

Course Assessment Method
(CIE: 40 marks , ESE: 60 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Assignment/ Microproject	Internal Examination-1 (Written)	Internal Examination- 2 (Written)	Total
5	15	10	10	40

End Semester Examination Marks (ESE)

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions

Part A	Part B	Total
<ul style="list-style-type: none"> 2 Questions from each module. Total of 8 Questions, each carrying 3 marks <p align="center">(8x3 =24marks)</p>	<ul style="list-style-type: none"> Each question carries 9 marks. Two questions will be given from each module, out of which 1 question should be answered. Each question can have a maximum of 3 sub divisions. <p align="center">(4x9 = 36 marks)</p>	60

Course Outcomes (COs)

At the end of the course students should be able to:

Course Outcome		Bloom's Knowledge Level (KL)
CO1	Understand the relevance of mechanical engineering and its various disciplines.	K2
CO2	Learn the applications of thermodynamics through IC engines and refrigeration systems.	K2
CO3	Understand the various manufacturing processes adapted by mechanical engineers.	K2
CO4	Understand the relevance of civil engineering and its various disciplines.	K2
CO5	Describe the relevance of various building codes and types of buildings as per NBC	K2
CO6	Understand different building components and building materials.	K2

Note: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create

CO-PO Mapping Table:

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

Text Books				
Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Basic Mechanical Engineering	Pravin Kumar	Pearson Education	1st Edition, 2013
2	A Textbook of Basic Mechanical Engineering	R.K. Rajput	Laxmi Publications	3rd Edition, 2017
3	Elements of Mechanical Engineering	K.P. Roy, S.K. Hajra Choudhury, A.K. Hajra Choudhury	Media Promoters & Publishers Pvt. Ltd.	Revised Edition, 2012
4	Fundamentals of Mechanical Engineering	G.S. Sawhney	PHI Learning Pvt. Ltd.	1st Edition, 2013
5	Essentials of Civil Engineering	Dalal K R	Charotar Publishing house	1 st Edition 2012
6	Engineering Materials(Material Science)	Rangwala S C	Charotar Publishing House Pvt Limited	43 rd Edition 2019
7	Building Materials	Duggal S K	New Age International	5 th Edition 2019

Reference Books				
Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Hybrid Electric Vehicles: Principles and Applications with Practical Perspectives	Chris Mi and M. Abul Masrur	John Wiley & Sons	2nd Edition, 2017
2	Automotive Engineering Fundamentals	Richard Stone and Jeffrey K. Ball	SAE International	1st Edition, 2004
3	Additive Manufacturing Technologies: 3D Printing, Rapid Prototyping, and Direct Digital Manufacturing	Ian Gibson, David W. Rosen, and Brent Stucker	Springer	2nd Edition, 2015
4	Heating, Ventilating, and Air Conditioning Analysis and Design	Faye C. McQuiston, Jerald D. Parker, and Jeffrey D. Spitler	John Wiley & Sons	6th Edition, 2005
5	Materials for Civil and Construction Engineering	Mamlouk, M.S., and Zaniewski, J.P	Pearson Publishers	4th Edition, 2017
6	Building Construction	Rangwala, S.C and Dalal, KB	Charotar Publishing house	34 th Edition 2022
7	Construction Technology Vol.ItoIV	Chudley, R	Longman group, England Course Plan	2 nd Edition 2014
8	Building Construction Volumes I to 4	Mckay, W.B. and Mckay, J.K	Pearson India Education Services	5 th Edition
9	Engineering Geology	Duggal S. K., Pandey H.K. and Rawat N,	Mcgraw Hill Education, New Delhi	1 st Edition 2017
10	Latest Building codes and related rules and regulations.			

Video Links (NPTEL, SWAYAM...)	
Module No.	Link ID
1	https://nptel.ac.in/courses/112/105/112105123/ https://nptel.ac.in/courses/112/106/112106133/ https://nptel.ac.in/courses/112/105/112105129/
2	https://nptel.ac.in/courses/112/105/112105171/ https://nptel.ac.in/courses/112/105/112105268/ https://archive.nptel.ac.in/courses/112/107/112107145
3	https://archive.nptel.ac.in/courses/105/106/105106201/
4	https://archive.nptel.ac.in/courses/105/106/105106206/

SEMESTER S1

COURSE NAME: Algorithmic Thinking with Python

(Common to All Branches)

Course Code	UCEST105	CIE Marks	40
Teaching Hours/Week (L: T:P: R)	3:0:2:0	ESE Marks	60
Credits	4	Exam Hours	2.30
Prerequisites (if any)	None	Course Type	Theory

Course Objectives:

1. Provide a comprehensive understanding of algorithmic thinking and its practical applications.
2. Explore algorithmic paradigms including brute force, divide-and-conquer, dynamic programming and heuristics in solving complex problems.

SYLLABUS

Module No.	Syllabus Description	Contact Hours
1	<p>PROBLEM-SOLVING STRATEGIES - Problem-solving strategies defined - Importance of Understanding Multiple Problem-solving Strategies - Trial and Error - Algorithm and Heuristic - Means-Ends Analysis</p> <p>THE PROBLEM SOLVING PROCESS - Computer as a model of computation - Understanding the Problem - Formulating a Model - Developing an Algorithm - Writing the Program - Testing the Program - Evaluating the Solution</p> <p>ESSENTIALS OF PYTHON PROGRAMMING - Creating and using Variables in Python, Numeric types in Python, Using strings in Python, Using the math module, Using the Python Standard Library for handling file I/O, basic mathematics, etc</p> <p>Using the NumPy library</p>	8

<p style="text-align: center;">2</p>	<p>ALGORITHMS - The Notion of Algorithm : Reasons for Algorithm, Steps Involved in Algorithm Development, Characteristics of Algorithm, Representation of Algorithms, Representative Algorithms for Simple Problems, Measuring Efficiency of Algorithms, Advantages and Disadvantages of Algorithms.</p> <p>FLOWCHARTS - Concept of Flowcharts; Symbols used in Creating a Flowchart : Basic Symbols, Intermediate and Advanced Symbols, Common Types of Flowchart Types, Areas for using Flowcharts, Considerations in Flowcharting, Sample Flowcharts, Differences between Algorithm and Flowchart, Advantages of Flowcharts</p> <p>PSEUDOCODE - Meaning and Definition of Pseudocode, Reasons for using Pseudocode, The main constructs of pseudocode, Rules for writing pseudocode, Advantages of pseudocode, Worked Examples.</p>	<p style="text-align: center;">10</p>
<p style="text-align: center;">3</p>	<p>IMPLEMENTATION STRATEGIES (CONTROL STRUCTURES)</p> <p>SELECTION AND ITERATION USING PYTHON - Using If - Else, Elif, For Loops, range(), While Loops function in Python</p> <p>Creating and using Arrays in Python</p> <p>DECOMPOSITION AND MODULARISATION - Decomposition : Approach to Problem Decomposition, Modularisation, Motivations for Modularisation, Basic concept of Modularisation : Program Control Function, Specific Task Function, Basic Properties of Modularity, Advantages of modularisation in Programming, Creating and using Functions in Python, Functions with multiple return values.</p> <p>RECURSION - Recursion Defined, Reasons for using Recursion, The Call Stack, Recursion and the Stack, Avoiding Circularity in Recursion, Overhead of Recursion.</p>	<p style="text-align: center;">11</p>
<p style="text-align: center;">4</p>	<p>COMPUTATIONAL APPROACHES TO PROBLEM SOLVING -</p> <p>(Introductory diagrammatic/algorithmic explanations are enough. Analysis not required).</p> <p>Brute-force Approach -</p> <p>Divide-and-conquer Approach -</p> <ul style="list-style-type: none"> - Example: The Merge Sort Algorithm - Advantages of Divide and Conquer Approach - Disadvantages of Divide and Conquer Approach <p>Dynamic Programming Approach</p> <ul style="list-style-type: none"> - Example: Fibonacci series - Recursion vs Dynamic Programming <p>Greedy Algorithm Approach</p> <ul style="list-style-type: none"> - Characteristics of the Greedy Algorithm - Motivations for Greedy Approach - Greedy Algorithms vs Dynamic Programming <p>Randomized Approach.</p>	<p style="text-align: center;">8</p>

Course Assessment Method
(CIE: 40 marks , ESE: 60 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Continuous Assessment (Accurate Execution of Programming Tasks)	Internal Examination-1 (Written Examination)	Internal Examination-2 (Written Examination)	Internal Examination- 3 (Lab Examination)	Total
5	5	10	10	10	40

End Semester Examination Marks (ESE)

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions

Part A	Part B	Total
<ul style="list-style-type: none"> • 2 Questions from each module. • Total of 8 Questions, each carrying 3 marks <p style="text-align: center;">(8x3 =24marks)</p>	<ul style="list-style-type: none"> • Each question carries 9 marks. • Two questions will be given from each module, out of which 1 question should be answered. • Each question can have a maximum of 3 sub divisions. <p style="text-align: center;">(4x9 = 36 marks)</p>	60

Course Outcomes (COs)

At the end of the course students should be able to:

Course Outcome		Bloom's Knowledge Level (KL)
CO1	Understand the role of a computer as a model of computation in solving problems.	K2
CO2	Develop skills to understand a problem before attempting to solve it and formulate a clear and accurate model to represent the problem.	K3
CO3	Create effective algorithms to solve formulated models and translate algorithms into executable programs.	K3
CO4	Infer the problem-solving strategies, a systematic approach to solving computational problems, and essential Python programming skills	K2

Note: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create

CO-PO Mapping Table:

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

Reference Books				
Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Creative Problem Solving: An Introduction	Donald Treffinger., Scott Isaksen, Brian Stead-Doval	Prufrock Press	2005
2	Psychology (Ch. Problem Solving.)	Spielman, R. M., Dumper, K., Jenkins, W., Lacombe, A., Lovett, M., & Perlmutter, M	H5P Edition	2021
3	Computer Arithmetic Algorithms	Koren, Israel	AK Peters/CRC Press	2018
4	INTRODUCTION TO COMPUTATION AND PROGRAMMING USING PYTHON	Gutttag John V	PHI	2nd Edn., 2016
5	Python for Everyonr	Cay S. Horstmann, Rance D. Necaise	Wiley	
6	Computational Thinking : A Primer for Programmers and Data Scientists	G Venkatesh Madhavan Mukund	MySpot Education Services Private Limited	2020
7				

Video Links (NPTEL, SWAYAM...)	
Module No.	Link ID
1	https://opentextbc.ca/h5pppsychology/chapter/problem-solving/
2	https://onlinecourses.nptel.ac.in/noc21_cs32/preview

1. Continuous Assessment (5 Marks)

Accurate Execution of Programming Tasks

- Correctness and completeness of the program
- Efficient use of programming constructs
- Handling of errors
- Proper testing and debugging

2. Evaluation Pattern for Lab Examination (10 Marks)

1. Algorithm (2 Marks)

Algorithm Development: Correctness and efficiency of the algorithm related to the question.

2. Programming (3 Marks)

Execution: Accurate execution of the programming task.

3. Result (3 Marks)

Accuracy of Results: Precision and correctness of the obtained results.

4. Viva Voce (2 Marks)

Proficiency in answering questions related to theoretical and practical aspects of the subject.

Sample Classroom Exercises:

1. Identify ill-defined problem and well-defined problems
2. How do you differentiate the methods for solving algorithmic problems: introspection, simulation, computer modelling, and experimentation?
3. Use cases for Trial and error, Algorithm, Heuristic and Means-ends analysis can be applied in proffering solution to problems
4. Use a diagram to describe the application of Tower of Hanoi in choosing and analysing an action at a series of smaller steps to move closer to the goal
5. What effect will be generated if the stage that involves program writing is not observed in the problem solving process?
6. What effect will be generated if the stage that involves program writing is not observed in the problem solving process?
7. Evaluate different algorithms based on their efficiency by counting the number of steps.
8. Recursive function that takes a number and returns the sum of all the numbers from zero to that number.
9. Recursive function that takes a number as an input and returns the factorial of that number.
10. Recursive function that takes a number 'n' and returns the nth number of the Fibonacci number.
11. Recursive function that takes an array of numbers as an input and returns the product of all the numbers in the list.

LAB Experiments:

1. Demonstrate about Basics of Python Programming
2. Demonstrate about fundamental Data types in Python Programming. (i.e., int, float, complex, bool and string types)
3. Demonstrate different Arithmetic Operations on numbers in Python.
4. Create, concatenate, and print a string and access a sub-string from a given string.
5. Familiarize time and date in various formats (Eg. “Sun May 29 02:26:23 IST 2017”)
6. Write a program to create, append, and remove lists in Python using numPy.
7. Programs to find the largest of three numbers.
8. Convert temperatures to and from Celsius, and Fahrenheit. [Formula: $c/5 = f-32/9$]
9. Program to construct the stars(*) pattern, using a nested for loop
10. Program that prints prime numbers less than 20.
11. Program to find the factorial of a number using Recursion.
12. Recursive function to add two positive numbers.
13. Recursive function to multiply two positive numbers
14. Recursive function to the greatest common divisor of two positive numbers.
15. Program that accepts the lengths of three sides of a triangle as inputs. The program output should indicate whether or not the triangle is a right triangle (Recall from the Pythagorean Theorem that in a right triangle, the square of one side equals the sum of the squares of the other two sides). Implement using functions.
16. Program to define a module to find Fibonacci Numbers and import the module to another program.
17. Program to define a module and import a specific function in that module to another program.
18. Program to check whether the given number is a valid mobile number or not using functions?
Rules:
 1. Every number should contain exactly 10 digits.
 2. The first digit should be 7 or 8 or 9

SEMESTER S1

COURSE NAME: ENGINEERING WORKSHOP

Course Code	GCESL106	CIE Marks	50
Teaching Hours/Week (L: T:P: R)	0-0-2-0	ESE Marks (Internal only)	50
Credits	1	Exam Hours	2 Hrs
Prerequisites (if any)	None	Course Type	Lab

Course Objectives:

1. Understand and learn various mechanical workshop specializations and operations by practice.
2. Learn and practice safe and sustainable measures in a workplace according to the nature of operations.
3. Learn and Practice various techniques of taking measurement of plane and sloping ground levels
4. Understand and learn to handle conventional construction materials and building practices.

Expt. No.	Experiments
1	General: Introduction to workshop practice, Safety precautions, Shop floor ethics, and Basic First Aid knowledge. Study of mechanical and measurement tools, components and their applications: (a) Tools: screw drivers, spanners, Allen keys, cutting pliers etc. and accessories (b) bearings, seals, O-rings, circlips, keys etc.(c)Vernier Calipers, Height Gauge, Depth Gauge, Micrometers, Bevel Protractor etc.
2	Carpentry: Understanding carpentry tools and knowledge of at least one model 1. T –Lap joint 2. Cross lap joint 3. Dovetail joint 4. Mortise joints
3	Foundry: Understanding of foundry tools and knowledge of at least one model 1. Bench Moulding 2. Floor Moulding 3. Core making 4. Pattern making
4	Sheet Metal: Understanding sheet metal working tools and knowledge of at least one model 1. Cylindrical shape 2. Conical shape 3. Prismatic shaped job from sheet metal
5	Fitting: Understanding the tools used for fitting and knowledge of at least one model 1. Square Joint 2. V- Joint 3. Male and female fitting
6	Plumbing: - Understanding plumbing tools and pipe joints, along with practicing one exercise on joining pipes using a minimum of three types of pipe joints
7	Smithy: - Understanding the tools used in smithy. Demonstrating the forge-ability of different materials (MS, Al, alloy steel and cast steels) in both cold and hot states. Observing the qualitative difference in the hardness of these materials. Minimum any one exercise on smithy 1. Square prism

8	Welding: Understanding welding equipment and practicing at least one welding technique, such as making joints using electric arc welding. Bead formation in horizontal, vertical and overhead positions
9	Rolling: - Objective of rolling, rolling process, practical on two high rolling mill
10	Electroplating: -Electroplating a given job
11	Metrology: Common measuring instruments used in workshop, experiments to find the angle of a dovetail, angle of a taper and the radius of a circular surface. Introduction to instruments Vernier Bevel Protractor, Vernier Depth Gauge, Vernier Height Gauge.
12	Assembly: Demonstration only Disassembling and assembling of 1. Cylinder and piston assembly 2. Tail stock assembly 3. Bicycle 4. Pump or any other machine
13	Machines: Demonstration of the following machines: Shaping and slotting machine; Milling machine; Grinding Machine; Lathe; Drilling Machine.
14	Modern manufacturing methods (Fablab/IDEALab - Demonstration only): Power tools, CNC machine tools, 3D printing, Soft Materials cutting using special machines
15	Use of proper Personal Protective Equipments. Measurements using Tape, Ruler, Vernier calliper, screw gauge
16	Measuring the area of a plot with an irregular boundary using a chain and cross staff
17	Measuring the area of a building using Distomat
18	Finding the level difference between two points using dumpy level
19	Onsite quality assessment of brick, and cement
20	Construct a 1 and 1 ½ thick brick wall with a height of 50 cm and a minimum length of 60 cm using English bond. Check the verticality of the wall
21	Construct a 1 and 1 ½ thick brick wall with a height of 50 cm and a minimum length of 60 cm using Flemish bond. Check the verticality of the wall
22	Estimate the number of different types of building blocks needed to construct the walls of a room measuring 2m x 3m, accounting for standard-sized doors and windows.
23	Setting out of a two roomed building using thread, tape and water tube levelling.
24	Conduct a market study to understand the types, prices, and general specifications of any two construction materials available in the market (such as bricks, cement, aggregates, steel, plumbing items, etc.).
25	Studying the tools and testing instruments for electrical works. Wiring a light or a fan circuit using one way and two-way switch.
26	Familiarization/Application of testing instruments and commonly used tools in electronic works. [Multimeter, Soldering iron, De-soldering pump, Pliers, Cutters, Wire strippers, Screw drivers, Tweezers, Crimping tool, Hot air soldering and desoldering station etc.]

Course Assessment Method
(CIE: 50 marks, ESE: 50 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Preparation/Pre-Lab Work, experiments, Viva and Timely completion of Lab Reports / Record (Continuous Assessment)	Total
5	45	50

End Semester Examination Marks (ESE): (Internal evaluation only)

Procedure/ Preparatory work/Design/ Algorithm	Conduct of experiment/ Execution of work/ troubleshooting/ Programming	Result with valid inference/ Quality of Output	Viva voce	Record	Total
10	15	10	10	5	50

- *Submission of Record: Students shall be allowed for the end semester examination only upon submitting the duly certified record.*
- *Minimum Pass Mark: The requirement for passing the lab course included in the first-year curriculum is that the student must score a minimum of 50% overall, combining marks from both Continuous Internal Evaluation (CIE) and End Semester Examination (ESE). There is no separate minimum requirement for each component.*
- *There will not be any relaxation in the attendance requirement.*

Course Outcomes (COs)

At the end of the course students should be able to:

Course Outcome		Bloom's Knowledge Level (KL)
CO1	Identify workshop operations and instruments in accordance with the material and objects	K3
CO2	Understand appropriate tools and instruments with respect to the workshop specializations	K3
CO3	Understand the industrial and practical relevance of various mechanical operations like industrial coating, metal rolling, Digital subtractive and additive operations etc.	K3
CO4	Understand the common practices of measurements of a plot	K3
CO5	Understand common quality assessment techniques of bricks and simple construction practices using bricks.	K3
CO6	Understand the market rates of conventional building materials	K3

Note: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create

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

CO-PO Mapping Table:

Text Books				
Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Mechanical Workshop Practice	K C John	PHI Learning	Edition 2 2010
2	Engineering Materials	S C Rangwala	Charotar Publishing House Pvt Limited	Edition 43 2019
3	Building Materials	S K Duggal	New Age International	Edition 6 2025
4	Indian Practical Civil Engineering Handbook	Khanna P.N,	UBS Publishers Distributers (P) Ltd.	Year 2012
5	Building Construction	Arora S.P and Bindra S.P,	Dhanpat Rai Publications	Edition 5 Year 2022

Reference Books				
Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Elements of Workshop Technology Vol-1-Manufacturing Processes	S K Hajra Choudhury A K Hajra Choudhury Nirjhar Roy	MPP Media Promoters and Publishers	2008

Video Links (NPTEL, SWAYAM...)	
Module No.	Link ID
1	https://archive.nptel.ac.in/courses/105/106/105106206/
2	https://archive.nptel.ac.in/courses/105/106/105106201/
3	https://archive.nptel.ac.in/courses/105/104/105104101/
4	https://archive.nptel.ac.in/courses/117/106/117106108/

Continuous Assessment (45 Marks)

1. Preparation and Pre-Lab Work (10 Marks)

- Pre-Lab Assignments: Assessment of pre-lab assignments or quizzes that test understanding of the upcoming experiment.
- Understanding of Theory: Evaluation based on students' preparation and understanding of the theoretical background related to the experiments.

2. Conduct of Experiments (15 Marks)

- Procedure and Execution: Adherence to correct procedures, accurate execution of experiments, and following safety protocols.
- Skill Proficiency: Proficiency in handling equipment, accuracy in observations, and troubleshooting skills during the experiments.
- Teamwork: Collaboration and participation in group experiments.

3. Lab Reports and Record Keeping (10 Marks)

- Quality of Reports: Clarity, completeness and accuracy of lab reports. Proper documentation of experiments, data analysis and conclusions.
- Timely Submission: Adhering to deadlines for submitting lab reports/rough record and maintaining a well-organized fair record.

4. Viva Voce (10 Marks)

- Oral Examination: Ability to explain the experiment, results and underlying principles during a viva voce session.

Evaluation Pattern for End Semester Examination (50 Marks)

1. Procedure/Preliminary Work/Design/Algorithm (10 Marks)

- Procedure Understanding and Description: Clarity in explaining the procedure and understanding each step involved.
- Preliminary Work and Planning: Thoroughness in planning and organizing materials/equipment.
- Algorithm Development: Correctness and efficiency of the algorithm related to the experiment.
- Creativity and logic in algorithm or experimental design.

2. Conduct of Experiment/Execution of Work/Programming (15 Marks)

- Setup and Execution: Proper setup and accurate execution of the experiment or programming task.

3. Result with Valid Inference/Quality of Output (10 Marks)

- Accuracy of Results: Precision and correctness of the obtained results.
- Analysis and Interpretation: Validity of inferences drawn from the experiment or quality of program output.

4. Viva Voce (10 Marks)

- Ability to explain the experiment, procedure results and answer related questions
- Proficiency in answering questions related to theoretical and practical aspects of the subject.

5. Record (5 Marks)

- Completeness, clarity, and accuracy of the lab record submitted

SEMESTER 2

Dr.

SEMESTER S2

COURSE NAME: Mathematics for Physical Science – 2

Course Code	GYMAT201	CIE Marks	40
Teaching Hours/Week (L: T:P: R)	3:0:0:0	ESE Marks	60
Credits	3	Exam Hours	2Hr. 30 Min.
Prerequisites (if any)	Basic knowledge in single variable calculus.	Course Type	Theory

Course Objectives:

- To provide a comprehensive understanding of partial derivatives, multiple integrals, and differentiation and integration of vector-valued functions emphasizing their applications in engineering contexts.

SYLLABUS

Module No.	Syllabus Description	Contact Hours
1	Limits and continuity, Partial derivatives, Partial derivatives of functions with two variables, Partial derivatives viewed as rate of change and slopes, Partial derivatives of functions with more than two variables, Higher order partial derivatives, Local Linear approximations, Chain rule, Implicit differentiation, Maxima and minima of functions of two variables - relative maxima and minima (Text 1: Relevant topics from sections 13.2, 13.3, 13.4, 13.5, 13.8)	9
2	Double integrals, Reversing the order of integration in double integrals, Change of coordinates in double integrals (Cartesian to polar), Evaluating areas using Double integrals, Finding volumes using double integration, Triple integrals, Volume calculated as triple integral, Triple integral in Cartesian and cylindrical coordinates. (Text 1: Relevant topics from section 14.1, 14.2, 14.3, 14.5, 14.6)	9
3	Vector valued function of single variable - derivative of vector valued function, Concept of scalar and vector fields, Gradient and its properties, Directional derivative, Divergent and curl, Line integrals of vector fields, Work done as line integral, Conservative vector field, independence of path, Potential function (results without proof). (Text 1: Relevant topics from section 12.1, 12.2, 13.6, 15.1, 15.2, 15.3)	9
4	Green's theorem (for simply connected domains, without proof) and applications to evaluating line integrals, finding areas using Greens theorem, Surface integrals over surfaces of the form $z=g(x, y)$, Flux integrals over surfaces of the form $z = g(x, y)$, Divergence theorem (without proof), Using Divergence theorem to find flux, Stokes theorem (without proof) (Text 1: Relevant topics from section 15.4, 15.5, 15.6, 15.7,15.8)	9

Course Assessment Method
(CIE: 40 marks , ESE: 60 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Assignment/ Microproject	Internal Examination-1 (Written)	Internal Examination- 2 (Written)	Total
5	15	10	10	40

End Semester Examination Marks (ESE)

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions

Part A	Part B	Total
<ul style="list-style-type: none"> • 2 Questions from each module. • Total of 8 Questions, each carrying 3 marks <p style="text-align: center;">(8x3 =24marks)</p>	<ul style="list-style-type: none"> • Each question carries 9 marks. • Two questions will be given from each module, out of which 1 question should be answered. • Each question can have a maximum of 3 sub divisions. <p style="text-align: center;">(4x9 = 36 marks)</p>	60

Course Outcomes (COs)

At the end of the course students should be able to:

Course Outcome		Bloom's Knowledge Level (KL)
CO1	Compute the partial and total derivatives and maxima and minima of multivariable functions and to apply in engineering problems.	K3
CO2	Understand theoretical idea of multiple integrals and to apply them to find areas and volumes of geometrical shapes.	K3
CO3	Compute the derivatives and line integrals of vector functions and to learn their applications.	K3
CO4	Apply the concepts of surface and volume integrals and to learn their inter-relations and applications.	K3

Note: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create

CO-PO Mapping Table:

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

Text Books				
Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Calculus	H. Anton, I. Biven, S.Davis	Wiley	12 th edition, 2024

Reference Books				
Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Thomas' Calculus	Maurice D. Weir, Joel Hass, Christopher Heil, Przemyslaw Bogacki	Pearson	15 th edition, 2023
2	Essential Calculus	J. Stewart	Cengage	2 nd edition, 2017
3	Advanced Engineering Mathematics	Erwin Kreyszig	John Wiley & Sons	10 th edition, 2016
4	Bird's Higher Engineering Mathematics	John Bird	Taylor & Francis	9 th edition, 2021
5	Higher Engineering Mathematics	B. V. Ramana	McGraw-Hill Education	39 th edition, 2023

Video Links (NPTEL, SWAYAM...)	
Module No.	Link ID
1	https://nptel.ac.in/courses/111107108
2	https://nptel.ac.in/courses/111107108
3	https://nptel.ac.in/courses/111107108
4	https://nptel.ac.in/courses/111107108

SEMESTER S1/S2

COURSE NAME: Physics for Physical Science

(Common to Group C & D)

Course Code	GZPHT121	CIE Marks	40
Teaching Hours/Week (L: T:P: R)	3:0:2:0	ESE Marks	60
Credits	4	Exam Hours	2Hr. 30Mns.
Prerequisites (if any)	None	Course Type	Theory + Lab

Course Objectives:

1. To provide students a solid background in the fundamentals of Physics and to impart that knowledge in Physical Science & Life Science disciplines. The course is designed to develop scientific attitudes and enable the students to correlate the concepts of Physics with the core programmes.
2. To make the students gain practical knowledge to correlate the theoretical studies and to develop practical applications of engineering.

SYLLABUS

Module No.	Syllabus Description	Contact Hours
1	Laser & Fibre Optics Optical processes – Absorption-Spontaneous emission and stimulated emission, Principle of laser - conditions for sustained lasing – Population inversion- Pumping- Metastable states, Basic components of laser - Active medium - Optical resonant cavity, Construction and working of Ruby laser and CO ₂ laser, Construction and working Semiconductor laser (qualitative), Properties of laser, Applications of laser. Optic fibre-Principle of propagation of light, Types of fibres-Step index and Graded index fibres - Multimode and single mode fibers, Acceptance angle, Numerical aperture –Derivation, Applications of optical fibres - Fibre optic communication system (block diagram)	9
2	Interference and Diffraction Introduction, Principle of super position, Constructive and destructive interference, Optical path, Phase difference and path difference, Cosine law- reflected system- Condition for constructive and destructive	9

	<p>interference, Colours in thin films, Newton's Rings-Determination of refractive index of transparent liquids and wavelength, Air wedge-Measurement of thickness of thin sheets.</p> <p>Diffraction-types of diffraction, Diffraction due to a single slit, Diffraction grating – Construction - grating equation, Dispersive and Resolving Power (qualitative).</p>	
3	<p>Quantum Mechanics</p> <p>Introduction, Concept of uncertainty and conjugate observables (qualitative), Uncertainty principle (statement only), Application of uncertainty principle- Absence of electron inside nucleus - Natural line broadening, Wave function – properties - physical interpretation, Formulation of time dependent and time independent Schrodinger equations, Particle in a one- dimensional box - Derivation of energy eigen values and normalized wave function, Quantum Mechanical Tunnelling (qualitative)</p>	9
4	<p>Waves & Acoustics</p> <p>Waves- transverse and longitudinal waves, Concept of frequency, wavelength and time period (no derivation), Transverse vibrations in a stretched string- derivation of velocity and frequency - laws of transverse vibration.</p> <p>Acoustics- Reverberation and echo, Reverberation time and its significance - Sabine's Formula, Factors affecting acoustics of a building. Ultrasonics- Piezoelectric oscillator, Ultrasonic diffractometer, SONAR, NDT-Pulse echo method, medical application-Ultrasound scanning (qualitative)</p>	9

Course Assessment Method
(CIE: 40 marks , ESE: 60 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Continuous Assessment	Internal Examination-1 (Written)	Internal Examination-2 (Written)	Internal Examination- 3 (Lab Examination)	Total
5	10	10	10	5	40

End Semester Examination Marks (ESE)

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions

Part A	Part B	Total
<ul style="list-style-type: none"> 2 Questions from each module. Total of 8 Questions, each carrying 3 marks <p>(8x3 =24marks)</p>	<ul style="list-style-type: none"> Each question carries 9 marks. Two questions will be given from each module, out of which 1 question should be answered. Each question can have a maximum of 3 sub divisions. <p>(4x9 = 36 marks)</p>	60

Course Outcomes (COs)

At the end of the course students should be able to:

Course Outcome		Bloom's Knowledge Level (KL)
CO1	Describe the basic principles and properties of laser and optic fibers.	K2
CO2	Describe the phenomena of interference and diffraction of light.	K2
CO3	Describe the behaviour of matter in the atomic and subatomic level through the principles of quantum mechanics.	K2
CO4	Apply the knowledge of waves and acoustics in non-destructive testing and in acoustic design of buildings.	K3
CO5	Apply basic knowledge of principles and theories in physics to conduct experiments.	K3

Note: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create

CO-PO Mapping Table:

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

Text Books				
Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	A Textbook of Engineering Physics	M N Avadhanulu, P G Kshirsagar & TVS Arun Murthy	S Chand & Co.	2 nd Edition, 2019
2	Engineering Physics	H K Malik , A.K. Singh,	McGraw Hill Education	2 nd Edition, 2017
3	Optics	Ajoy Ghatak	Mc Graw Hill Education	6 th Edition, 2017

Reference Books				
Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Engineering Physics	G Vijayakumari	Vikas Publications	8 th Edition, 2014
2	Concepts of Modern Physics	Arthur Beiser	Tata McGraw Hill Publications	6 th Edition 2003
3	Engineering Physics	Aruldas G.	PHI Pvt. Ltd	2 nd Edition, 2015
4	Fiber Optic Communications	Gerd Keiser	Springer	2021
5	A Text Book of Engineering physics	I. Dominic, A. Nahari	OWL Publications	2 nd Edition, 2016
6	Advanced Engineering Physics	Premlet B	Phasor Books	
7	Engineering Physics	Rakesh Dogra	Katson Books	1 st Edition, 2019

Video Links (NPTEL, SWAYAM...)

Module No	Link ID
1	https://nptel.ac.in/courses/115102124 https://nptel.ac.in/courses/104104085
2	https://nptel.ac.in/courses/115105537
3	https://nptel.ac.in/courses/115102023 https://nptel.ac.in/courses/115101107
4	https://nptel.ac.in/courses/112104212 https://nptel.ac.in/courses/124105004

1. Continuous Assessment (10 Marks)

i. Preparation and Pre-Lab Work (2 Marks)

- Pre-Lab Assignments: Assessment of pre-lab assignments or quizzes that test understanding of the upcoming experiment.
- Understanding of Theory: Evaluation based on students' preparation and understanding of the theoretical background related to the experiments.

ii. Conduct of Experiments (2 Marks)

- Procedure and Execution: Adherence to correct procedures, accurate execution of experiments, and following safety protocols.
- Skill Proficiency: Proficiency in handling equipment, accuracy in observations, and troubleshooting skills during the experiments.
- Teamwork: Collaboration and participation in group experiments.

iii. Lab Reports and Record Keeping (3 Marks)

- Quality of Reports: Clarity, completeness and accuracy of lab reports. Proper documentation of experiments, data analysis and conclusions.
- Timely Submission: Adhering to deadlines for submitting lab reports/rough record and maintaining a well-organized fair record.

iv. Viva Voce (3 Marks)

- Oral Examination: Ability to explain the experiment, results and underlying principles during a viva voce session.

Final Marks Averaging: The final marks for preparation, conduct of experiments, viva, and record are the average of all the specified experiments in the syllabus.

2. Evaluation Pattern for Lab Examination (5 Marks)

1. Procedure/Preliminary Work/Conduct of Experiments (2 Marks)

- Procedure Understanding and Description: Clarity in explaining the procedure and understanding each step involved.
- Preliminary Work and Planning: Thoroughness in planning and organizing materials/equipment.
- Setup and Execution: Proper setup and accurate execution of the experiment or programming task

2. Result (2 Marks)

- Accuracy of Results: Precision and correctness of the obtained results.

3. Viva Voce (1 Marks)

- Proficiency in answering questions related to theoretical and practical aspects of the subject.

Experiment List

Experiment No.	Experiment
1	Optical fiber characteristics- Measurement of Numerical aperture.
2	Determination of wavelength of Laser using diffraction grating.
3	Measure the wavelength of Laser using a millimetre scale as a grating.
4	Determination of wavelength of a monochromatic light using Newton's Rings method.
5	Determination of diameter of wire or thickness of thin sheet using Air wedge method.
6	Determination of slit width (diffraction due to a single slit).
7	Measure wavelength of light source using diffraction grating.
8	Determination of resolving power and dispersive power of grating.
9	Characteristics of LED.
10	CRO basics-Measurement of frequency and amplitude of wave forms.
11	Solar Cell- I V and Intensity Characteristics.
12	Melde's experiment- Frequency calculation in Transverse and Longitudinal Mode.
13	LCR circuit –forced and damped harmonic oscillations.
14	Determination of wavelength and velocity of ultrasonic waves using ultrasonic diffractometer.
15	Determination of particle size of lycopodium powder.

SEMESTER S1/S2

COURSE NAME: Chemistry for Physical Science

(Group C)

Course Code	GCCYT122	CIE Marks	40
Teaching Hours/Week (L: T:P: R)	3:0:2:0	ESE Marks	60
Credits	4	Exam Hours	2Hr. 30Mns.
Prerequisites (if any)	None	Course Type	Theory

Course Objectives:

1. To equip students with a thorough understanding of chemistry concepts relevant to engineering applications.
2. Additionally, to familiarize students with applied topics such as spectroscopy, electrochemistry, and instrumental methods.
3. To raise awareness among students about environmental issues such as climate change, pollution, and waste management, which impact quality of life.

SYLLABUS

Module No.	Syllabus Description	Contact Hours
1	<p>Engineering Materials</p> <p>Fuels: Calorific value – HCV and LCV – Experimental determination of calorific value of solid fuels. Analysis of coal – Proximate analysis- Octane & Cetane Number. Biofuels- Biodiesel-Green Hydrogen.</p> <p>Lubricants: Classification - Solid, Semisolid and Liquid lubricants. Properties of lubricants - Viscosity Index, Flash point, Fire point, Cloud Point, Pour Point & Aniline Point.</p> <p>Cement: Manufacture of Portland cement – Theory of setting and hardening of cement.</p> <p>Nanomaterials: Classification based on Dimension & Materials- Synthesis – Sol gel & Chemical Reduction - Applications of nanomaterials –</p>	9

	<p>Supercapacitor Materials - Carbon Nanotubes, Fullerenes & Graphene – structure, properties & application.</p> <p>Polymers: ABS & Kevlar -Synthesis, properties and applications. Conducting Polymers- Classification – Application.</p>	
2	<p>Electrochemistry and Corrosion Science</p> <p>Electrochemical Cell- Electrode potential- Nernst equation for single electrode and cell (Numerical problems)- Reference electrodes – SHE & Calomel electrode –Construction and Working - Electrochemical series - Applications – Glass Electrode & pH Measurement-Conductivity-Measurement using Digital conductivity meter. Li-ion battery & H₂-O₂ fuel cell (acid electrolyte only) construction and working.</p> <p>Corrosion –Electrochemical corrosion mechanism (acidic & alkaline medium). - Galvanic series - Corrosion control methods - Cathodic Protection - Sacrificial anodic protection and impressed current cathodic protection –Electroplating of copper - Electroless plating of Copper</p>	9
3	<p>Instrumental Methods of Analysis</p> <p>Molecular Spectroscopy: Types of spectra- Molecular energy levels - Beer Lambert's law – Numerical problems - Electronic Spectroscopy – Principle, Types of electronic transitions –Role of Conjugation in absorption maxima - Instrumentation-Applications – Vibrational spectroscopy – Principle-Number of vibrational modes - Vibrational modes of CO₂ and H₂O – Applications</p> <p>Thermal analysis: –TGA- Principle, instrumentation (block diagram) and applications – TGA of CaC₂O₄.H₂O and polymers. DTA-Principle, instrumentation (block diagram) and applications - DTA of CaC₂O₄.H₂O.</p> <p>Chromatography- Gas Chromatography- Principle-Instrumentation-Application – Analysis of chemical composition of exhaust gases.</p> <p>Electron Microscopic Techniques: SEM - Principle, instrumentation and Applications.</p>	9
4	<p>Environmental Chemistry</p> <p>Water characteristics - Hardness - Types of hardness- Temporary and Permanent - Disadvantages of hard water -Degree of hardness (Numericals) Water softening methods-Ion exchange process-Principle, procedure and advantages. Reverse osmosis – principle, process and advantages. – Water disinfection methods – chlorination-Break point chlorination, ozone and UV irradiation. Dissolved oxygen (DO), BOD and COD- Definition & Significance</p> <p>Waste Management: Air Pollution- Sources & Effects- Greenhouse Gases- Ozone depletion. Control methods. Sewage water treatment- Primary, Secondary and Tertiary - Flow diagram -Trickling filter and UASB process. Solid waste-disposal methods- Composting, Landfill & Incineration.</p>	9

Course Assessment Method
(CIE: 40 marks, ESE: 60 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Continuous Assessment	Internal Examination-1 (Written)	Internal Examination-2 (Written)	Internal Examination- 3 (Lab Examination)	Total
5	10	10	10	5	40

End Semester Examination Marks (ESE)

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions

Part A	Part B	Total
<ul style="list-style-type: none"> • 2 Questions from each module. • Total of 8 Questions, each carrying 3 marks <p style="text-align: center;">(8x3 =24marks)</p>	<ul style="list-style-type: none"> • Each question carries 9 marks. • Two questions will be given from each module, out of which 1 question should be answered. • Each question can have a maximum of 3 sub divisions. <p style="text-align: center;">(4x9 = 36 marks)</p>	60

Course Outcomes (COs)

At the end of the course students should be able to:

Course Outcome		Bloom's Knowledge Level (KL)
CO1	Describe the use of various engineering materials in different industries.	K2
CO2	Explain the Basic Concepts of Electrochemistry and Corrosion to Explore the Possible Applications in Various Engineering Fields.	K2
CO3	Use appropriate analytical techniques for different engineering materials	K3
CO4	Outline various water treatment and waste management methods	K2

Note: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create

CO-PO Mapping Table:

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

Text Books				
Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Engineering Chemistry	B. L. Tembe, Kamaluddin, M. S. Krishnan	NPTEL Web-book	2018
2	Physical Chemistry	P. W. Atkins	Oxford University Press	International Edition- 2018
3	Instrumental Methods of Analysis	H. H. Willard, L. L. Merritt	CBS Publishers	7th Edition- 2005
4	Engineering Chemistry	Jain & Jain	Dhanpath Rai Publishing Company	17 th Edition - 2015

Reference Books				
Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Fundamentals of Molecular Spectroscopy	C. N. Banwell	McGraw-Hill	4 th edn., 1995
2	Principles of Physical Chemistry	B. R. Puri, L. R. Sharma, M. S. Pathania	Vishal Publishing Co	47th Edition, 2017
3	Introduction to Spectroscopy	Donald L. Pavia	Cengage Learning India Pvt. Ltd	2015
4	Polymer Chemistry: An Introduction	Raymond B. Seymour, Charles E. Carraher	Marcel Dekker Inc	4th Revised Edition, 1996

5	The Chemistry of Nanomaterials: Synthesis, Properties and Applications	Prof. Dr. C. N. R. Rao, Prof. Dr. h.c. mult. Achim Müller, Prof. Dr. A. K. Cheetham	Wiley-VCH Verlag GmbH & Co. KGaA	2014
6	Organic Electronics Materials and Devices	Shuichiro Ogawa	Springer Tokyo	2024
7	Principles and Applications of Thermal Analysis	Gabbot, P	Oxford: Blackwell Publishing	2008

Video Links (NPTEL, SWAYAM...)	
Module No.	Link ID
1	https://archive.nptel.ac.in/courses/104/106/104106137/ https://archive.nptel.ac.in/courses/113/105/113105102/ https://archive.nptel.ac.in/courses/113/104/113104082/ https://www.youtube.com/watch?v=BeSxFLvk1h0
2	https://archive.nptel.ac.in/courses/113/104/113104102/ https://archive.nptel.ac.in/courses/104/105/104105124/ https://archive.nptel.ac.in/courses/105/104/105104157/

Continuous Assessment (10 Marks)

Continuous assessment evaluations are conducted based on laboratory associated with the theory.

Mark distribution

1. Preparation and Pre-Lab Work (2 Marks)

- Pre-Lab Assignments: Assessment of pre-lab assignments or quizzes that test understanding of the upcoming experiment.
- Understanding of Theory: Evaluation based on students' preparation and understanding of the theoretical background related to the experiments.

2. Conduct of Experiments (2 Marks)

- Procedure and Execution: Adherence to correct procedures, accurate execution of experiments, and following safety protocols.
- Skill Proficiency: Proficiency in handling equipment, accuracy in observations, and troubleshooting skills during the experiments.
- Teamwork: Collaboration and participation in group experiments.

3. Lab Reports and Record Keeping (3 Marks)

- Quality of Reports: Clarity, completeness and accuracy of lab reports. Proper documentation of experiments, data analysis and conclusions.
- Timely Submission: Adhering to deadlines for submitting lab reports/rough record and maintaining a well-organized fair record.

2. Viva Voce (3 Marks)

- Oral Examination: Ability to explain the experiment, results and underlying principles during a viva voce session.

Final Marks Averaging: The final marks for preparation, conduct of experiments, viva, and record are the average of all the specified experiments in the syllabus.

Evaluation Pattern for Lab Examination (5 Marks)

1. Procedure/Preliminary Work/Conduct of Experiments (2 Marks)

- Procedure Understanding and Description: Clarity in explaining the procedure and understanding each step involved.
- Preliminary Work and Planning: Thoroughness in planning and organizing materials/equipment.
- Setup and Execution: Proper setup and accurate execution of the experiment or programming task.

2. Result (2 Marks)

- Accuracy of Results: Precision and correctness of the obtained results.

3. Viva Voce (1 Marks)

- Proficiency in answering questions related to theoretical and practical aspects of the subject.

List of Experiments

*Any 8 Experiments Mandatory

Expt. Nos.	Experiment
1	Estimation of iron in iron ore
2	Estimation of copper in brass
3	Determination of cell constant and conductance of solutions
4	Calibration of pH meter and determination of pH of a solution
5	Synthesis of polymers (a) Urea-formaldehyde resin (b) Phenol-formaldehyde resin
6	Determination of wavelength of absorption maximum and colorimetric estimation of Fe^{3+} in solution
7	Determination of molar absorptivity of a compound (KMnO_4 or any water-soluble food colorant)
8	Analysis of IR spectra
9	Identification of drugs using TLC
10	Estimation of total hardness of water-EDTA method
11	Estimation of dissolved oxygen by Winkler's method
12	Determination of calorific value using Bomb calorimeter
13	Determination of saponification value of a given vegetable oil
14	Determination of acid value of a given vegetable oil
15	Verification of Nernst equation for electrochemical cell.

SEMESTER 2

COURSE NAME: Engineering Graphics and Computer Aided Drawing

Course Code	GCEST203	CIE Marks	40
Teaching Hours/Week (L: T:P: R)	2-0-2-0	ESE Marks	60
Credits	3	Exam Hours	2hrs 30 minutes
Prerequisites (if any)	None	Course Type	Theory & Lab

Course Objectives:

1. Learn dimensioning and preparation of drawings
2. Learn to interpret engineering drawings
3. Learn the features of CAD software

SYLLABUS

Module No.	Syllabus Description	Contact Hours
1	Introduction: Relevance of technical drawing in engineering field. Types of lines, Dimensioning, BIS code of practice for technical drawing. (No questions for the end semester examination) Projection of points in different quadrants, Projection of straight lines inclined to one plane and inclined to both planes. Traces of a line. Inclination of lines with reference planes True length and true inclinations of line inclined to both the reference planes.	9/11hrs
2	Projection of Simple solids such as Triangular, Rectangle, Square, Pentagonal and Hexagonal Prisms, Pyramids, Cone Cylinder and tetrahedron. Projection of solids in simple position including profile view. Projection of solids with axis inclined to one of the reference planes and with axis inclined to both reference planes.	9/11hrs
3	Sections of Solids: Sections of tetrahedron, Prisms, Pyramids, Cone, Cylinder with axis in vertical position and cut by different section planes. True shape of the sections. (Exclude true shape given problems) Development of Surfaces: Development of surfaces of the solids and solids	9/11hrs

	cut by different section planes. (Exclude problems with through holes)	
4	<p>Isometric Projection: Isometric scale- Isometric View and Projections of Prisms, Pyramids, Cone, Cylinder, Frustum of Pyramid, Frustum of Cone, Sphere, Hemisphere and their combinations.</p> <p>Computer Aided Drawing (CAD): Introduction, Role of CAD in design and development of new products, Advantages of CAD. Creating two dimensional drawing with dimensions using suitable software. (CAD, only internal evaluation)</p>	9/11hrs

* Manual drafting can be done on A4, A3 or A2 sheets.

* Mini drafter is recommended but not mandatory

Course Assessment Method
(CIE: 40 marks , ESE: 60 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Assignment/ Microproject	Internal Examination-1 (Written)	Internal Examination- 2 (Written)	Total
5	15	10	10	40

End Semester Examination Marks (ESE)

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions

Part A	Part B	Total
<ul style="list-style-type: none"> • 2 Questions from each module. • Total of 8 Questions, each carrying 3 marks <p style="text-align: center;">(8x3 =24marks)</p>	<ul style="list-style-type: none"> • Each question carries 9 marks. • Two questions will be given from each module, out of which 1 question should be answered. • Each question can have a maximum of 3 sub divisions. <p style="text-align: center;">(4x9 = 36 marks)</p>	60

Course Outcomes (COs)

At the end of the course students should be able to:

Course Outcome		Bloom's Knowledge Level (KL)
CO1	Understand and plot the projection of points and lines located in different quadrants	K2/K3
CO2	Prepare multiview orthographic projections of objects by visualizing them in different positions	K3
CO3	Plot sectional views and develop surfaces of a given object	K3
CO4	Prepare pictorial drawings using the principles of isometric projection	K3
CO5	Sketch simple drawing using cad tools.	K3

Note: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create

CO-PO Mapping Table:

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

Text Books				
Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Engineering Graphics	Varghese, P. I.	V I P Publishers	1st Edition 2012
2	Engineering Graphics,	Benjamin, J.	Pentex Publishers	5 th Edition 2017
3	Engineering Graphics for degree	John, K. C.	Prentice Hall India Publishers	Published in 2011
5	Engineering Graphics,	Anilkumar, K. N.	Adhyuth Narayan Publishers	10 th Edition 2016

Reference Books				
Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Engineering Graphics with AutoCAD,	Kulkarni, D. M., Rastogi, A. P. and Sarkar, A. K.,	Prentice Hall India Publishers	Published in 2009
2	Engineering Drawing & Graphics	Venugopal, K.	New Age International Publishers	4 th edition 2007
3	Engineering Drawing	Parthasarathy, N. S., and Murali, V.	Oxford University Press	Published in 2015

Video Links (NPTEL, SWAYAM...)	
Module No.	Link ID
1	https://archive.nptel.ac.in/courses/112/102/112102304/
2	https://archive.nptel.ac.in/courses/112/102/112102304/
3	https://archive.nptel.ac.in/courses/112/102/112102304/
4	https://archive.nptel.ac.in/courses/112/102/112102304/

SEMESTER S2

COURSE NAME: BASIC ELECTRICAL & ELECTRONICS ENGINEERING

(Common to Group C &D)

Course Code	GDEST204	CIE Marks	40
Teaching Hours/Week (L: T:P: R)	4:0:0:0	ESE Marks	60
Credits	4	Exam Hours	2 Hrs. 30 Mns
Prerequisites (if any)	None	Course Type	Theory

Course Objectives:

1. Apply fundamental concepts and circuit laws to solve simple DC/AC electric circuits
2. Develop an awareness on the fundamentals of electric power generation, transmission and distribution
3. Compare different types of DC and AC motors
4. Describe the fundamental concepts of electronic components and devices
5. Outline the basic principles of an electronic instrumentation system
6. Identify important applications of modern electronics in the contemporary world

SYLLABUS

Module No.	Syllabus Description	Contact Hours
1	<p>Generation of alternating voltages: - Faradays laws of Electromagnetic induction, Generation of Alternating Voltage, Elementary Generator, Representation of ac voltage and currents, sinusoidal waveforms: frequency, period average, RMS values and form factor of waveform; (Simple numerical problems)</p> <p>DC Circuits: Resistance in Series and Parallel, Ohms Law and Kirchhoff's laws, Voltage and current divider rule (Simple numerical problems)</p> <p>AC circuits: Purely resistive, inductive and capacitive circuits; Inductive and capacitive reactance, concept of impedance. (Simple numerical problems)</p> <p>Three phase AC systems: Representation of three phase voltages; star and delta connections (balanced only), relation between line and phase voltages,</p>	11

	<p>line and phase currents</p> <p>Power in AC circuits – Power factor; active, reactive and apparent power in single phase and three phase system. (Simple numerical problems)</p>	
2	<p>Generation of electrical energy: Conventional Sources: Hydro, thermal, nuclear plants (Block diagram description)</p> <p>Introduction to non-conventional energy sources: solar, wind, small hydro plants, PV system for domestic application.</p> <p>Transformers. Principle of operation, step-up and step-down transformers</p> <p>AC power supply scheme: Single phase and three phase system, Three phase 3 wire and 4 wire systems, Transmission System, Distribution system: Feeder, distributor, service mains</p> <p>Types of Motors – Principle of Operation: Block diagram showing power stages, losses and efficiency (electrical and mechanical and overall efficiency); Simple numerical efficiency</p> <p>Introduction to different types of DC and AC motors. Classification and different type of dc and ac motors, common applications: Principle of traction and applications</p> <p>Earthing: need for earthing, Types of earthing; pipe earthing, plate earthing;</p> <p>Principle of operation of MCB, ELCB/RCCB</p>	11
3	<p>Introduction to Semiconductor devices:</p> <p>Electronic components- Passive and active components - Resistors, Capacitors and Inductors (constructional features not required): types, specifications. Standard values, colour coding.</p> <p>PN Junction diode:- Principle of operation, V-I characteristics. Bipolar Junction Transistors: PNP and NPN structures, Principle of operation</p> <p>Digital Electronics:- Binary number system, Boolean algebra and Logic Gates, Universal gates.</p> <p>Basic electronic circuits:- Rectifiers and power supplies: Block diagram description of a dc power supply, working of a full wave bridge rectifier, capacitor filter (no analysis), working of simple zener voltage regulator.</p> <p>Amplifiers:- Transistor as an amplifier, Block diagram of Public Address system</p>	11
4	<p>Electronic Instrumentation:</p> <p>Quality of measurements -accuracy, precision, sensitivity and resolution, Working principle and applications of Sensors – pressure – strain gauge, Bourden gauge, temperature – RTD, thermocouple, proximity – capacitive sensor, ultrasonic sensor and accelerometer.</p> <p>Internet of things (IoT): Introduction, architecture of IoT, Implementation of smart city – street lighting, smart parking.</p>	11

Course Assessment Method
(CIE: 40 marks , ESE: 60 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Assignment/ Microproject	Internal Examination-1 (Written)	Internal Examination- 2 (Written)	Total
5	15	10	10	40

End Semester Examination Marks (ESE)

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions

Part A	Part B	Total
<ul style="list-style-type: none"> • 2 Questions from each module. • Total of 8 Questions, each carrying 3 marks <p style="text-align: center;">(8x3 =24marks)</p>	<ul style="list-style-type: none"> • Each question carries 9 marks. • Two questions will be given from each module, out of which 1 question should be answered. • Each question can have a maximum of 3 sub divisions. <p style="text-align: center;">(4x9 = 36 marks)</p>	60

Course Outcomes (COs)

At the end of the course students should be able to:

Course Outcome		Bloom's Knowledge Level (KL)
CO1	Apply fundamental concepts and circuit laws to solve simple DC/AC electric circuits	K2
CO2	Develop an awareness on the fundamentals of electric power generation, transmission and distribution	K3
CO3	Compare different types of DC and AC motors	K2
CO4	Describe the fundamental concepts of electronic components and devices	K2
CO5	Outline the basic principles of an electronic instrumentation system	K2
	Identify important applications of modern electronics in the contemporary world	K2

Note: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create

CO-PO Mapping Table:

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

Text Books				
Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Basic Electrical Engineering	D P Kothari and I J Nagrath	Tata McGraw Hill	4/e 2019
2	Schaum's Outline of Basic Electrical Engineering	J.J.Cathey and Syed A Nasar	Tata McGraw Hill	
3	Basic Electronics: Principles and Applications	Chinmoy Saha, Arindham Halder and Debarati Ganguly	Cambridge University Press	1/e 2018
4	Basic Electrical and Electronics Engineering	D. P. Kothari and I. J. Nagrath	McGraw Hill	2/e 2020
5	The Internet of Things: How Smart TVs, Smart Cars, Smart Homes, and Smart Cities Are Changing the World	Michael Miller	QUE	1/e 2015
6	Basic Electronics and Linear Circuits	N N Bhargava D C Kulshreshtha and S. C. Gupta	McGraw Hill	2/e 2017
7	Electronic Communication Systems	Kennedy and Davis	McGraw Hill	6/e 2017

Reference Books				
Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year

1	Basic Electrical Engineering	D C Kulshreshtha	Tata McGraw Hill	2/e 2019
2	Electrical Engineering Fundamentals	Del Toro V	Pearson Education	2/e 2019
3	Basic Electrical Engineering	T. K. Nagsarkar, M. S. Sukhija	Oxford Higher Education	3/e 2017
4	Electronics: A Systems Approach	Neil Storey	Pearson	6e 2017
5	Electronic Devices and Circuit Theory	Robert L. Boylestad and Louis Nashelsky	Pearson	11e 2015
6	Principles of Electronic Communication Systems	Frenzel, L. E	McGraw Hill	4e 2016
7	Internet of Things: Architecture and Design Principles	Raj Kamal	McGraw Hill	1/e 2017
8	Electronic Communication	Dennis Roddy and John Coolen	McGraw Hill	4/e 2008
9	Basic Electrical Engineering	D C Kulshreshtha	Tata McGraw Hill	2/e 2019

SEMESTER S1/S2

COURSE NAME: HEALTH AND WELLNESS

(Common to all Groups)

Course Code	UCPWT127	CIE Marks	
Teaching Hours/Week (L: T:P: R)	1:0:1:0	ESE Marks	
Credits	1	Exam Hours	2 Hours
Prerequisites (if any)	None	Course Type	

Course Objectives:

1. This course provides essential knowledge on physical activity, health, and wellness. Students will understand body systems, exercise principles, nutrition, mental health, and disease management.
2. Students will learn about the benefits of yoga, risks of substance abuse, and basic first aid. By the end, students will be equipped to lead healthier lifestyles and design effective exercise programs.

SYLLABUS

Module No.	Syllabus Description	Contact Hours
1	Human Body Systems related to Physical activity and its functions: Respiratory System - Cardiovascular System . Musculoskeletal System and the Major Muscle groups of the Human Body. Quantifying Physical Activity Energy Expenditure and Metabolic equivalent of task (MET) Exercise Continuum: Light-intensity physical activity, Moderate - intensity physical activity, Vigorous -intensity physical activity. Defining Physical Activity, Aerobic Physical Activity, Anaerobic Physical Activity, Exercise and Health-Related Physical Fitness. FITT principle to design an Exercise programme Components of Health related Physical Fitness : - Cardiorespiratory Fitness- Muscular strength- Muscular endurance- Flexibility- Body composition.	4

2	<p>Concept of Health and Wellness: Health and wellness differentiation, Factors affecting health and wellness. Mental health and Factors affecting mental health.</p> <p>Sports and Socialization: Sports and character building - Leadership through Physical Activity and Sports</p> <p>Diet and nutrition : Exploring Micro and Macronutrients: Concept of Balanced diet Carbohydrate & the Glycemic Index Animal & Plant - based Proteins and their Effects on Human Health Dietary Fats & their Effects on Human Health Essential Vitamins and Minerals</p>	2
3	<p>Lifestyle management strategies to prevent / manage common hypokinetic diseases and disorders - Obesity - Cardiovascular diseases (e.g., coronary artery disease, hypertension) - Diabetes - Osteoporosis - Musculoskeletal disorders (e.g., osteoarthritis, Low back pain, Kyphosis, lordosis , flat foot, Knock knee)</p> <p>Meaning Aims and objectives of yoga - Classification and importance of of Yogic Asanas (Sitting, Standing, lying) Pranayama and Its Types - Active Lifestyle and Stress Management Through Yoga</p> <p>Understanding on substance abuse and addiction - Psychoactive substances & its ill effects- Alcohol- Opioids- Cannabis -Sedative - Cocaine -Other stimulants, including caffeine -Hallucinogens - Tobacco -Volatile solvents.</p>	4
4	<p>First aid and principles of First Aid : Primary survey : ABC (Airway, Breathing, Circulation). Qualities of a Good First Aider</p> <p>First aid measures for : - Cuts and scrapes - Bruises - Sprains - Strains - Fractures - Burns - Nosebleeds. First Aid Procedures: Cardiopulmonary Resuscitation (CPR) - Heimlich Maneuver - Applying a sling</p> <p>Sports injuries: Classification (Soft Tissue Injuries - Abrasion, Contusion, Laceration, Incision, Sprain & Strain)</p>	2

Additional Topics

- Need and Importance of Physical Education and its relevance in interdisciplinary context. Understanding of the Endocrine System
- Developing a fitness profile

- Healthy foods habits for prevention and progression of Lifestyle Diseases. Processed foods and unhealthy eating habits.
- Depression - Anxiety - Stress
- Different ways of carrying an injured person. Usage of Automated external defibrillator

Course Assessment Method
(CIE: 50 marks , ESE: 50 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Case Study/Micro project	Activity evaluation	Total
10	20	20	50

Course Outcomes (COs)

At the end of the course students should be able to:

Course Outcome		Bloom's Knowledge Level (KL)
CO1	Explain the different human body systems and describe various types of physical activities along with methods to measure and quantify these activities.	K2
CO2	Explain how to maintain or improve health and wellness through psychological practices, dietary habits, and sports activities.	K2
CO3	Discuss about common hypokinetic disorders and musculoskeletal disorders, and describe the importance of leading a healthy lifestyle through the practice of yoga and abstaining from addictive substances.	K2
CO4	Explain the basics of first aid and describe common sports injuries	K2

Note: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create

CO-PO Mapping Table:

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

Text Books				
Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Foundations of Nutrition	Bhavana Sabarwal	Commonwealth Publishers	1999
2	Anatomy and physiology in health and illness.	Ross and Wilson	Waugh, A., & Grant, A.	2022

Reference Books				
Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Fit to be Well Essential Concept	Thygerson, A. L., Thygerson, S. M., & Thygerson, J. S.	Jones & Bartlett Learning.	2018
2	Introduction to physical education, fitness, and sport.	Siedentop, D., & Van der Mars, H.	Human kinetics.	2022
3	Substance Use Disorders. Manual for Physicians.	Lal, R., & Ambekar, A. (2005).	National Drug Dependence Treatment Centre, New Delhi	2005
4	The exercise health connection-how to reduce your risk of disease and other illnesses by making exercise your medicine.	Nieman, D. C., & White, J. A	Public Health	1998
5	ACSM's resource manual for guidelines for exercise testing and prescription.	Lippincott Williams & Wilkins.	American College of Sports Medicine.	2012
6	Exercise Physiology: energy, nutrition and human performance.	Katch, F. I., Katch, V. L., & McArdle, W. D.	Lippincott Williams & Wilkins	2010

Method to award credit for the Health and wellness course

Students will be awarded one credit for the HEALTH AND WELLNESS course upon successful completion of the evaluation process for the following criteria.

Criteria	Title	Method of Evaluation
Criteria-1	Attendance	Attend at least 60% of both theory and practical classes. - Students who do not meet this requirement will not be eligible to proceed to attain the next criteria.
Criteria - 2	Attend the Physical Fitness Assessment criteria set forth by the FIT India Fitness Protocols and Guidelines for individuals aged 18+ to 65 years.	The faculty handling the class will use the tests from the Fitness Protocols and Guidelines for ages 18+ to 65 years, as set forth by FIT India. Measurements will be taken for all the tests of the FIT India Fitness Protocol and the evaluation will be based on the benchmark score received for the following tests: <ol style="list-style-type: none">1. V Sit Reach Test2. Partial Curl Up - 30 seconds3. Push Ups (Male) and Modified Push Up (Female)4. Two (2) Km Run/Walk Students who achieve a total benchmark score of 8 across the aforementioned 4 tests will be proclaimed as having passed the course and will be eligible for one credit.
Criteria - 3	Special Circumstances	Physically challenged and medically unfit students can opt for an objective test to demonstrate their knowledge of the subjects taught. Based on their performance in the objective test, they will be proclaimed as having passed the course and will be awarded one credit.
Criteria - 4	Special Considerations - NCC	Students who enrolled themselves in the NCC during the course period (between the start and end dates of the program) and attended 5 college level parades will be proclaimed as having passed the course and will be awarded one credit without considering their performance in Criterion 2.

Tests to evaluated as per Criterion - 2 and Benchmark Scores

V Sit Reach Test

How to Perform:

1. The subject removes their shoes and sits on the floor with the measuring line between their legs and the soles of their feet placed immediately behind the baseline, heels 8-12" apart.
2. The thumbs are clasped so that hands are together, palms facing down and placed on the measuring line.
3. With the legs held flat by a partner, the subject slowly reaches forward as far as possible, keeping the fingers on baseline and feet flexed.
4. After three tries, the student holds the fourth reach for three seconds while that distance is recorded.
5. Make sure there are no jerky movements, and that the fingertips remain level and the legs flat.

Infrastructure/Equipment Required:

1. A tape for marking the ground, marker pen, and ruler.
2. With the tape mark a straight line two feet long on the floor as the baseline, and a measurement line perpendicular to the midpoint of the baseline extending two feet on each side.
3. Use the marker pen to indicate every centimeter and millimeter along the measurement line. The point where the baseline and the measuring line intersect is the zero point.

Scoring: The score is recorded in centimeters and millimeters as the distance reached by the hand, which is the difference between the zero point (where the baseline and measuring line intersect) and the final position.

Scoring for V Sit Reach Test for Males

Level	Benchmark Score	Measurement (cm)
1	2	<11
2	4	12-13
3	6	14-17
4	7	18-19
5	8	20-21
6	9	22
7	10	>22

Scoring for V Sit Reach Test for Females

Level	Benchmark Score	Measurement (cm)
1	2	<14
2	4	15-16
3	6	17-19
4	7	20-21
5	8	22
6	9	23
7	10	>23

Partial Curl Up - 30 seconds

How to Perform:

1. The subject lies on a cushioned, flat, clean surface with knees flexed, usually at 90 degrees, with hands straight on the sides (palms facing downwards) closer to the ground, parallel to the body.
2. The subject raises the trunk in a smooth motion, keeping the arms in position, curling up the desired amount (at least 6 inches above/along the ground towards the parallel strip).
3. The trunk is lowered back to the floor so that the shoulder blades or upper back touch the floor.

Infrastructure/Equipment Required:

Flat clean cushioned surface with two parallel strips (6 inches apart), Stopwatch

Scoring: Record the maximum number of Curl ups in a certain time period 30 seconds.

Scoring for Partial Curl Up - 30 seconds Test for Males

Level	Benchmark Score	Numbers
1	2	<25
2	4	25-30
3	6	31-34
4	7	35-38
5	8	39-43
6	9	44-49
7	10	>49

Scoring for Partial Curl Up - 30 seconds Test for Females

Level	Benchmark Score	Numbers
1	2	<18
2	4	18-24
3	6	25-28
4	7	29-32
5	8	33-36
6	9	37-43
7	10	>43

Draft

Push Ups for Male/Modified Push Ups for Female

How to Perform:

1. A standard push up begins with the hands and toes touching the floor, the body and legs in a straight line, feet slightly apart, the arms at shoulder width apart, extended and at a right angle to the body.
2. Keeping the back and knees straight, the subject lowers the body to a predetermined point, to touch some other object, or until there is a 90-degree angle at the elbows, then returns back to the starting position with the arms extended.
3. This action is repeated, and the test continues until exhaustion, or until they can do no more in rhythm or have reached the target number of push-ups.
4. For Female: push-up technique is with the knees resting on the ground.

Infrastructure/Equipment Required:

Flat clean cushioned surface/Gym mat

Scoring: Record number of correctly completed pushups.

Scoring for Push Ups for Male

Level	Benchmark Score	Numbers
1	2	<4
2	4	04- 10
3	6	11 -18
4	7	19-34
5	8	35-46
6	9	47-56
7	10	>56

Scoring for Modified Push Ups for Female

Level	Benchmark Score	Numbers
1	2	0-1
2	4	2 - 5
3	6	6 -10
4	7	11 - 20
5	8	21-27
6	9	27-35
7	10	>35

Draft

2 Km Run/Walk

How to Perform:

1. Participants are instructed to run or walk 2 kms in the fastest possible pace.
2. The participants begin on signal (Starting point)- “ready, start”. As they cross the finish line, elapsed time should be announced to the participants.
3. Walking is permitted but the objective is to cover the distance in the shortest possible time.

Infrastructure/Equipment Required:

Stopwatch, whistle, marker cone, lime powder,

measuring tape, 200 or 400 m with 1.22 m (minimum 1 m) width preferably on a flat and even playground with a marking of starting and finish line. You can also use any application on your mobile phone that tells you the distance.

Scoring: Time taken for completion (Run or Walk) in min, sec.

Scoring for 2Km Run/walk for Male

Level	Benchmark Score	Minutes : Seconds
1	2	> 11:50
2	4	10:42
3	6	09:44
4	7	08:59
5	8	08:33
6	9	07:37
7	10	>07:37

Scoring for 2Km Run/walk for Female

Level	Benchmark Score	Minutes : Seconds
1	2	>13:47
2	4	12:51
3	6	12:00
4	7	11:34
5	8	10:42
6	9	09:45
7	10	>09:45

Draft

SEMESTER - S1/S2

LIFE SKILLS AND PROFESSIONAL COMMUNICATION (Common to all Branches)

Course Code	UCHUT128	CIE Marks	100
Teaching Hours/Week (L: T:P: R)	2:0:1:0	ESE Marks	0
Credits	1	Exam Hours	-
Prerequisites (if any)	None	Course Type	Activity-based learning

Course objectives:

1. Personality development by being aware of the self, communicating and connecting with others, participating in groups/teams, developing thinking skills, developing problem-solving & decision-making skills, and developing ability to exercise emotional intelligence
2. Equip students with the necessary skills to listen, read, write & speak, to comprehend and successfully convey any idea, technical or otherwise
3. Equip students to build their profile in line with the professional requirements.

Syllabus

This course has no specific syllabus showing modules and class hours. The entire course is described as specific activities completed individually or as a group.

Sl. No.	Activity	Class room (L) / Self Study (SS)	Week of completion	Group / Individual (G/I)	Marks	Skills	CO
1.1	Group formation and self-introduction among the group members	L	1	G	-	• Connecting with group members • Time management - Gantt Chart	
1.2	Familiarizing the activities and preparation of the time plan for the activities	L	1	G	-		
1.3	Preparation of Gantt chart based on the time plan	SS	1	G	2		
2.1	Take an online personality development test, self reflect and report	SS	1	I	2	• Self-awareness Writing	CO1

2.2	<p>Role-storming exercise 1: Students assume 2 different roles given below and write about their</p> <ul style="list-style-type: none"> ● Strengths, ● Areas for improvement, ● Concerns, ● Areas in which he/she hesitates to take advice, ● Goals/Expectations, <p>from the point of view of the following assumed roles</p> <p>i) their parent/guardian/mentor ii) their friend/sibling/cousin</p>	L	1	I	3	<ul style="list-style-type: none"> ● Goal setting - Identification of skills and setting goal ● Self-awareness ● Discussion in groups ● Group work- Compiling of ideas ● Mind mapping 	CO1
2.3	<p>Role-storming exercise 2: Students assume the role of their teacher and write about the</p> <ul style="list-style-type: none"> ● Skills required as a B.Tech graduate ● Attitudes, habits, approaches required and activities to be practised during their B.Tech years, in order to achieve the set goals 	SS	1	I	3		CO1
2.4	Discuss the skills identified through rolestorming exercise by each one within their own group and improvise the list of skills	L	1	G	3		CO1
2.5	Prepare a mind map based on the role-storming exercise and exhibit/present it in class	SS	2	G	3		CO1
3	Prepare a presentation on instances of empathy they have observed in their own life or in other's life	L	2 to 4	I	3		<ul style="list-style-type: none"> ● Empathy
4.1	Each student connects and networks with a minimum of 3 professionals from industry/public sector organizations/other agencies/NGOs /academia (atleast 1 through LinkedIn)	SS	3	I	3	<ul style="list-style-type: none"> ● Workplace awareness ● Listening ● Communication - interacting with people ● Networking through various media including LinkedIn ● Discussion in groups ● Report preparation ● Creativity <p>Goal setting - Preparation of action plan</p>	CO2
4.2	Interact with them to understand their workplace details including	SS	3	I	5		
4.3	Discuss the different workplace details & work readiness activities assimilated by each through the interactions within their group and compile the inputs collected by the individuals Prepare the Minutes of the discussions	SS	3	G	3		CO2
4.4	Report preparation based on the	SS	4	G	5		CO4

	discussions						
4.5	Perform a role-play based on the workplace dynamics assimilated through interactions and group discussions	L	5	G	5		CO3
4.6	Identify their own goal and prepare an action plan for their undergraduate journey to achieve the goal	SS	5	I	3		CO1
5.1	Select a real-life problem that requires a technical solution and list the study materials needed	L	6	G	3		CO3
5.2	Listen to TED talks & video lectures from renowned Universities related to the problem and prepare a one-page summary (Each group member should select a different resource)	SS	6	I	3		CO4
5.3	Use any online tech forum to gather ideas for solving the problem chosen	SS	6	G	3		CO5
5.4	Arrive at a possible solution using six thinking hat exercise	L	7	G	4		CO3
5.5	Prepare a report based on the problem-solving experience	SS	7	G	3		CO4
6.1	Linkedin profile creation	SS	1	I	2	Profile-building	CO6
6.2	Resume preparation	SS	8	I	2		CO6
6.3	Self introduction video	SS	8	I	4		CO6
7	Prepare a presentation on instances of demonstration of emotional intelligence	SS	9	I	3	Emotional intelligence	CO2
8	Prepare a short video presentation on diversity aspects observed in our society (3 to 5 minutes)	SS	10	G	4	Diversity	CO2, CO5
9	Take online Interview skills development sessions like robotic interviews; self-reflect and report	SS	10	I	2	• Interview skills	CO6
10	Take an online listening test, self reflect and report	SS	11	I	2	Listening skills	CO6
11.1	Activities to improve English vocabulary of students	L	8	I/G	5	<ul style="list-style-type: none"> • English vocabulary • English language skills • Writing • Presentation • Group work • Self-reflection 	CO4
11.2	Activities to help students identify errors in English language usage	L	9	I/G	3		CO4
11.3	Activity to help students identify commonly misspelled words, commonly mispronounced words and confusing words	L	10	I/G	2		CO4
11.4	Write a self-reflection report on the improvement in English language communication through this course	SS	12	I	2		CO4
11.5	Presentation by groups on the experience of using online collaboration tools in various group activities and time management experience as per the Gantt chart prepared	L	11 to 12	G	3		CO4, CO5

12.1	Each group prepares video content for podcasts on innovative technological interventions/research work tried out in Kerala context by academicians/professionals/Govt. agencies/research institutions/private agencies/NGOs/other agencies	SS	12	G	5	<ul style="list-style-type: none"> • Audio-visual presentations creations with the use of technology tools • Effective use of social media platforms • Profile building 	CO2, CO4, CO5
12.2	Upload the video content to podcasting platforms or YouTube	SS	12	G	1		CO5
12.3	Add the link of the podcast in their LinkedIn profile	SS	12	G	1		CO5

Course Assessment Method
(CIE: 40 marks , ESE (Internal): 60 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Continuous Assessment	Internal Examination-1 (Written)	Internal Examination-2 (Written)	Internal Examination- 3 (Lab Examination)	Total
5	10	10	10	5	40

End Semester Examination Marks (ESE): Internal Exams only

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions

Part A	Part B	Total
<ul style="list-style-type: none"> • 2 Questions from each module. • Total of 8 Questions, each carrying 3 marks <p style="text-align: center;">(8x3 =24marks)</p>	<ul style="list-style-type: none"> • Each question carries 9 marks. • Two questions will be given from each module, out of which 1 question should be answered. • Each question can have a maximum of 3 sub divisions. <p style="text-align: center;">(4x9 = 36 marks)</p>	60

Continuous internal evaluation is based on the individual and group activities as detailed in the activity table given below.

- The students should be grouped into groups of size 4 to 6 at the beginning of the semester. They should use online collaboration tools for group activities, report/presentation making and work management.
- Activities are to be distributed between 3 class hours (2L+1P) and 3.5 Self-study hours
- Marks given against each activity should be awarded fully if the students successfully complete the activity.

- Students should maintain a portfolio file with all the reports and other textual materials generated from the activities. Students should also keep a journal related to the activities undertaken.
- The portfolio and journal should be carried forward and displayed during the 7th Semester Seminar course as a part of the experience sharing regarding the skills developed through the HMC courses and Miniproject course.
- Self-reflection questions shall be given at the beginning of the semester, in between and at the end of the semester.
- Language training in Language Labs can be done during the Lab hour.

Course Outcome		Bloom's Knowledge Level (KL)
CO1	Develop the ability to know & understand oneself, show confidence in one's potential & capabilities, set goals and develop plans to accomplish tasks	K5
CO2	Develop the ability to communicate and connect with others, participate in groups/teams, empathise, respect diversity, be responsible and understand the need to exercise emotional intelligence	K5
CO3	Develop thinking skills, problem-solving and decision-making skills	K5
CO4	Develop listening, reading, writing & speaking skills, ability to comprehend & successfully convey any idea, and ability to analyze, interpret & effectively summarize textual, audio & visual content	K6
CO5	Develop the ability to create effective presentations through audio-visual mediums with the use of technology tools and initiate effective use of social media platforms & tech forums for content delivery and discussions	K6
CO6	Initiate profile-building exercises in line with the professional requirements, and start networking with professionals/academicians	K6

CO-PO Mapping

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

Note: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create

Text Books				
Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Life Skills & Personality Development	Maithry Shinde et.al.	Cambridge University Press	First Edition, 2022
2	Emotional Intelligence: Why it can matter more than IQ	Daniel Goleman	Bloomsbury, Publishing PLC	25th Anniversary Edition December 2020
3	Think Faster, Talk Smarter: How to speak successfully when you are put on the spot	Matt Abrahams	Macmillan Business	September 2023
4	Deep Work: Rules for focused success in a distracted world	Cal Newport	PIATKUS	January 2016
5	Effective Technical Communication	Ashraf Rizvi	McGraw Hill Education	2nd Edition 2017

Reference Books				
Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Life Skills for Engineers	Remesh S., Vishnu R.G.	Ridhima Publications	First Edition, 2016
2	Soft Skills & Employability Skills	Sabina Pillai and Agna Fernandez	Cambridge University Press	First Edition, 2018
3	Effective Technical Communication	Ashraf Rizvi	McGraw Hill Education	2nd Edition 2017
4	English Grammar in Use	Raymond Murphy,	Cambridge University Press India PVT LTD	5th Edition 2023
5	Guide to writing as an Engineer	David F. Beer and David McMurrey	John Willey. New York	2004

SEMESTER S2

COURSE NAME: Basic Electrical and Electronics Engineering Workshop (Common to All Groups except for Civil Engineering Branch)

Course Code	GZESL208	CIE Marks	50
Teaching Hours/Week (L: T:P: R)	0:0:2:0	ESE Marks (Internal only)	50
Credits	1	Exam Hours	2 Hrs
Prerequisites (if any)	None	Course Type	Lab

Course Objectives:

1. Demonstrate safety measures against electrical shocks
2. Develop familiarity with transformers, rheostats, batteries and earthing schemes
3. Develop the connection diagram and identify the suitable accessories necessary for wiring simple electric circuits
4. Identify various electronic components
5. Operate various measuring instruments
6. Design simple electronic circuits on breadboard and PCB
7. Build the ability to work in a team with good interpersonal skills.

Expt. No.	Experiments
1	a) Demonstrate the precautionary steps adopted in case of Electrical shocks. b) Identify different types of cables, wires, switches, fuses, fuse carriers, MCB, ELCB and MCCB, familiarise the ratings.
2	Wiring of a simple light circuit for light/ fan point (PVC conduit wiring) and a 6A plug socket with individual control.
3	Wiring of light/fan circuit using two way switches. (Staircase wiring)
4	Wiring of fluorescent lamp and a power plug (16 A) socket with a control switch.
5	Wiring of power distribution arrangement using single phase MCB distribution board with ELCB, main switch and Energy meter.
6	Familiarisation of step up and step down transformers, (use low voltage transformers) Measurement and representation of voltage and waveform to scale in graph sheet with the help of CRO

7	Familiarisation of rheostats, measurement of potential across resistance elements and introducing the concept of relative potential using a DC circuit.
8	a) Identify battery specifications using different types of batteries. (Lead acid, Li Ion, NiCd etc.) b) Familiarize different types of earthing (Pipe, Plate Earthing, Mat Schemes) and ground enhancing materials (GEM).
ELECTRONICS WORKSHOP (Minimum of 7 Experiments to be done)	
1	Familiarization/Identification of electronic components with specification (Functionality, type, size, colour coding, package, symbol and cost of -Active, Passive, Electrical, Electronic, Electro-mechanical, Wires, Cables, Connectors, Fuses, Switches, Relays, Crystals, Displays, Fasteners, Heat sink etc.)
2	Drawing of electronic circuit diagrams using BIS/IEEE symbols and Interpret data sheets of discrete components and IC's
3	Familiarization/Application of testing instruments and commonly used tools. - Multimeter, Function generator, Power supply, CRO, DSO. Soldering iron, Desoldering pump, Pliers, Cutters, Wire strippers, Screw drivers, Tweezers, Crimping tool, Hot air soldering and de- soldering station
4	Testing of electronic components using multimeter - Resistor, Capacitor, Diode, Transistor and JFET.
5	Printed circuit boards (PCB) - Types, Single sided, Double sided, PTH, Processing methods. Design and fabrication of a single sided PCB for a simple circuit.
6	Inter-connection methods and soldering practice. Bread board, Wrapping, Crimping, Soldering - types - selection of materials and safety precautions. Soldering practice in connectors and general purpose PCB, Crimping.
7	Assembling of electronic circuit/system on general purpose PCB, test and show the functioning (Any two)- <ul style="list-style-type: none"> ● Fixed voltage power supply with transformer ● Rectifier diode ● Capacitor filter ● Zener/IC regulator Square wave generation using IC 555 timer in IC base.
8	Assembling of electronic circuits using SMT (Surface Mount Technology) stations.
9	Introduction to EDA tools (such as KiCad or Xcircuit)

Course Assessment Method
(CIE: 50 marks, ESE: 50 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Preparation/Pre-Lab Work, experiments, Viva and Timely completion of Lab Reports / Record (Continuous Assessment)	Total
5	45	50

End Semester Examination Marks (ESE): (Internal evaluation only)

Procedure/ Preparatory work/Design/ Algorithm	Conduct of experiment/ Execution of work/ troubleshooting/ Programming	Result with valid inference/ Quality of Output	Viva voce	Record	Total
10	15	10	10	5	50

- *Submission of Record: Students shall be allowed for the end semester examination only upon submitting the duly certified record.*
- *Minimum Pass Mark: The requirement for passing the lab course included in the first-year curriculum is that the student must score a minimum of 50% overall, combining marks from both Continuous Internal Evaluation (CIE) and End Semester Examination (ESE). There is no separate minimum requirement for each component.*
- *There will not be any relaxation in the attendance requirement.*

Course Outcomes (COs)

At the end of the course students should be able to:

Course Outcome		Bloom's Knowledge Level (KL)
CO1	Demonstrate safety measures against electrical shocks	K2
CO2	Develop familiarity with transformers, rheostats, batteries and earthing schemes	K3
CO3	Develop the connection diagram and identify the suitable accessories necessary for wiring simple electric circuits	K3
CO4	Identify various electronic components	K2
CO5	Operate various measuring instruments	K3
CO6	Design simple electronic circuits on breadboard and PCB	K3
CO7	Build the ability to work in a team with good interpersonal skills	K3

Note: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create

CO-PO Mapping Table:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1						3						2
CO2	1					2	1					2
CO3	2					1						2
CO4	3					2						3
CO5	3				3	2			2			3
CO6	3		3	1	3	2	1		2			3
CO7									3	2		2

Text Books				
Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Electrical Design Estimating and Costing	K B Raina and S K Bhattacharya	New Age International Publishers	2/e 2024
2	Electrical Systems Design	M K Giridharan	I K International Publishing House Pvt. Ltd	3/e 2022
3	Basic Electrical Engineering	D P Kothari and I J Nagrath	Tata McGraw Hill	4/e 2019
4	Basic Electronics and Linear Circuits	NN Bhargava, D C Kulshreshtha and S C Gupta	Mc Graw Hill	2/e 2017

Continuous Assessment with equal weightage for both specialisations (45 Marks)

1. Preparation and Pre-Lab Work (10 Marks)

- Pre-Lab Assignments: Assessment of pre-lab assignments or quizzes that test understanding of the upcoming experiment.
- Understanding of Theory: Evaluation based on students' preparation and understanding of the theoretical background related to the experiments.

2. Conduct of Experiments (15 Marks)

- Procedure and Execution: Adherence to correct procedures, accurate execution of experiments, and following safety protocols.
- Skill Proficiency: Proficiency in handling equipment, accuracy in observations, and troubleshooting skills during the experiments.
- Teamwork: Collaboration and participation in group experiments.

3. Lab Reports and Record Keeping (10 Marks)

- Quality of Reports: Clarity, completeness and accuracy of lab reports. Proper documentation of experiments, data analysis and conclusions.
- Timely Submission: Adhering to deadlines for submitting lab reports/rough record and maintaining a well-organized fair record.

4. Viva Voce (10 Marks)

- Oral Examination: Ability to explain the experiment, results and underlying principles during a viva voce session.

Evaluation Pattern for End Semester Examination with equal weightage in both specialisations (50 Marks)

1. Procedure/Preliminary Work/Design/Algorithm (10 Marks)

- Procedure Understanding and Description: Clarity in explaining the procedure and understanding each step involved.
- Preliminary Work and Planning: Thoroughness in planning and organizing materials/equipment.
- Algorithm Development: Correctness and efficiency of the algorithm related to the experiment.
- Creativity and logic in algorithm or experimental design.

2. Conduct of Experiment/Execution of Work/Programming (15 Marks)

- Setup and Execution: Proper setup and accurate execution of the experiment or programming task.

3. Result with Valid Inference/Quality of Output (10 Marks)

- Accuracy of Results: Precision and correctness of the obtained results.
- Analysis and Interpretation: Validity of inferences drawn from the experiment or quality of program output.

4. Viva Voce (10 Marks)

- Ability to explain the experiment, procedure results and answer related questions
- Proficiency in answering questions related to theoretical and practical aspects of the subject.

5. Record (5 Marks)

- Completeness, clarity, and accuracy of the lab record submitted

SEMESTER S2

COURSE NAME: CIVIL ENGINEERING DRAFTING LAB

(Common to CE and CV)

Course Code	PCCEL208	CIE Marks	50
Teaching Hours/Week (L: T:P: R)	0:0:2:0	ESE Marks	50
Credits	1	Exam Hours	2 Hrs
Prerequisites (if any)	GCEST104/ Equivalent	Course Type	Practical

Course Objectives:

1. The course is designed to introduce the fundamentals of Civil Engineering Drawing and understand the principles of planning.
2. The students will be able to learn the drafting of buildings manually and using drafting software.

Details of Experiment

Expt. No	Experiment
1	Introduction to Civil Engineering Drawing, Concept of Scale, Plan, Section and Elevation. Drawing tools and accessories, Manual and Computer Aided Drafting Draw the view of simple objects (books, shelves, benches, etc.) adopting appropriate scales
2	Draw sectional details and elevation of panelled doors.
3	Draw sectional details and elevation of wooden glazed window.
4	Draw elevation, section and detailing of connection between members for steel roof truss
5	Draw plan, section and elevation of dog legged staircase
6	Prepare a model of a single storied building with card board from given drawings (Not expected to complete in the lab hours)
7	Draw plan, section and elevation of single storied residential building from the given line sketch.
8	Draw plan, section and elevation of two-storied framed building from the given line sketch.
9	Draw plan, section and elevation of an industrial building.
10	Introduction to Auto CAD : Preparation of CAD drawing of any of the building components (Expt 2-5)
11	Preparation of CAD drawing of plan, section and elevation of single storied residential building (Expt 7).

Course Assessment Method (CIE: 50 Marks, ESE 50 Marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Preparation/Pre-Lab Work, experiments, Viva and Timely completion of Lab Reports / Record. (Continuous Assessment)	Internal Exam	Total
5	25	20	50

End Semester Examination Marks (ESE):

Procedure/ Preparatory work/Design/ Algorithm	Conduct of experiment/ Execution of work/ troubleshooting/ Programming	Result with valid inference/ Quality of Output	Viva voce	Record	Total
10	15	10	10	5	50

Mandatory requirements for ESE:

- Submission of Record: Students shall be allowed for the end semester examination only upon submitting the duly certified record.
- Endorsement by External Examiner: The external examiner shall endorse the record.

Course Outcomes (COs)

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

Course Outcome		Bloom's Knowledge Level (KL)
CO1	Illustrate ability to organise civil engineering drawings systematically and professionally	K2
CO2	Illustrate the detailing of building components like doors, windows, roof trusses etc	K2
CO3	Develop the sketch of plan, front elevation and sectional elevation from line diagram.	K3
CO4	Draft the plan elevation and sectional views of the residential buildings, industrial buildings, and framed structures using software.	K3

K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create

CO-PO Mapping Table

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

1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), : No Correlation

Text Books				
Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Building Drawing and Detailing	Dr. Balagopal T.S. Prabhu	Spades Publishers, Calicut	Revised Edition 2022
2	Building Drawing With An Integrated Approach to Built Environment	Shah, M.G., Kale, C. M. and Patki, S.Y.	Tata McGraw Hill Publishing Company Limited, New Delhi	5 th edition 2017
3	Building Planning and Drawing	M.V. Chitawadagi S.S. Bhavikatti	Dreamtech Press	2019

References	
Sl. No	Title of the Book
1	National Building Code of India (refer the latest updates)
2	Kerala panchayat building rules (refer the latest updates)
3	Kerala Municipality building rules (refer the latest updates)
4	IS962: 1989 (Reaffirmed 2022) Indian Standard Code of practice for architectural And building drawings

Continuous Assessment (25 Marks)

1. Preparation and Pre-Lab Work (7 Marks)

- Pre-Lab Assignments: Assessment of pre-lab assignments or quizzes that test understanding of the upcoming experiment.
- Understanding of Theory: Evaluation based on students' preparation and understanding of the theoretical background related to the experiments.

2. Conduct of Experiments (7 Marks)

- Procedure and Execution: Adherence to correct procedures, accurate execution of experiments, and following safety protocols.
- Skill Proficiency: Proficiency in handling equipment, accuracy in observations, and troubleshooting skills during the experiments.
- Teamwork: Collaboration and participation in group experiments.

3. Lab Reports and Record Keeping (6 Marks)

- Quality of Reports: Clarity, completeness and accuracy of lab reports. Proper documentation of experiments, data analysis and conclusions.
- Timely Submission: Adhering to deadlines for submitting lab reports/rough record and maintaining a well-organized fair record.

4. Viva Voce (5 Marks)

- Oral Examination: Ability to explain the experiment, results and underlying principles during a viva voce session.

Final Marks Averaging: The final marks for preparation, conduct of experiments, viva, and record are the average of all the specified experiments in the syllabus.

Evaluation Pattern for End Semester Examination (50 Marks)

1. Procedure/Preliminary Work/Design/Algorithm (10 Marks)

- Procedure Understanding and Description: Clarity in explaining the procedure and understanding each step involved.
- Preliminary Work and Planning: Thoroughness in planning and organizing materials/equipment.
- Algorithm Development: Correctness and efficiency of the algorithm related to the experiment.
- Creativity and logic in algorithm or experimental design.

2. Conduct of Experiment/Execution of Work/Programming (15 Marks)

- Setup and Execution: Proper setup and accurate execution of the experiment or programming task.

3. Result with Valid Inference/Quality of Output (10 Marks)

- Accuracy of Results: Precision and correctness of the obtained results.
- Analysis and Interpretation: Validity of inferences drawn from the experiment or quality of program output.

4. Viva Voce (10 Marks)

- Ability to explain the experiment, procedure results and answer related questions
- Proficiency in answering questions related to theoretical and practical aspects of the subject.

5. Record (5 Marks)

- Completeness, clarity, and accuracy of the lab record submitted

Draft

PROGRAM CORE
GROUP C

SEMESTER S2

COURSE NAME: FUNDAMENTALS OF MANUFACTURING SYSTEMS AND PROCESSES

Course Code	PCPET205	CIE Marks	40
Teaching Hours/Week (L: T:P: R)	3-1-0-0	ESE Marks	60
Credits	4	Exam Hours	2 Hrs 30 Mns
Prerequisites (if any)	None	Course Type	Theory

Course Objectives:

1. Summarize about Manufacturing Systems and Strategies
2. Identify the appropriate process for a given engineering material.

SYLLABUS

Module No.	Syllabus Description	Contact Hours
1	<p>Introduction to Manufacturing Systems, Classification of Manufacturing Systems; Discreet Manufacturing, Repetitive Manufacturing, Job Shop Manufacturing, Batch Manufacturing, Continues manufacturing, Additive Manufacturing.</p> <p>Manufacturing Strategies; Lean Manufacturing, Mass Customization, Green Manufacturing, Total Quality Management, Agile Manufacturing, Just in Time.</p> <p>Original Equipment Manufacturer, Reconfigurable Manufacturing, Assembly Lines, Concept of Inventory.</p> <p>(Should cover basics concepts only)</p>	11
2	<p>Glass and Ceramic Manufacturing; Relevant Properties of glass and ceramics, Processing Steps; Mixing, melting, forming, cooling and finishing, equipment's used for processing: rotary kiln, tumbler, ball milling, hydraulic presses & jiggers.</p> <p>Plastic Manufacturing; Relevant Properties of Plastics, Processing Methods; Plastic Extrusion, Injection Moulding, Rotational Moulding, Plastic extrusion & injection blow moulding, Vacuum casting, Thermoforming &</p>	11

	<p>Vacuum forming, Compression moulding.</p> <p>Rubber Manufacturing; Relevant properties of Rubber, Processing Steps; mastication, mixing, shaping, , calendaring, curing.</p> <p>Textile Manufacturing: Weaving; Cutting. Spinning, Yarn production, Dyeing, Pattern making, Bleaching, Grading, Packing, Wet processing.</p> <p>(Should cover basics concepts only)</p>	
3	<p>Metal industries –Ferrous Metals and Alloys- -raw materials for iron making, blast furnace and electric furnace operation, shaping and finishing, application of iron and steel.</p> <p>Non-Ferrous Metals, examples of nonferrous metals- extraction of ore, smelting & refining, shaping and finishing, alloying, application of nonferrous metals.</p> <p>(Should cover basics concepts only)</p>	11
4	<p>Wood based integrated Pulp and paper mill – Wood chips production, Batch digester, Pulp washing filters, bleaching, drying and calendaring.</p> <p>Cement manufacturing process- flow diagram, raw mill circuit, cement beneficiation, Manufacturing method and equipment used in Portland cement manufacture</p> <p>Petroleum refining process- flow diagram illustrating refining of crude oil well to saleable product.</p> <p>(Should cover basics concepts only)</p>	11

Course Assessment Method
(CIE: 40 marks , ESE: 60 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Assignment/ Microproject	Internal Examination-1 (Written)	Internal Examination- 2 (Written)	Total
5	15	10	10	40

End Semester Examination Marks (ESE)

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions

Part A	Part B	Total
<ul style="list-style-type: none"> 2 Questions from each module. Total of 8 Questions, each carrying 3 marks <p>(8x3 =24marks)</p>	<ul style="list-style-type: none"> Each question carries 9 marks. Two questions will be given from each module, out of which 1 question should be answered. Each question can have a maximum of 3 sub divisions. <p>(4x9 = 36 marks)</p>	60

Course Outcomes (COs)

At the end of the course students should be able to:

Course Outcome		Bloom's Knowledge Level (KL)
CO1	Summarize about Manufacturing Systems and Strategies	K2
CO2	Explain the manufacturing processes involved in polymer, ceramic and textile industries	K2
CO3	Classify the manufacturing processes involved in metal industries.	K2
CO4	Outline the manufacturing processes involved in cement paper and petroleum industries.	K2

Note: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create

CO-PO Mapping Table:

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

Text Books				
Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Fundamentals of Modern Manufacturing, Materials, Processes and Systems	Mikell P Groover	Wiley	7th Edition, 2019

Reference Books				
Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Ceramics, Glass and Glass-Ceramics	Francesco Baino (Editor), Massimo Tomalino (Editor), Dilshat Tulyaganov(Editor),	Springer.	Kindle edition 2021
2	Modern Plastic Handbook	Charles A. Harper	McGraw Hill	1999
3	The Complete Book on Rubber Processing and Compounding Technology	NIIR Board of Consultants and Engineers	NIIR Board of Consultants and Engineers	2011
4	Textbook of Fabric Science: Fundamentals to Finishing	Seema Sekhri	PHI.	Kindle edition 2011
5	Ironmaking and Steelmaking: Theory and Practice	Ahindra Ghosh	PHI.	1 st edition 2008
6	Manufacturing Technology of Non-Ferrous Metal Products	Brahmpal Bhardwaj	Engineers India Research Institute	1 st edition 2012
7	The chemical process industries	R . Norris Shreve	Mc Graw Hill	2 nd edition 1956
8	Energy performance assessment for equipment and utility systems	Bureau of energy efficiency	Bureau of energy efficiency	4 th edition 2015

SEMESTER S2

COURSE NAME: CROP PRODUCTION & PROTECTION TECHNOLOGIES

Course Code	PCAGT205	CIE Marks	40
Teaching Hours/Week (L: T:P: R)	3:1:0:0	ESE Marks	60
Credits	4	Exam Hours	2 Hrs 30 Mns
Prerequisites (if any)	None	Course Type	Theory

Course Objectives:

1. To understand the principles of agricultural crop production and protection practices of different crops
2. To understand the role and importance of Agricultural Engineers in crop production
3. To equip the students with the basic principles of cropping and cultivation practices of important crops of Kerala.

SYLLABUS

Module No.	Syllabus Description	Contact Hours
1	<p>Introduction to agriculture -Importance of agricultural science for crop production - Branches of agricultural science-National and international agricultural research Institutes - Basic elements of crop production,- Agricultural seasons in India and Kerala.</p> <p>Classification of crops based on the intensity of cultivation, uses, life span, growth habit, and climatic response and/or habitat. Factors affecting crop growth and production: genetic (internal) and environmental (external) factors. Crop management through environmental modification and adaptation of crops to the existing environment through crop cultural practices.</p> <p>Competition among crop plants -Selection of crops- seed rate, seed treatment, raising of nursery and production of quality planting material. Field preparation for crops including systems of tillage; Spacing and arrangement of crop plants; Establishment of an adequate crop stand and ground cover. Types and methods of harvest</p>	11

<p style="text-align: center;">2</p>	<p>Crop rotation, cropping systems, cropping scheme, relay cropping, mixed cropping and intercropping.</p> <p>Soil-water-plant relationship, crop coefficients, water requirement of crops and critical stages for irrigation; Weeds and their management in crops;</p> <p>Time and method of sowing of major field crops, seed rate for important crops; Methods and time of application of manures and fertilizers, fertigation;</p> <p>Horticulture- Branches-Scope and importance; Seed rate and seed treatment for vegetable crops; Macro and micro propagation methods; Types of plant growing structures; Pruning and training; Orchard- site selection, layout and Management of orchard.</p>	<p style="text-align: center;">11</p>
<p style="text-align: center;">3</p>	<p>Definition of soil. Different functions of soil in our eco system namely as medium of plant growth, Regulator of water supply, Recycle of raw materials, Modifier of atmosphere, Habitat for organisms, Engineering medium etc. Soil profiles and horizons: O, A,B and C. Soil as an interface of solids, water and air and their percentage composition.</p> <p>Formation of soils: Weathering of rocks and minerals, Physical weathering, Biogeochemical weathering, Factors influencing soil formation, soil taxonomy orders. Important soil physical properties: texture, structure, density, porosity, consistency, temperature.</p> <p>The concepts of soil fertility and productivity. The essential elements and their functions in plants. Soil colloids – properties – nature - types and significance. Layer silicate clays - their genesis and sources of charges. Adsorption of ions - ion exchange - CEC and AEC - factors influencing ion exchange and its significance. Concept of pH - soil acidity - brief overview of saline, sodic and calcareous soils. Soil organic matter – composition – decomposability – humus.</p>	<p style="text-align: center;">11</p>
<p style="text-align: center;">4</p>	<p>Organic and inorganic fertilizers- its Importance- soil reactions. Gypsum requirement for reclamation of sodic soils and neutralizing RSC; Liquid fertilizers and their solubility and compatibility.</p> <p>Major pests and diseases of field crops and horticultural crops and their management. Integrated methods of managing water, nutrients and plant protection.</p> <p>Crop production technology of field crops in Kerala: cereal crops, grain legumes, oil seed crops, sugarcane, and fibre crops. Cultivation practices of horticultural crops: vegetable crops, fruit crops, flower crops. Basic principles of natural farming, organic farming and sustainable agriculture</p>	<p style="text-align: center;">11</p>

Course Assessment Method
(CIE: 40 marks , ESE: 60 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Assignment/ Microproject	Internal Examination-1 (Written)	Internal Examination- 2 (Written)	Total
5	15	10	10	40

End Semester Examination Marks (ESE)

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions

Part A	Part B	Total
<ul style="list-style-type: none"> • 2 Questions from each module. • Total of 8 Questions, each carrying 3 marks <p style="text-align: center;">(8x3 =24marks)</p>	<ul style="list-style-type: none"> • Each question carries 9 marks. • Two questions will be given from each module, out of which 1 question should be answered. • Each question can have a maximum of 3 sub divisions. <p style="text-align: center;">(4x9 = 36 marks)</p>	60

Course Outcomes (COs)

At the end of the course students should be able to:

Course Outcome		Bloom's Knowledge Level (KL)
CO1	Explain the general crop production techniques of field crops and horticultural crops.	K2
CO2	Describe the factors affecting crop growth and explain environmental management for crop production.	K1
CO3	Identify different crops and understand the growing seasons of major crops of Kerala	K3
CO4	Describe crop water management, nutrition management and crop protection	K4
CO5	Explain cultivation practices of various field crops and horticultural crops commonly grown in Kerala	K2

Note: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create

CO-PO Mapping Table:

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

Text Books				
Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Textbook of Field Crops Production Vol 1: Foodgrain Crops (PB)	Dr. Rajendra Prasad	Indian Council of Agricultural Research, New Delhi	First Edition, 2006
2	Textbook of Field Crops Production: Commercial Crops Vol. II	Dr. Rajendra Prasad	Indian Council of Agricultural Research, New Delhi	First Edition, 2006
3	Principles of Agronomy	T. Yellamanda Reddy and G.H.Sankara Reddy	Kalyani Publishers, New Delhi	First Edition, 2005
4	Fundamentals of Agronomy	Amal Saxena and Lal Singh	Write And Print Publications, New Delhi	First Edition, 2008
5	Text Book of Soil Science.	Biswas, T.D. and Mukherjee, S.K.	Tata McGraw Hill Publishing Co., New Delhi	
6	Introductory Soil Science.	Das.D.K	Kalyani Publishers, New Delhi	

Reference Books				
Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Handbook of Agriculture.		ICAR Publications, New Delhi	6th Revised Edition, 2011.
2	Vegetable Crops of India.	Das P.C.	Kalayani Publishers, New Delhi	1993
3	Fundamentals of Agronomy.	De, G.C.	Oxford & IBH Publishing Co Pvt Ltd, New Delhi	1989
4	Introduction to Horticulture	Kumar N.	Rajalakshmi Publications, Nagarcoil	7 th Edition, 2015
5	Nature and Properties of Soils.	Brady, N.C	Pearson	

Video Links (NPTEL, SWAYAM...)

Module No.	Link ID
1	https://youtu.be/3JobwSAvEcw ; https://youtu.be/PKNWeCbMVWk
2	https://youtu.be/4PTywZ_VWYA ; https://youtu.be/PKNWeCbMVWk
3	https://youtu.be/N5V_3WdDvlM
4	https://youtu.be/r_lhap2hDdk ; https://youtu.be/_CyFdcokjMA https://youtu.be/_CyFdcokjMA

SEMESTER S2

COURSE NAME: FUNDAMENTALS OF AERONAUTICS AND AIRCRAFT INSTRUMENTS

Course Code	PCAOT205	CIE Marks	40
Teaching Hours/Week (L: T:P:R)	3:1:0:0	ESE Marks	60
Credits	4	Exam Hours	2Hrs 30Mns
Prerequisites (if any)	NIL	Course Type	Theory

Course Objectives:

1. Introduce the basic concepts of aeronautics
2. Discuss about instruments, display and navigation systems employed in aircraft.

SYLLABUS

Module No.	Syllabus Description	Contact Hours
1	Atmospheric properties: Physical properties and structure of atmosphere- temperature, pressure and altitude relations. Basic concepts of Aeronautics: Laws of motion applied to aeronautics. Aerodynamic forces, Nomenclature and Classification of airfoil, mean aerodynamic chord, Centre of pressure and aerodynamic center, Types of drag - reduction techniques, Aerofoil characteristics: lift and drag curves, Speed of sound, Mach number, aspect ratio, wing loading. (Numericals)	11
2	Aircraft Classification and Components: Aircraft classifications. Airplane configurations based on wing, landing gear, engines attachments. Components of Wing, Fuselage-Fuselage Construction Truss, Monocoque, Semi-Monocoque. Control surfaces and maneuvers.	9
3	Basic Instruments: Pitot static system, Pitot static instruments: Altimeter, Vertical speed indicator, Airspeed indicator. Mach meter, Gyroscope, heading indicator, Turn coordinator, Engine instruments: Temperature gauges, Pressure gauges, Tachometer: Mechanical and Electrical. Modern control systems-Fly by wire systems and Auto pilot systems.	13

4	<p>Cockpit Display systems: Head Up Display, Head Down Display, Helmet Mount Display, Multifunctional Keyboard, Multifunctional Display, Direct Voice Input, Hands on Throttle and Stick.</p> <p>Navigation systems: Distance Measuring Equipment, Very High Omnidirectional Range, Automatic Direction Finder, Instrument Landing System, Microwave Landing Systems, Inertial Navigation Systems, Global Positioning System.</p>	11
----------	---	-----------

Course Assessment Method
(CIE: 40 marks , ESE: 60 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Assignment/ Microproject	Internal Examination-1 (Written)	Internal Examination- 2 (Written)	Total
5	15	10	10	40

End Semester Examination Marks (ESE)

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions

Part A	Part B	Total
<ul style="list-style-type: none"> ● 2 Questions from each module. ● Total of 8 Questions, each carrying 3 marks <p style="text-align: center;">(8x3 =24marks)</p>	<ul style="list-style-type: none"> ● Each question carries 9 marks. ● Two questions will be given from each module, out of which 1 question should be answered. ● Each question can have a maximum of 3 sub divisions. <p style="text-align: center;">(4x9 = 36 marks)</p>	60

Course Outcomes (COs)

At the end of the course students should be able to:

Course Outcome		Bloom's Knowledge Level (KL)
CO1	Understand the structure of atmosphere and basic concepts of aircraft	K2
CO2	Describe the classification, components, and maneuvers of airplane	K2
CO3	Explain the basic working principles of various aircraft instruments.	K2
CO4	Understand the principles and working of various cockpit display and aircraft navigation systems.	K2

Note: *K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create*

CO-PO Mapping Table:

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

Text Books

Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Introduction to Flight	J D Anderson Jr. and Mary L.Bowden	Mc Graw Hill	Ninth Edition 2021
2	Aircraft Instruments	EHJ Pallet	Pearson	Second Edition 2009
3	Mechanics of Flight	AC Kermode, RH Barnard, D R Philpott	Pearson	Eleventh Edition 2006
4	Flight Physics	E Torenbeek, H.Wittenberg	Springer	2009

Reference Books				
Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Flight without Formulae	A C Kermode	Pearson	
2	The Avionics Hand Book	Spitzer CR	CRC Press	Second Edition 2006
3	Avionics Training systems, Installation and troubleshooting	Len Buckwalter	Avionics Communication	Second Edition 2005
4	Fundamentals of Flight	Richard S Shevell	Pearson	

Video Links (NPTEL, SWAYAM...)	
Module No.	Link ID
1	archive.nptel.ac.in/courses/101/104/101104061/
2	archive.nptel.ac.in/courses/101/101/101101079/
3, 4	archive.nptel.ac.in/courses/101/104/101104061/