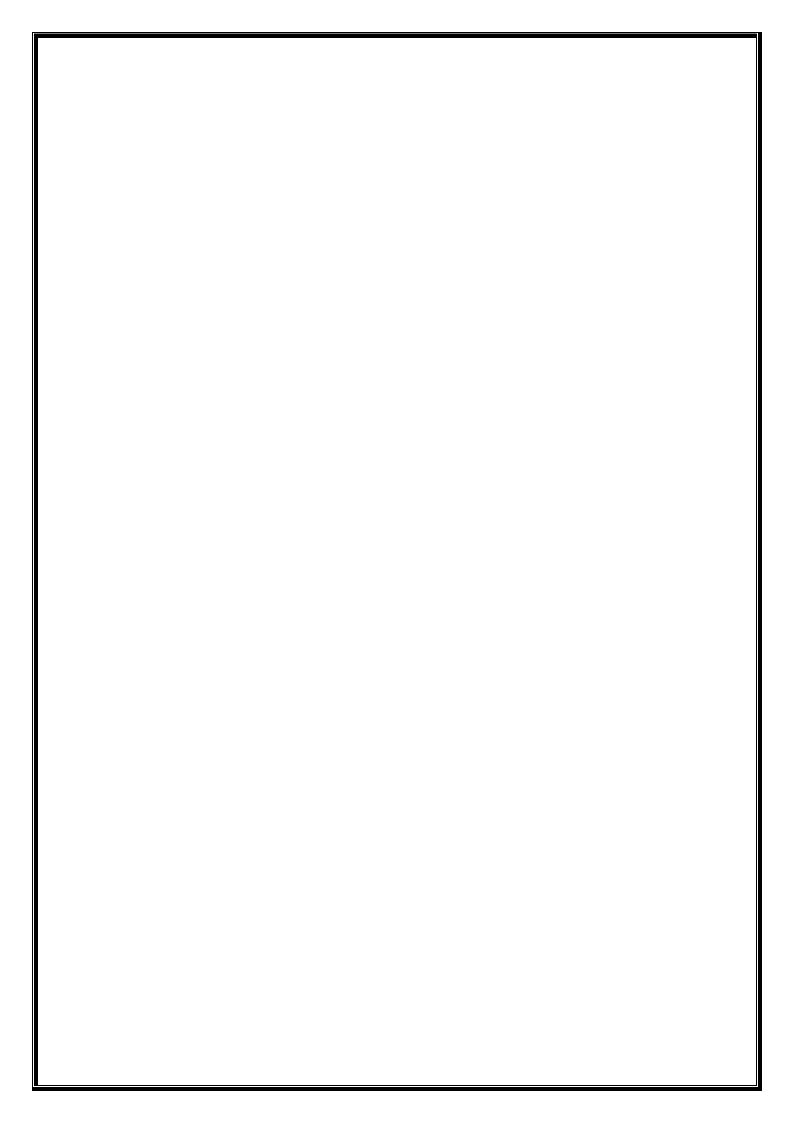


DEPARTMENT OF APPLIED SCIENCES



SCHEME & SYLLABUS OF FIRST YEAR BE
AS PER THE NATIONAL EDUCATION POLICY 2020
(COMMON TO ALL BRANCHES)
ACADEMIC YEAR 2024-25





NEW HORIZON COLLEGE OF ENGINEERING

VISION

To emerge as an institute of eminence in the fields of engineering, technology and management in serving the industry and the nation by empowering students with a high degree of technical, managerial and practical competence.

MISSION

To strengthen the theoretical, practical and ethical dimensions of the learning process by fostering a culture of research and innovation among faculty members and students.

To encourage long-term interaction between the academia and industry through their involvement in the design of the curriculum and its hands-on implementation.

To strengthen and mould students in professional, ethical, social and environmental dimensions by encouraging participation in co-curricular and extracurricular activities.

OUALITY POLICY

To provide educational services of the highest quality both curricular and co-curricular to enable students integrate skills and serve the industry and society equally well at a global level.

VALUES

Academic Freedom Innovation Integrity

Professionalism

Inclusiveness Social Responsibility

DEPARTMENT OF APPLIED SCIENCES

VISION

To build strong and sustainable platform for churning out quality students bearing appreciable conceptual knowledge and engineering mind sets to their respective branch department(s)

MISSION

To develop and nurture dedicated teachinglearning team equipped with strong personality traits towards application driven approach, encompassing all stakeholders

OUALITY POLICY

To provide education services of the highest quality both curricular and co-curricular so that our students can integrate skills and serve industry and society equally well at the Global level.

Program Outcomes as defined by NBA (PO)

Engineering Graduates will be able to:

- **1. Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- 2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- **3. Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- **4. Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- **5. Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
- **6.** The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- **7. Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- **8. Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- **9. Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- 10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- 11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
- **12. Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

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CREDIT SCHEME FOR I SEMESTER BE

AIM	AIML/ ECE/DS/ME												Chemistry Cycle		
S.		and Course	Course Title	BOS	D	Cre istril		n	Overall	Contact	Marks				
No.	,	Code			L	T	P	S	Credits	Hours	CIE	SEE	Total		
1	ASC	24MAT11	Applied Mathematics for Engineers – I	AS	2	1	1	0	4	2+2+2	50	50	100		
2	ASC	24CHE12	Applied Chemistry for Engineers	AS	3	0	1	0	4	4+2	50	50	100		
3	ESC-I	24ESC132/ 24ESC133	Basic Electrical Engineering(AIML/ECE/DS) Basic Mechanical Engineering(ME)	EEE / ME	3	0	0	0	3	4	50	50	100		
4	PLC-I	24PLC141	Problem solving using python	CS	2	0	1	0	3	3+2	50	50	100		
5	ESC	24CAD15	Computer Aided Engineering Drawing.	ME	2	0	1	0	3	5	50	50	100		
6	AEC	24ENG16	Communicative English	HSS	0	0	1	0	1	2	50	50	100		
7	HSS	24CIP17	Constitution of India and Professional Ethics	HSS	1	0	0	0	1	2	50	50	100		
8	AEC	24EDM18	Environment and Disaster Management	AS	1	0	0	0	1	2	50	50	100		
	Total								20	32	400	400	800		

CSE/	EEE											Physics (Cycle
S.	Course	and Course	G TVI	во	Credit Distribution				Overall	Conta	Marks		
No.	(Code	Course Title	S	L	T	P	S	Credits	ct Hours	CI E	SEE	Tot al
1	ASC	24MAT11	Applied Mathematics for Engineers – I	AS	2	1	1	0	4	2+2+2	50	50	100
2	ASC	24PHY12	Applied Physics for Engineers	AS	3	0	1	0	4	4+2	50	50	100
3	ESC-I	24ESC131	Basic Electronics	ECE	3	0	0	0	3	4	50	50	100
4	PLC-I	24PLC141	Problem solving using python	CS	2	0	1	0	3	3+2	50	50	100
5	ETC-I	24ETC151	Robotics and Automation	ME	3	0	0	0	3	4	50	50	100
6	AEC	24ENG16	Communicative English	HSS	0	0	1	0	1	2	50	50	100
7	HSS	24KSK17 / 24KBK17	Samskrutika Kannada/ Balake Kannada	HSS	1	0	0	0	1	2	50	50	100
8	AEC	24EIH18	Engineering Innovations in Health Care	AS	1	0	0	0	1	2	50	50	100
	Total								20	31	400	400	800

(ESC-I) Engine	ering Science Courses-I	(ETC-I) Emerging Technology Courses-I						
24ESC131	Basic Electronics	24ETC151	Robotics and Automation					
24ESC132	Basic Electrical Engineering	24ETC152	Basics of Electric Vehicles					
24ESC133	Basic Mechanical Engineering	24ETC153	Fundamentals of Internet of Things					
24ESC134	Basic Civil Engineering	24ETC154	Drone Technology					
		24ETC155	Fundamentals of Cyber Security					
(PLC-I) Progra	mming Language Courses-I	24ETC156	Nano Technology					
24PLC141	Problem Solving using Python	24ETC157	Renewable Energy Sources					
24PLC142	Problem Solving using C							
24PLC143	Basic Web Programming							

CREDIT SCHEME FOR II SEMESTER BE

CSE	E/EEE										Chemistry Cycle			
S.		Course Title		BOS	Credit Distribution				Overall	Contact	Marks			
No	Cours	se Code	Course The	DOS	L	Т	P	S	Credits	Hours	CIE	SEE	Total	
1	ASC	24MAT21	Applied Mathematics for Engineers – II	AS	2	1	1	0	4	2+2+2	50	50	100	
2	ASC	24CHE22	Applied Chemistry for Engineers	AS	3	0	1	0	4	4+2	50	50	100	
3	ESC-II	24ESC232	Basic Electrical Engineering	EEE	3	0	0	0	3	4	50	50	100	
4	ESC	24CSE24	Data Structures using C	CS	2	0	0	0	2	3	50	50	100	
5	ESC	24CSL24	Data Structures using C Lab	CS	0	0	1	0	1	2	50	50	100	
6	ESC	24CAD25	Computer Aided Engineering Drawing	ME	2	0	1	0	3	5	50	50	100	
7	AEC	24ENG26	Professional writing skills in English	HSS	1	0	0	0	1	2	50	50	100	
8	HSS	24CIP27	Constitution of India and Professional Ethics	HSS	1	0	0	0	1	2	50	50	100	
9	O TALC TOTALIMOST		Environment and Disaster Management	AS	1	0	0	0	1	2	50	50	100	
Total 20 3									32	450	450	900		

AIMI	L/ DS / EC	CE/ME									Physics Cycle			
S.	Cor	Course and		BOS	Di	Cro stril	edit oution	1	Overall	Contact	Marks			
No.	Co	ourse Code	Course Title	воз	L	Т	P	S	Credits	Hours	CIE	SEE	Tot al	
1	ASC	24MAT21	Applied Mathematics for Engineers – II	AS	2	1	1	0	4	2+2+2	50	50	100	
2	ASC	24PHY22	Applied Physics for Engineers	AS	3	0	1	0	4	4+2	50	50	100	
3	ESC-II	24ESC231	Basic Electronics	ECE.	3	0	0	0	3	4	50	50	100	
4	ESC	24CSE24	Data Structures using C	CS	2	0	0	0	2	3	50	50	100	
5	ESC	24CSL24	Data Structures using C Lab	CS	0	0	1	0	1	2	50	50	100	
6	ETC-II	24ETC251	Robotics and Automation	ME	3	0	0	0	3	4	50	50	100	
7	AEC	24ENG26	Professional writing skills in English	HSS	1	0	0	0	1	2	50	50	100	
8	HSS	24KSK27 / 24KBK27	Samskrutika Kannada/ Balake Kannada	HSS	1	0	0	0	1	2	50	50	100	
9	AEC	24EIH28	Engineering Innovations in Health Care	AS	1	0	0	0	1	2	50	50	100	
			Total						20	31	450	450	900	

(ESC-I) Engine	ering Science Courses-I	(ETC-I) Emerging Technology Courses-I						
24ESC231	Basic Electronics	24ETC251	Robotics and Automation					
24ESC232	Basic Electrical Engineering	24ETC252	Basics of Electric Vehicles					
24ESC233	Basic Mechanical Engineering	24ETC253	Fundamentals of Internet of Things					
24ESC234	Basic Civil Engineering	24ETC254	Drone Technology					
		24ETC255	Fundamentals of Cyber Security					
(PLC-I) Progra	mming Language Courses-I	24ETC256	Nano Technology					
24PLC241	Problem Solving using Python	24ETC257	Renewable Energy Sources					
24PLC242	Problem Solving using C							
24PLC243	Basic Web Programming							

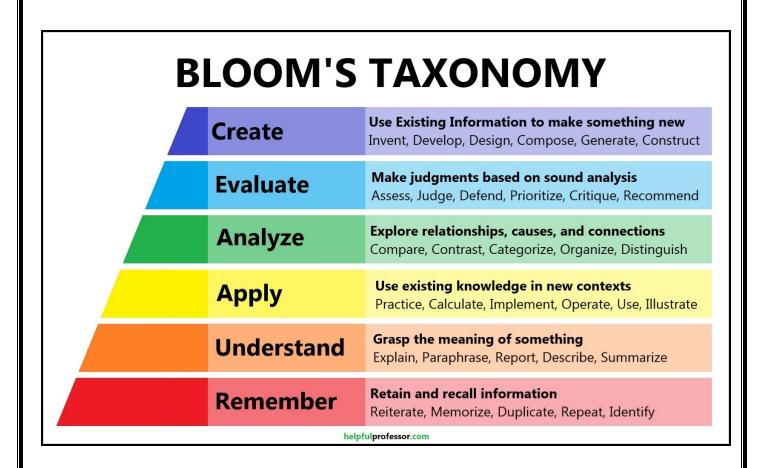
KEY WORDS AND TERMINOLOGY

Outcome Based Education (Outcome-Based Education is a student-centric teaching and learning methodology in which the course delivery, assessment are planned to achieve stated objectives and outcomes.
Board of Studies
Lecture: Tutorial: Practical: Self study
Continuous Internal Evaluation
Semester End Examination
A unit by which the course work is measured. It determines the number of hours of instructions required per week. One credit is equivalent to one hour of teaching (lecture) or two hours of tutorial or two hours practical or two hours self-study per week. Credits of a course are distributed across L: T: P: S
Course outcome (Is a statement that clearly describes what and how much or how well the student will know and be able to do after successfully completing the specified course – the essential knowledge, abilities, and attitudes that constitute the basic learning needed by a graduate of the course.
Programme Outcomes (POs are statements about the knowledge, skills and attitudes (attributes) the graduate of a formal engineering program should have. POs deal with the general aspect of graduation for a particular program, and the competencies and expertise a graduate will possess after completion of the program). (Refer POs defined by NBA)
Semester Grade Point Average (The performance of a student in a semester is indicated by a number called SGPA) $SGPA = \frac{\sum [Course \ Credits \ x \ Grade \ Points] \ for \ all \ the \ Courses \ in \ that \ semester}{\sum [Course \ Credits \] \ for \ all \ the \ Courses \ in \ that \ Semester}$
Cumulative Grade Point Average (which is the sum total of the SGPA's of all semesters or that of an academic year) $\sum [\text{Course Credits x Grade Points}] \text{ for all Courses excluding those with F}$ $\frac{\text{grades}}{\text{CGPA}} = \frac{\text{until that semester}}{\text{Course Credits}} \text{ for all Courses excluding those with F grades until that semester}$

I	Letter Grade and corresponding Grade Points on a typical 10 - Point scale											
Level	Outstanding	Excellent	Very Good	Good	Above Average	Average	Pass	Fail	Not Eligible			
Grade	O	A+	A	B+	В	С	P	F	NE			
Grade Points	10	9	8	7	6	5	4	0	0			
Score (Marks) Range %	90-100	80-89	70-79	60-69	55-59	50-54	40-49	0-39	-			

RBT

Revised Blooms Taxonomy Levels (There are six levels of cognitive learning according to the revised version of Bloom's Taxonomy. Each level is conceptually different. The six levels are remembering(L1), understanding(L2), applying(L3), analyzing(L4), evaluating(L5), and creating(L6).



	EC
APPLIED SCIENCES COURS	LS
	Page 5

		AI			EMATI IML, C			NEERS-	-I			
Course Code	24MA	Т11		(FOR A	mil, C		Marks				50	
L:T:P:S	2:1:1:0						Marks				50	
Hrs. / Week	2+2+2	<u>′</u>				_	Marks				100	
Credits	04						Hours				03	
		e end of	the cour	se, the s	tudent w						1 00	
CO1	control Solve the system of linear equations by applying the ideas of linear algebra.											
CO2		•			•					rical circ	nits ana	lysis
			• •							lications		•
CO3		s and cor			ii dilicic	iii coord	illiaic sy	sicilis all	a ns app	ncations	in digita	41
CO4					r some r	eal prob	lems and	l estimati	ing the r	naximun	n/minim	um
		for a phy										
CO5					ledge to		er algorit	thms.				
Mapping of Co								7.00		7010		201
CO1	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	-	-	-	-	-	-	-	-	-	_
MODULE-1	ELEM	ENTS (OF LINI	EAR AI	GEBRA	<u> </u>			C	01	9 H	ours
Elementary tran							elon forn	ı, Rank o				
system of linear												
trivial solutions												
Text Book		ook 1: 2.					-					
	Text B	ook 2: 7.	4, 8.1, 8	.4								
		ook 3: 1.										
MODULE-2					A AND					O2		ours
Eigen values an						gh's pov	wer metl	od to fii	nd the do	ominant	Eigenval	lue and
Eigenvector, Po												
Applications	+				cal circu			4 55	. D. 1.0	1 1 2		. 1
Text Book	_	ook 1: 2				ook 2: 7.	9, 8.1, 8	.4 Tex		5: 1.4.2, 1		
MODULE-3		RENTI				1 1 4	.1	1'		O3	9 H	
Importance of ca		•		-	em: Ang	le betwe	en the ra	dius vec	tor and t	angent, a	angle bet	ween
two curves, Ped	•	•						•				
Curvature and ra	1											
Applications				1 0	mming,	Digital	gadgets	, Handli	ng diffe	rent geo	metries.	
Text Book		ook 1: 4.									T	
MODULE-4					ATIVE					O4		ours
Existence of mu												
differentiation, l	_			ıler's Th	eorem, T	Taylors a	ınd Macl	aurin's s	series for	two var	iables, E	xtreme
values of the fur							0					
Applications			eam wit	th relativ	e chang	es, Tran	isformat	ion fron	n one co	ordinate	system	to
another.												
Text Book Text Book 1: 5.2, 5.4, 5.5, 5.7, 5.9, 5.11 MODULE-5 MODULAR ARITHMETIC CO5 9 Hours												
Introduction to Congruences, Linear Congruences, The Remainder theorem, Solving Polynomials, Linear												
Diophantine equation, System of Linear Congruences, Euler's theorem, Wilson theorem and Fermat's little												
theorem. RSA algorithm. Applications Cryptography, Encoding and Decoding, RSA applications in public key encryption.												
Applications			Encodi	ng and I	Decoding	g, RSA	applicati	ions in p	ublic ke	ey encry	ption.	
Text Book	Text B											
List of Experi	ments i	n Pytho	n							· · · · · · · · · · · · · · · · · · ·		
Sl. No.					Experi	ments					CC)s

1.	Finding the rank of a Matrix.	CO1
2.	Solution of system of linear equations using Gauss-Seidel method.	CO1
3.	Compute the Eigen values and Eigen vectors of a square matrix.	CO2
4.	Find the largest and smallest eigenvalue by Rayleigh power method.	CO2
5.	Finding the angle between the radius vector and tangent.	CO3
6.	Finding the radius of curvature in cartesian and polar forms.	CO3
7.	Finding the Partial Derivatives.	CO4
8.	Partial Derivatives by Jacobian Method.	CO4
9.	Finding GCD using Euclid's Algorithm	CO5
10.	Solving linear congruences $ax \equiv b \pmod{m}$	CO5

	•			
	RBT Levels	Test(s)	Qualitative Assessment	Lab
		25	5	20
L1	Remember	5	2.5	2.5
L2	Understand	5	2.5	2.5
L3	Apply	10	-	10
L4	Analyze	2.5	-	2.5
L5	Evaluate	2.5	-	2.5
L6	Create	-	-	-

SEE Assessment Pattern (50 Marks – Theory)

	RBT Levels	Exam Marks Distribution (50)
L1	Remember	10
L2	Understand	10
L3	Apply	20
L4	Analyze	5
L5	Evaluate	5
L6	Create	-

Suggested Learning Resources:

Text Books:

- 1) B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, Forty fourth Edition, 2022, ISBN: 9788193328491.
- 2) Erwin Kreyszig, Advanced Engineering Mathematics, Wiley-India Publishers, Tenth Edition, Reprint 2016, ISBN: 9788126554232.
- 3) Glyn James, Advanced Modern Engineering Mathematics, Pearson Education, Fourth Edition, 2016, ISBN: 9789332575288.
- 4) M.K.Pathak, S.Ramasamy, Modular Arithmetics, Campus Books International, 2012 Edition, ISBN: 9788180303463.

Reference Books:

- 1) David C Lay, Linear Algebra and its applications, Addison-Wesley Publishers, Fourth Edition, 2012, ISBN: 9780321385178.
- 2) B. V. Ramana, Higher Engineering Mathematics, McGraw Hill Education (India) Private Limited, Fourth Edition, 2017, ISBN: 9780070634190.
- 3) H. K. Dass, Advanced Engineering Mathematics, S. Chand & Company Ltd., Twenty Second Edition, 2018, ISBN: 9789352533831.
- 4) N.P.Bali and Manish Goyal, A Text Book of Engineering Mathematics, Laxmi Publications (P) Ltd., Ninth Edition, 2014, ISBN: 9788131808320.

Web links and Video Lectures (e-Resources):

- $1) \ https://youtu.be/I0E3QXcIYR0?si=af23LlzOXE6udyqi$
- 2) https://youtu.be/p8XcOigHZoo?si=ueuQaQh4iMb1fi2
- 3) https://youtu.be/JV0hjyI4Erg?si=X9xFpzvscqsyheYh
- 4) https://youtu.be/bTs7ncA AtY
- 5) https://youtu.be/HEAokut4F4I

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

- Contents related activities (Activity-based discussions)
- > For active participation of students, instruct the students to prepare Algorithms/Flowcharts/Programming Codes
- > Organizing Group wise discussions on related topics

Seminars

Course Code	24N	IAT11			(FOR E		E Mark	2			50		
L:T:P:S	2:1:						SEE Marks				50		
Hrs. / Week		2+2+2 Total Marks								100			
Credits		04 Exam Hours											
		s: At the end of the course, the student will be able to											
CO1		Solve the system of linear equations by applying the ideas of linear algebra.											
CO2		Understand the properties of Linear Algebra for network, traffic and electrical circuits analysis.											
		Understand the relations between different coordinate systems and its applications in digital											
CO3		gadgets and computer codes.											
604						e real pr	oblems	and estin	nating th	ne maxim	num/min	imum	
CO4			physical			•			C				
CO5	App	ly the co	oncept of	f vector	calculus	for solvi	ng engir	neering p	roblems	١.			
	Course	Outcor	nes to P	Program	Outco	mes.							
Mapping of Course Outcomes to Program Outcomes:													
	PO	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	
	1												
CO1	3	2	-	-	-	-	-	-	-	-	-	-	
CO2	3	2	-	-	-	-	-	-	-	-	-	-	
CO3	3	2	-	-	-	-	-	-	-	-	-	-	
CO4	3	2	-	-	-	-	-	-	-	-	-	-	
CO5	3	2	-	-	-	-	-	-	-	-	-	-	
MODIUS													
MODULE-1 ELEMENTS OF LINEAR ALGEBRA CO1 9 Hours										CO1	Δ.ΤΙ		
Elementary to system of line	ransform ear equat	ations, F	Reduction	n of the n. Soluti	given ma	atrix to e ystem of	linear h	omogen	nk of a N eous equ	Matrix, C nations (t	onsisten	cy of a	
Elementary to	ransform ear equat ns), Solu Text	ations, Fions and ation of a tion of a	Reduction solution system : 2.7, 2.	n of the n. Solution of non-1 10, 28.5	given ma on of a s nomoger	atrix to e ystem of	linear h	omogen y Gauss	nk of a N eous equ -Seidel 1	Matrix, C nations (t	onsisten	cy of a	
Elementary tr system of line trivial solution	ransform ear equat ns), Solu Text Text	ations, Frions and ation of a tion o	Reduction solution system: 2.7, 2: 1.2.5,	n of the n. Solution of non-1 10, 28.5 1.2.6, 1.6	given ma on of a s nomoger	atrix to e ystem of neous equ	linear hations book 2: 7.4	omogenoy Gauss 1, 8.1, 8.4	nk of a N eous equ -Seidel 1	Matrix, C nations (t	onsisten rivial an	cy of a	
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Elementary tr system of line trivial solution Text Book MODULE-2 Eigen values and Eigenvect Applications Text Book MODULE-3 Importance of between two Curvature and Applications Text Book MODULE-4 Existence of Total different Extreme valut Applications Text Book MODULE-5 Velocity and Solenoidal and Text Book Sl. No.	ransform ear equaters), Solutions), Solutions), Solutions), Solutions, Solutions, Solutions, Power and Eigenster, Eigenster, Eigenster, Eigenster, Solutions, Indicate and Eigenster, Power and Eigenster, Ei	ations, Frions and ation of a took 1 took 2	Reduction I solution a system : 2.7, 2	n of the n. Solution of non-log 28.5 1.2.6, 1.6 R ALGE quare making Diagram, Electron or polar contesian, I an C-proof 7, 4.8, 4. LE DER oblems log inction Electron suith relations. With relation suith relations of the polar contesian, I and the polar contesian in the polar	given may on of a system of a	retrix to e ystem of neous equations equations. Text Book 2 ND ITS syleigh's cion. Teuit protect Book 2 Angle cic, Polar ng, Digit of partial cheorem, anges, Total citions. Laplacitions. t Book 2	PROPE power r blems 7.9, 8.1 between and Ped tal gadg derivativ Taylors a ransforr	RTIES nethod t the rad al forms ets, Han ves under and Mac nation fi	o find the course of the cours	Matrix, C nations (to method. CO2 The domin Ok 3: 1.4. CO3 Or and to the dominant of the	9 H ant Eige 2, 1.5.1, 9 H angent, geometri 4 different two variate systems. 9 H olems. 3.3	ours envalue 1.6.1 ours angle es. ours tiation, riables, em to ours	

3.	Compute the Eigen values and Eigen vectors of a square matrix.	CO2
4.	Find the largest and smallest eigenvalue by Rayleigh power method.	CO2
5.	Finding the angle between the radius vector and tangent.	CO3
6.	Finding the radius of curvature in cartesian and polar forms.	CO3
7.	Finding the Partial Derivatives.	CO4
8.	Partial Derivatives by Jacobian Method.	CO4
9.	Finding the Gradient of a function	CO5
10.	Calculating the curl of a vector field	CO5

			Marks Distribution	
	RBT Levels	Test(s)	Qualitative Assessment	Lab
		25	5	20
L1	Remember	5	2.5	2.5
L2	Understand	5	2.5	2.5
L3	Apply	10	-	10
L4	Analyze	2.5	-	2.5
L5	Evaluate	2.5	-	2.5
L6	Create	-	-	-

SEE Assessment Pattern (50 Marks – Theory)

	RBT Levels	Exam Marks Distribution (50)
L1	Remember	10
L2	Understand	10
L3	Apply	20
L4	Analyze	5
L5	Evaluate	5
L6	Create	-

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- 2) https://youtu.be/p8XcOigHZoo?si=ueuQaQh4iMb1fi2
- 3) https://youtu.be/JV0hjyI4Erg?si=X9xFpzvscqsyheYh
- 4) https://youtu.be/bTs7ncA AtY
- 5) https://youtu.be/3TKfcgdQBfU?si=H9JTHtprff2xUlTp

- Contents related activities (Activity-based discussions)
 - For active participation of students, instruct the students to prepare Algorithms/Flowcharts/Programming Codes
 - ➤ Organizing Group wise discussions on related topics
 - > Seminars

		Δ	PPL IFI) MATI	HEMAT	ICS FO	R FNCI	NEERS	_1			
		Α) WIATT		R ME)	K ENGI	NEEKS	-1			
Course Code	24MA	Γ11			`	CI	E Mark	S			50	
L:T:P:S	2:1:1:0)					E Mark				50	
Hrs. / Week	2+2+2 Total Marks							100	_			
Credits	04 Exam Hours									03		
		: At the end of the course, the student will be able to										
CO1	Solve t	olve the system of linear equations by applying the ideas of linear algebra.										
CO2	Unders	tand the	properti	es of Lin	ear Alge	bra for r	etwork,	traffic a	nd electr	rical circu	uits analy	/sis.
CO3		Inderstand the properties of Linear Algebra for network, traffic and electrical circuits analysis. Inderstand the relations between different coordinate systems and its applications in digital adgets and computer codes.										
CO4		multivari for a phy			some rea	al proble	ms and e	estimatin	g the ma	ximum/ı	ninimun	1
CO5	Apply 1	partial di	fferentia	l equation	on techni	ques to s	olve En	gineering	g problei	ns.		
Mapping of C												
	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	-	-	-	-	-	-	-	-	-	
MODULE-1	FIEM	ENTS (NE I INI	CAD AT	CEDDA					CO1	0.11	lours
Elementary trai							elon form	n Rank	of a Mat			
system of linea												
trivial solutions												011
Text Book		ook 1: 2.				kt Book 2						
	Text Bo	ook 3: 1.	2.5, 1.2.	6, 1.6.1				•				
MODULE-2					A AND					CO ₂		lours
Eigen values an						eigh's po	wer met	hod to fi	nd the d	ominant	Eigenva	lue and
Eigenvector, Po				_		. 11						
Applications					al circui			4 T	D - 1- 2	1 4 2 1	<i>5</i> 1 1 <i>C</i>	1
Text Book MODULE-3		RENTL			Text Bo	OOK 2: 7.5	9, 8.1, 8.	4 Text	BOOK 3:	CO3		lours
Importance of o						ile hetwe	en the ra	dius vec	tor and 1			
two curves, Ped		_			.cm. Ang	ic octwe	cii tiic it	idius vec	tor and	iangent, a	angie oei	WCCII
Curvature and	•	•			ametric,	Polar an	d Pedal	forms.				
Applications					mming,	Digital g	gadgets,	Handlir	ng differ	ent geor	netries.	
Text Book		ook 1: 4.							<u> </u>		<u> </u>	
MODULE-4					ATIVES				1:	CO4		lours
Existence of mudifferentiation, values of the fu	Homoge	neous fu	nction E									
Applications		th of a b		h relativ	e change	es, Trans	sformati	on from	one coo	ordinate	system t	
Text Book			.2, 5.4.	5.5, 5.7.	5.9, 5.1	1						
MODULE-5					EQUA					CO5	9 H	lours
Formation of partial different	artial dif	ferential	equation	by elim	inating a	arbitrary		s and fu	nctions.	Solution		
Applications	Solutio		e-dimens		at, wave			ional La _l	place equ	uation by	separati	on of
Text Book				. 18.2. 1	8.4, 18.5	. 18.7	Text Boo	ok 2: 12.	2, 12.5.	12.11		
		t of Exp				,	222 200	12.1	, - - ,			
Sl. No.						riments					C	COs
1.	Finding	g the ranl	of a M	atrix.							C	O1

2.	Solution of system of linear equations using Gauss-Seidel method.	CO1
3.	Compute the Eigen values and Eigen vectors of a square matrix.	CO2
4.	Find the largest and smallest eigenvalue by Rayleigh power method.	CO2
5.	Finding the angle between the radius vector and tangent.	CO3
6.	Finding the radius of curvature in cartesian and polar forms.	CO3
7.	Finding the Partial Derivatives.	CO4
8.	Partial Derivatives by Jacobian Method.	CO4
9.	Solution of Lagrange's partial differential equation	CO5
10.	Solution by separation of variables method	CO5

		Marks Distribution								
	RBT Levels	Test(s)	Qualitative Assessment	Lab						
		25	5	20						
L1	Remember	5	2.5	2.5						
L2	Understand	5	2.5	2.5						
L3	Apply	10	-	10						
L4	Analyze	2.5	-	2.5						
L5	Evaluate	2.5	-	2.5						
L6	Create	-	-	-						

SEE Assessment Pattern (50 Marks – Theory)

SEE ASSESSMENT ACCOUNTING THEOLY)							
	RBT Levels	Exam Marks Distribution (50)					
L1	Remember	10					
L2	Understand	10					
L3	Apply	20					
L4	Analyze	5					
L5	Evaluate	5					
L6	Create	-					

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- 2) https://youtu.be/p8XcOigHZoo?si=ueuQaQh4iMb1fi2
- 3) https://youtu.be/JV0hjyI4Erg?si=X9xFpzvscqsyheYh
- 4) https://youtu.be/bTs7ncA AtY
- 5) https://youtu.be/hcm-CgHFbwI

- Contents related activities (Activity-based discussions)
 - For active participation of students, instruct the students to prepare Algorithms/Flowcharts/Programming Codes
 - Organizing Group wise discussions on related topics
 - > Seminars

		A	PPLIED		IEMATI			NEERS-	·II			
	0.43.5.4	T04		(FOR	AI&M							
Course Code	24MA						E Mark				50	
L:T:P:S	2:1:1:0)					SEE Marks				50	
Hrs. / Week	2+2+2 Total Marks								100			
Credits	04	V									03	
		s: At the end of the course, the student will be able to										
CO1		Find an approximate curve for a real practical problem using least square method.										
CO2					CR and N				ta avalu	ata mayalti	mla imtaa	.mola
CO3	and the	ir usage	in comp	uting are	order of a and vo	lume.					pie integ	rais
CO4					nuous/pe					ns.		
CO5			•		ulus for		engineer	ing probl	lems.			
Mapping of C	ourse C			ogram (Outcome	es						
	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	-	-	-	-	-	-	-	-	-	-
MODULE-1	STAT	ISTICA	Ι. ΔΝΔ	LVSIS						CO1	9 1	lours
Fitting of the co					ntial and	geometr	ic curves	hv least	collare			
and Regression		illicai, q	uauratic,	cxponci	itiai aiiu	gcomen	ic cui ves	b by icasi	square	memou.	Conciai	1011
Text Book		ook 1: 2	15 25 1	2 25 12	25.14							
MODULE-2						ATION	IC			CO2	0.1	lours
First order and								م منا مدامه	on andin			
Inverse differe												
Solution of Leg						юпѕ-е ,	e 1(x), SIII (a	ι Χ Τ υ <i>)</i> , ι	CUS (ax -	T D) alle	u ax .
Applications					rircuits, S	Colution	of initial	and have	ndom: 11	alua prob	loma	
Text Book		ook 1: 1				xt Book		and bou	iluary va	arue proc	dems.	
MODULE-3		FIPLE I			<u> </u>	At DOOK	∠, 1, 1			CO3	0.1	lours
Evaluation of d					tion of d	louble in	teorals k	vy change	e of ord			
changing into p		•	_	s, cvarua	tion of u	iouoic iii	itegrais t	by change	c or ord	CI OI IIIW	gration,	
					. :	4:	11					
Applications				•	e integra	ition met	noa.					
Text Book		ook 1: 7.			LADIA	CE TD	ANGEO	DMC		CO4	0.11	•
MODULE-4					LAPLA				<u> </u>	CO4		lours
Definition of L	aplace to	ransform	and its	standard	1 Tunction	ns. Prop	erties of	Laplace	transfoi	rms: Shii	ting pro	perties,
$t^n f(t), \frac{f(t)}{t}$ for												
Applications		n ot con lifferenti			uous fur	ictions, e	electrical	circuits,	bridges	/beams a	nd Solut	tion of
Text Book					1.9, 21.1	0, 21.12	21.15	Text Bo	ok 3: 5.2	2, 5.3.1,	5.3.2, 5.5	5.6
MODULE-5		OR CA			,					CO5		lours
Velocity and A				_		aplacian	-physica	l signific	ance an	d probler	ns. Sole	noidal
and Irrotational												
Text Book			3, 8.5, 8	.7, 8.18	Text Bo	ook 2: 9.′	7, 9.8, 9.	9 Text	Book 3:	3.2, 3.3		
List of Experi	ments in	Python										
Sl. No.					Expe	riments						COs
1.		g the mea									_	O1
2.	•				ent betwe		l y				_	O1
3.	Solutio	n of firs	t-order d	ifferentia	al equation	on					C	O2
4.	Solutio	n of seco	ond orde	r linear c	lifferenti	al equati	on				C	CO2
5.	Evalua	ting the l	Double I	ntegratio	on						C	CO3
6.	Evalua	ting the	Triple In	tegration	1						C	CO3
7.						ion.					C	CO4
_		Finding the Laplace transform of a function. CO4										

8.	Finding the Inverse Laplace transform of a function	CO4
9.	Finding the Gradient of a function	CO5
10.	Calculating the curl of a vector field	CO5

			Marks Distribution	
	RBT Levels	Test(s)	Qualitative Assessment	Lab
		25	5	20
L1	Remember	5	2.5	2.5
L2	Understand	5	2.5	2.5
L3	Apply	10	-	10
L4	Analyze	2.5	-	2.5
L5	Evaluate	2.5	-	2.5
L6	Create	-	-	-

SEE Assessment Pattern (50 Marks – Theory)

	RBT Levels	Exam Marks Distribution (50)
L1	Remember	10
L2	Understand	10
L3	Apply	20
L4	Analyze	5
L5	Evaluate	5
L6	Create	-

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- 4) https://youtu.be/4Mr7aEHQr8E
- 5) https://youtu.be/3TKfcgdQBfU?si=H9JTHtprff2xUlTp

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 - For active participation of students, instruct the students to prepare Algorithms/Flowcharts/Programming Codes
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						ICS FOI CE, EEE)					
Course Code	24MAT	21					Marks			5	50	
L:T:P:S	2:1:1:0						Marks			50		
Hrs. / Week	2+2+2					Total	Marks			1	100	
Credits	04						n Hours)3	
Course outcon	nes: At the	e end of	the cour	se, the s	tudent w	ill be ab	le to			<u>'</u>		
CO1	Find an	annroxin	nate cur	ve for a 1	real nrac	tical prol	hlem usii	no least s	sanare m	nethod		
							law of co		square ii	icinou.		
CO2	11.5											
CO3	their usa	ge in coi	mputing	area and	d volume	e				te multip	le integra	als an
CO4							d its initi					
CO5						•	olve Eng	ineering	problen	1S.		
Mapping of	Course C	outcome	s to Pro	ogram (Outcom	es						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO ₁
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	
CO3	3	2	-	-	-	-	-	-	-	-	-	
CO4	3	2	-	-	-	-	-	-	-	-	-	
CO5	3	2	-	-	-	-	-	-	-	-	-	
MODULE-1 Fitting of the o					ntial and	gaamati	io ourvo	hy loog		01	9 Ho	
and Regression		imear, qu	iadratic,	expone	ntiai and	geomen	ric curves	s by leas	i square	memoa.	Correlat	1011
Text Book		ook 1: 2	15 25 1	12 25 13	2 25 14							
MODULE-2												
MODULE-2	OKDI				A I 12' () I	TATION	JC		C	Ω 2	0 Ha	TIME
First order and	First door							order line		O2	9 Ho	
First order and		ree: Exac	t, Redu	cible to e	xact. Sec	cond and	Higher o		ar ordin	ary differ	rential eq	uation
Inverse differ	ential op	ree: Exac erator te	ct, Reduce chnique	cible to e	exact. Sec ne funct	cond and	Higher o		ar ordin	ary differ	rential eq	uation
Inverse differ Solution of Le	rential op egendre's	ree: Exac erator te linear dit	ct, Reduce chnique fferentia	cible to e es for th l equation	exact. Sec ne funct on.	cond and ions-e ^{ax}	Higher of the Hi), Sin (a	ear ordin ax + b),	ary differ Cos (ax -	rential eq + b) and	uation
Inverse differ Solution of Le Applications	rential op egendre's Newton	ree: Exac erator te linear dit 1's law o	ct, Reduce chnique fferentiant f cooling	cible to e es for the l equation g, LCR o	exact. Second function.	cond and ions-e ^{ax} Solution	Higher of the Higher of Hi), Sin (a	ear ordin ax + b),	ary differ Cos (ax -	rential eq + b) and	uation
Inverse differ Solution of Le Applications Text Book	rential op egendre's Newton Text B	ree: Exac erator te linear dit	et, Reduce echnique fferentian of cooling 1.11, 11	es for the es for the equation g, LCR of 1.12, 13.	exact. Second function.	cond and ions-e ^{ax}	Higher of the Higher of Hi), Sin (a	ear ordin nx + b), ndary v	ary differ Cos (ax - alue prob	rential eq + b) and olems.	uation 1 a x ¹
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5.	Evaluating the Double Integration	CO3
6.	Evaluating the Triple Integration	CO3
7.	Finding the Laplace transform of a function.	CO4
8.	Finding the Inverse Laplace transform of a function	CO4
9.	Solution of Lagrange's partial differential equation	CO5
10.	Solution by separation of variables method	CO5

			Marks Distribution	
	RBT Levels	Test(s)	Qualitative Assessment	Lab
		25	5	20
L1	Remember	5	2.5	2.5
L2	Understand	5	2.5	2.5
L3	Apply	10	-	10
L4	Analyze	2.5	-	2.5
L5	Evaluate	2.5	-	2.5
L6	Create	-	-	-

SEE Assessment Pattern (50 Marks – Theory)

	RBT Levels	Exam Marks Distribution (50)
L1	Remember	10
L2	Understand	10
L3	Apply	20
L4	Analyze	5
L5	Evaluate	5
L6	Create	-

Suggested Learning Resources:

Text Books:

- 1) B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, Forty fourth Edition, 2022, ISBN: 9788193328491.
- 2) Erwin Kreyszig, Advanced Engineering Mathematics, Wiley-India Publishers, Tenth Edition, Reprint 2016, ISBN: 9788126554232.
- 3) Glyn James, Advanced Modern Engineering Mathematics, Pearson Education, Fourth Edition, 2016, ISBN: 9789332575288.

Reference Books:

- 1) David C Lay, Linear Algebra and its applications, Addison-Wesley Publishers, Fourth Edition, 2012, ISBN: 9780321385178.
- 2) B. V. Ramana, Higher Engineering Mathematics, McGraw Hill Education (India) Private Limited, Fourth Edition, 2017, ISBN: 9780070634190.
- 3) H. K. Dass, Advanced Engineering Mathematics, S. Chand & Company Ltd., Twenty Second Edition, 2018, ISBN: 9789352533831.
- 4) N.P.Bali and Manish Goyal, A Text Book of Engineering Mathematics, Laxmi Publications (P) Ltd., Ninth Edition, 2014, ISBN: 9788131808320.

Web links and Video Lectures (e-Resources):

- 1) https://youtu.be/kAa5ReiZH6o
- 2) https://youtu.be/hiNbVgSye-o
- 3) https://youtu.be/BJ 0FURo9RE
- 4) https://youtu.be/4Mr7aEHQr8E
- 5) https://youtu.be/hcm-CgHFbwI

- Contents related activities (Activity-based discussions)
- For active participation of students, instruct the students to prepare Algorithms/Flowcharts/Programming Codes
- Organizing Group wise discussions on related topics
- Seminars

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Applications				•	oie integ	ration me	einoa.					
Text Book MODULE-4			7.1, 7.2,		TADI	A CE TI	ANCE	DMC		101	0.11.	
Definition of La							RANSF(04	9 Ho	
											iting pro	perties,
$t^n f(t), \frac{f(t)}{t}$ form	ms. Per	iodic fur	nctions, i	unit-step	function	ı-Probler	ns. Inver	se Lapla	ice Trans	sform.		
Applications			ntinuous tial equa		inuous fi	unctions,	electrica	al circuit	s, bridge	es/beams	and Solu	tion of
Text Book					21.9. 21	.10, 21.1	221.15	Text F	300k 3: 5	5.2, 5.3.1,	5.3.2. 5	5.6
MODULE-5			ARITH			, -1.1		1 3/10 L		O5	9 Ho	
Introduction to 0						Remainde	er theore	m. Solvi				
	Diophantine equation, System of Linear Congruences, Euler's theorem, Wilson theorem and Fermat's little theorem. RSA algorithm.											
Applications	Cryptography, Encoding and Decoding, RSA applications in public key encryption.											
Text Book	Text Book 4											
	List of Experiments in Python											
Sl. No.		Experiments COs										
1		Finding the mean of x and y CO1									/3	
1.												
2.						veen x aı	nd y)1
	Findin Soluti	ng the Co	orrelation st-order	n coeffic differen	ient bety	veen x an					CC)1)1
2.	Findin Soluti Soluti	ng the Co on of fir on of se	orrelation st-order	n coeffic different ler linear	ient bety tial equate	veen x aı					CC)1)1)2)2

6.	Evaluating the Triple Integration	CO3
7.	Finding the Laplace transform of a function.	CO4
8.	Finding the Inverse Laplace transform of a function	CO4
9.	Finding GCD using Euclid's Algorithm	CO5
10.	Solving linear congruences $ax \equiv b \pmod{m}$	CO5

			Marks Distribution	on
RBT Levels		Test(s)	Qualitative Assessment	Lab
		25	5	20
L1	Remember	5	2.5	2.5
L2	Understand	5	2.5	2.5
L3	Apply	10	-	10
L4	Analyze	2.5	-	2.5
L5	Evaluate	2.5	-	2.5
L6	Create	-	=	-

SEE Assessment Pattern (50 Marks – Theory)

	RBT Levels	Exam Marks Distribution (50)
L1	Remember	10
L2	Understand	10
L3	Apply	20
L4	Analyze	5
L5	Evaluate	5
L6	Create	-

Suggested Learning Resources:

Text Books:

- 1) B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, Forty fourth Edition, 2022, ISBN: 9788193328491.
- 2) Erwin Kreyszig, Advanced Engineering Mathematics, Wiley-India Publishers, Tenth Edition, Reprint 2016, ISBN: 9788126554232.
- 3) Glyn James, Advanced Modern Engineering Mathematics, Pearson Education, Fourth Edition, 2016, ISBN: 9789332575288.
- 4) M.K.Pathak, S.Ramasamy, Modular Arithmetics, Campus Books International, 2012 Edition, ISBN: 9788180303463.

Reference Books:

- 1) David C Lay, Linear Algebra and its applications, Addison-Wesley Publishers, Fourth Edition, 2012, ISBN: 9780321385178.
- 2) B. V. Ramana, Higher Engineering Mathematics, McGraw Hill Education (India) Private Limited, Fourth Edition, 2017, ISBN: 9780070634190.
- 3) H. K. Dass, Advanced Engineering Mathematics, S. Chand & Company Ltd., Twenty Second Edition, 2018, ISBN: 9789352533831.
- 4) N.P.Bali and Manish Goyal, A Text Book of Engineering Mathematics, Laxmi Publications (P) Ltd., Ninth Edition, 2014, ISBN: 9788131808320.

Web links and Video Lectures (e-Resources):

- 1) https://youtu.be/kAa5ReiZH60
- 2) https://youtu.be/hiNbVgSye-o
- 3) https://youtu.be/BJ 0FURo9RE?si=XSfVyPQPSJxR1i39
- 4) https://youtu.be/4Mr7aEHQr8E
- 5) https://youtu.be/HEAokut4F4I

- Contents related activities (Activity-based discussions)
 - For active participation of students, instruct the students to prepare Algorithms/Flowcharts/Programming Codes
 - > Organizing Group wise discussions on related topics
 - > Seminars

SEE Marks 50 Hrs / Week 4+2 Total Marks 100				Ari					GINEEF	N)			
Credits 04 Exam Hours 03 Course outcomes: At the end of the course, the student will be able to Color and surface the functioning of energy storage systems, corrosion mechanisms, and sensor technologic using fundamental electrochemical principles. CO2 Implement chemical techniques to control pollution and promote sustainability by understanding the environmental impact of industrial processes. CO3 Apply knowledge of advanced materials in energy storage, display systems, and environmental monitoring. CO4 Develop problem-solving skills through numerical problems, design challenges, and applications in electrochemistry, corrosion science, and nanotechnology. CO5 Understand the basics of chemical sensors and methods for e-waste management and metal recove to the properties of the properties	Course Code	24CI	HE12/22				_, _,,	())	CIE M		50		
Course outcomes: At the end of the course, the student will be able to CO1 Analyze the functioning of energy storage systems, corrosion mechanisms, and sensor technologic using fundamental electrochemical principles. CO2 Implement chemical techniques to control pollution and promote sustainability by understanding the environmental impact of industrial processes. Apply knowledge of advanced materials in energy storage, display systems, and environmental monitoring. CO3 Apply knowledge of advanced materials in energy storage, display systems, and environmental monitoring. CO4 Develop problem-solving skills through numerical problems, design challenges, and applications it electrochemistry, corrosion science, and nanotechnology. CO5 Understand the basics of chemical sensors and methods for e-waste management and metal recove mapping of Course Outcomes to Program Outcomes. Mapping of Course Outcomes to Program Outcomes. Mapping of Course Outcomes to Program Outcomes. PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 PO12 CO1 3 2 1 1 1 1	L: T : P :S	3:0:1	:0						SEE N	SEE Marks 50			
Course outcomes: At the end of the course, the student will be able to CO1 Analyze the functioning of energy storage systems, corrosion mechanisms, and sensor technologic using fundamental electrochemical principles. CO2 Implement chemical techniques to control pollution and promote sustainability by understanding denvironmental impact of industrial processes. CO3 Apply knowledge of advanced materials in energy storage, display systems, and environmental monitoring. CO4 Develop problem-solving skills through numerical problems, design challenges, and applications in electrochemistry, corrosion science, and nanotechnology. CO5 Understand the basics of chemical sensors and methods for e-waste management and metal recove **Mapping of Course Outcomes to Program Outcomes.** PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 CO1 3 2 1 - - - - - - - - -	Hrs / Week	4+2							Total 1	Marks	100		
Analyze the functioning of energy storage systems, corrosion mechanisms, and sensor technologic using fundamental electrochemical principles. CO2	Credits	04							Exam	Hours	03		
Understand the New York Line Li	Course outcom	ies: At	the end	of the co	urse, the	student	will be a	ble to			•		
environmental impact of industrial processes. CO3 Apply knowledge of advanced materials in energy storage, display systems, and environmental monitoring. CO4 Develop problem-solving skills through numerical problems, design challenges, and applications is electrochemistry, corrosion science, and nanotechnology. CO5 Understand the basics of chemical sensors and methods for e-waste management and metal recove Mapping of Course Outcomes to Program Outcomes.	CO1							ems, cor	rosion m	echanisi	ns, and s	ensor tec	hnologies
Module Develop problem-solving skills through numerical problems, design challenges, and applications is electrochemistry, corrosion science, and nanotechnology. CO5	CO2	envir	onmenta	l impact	of indus	strial pro	cesses.					-	
electrochemistry, corrosion science, and nanotechnology.	CO3	moni	toring.								· 		
Mapping of Course Outcomes to Program Outcomes. PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12		electi	ochemis	stry, corr	osion sc	ience, an	d nanote	chnolog	y.				
PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12	<u>CO5</u>	Unde									agement	and meta	ıl recovery
CO1 3 2 1											I = - 1 -		7015
CO2 2 2 1 1 1 1					PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO3 3 2 1 1					-	-	-	-	-	-	-	-	-
CO4 3 2 1	CO2	2	2	1	-	-	-	1	-	-	-	-	-
MODULE-1 Energy Conversion and Storage CO1 9 Hou CO2 CO5 Fundamentals of Electrochemistry: Gibb's free energy, Single electrode potential, Galvanic cell, EMF, Reference electrode. Derivation of Nernst equation and Numerical. Concentration cell and numericals. Batteries: Introduction, classification, characteristics. Construction, working and applications of Zn- air and Li -ion pattery Fuel cell -Definition and classification. Construction, working and applications of solid oxide fuel cell (SOFC) Photo Voltaic Cells — Introduction. Construction and working of silicon solar cell and Dye-sensitized solar cell Advantages and disadvantages of PV cells Super Capacitors: Introduction and classification. Construction, working and applications of electro chemical double ayer capacitors. Laboratory Component: Potentiometric estimation of Iron using std. potassium dichromate solution. Self-study / Applications EMF measurement -Virtual lab: https://vlab.amrita.edu/index.php?sub=2&brch=190 Text Book MODULE-2 Corrosion Science Engineering CO2 9	CO3	3	2	1	-	-	-	1	-	-	-	-	-
MODULE-1 Energy Conversion and Storage CO1 CO2 CO5 Fundamentals of Electrochemistry: Gibb's free energy, Single electrode potential, Galvanic cell, EMF, Reference electrode. Derivation of Nernst equation and Numerical. Concentration cell and numericals. Batteries: Introduction, classification, characteristics. Construction, working and applications of Zn- air and Li -ion pattery Fuel cell -Definition and classification. Construction, working and applications of solid oxide fuel cell (SOFC) Photo Voltaic Cells – Introduction. Construction and working of silicon solar cell and Dye-sensitized solar cell Advantages and disadvantages of PV cells Super Capacitors: Introduction and classification. Construction, working and applications of electro chemical double ayer capacitors. Laboratory Component: Potentiometric estimation of Iron using std. potassium dichromate solution. Self-study / Applications EMF measurement -Virtual lab:	CO4	3	2	1	-	-	-	-	-	-	-	-	-
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Fundamentals of Electrochemistry: Gibb's free energy, Single electrode potential, Galvanic cell, EMF, Reference electrode. Derivation of Nernst equation and Numerical. Concentration cell and numericals. Batteries: Introduction, classification, characteristics. Construction, working and applications of Zn- air and Li -ion pattery Fuel cell -Definition and classification. Construction, working and applications of solid oxide fuel cell (SOFC) Photo Voltaic Cells – Introduction. Construction and working of silicon solar cell and Dye-sensitized solar cell Advantages and disadvantages of PV cells Super Capacitors: Introduction and classification. Construction, working and applications of electro chemical double ayer capacitors. Laboratory Component: Potentiometric estimation of Iron using std. potassium dichromate solution. Self-study / Applications EMF measurement -Virtual lab: https://vlab.amrita.edu/index.php?sub=2&brch=190 Text Book CO2 9											CO ₂		
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MODULE-2 Corrosion Science Engineering CO2 9	Text Book				_						<u> </u>		
CO4 Hou	Text Dook												
	MODULE-2	Corr	osion Sc	cience E							CO2		9

Corrosion Science: Electrochemical theory of corrosion. Types of corrosion - differential metal, differential aeration corrosion (pitting and waterline) and stress corrosion Caustic embrittlement. Factors influencing rate of corrosion- Nature of the metal, Relative anodic and cathodic areas and Nature of the corrosion product, selection and design of materials. Corrosion penetration rate (CPR) - Introduction and numerical problem.

CO5

Corrosion control techniques: – protective coatings – metal coatings (Anodic and Cathodic metal coatings taking Galvanization and Tinning as example). Inorganic coatings - Anodizing of aluminium. Cathodic protection by sacrificial anodic method and Impressed voltage method.

Metal Finishing - Introduction and technological importance.

Electro plating: Introduction. Chromium plating and its applications.

Electro less plating: Introduction, double sided PCB making using copper electro less plating.

Laboratory Component:

1.Determination of percentage of iron in rust by external indicator method

1:Betermination	of percentage of non-mirast by external material method					
Self-study	Collect the literature on Eco friendly metal finishing techniques.					
	Calculate CPR practically.					
Text Book	1,2,7,11&12					
MODULE-3	Nano Materials, Display Systems and Analytical	CO1	9			
	techniques	CO3	Hours			
		CO5				

Nanomaterials: Introduction, Size dependent properties. Classification based on dimensions (0D, 1D, 2D and 3D. Bottom up and top down approach of nano material synthesis, Synthesis and applications of copper oxide nanoparticles by co-precipitation method, carbon nano tubes(CNTs) by chemical vapor deposition. Applications of gold nano particles in cancer treatment.

Display systems: Liquid crystals - Introduction, classification, properties and application in Liquid Crystal Displays (LCD's). LED display system working and applications. OLED display system working and applications. QLED display system working and applications.

Analytical Techniques: Introduction. Principle, instrumentation and applications of UV-Visible spectrophotometry and conductometry.

Laboratory Component:

Synthesis of Cuo/ ZnO nano material

Estimation of mixture of acids using standard NaOH by conductometry sensor.

Self-study	Spectrophotometry (Virtual lab https://vlab.amrita.edu/index.php?sub=2&brch=190)			
	Determination of unknown concentration of an analyte by using the Beer-Lambert Law			
	(Virtual lab: https://mas-iiith.vlabs.ac.in/exp/unknown-concentration-analyte/			
Text Book	6,9 & 10			
MODULE-4	Advanced Methods for Air and Water Treatment	CO1	9	
		CO ₂	Hours	
		CO ₃		

Air pollution Management: Introduction to Primary and secondary air pollutants, Selective catalytic reduction of NOx, Chemical capturing of carbon dioxide, Electro static precipitation technique for the removal of particulate matter and smoke in mining industries.

Water treatment: Determination of chemical oxygen demand of Industry waste water sample, problems on it. Sewage treatment - primary and secondary methods. Softening of water by ion exchange method. Desalination of sea water by electro-dialysis. Construction and working of domestic water purifier. Role of reverse osmosis process in water purification. Photo catalytic dye degradation in water by TiO2 nano particles.

Laboratory Component:

Determination of total hardness of a sample of water by using standard EDTA Solution

Determination of chemical oxygen demand (COD) of the given industrial waste water sample.

Determination of	of total alkalinity of given water sample		
Self-study	Water Analysis-Determination of Physical parameters		
/Applications	Virtual lab: https://vlab.amrita.edu/index.php?sub=2&brch=193		
	Water Analysis-Determination of Physical parameters		
	Virtual lab: https://vlab.amrita.edu/index.php?sub=2&brch	<u>n=193</u>	
Text Book	1,2,3,11,12 &13		
MODULE-5	Chemical Sensors and E-Waste Management:	CO3	9
		CO4	Hours
		CO5	

Chemical Sensors: Definition and significance. Classification of Chemical Sensors based on transduction principle and analyte type. Basic Components of Chemical Sensors.

Electrochemical Sensors: Introduction and types. Construction and working of pH sensor.

Optical Sensors: Introduction and types. Construction and working of Flame photometer.

Applications of chemical sensors in Environmental monitoring (DO sensor). Medical diagnostics (Glucose sensor). Industrial processes (sensors for process control and safety)

E-Waste Management:

Introduction, sources of e-waste, composition, characteristics, and need of e-waste management. Toxic materials used in manufacturing electronic and electrical products, health hazards due to exposure to e-waste.

Metal Recovery from E-Waste: Physical, chemical (Pyro and hydro metallurgy), biological and integrated methods. Extraction of gold from E-waste. Li - ion battery recycling.

Laboratory Component:

Estimation of amount of copper in E -waste by optical sensor (Colorimetry)

Estimation of mixture of acids using standard NaOH by conductometry sensor

Determination of pKa value of a weak acid using pH sensor

Determination of Viscosity coefficient of an organic liquid.

Self-study	1. Soil Analysis-Determination of Specific conductivity of Soil (Virtual lab:		
component	https://vlab.amrita.edu/index.php?sub=2&brch=193)		
	2.Soil Analysis-Determination of pH of Soil (Virtual lab:		
	https://vlab.amrita.edu/index.php?sub=2&brch=193)		
Text Books	14,15&16		

CIE Assessment Pattern (50 Marks – Theory and Lab)

			Marks Distribution				
RBT Levels		Test(s)	Qualitative Assessment	Lab			
		25	05	20			
L1	Remember	5	-	-			
L2	Understand	10	2	10			
L3	Apply	5	2	5			
L4	Analyze	5	1	5			
L5	Evaluate						
L6	Create						

SEE Assessment Pattern (50 Marks – Theory)

	RBT Levels	Exam Marks Distribution (50)
L1	Remember	10
L2	Understand	20
L3	Apply	10
L4	Analyze	10
L5	Evaluate	-
L6	Create	

Suggested Learning Resources:

Text Books / Reference Books

- 1. Wiley Engineering Chemistry, Wiley India Pvt. Ltd. New Delhi, 2013- 2nd Edition. 20.11.2022
- 2. Engineering Chemistry, Satyaprakash & Manisha Agrawal, Khanna Book Publishing, Delhi
- 3. A Text Book of Engineering Chemistry, Shashi Chawla, Danpat Rai prakashan.
- 4. Essentials of Physical Chemistry, Bahl&Tuli, S.Chand Publishing
- 5. Text Book of Polymer Science, F.W. Billmeyer, John Wiley & Sons, 4th Edition, 1999.
- 6. Nanotechnology A Chemical Approach to Nanomaterials, G.A. Ozin & A.C. Arsenault, RSC Publishing, 2005.
- 7. Corrosion Engineering, M. G. Fontana, N. D. Greene, McGraw Hill Publications, New York, 3rd Edition, 1996.
- 8. Linden's Handbook of Batteries, Kirby W. Beard, Fifth Edition, McGraw Hill, 2019.
- 9. OLED Display Fundamentals and Applications, Takatoshi Tsujimura, Wiley-Blackwell, 2012
- 10. Principles of Instrumental Analysis, Douglas A. Skoog, F. James Holler, Stanley R. Crouch Seventh Edition,

Cengage Learning, 2020

- 11. Chemistry for Engineering Students, B. S. Jai Prakash, R. Venugopal, Sivakumaraiah & Pushpa Iyengar., Subash Publications, 5th Edition, 2014
- 12. "Engineering Chemistry", O. G. Palanna, Tata McGraw Hill Education Pvt. Ltd. New Delhi, Fourth Reprint, 2015.
- 13. Environmental Chemistry" by A.K. De
- 14. Electronic Waste Management: RSC Green Chemistry, Ronald E. Hester, Roy M. Harrison
- 15. Handbook of Chemical and Biological Sensors, R.F. Taylor, J.S. Schultz
- 16. Sensors and Transducers, D. Patranabis

Journal references

- 1. Design of materials for solid oxide fuel cells, perm selective membranes, and catalysts for biofuel transformation into syngas and hydrogen based on fundamental studies of their real structure, transport properties, and surface reactivity, Current Opinion in Green and Sustainable Chemistry 2022, 33:100558.
- 2. Graphene and graphene oxide as new class of materials for corrosion control and protection: Present status and future scenario, <u>Progress in Organic Coatings</u>, <u>Volume 147</u>, October 2020, 105741.
- 3. Review on dye-sensitized solar cells (DSSCs): Advanced techniques and research trends, Renewable and Sustainable Energy Reviews, Volume 68, Part 1, February 2017, Pages 234-246
- 4. Photocatalytic degradation of organic pollutants using TiO2-based photocatalysts: A review, Journal of Cleaner Production 268 (2020) 121725.
- 5. Production, structural design, functional control, and broad applications of carbon nanofiber-based nanomaterials: A comprehensive review, <u>Chemical Engineering Journal</u>, <u>Volume 402</u>, 15 December 2020, 126189.

Web links and Video Lectures (e-Resources):

https://youtu.be/2zr1-GKKet0 - Demonstration of galvanic cell

https://youtu.be/G5McJw4KkG8 - Li-ion battery working

https://youtu.be/PilpTDYtyIc - Construction and working of SOFC fuel cell

https://youtu.be/g1TfQ9rypHI - Construction and working of dye sensitized solar cell

https://youtu.be/f6WYxkhum-s - Galvanizing of Steel

https://www.youtube.com/watch?v=0yl35W0o9S0&t=118s - Anodizing of Al

https://www.youtube.com/watch?v=iLgiTAz86Hw - Cr plating

https://youtu.be/Ukc kc5OAhw - PCB making

https://youtu.be/JtdCLPOcz5Y - CuO synthesis

https://youtu.be/xAMhX3Drq14 - OLED working

https://youtu.be/aVdWqbpbv Y - Working of reverse osmosis

https://youtu.be/F7YKvhjNWsk - Sewage treatment plant

https://youtu.be/eH-LMwOU2fg - Dissolved oxygen sensor

https://youtu.be/ldlniZfA2X4 - Gold extraction from e waste

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

Video Demonstrations

Practical experiments in lab

Contents related activities (Activity-based discussions)

Flowcharts and Handout preparation by students

Group Discussion

Seminars

	APPLIED CHEMISTRY FOR ENGINEERS				
	(For ECE&EEF	E)			
Course Code	24CHE12/22	CIE Marks	50		
L: T : P :S	3:0:1:0	SEE Marks	50		
Hrs / Week	4+2	Total Marks	100		
Credits	04	Exam Hours	03		
Course outcome	es: At the end of the course, the student will be able				
CO1	Analyze the functioning of energy storage systemusing fundamental electrochemical principles.	ms, corrosion mechan	nisms, and sensor technologies		
CO2	Implement chemical techniques to control pollut environmental impact of industrial processes.	ion and promote susta	ainability by understanding the		
CO3	Apply knowledge of advanced materials in en monitoring.	nergy storage, display	y systems, and environmental		
CO4	CO4 Develop problem-solving skills through numerical problems, design challenges, and applications in electrochemistry, corrosion science, and nanotechnology.				
CO5	CO5 Understand the basic principles of electronic materials and Chemical sensors.				
Mapping of Co	ourse Outcomes to Program Outcomes.				

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

MODULE-1	Energy Conversion and Storage	CO1	9 Hours
		CO2	
		CO5	

Fundamentals of Electrochemistry: Gibb's free energy, Single electrode potential, Galvanic cell, EMF, Reference electrode.

Derivation of Nernst equation and Numerical. Concentration cell and numericals.

Batteries: Introduction, classification, characteristics. Construction, working and applications of Zn- air and Li -ion battery

Fuel cell -Definition and classification. Construction, working and applications of solid oxide fuel cell (SOFC)

Photo Voltaic Cells – Introduction. Construction and working of silicon solar cell and Dye-sensitized solar cell, Advantages and disadvantages of PV cells

Super Capacitors: Introduction and classification. Construction, working and applications of electro chemical double layer capacitors.

Laboratory Component:

1. Potentiometric estimation of Iron using std. potassium dichromate solution.

1	& I		
Self-study /	1. EMF measurement		
Applications	(Virtual lab: https://vlab.amrita.edu/index.php?sub=2&brch=1	<u>90</u>)	
Text Book	2,3,4,11&12		
MODULE-2	Corrosion Science Engineering	CO2	9 Hours
		CO4	
		CO5	

Corrosion Science: Electrochemical theory of corrosion. Types of corrosion - differential metal, differential aeration corrosion (pitting and waterline) and stress corrosion Caustic embrittlement. Factors influencing rate of corrosion-Nature of the metal, Relative anodic and cathodic areas and Nature of the corrosion product, selection and design of materials. Corrosion penetration rate (CPR) - Introduction and numerical problem.

Corrosion control techniques: – protective coatings – metal coatings (Anodic and Cathodic metal coatings taking Galvanization and Tinning as example). Inorganic coatings - Anodizing of aluminium. Cathodic protection by sacrificial anodic method and Impressed voltage method.

Metal Finishing - Introduction and technological importance.				
Electro plating:	Introduction. Chromium plating and its applications.			
Electro less plati	ing: Introduction, double sided PCB making using copper elect	ro less plating.		
Laboratory Con	mponent:			
1.Determination	of percentage of iron in rust by external indicator method			
Self-study	1. Collect the literature on Eco friendly metal finishing techniques.			
	2. Calculate CPR practically.			
Text Book	Text Book 1,2,7,11&12			
MODULE-3	Nano Materials, Display Systems and Analytical	CO1	9 Hours	
	techniques CO3			
	CO5			

Nanomaterials: Introduction, Size dependent properties. Classification based on dimensions (0D, 1D, 2D and 3D. Bottom up and top down approach of nano material synthesis, Synthesis and applications of copper oxide nanoparticles by co-precipitation method, carbon nano tubes(CNTs) by chemical vapor deposition. Applications of gold nano particles in cancer treatment.

Display systems: Liquid crystals - Introduction, classification, properties and application in Liquid Crystal Displays (LCD's). LED display system working and applications. OLED display system working and applications. QLED display system working and applications.

Analytical Techniques: Introduction. Principle, instrumentation and applications of UV-Visible spectrophotometry and conductometry.

Laboratory Component:

- 1. Synthesis of Cuo/ ZnO nano material
- 2. Estimation of mixture of acids using standard NaOH by conductometry sensor.

Self-study	1. Spectrophotometry				
	(Virtual lab https://vlab.amrita.edu/index.php?sub=2&brch=190)				
	2. Determination of unknown concentration of an analyte by using the Beer-Lambert Law (Virtual				
	lab: https://mas-iiith.vlabs.ac.in/exp/unknown-concentrat	ion-analyte/)			
Text Book	6,9 & 10				
MODULE-4	Advanced Methods for Air and Water Treatment	CO1	9 Hours		
		CO2			
		CO3			

Air pollution Management: Introduction to Primary and secondary air pollutants, Selective catalytic reduction of NOx, Chemical capturing of carbon dioxide, Electro static precipitation technique for the removal of particulate matter and smoke in mining industries.

Water treatment: Determination of chemical oxygen demand of Industry waste water sample, problems on it. Sewage treatment - primary and secondary methods. Softening of water by ion exchange method. Desalination of sea water by electro-dialysis. Construction and working of domestic water purifier. Role of reverse osmosis process in water purification. Photo catalytic dye degradation in water by TiO2 nano particles.

Laboratory Component:

- 1. Determination of total hardness of a sample of water by using standard EDTA solution
- 2. Determination of chemical oxygen demand (COD) of the given industrial waste water sample.
- 3. Determination of total alkalinity of given water sample

1. Water Analysis-Determination of Physical parameters				
Virtual lab: https://vlab.amrita.edu/index.php?sub=2&brch=193				
2. Water Analysis-Determination of Physical parameters				
Virtual lab: https://vlab.amrita.edu/index.php?sub=2&brch=193				
1,2,3,11,12 &13				
Chemistry of Electronic Materials and Chemical Sensors. CO3 9Hours				
	CO4			
	CO5			
	2. Water Analysis-Determination of Physical parameters Virtual lab: https://vlab.amrita.edu/index.php?sub=2&br 1,2,3,11,12 &13	Virtual lab: https://vlab.amrita.edu/index.php?sub=2&brch=193 2. Water Analysis-Determination of Physical parameters Virtual lab: https://vlab.amrita.edu/index.php?sub=2&brch=193 1,2,3,11,12 &13 Chemistry of Electronic Materials and Chemical Sensors. CO3 CO4		

Chemistry of Electronic Materials

Silicon as semiconductor and its applications. Production of solar grade silicon by Union carbide process and Zone refining. Synthesis of electronic grade silicon by Czochralski process (CZ).

Polymers for Electrical and Electronic Applications:

Conducting polymers: Synthesis and conducting mechanism of poly acetylene, Poly aniline and applications

Insulating Polymers: Synthesis and applications of PVC and Teflon

Chemical Sensors: Definition and significance. Classification of Chemical Sensors based on transduction principle and analyte type. Basic Components of Chemical Sensors.

Electrochemical Sensors: Introduction and types. Construction and working of pH sensor.

Optical Sensors: Introduction and types. Construction and working of Flame photometer.

Applications of chemical sensors in Environmental monitoring (DO sensor). Medical diagnostics (Glucose sensor). Industrial processes (sensors for process control and safety)

Laboratory Component:

- 1. Estimation of amount of copper in E -waste by optical sensor (Colorimetry)
- 2. Estimation of mixture of acids using standard NaOH by conductometry sensor
- 3. Determination of pKa value of a weak acid using pH sensor
- 4. Determination of Viscosity coefficient of an organic liquid.

Self-study	1. Soil Analysis-Determination of Specific conductivity of Soil (Virtual lab:	
component	https://vlab.amrita.edu/index.php?sub=2&brch=193)	
	2. Soil Analysis-Determination of pH of Soil (Virtual lab:	
	https://vlab.amrita.edu/index.php?sub=2&brch=193)	
Text Books	14,15&16	

CIE Assessment Pattern (50 Marks – Theory and Lab)

•			Marks Distribution				
	RBT Levels	Test (s)	Qualitative Assessment	Lab			
		25	05	20			
L1	Remember	5	-	-			
L2	Understand	10	2	10			
L3	Apply	5	2	5			
L4	Analyze	5	1	5			
L5	Evaluate						
L6	Create						

SEE Assessment Pattern (50 Marks – Theory)

RBT Levels		Exam Marks Distribution (50)
L1	Remember	10
L2	Understand	20
L3	Apply	10
L4	Analyze	10
L5	Evaluate	-
L6	Create	

Suggested Learning Resources:

Text Books / Reference Books

- 1. Wiley Engineering Chemistry, Wiley India Pvt. Ltd. New Delhi, 2013- 2nd Edition. 20.11.2022
- 2. Engineering Chemistry, Satyaprakash & Manisha Agrawal, Khanna Book Publishing, Delhi
- 3. A Text Book of Engineering Chemistry, Shashi Chawla, Danpat Rai prakashan.
- 4. Essentials of Physical Chemistry, Bahl&Tuli, S.Chand Publishing
- 5. Text Book of Polymer Science, F.W. Billmeyer, John Wiley & Sons, 4th Edition, 1999.
- 6. Nanotechnology A Chemical Approach to Nanomaterials, G.A. Ozin & A.C. Arsenault, RSC Publishing, 2005.
- 7. Corrosion Engineering, M. G. Fontana, N. D. Greene, McGraw Hill Publications, New York, 3rd Edition, 1996.
- 8. Linden's Handbook of Batteries, Kirby W. Beard, Fifth Edition, McGraw Hill, 2019.
- 9. OLED Display Fundamentals and Applications, Takatoshi Tsujimura, Wiley-Blackwell, 2012
- 10. Principles of Instrumental Analysis, Douglas A. Skoog, F. James Holler, Stanley R. Crouch Seventh Edition, Cengage Learning, 2020

- 11. Chemistry for Engineering Students, B. S. Jai Prakash, R. Venugopal, Sivakumaraiah & Pushpa Iyengar., Subash Publications, 5th Edition, 2014
- 12. "Engineering Chemistry", O. G. Palanna, Tata McGraw Hill Education Pvt. Ltd. New Delhi, Fourth Reprint, 2015.
- 13. Environmental Chemistry" by A.K. De
- 14. Electronic Waste Management: RSC Green Chemistry, Ronald E. Hester, Roy M. Harrison
- 15. Handbook of Chemical and Biological Sensors, R.F. Taylor, J.S. Schultz
- 16. Sensors and Transducers, D. Patranabis

Journal references

- 1. Design of materials for solid oxide fuel cells, perm selective membranes, and catalysts for biofuel transformation into syngas and hydrogen based on fundamental studies of their real structure, transport properties, and surface reactivity, Current Opinion in Green and Sustainable Chemistry 2022, 33:100558.
- 2. Graphene and graphene oxide as new class of materials for corrosion control and protection: Present status and future scenario, <u>Progress in Organic Coatings</u>, <u>Volume 147</u>, October 2020, 105741.
- 3. Review on dye-sensitized solar cells (DSSCs): Advanced techniques and research trends, Renewable and Sustainable Energy Reviews, Volume 68, Part 1, February 2017, Pages 234-246
- 4. Photocatalytic degradation of organic pollutants using TiO2-based photo catalysts: A review, Journal of Cleaner Production 268 (2020) 121725.
- 5. Production, structural design, functional control, and broad applications of carbon nanofiber-based nanomaterials: A comprehensive review, Chemical Engineering Journal, Volume 402, 15 December 2020, 126189.

Web links and Video Lectures (e-Resources):

- ➤ https://youtu.be/2zr1-GKKet0 Demonstration of galvanic cell
- https://youtu.be/G5McJw4KkG8 Li-ion battery working
- ➤ https://youtu.be/PilpTDYtyIc Construction and working of SOFC fuel cell
- https://youtu.be/g1TfQ9rypHI Construction and working of dye sensitized solar cell
- https://youtu.be/f6WYxkhum-s Galvanizing of Steel
- https://www.youtube.com/watch?v=0yl35W0o9S0&t=118s Anodizing of Al
- https://www.youtube.com/watch?v=iLgiTAz86Hw Cr plating
- https://youtu.be/Ukc kc5OAhw PCB making
- https://youtu.be/JtdCLPOcz5Y CuO synthesis
- https://youtu.be/xAMhX3Drq14 OLED working
- https://youtu.be/aVdWqbpbv Y Working of reverse osmosis
- https://youtu.be/F7YKvhjNWsk Sewage treatment plant
- https://youtu.be/eH-LMwOU2fg Dissolved oxygen sensor
- https://youtu.be/ldlniZfA2X4 Gold extraction from e waste

- Video Demonstrations
- Practical experiments in lab
- Contents related activities (Activity-based discussions)
 - Flowcharts and Handout preparation by students
 - Group Discussion
 - > Seminars

	APPLIED CHEMISTRY FOR ENGINEERS					
	(For ME)					
Course Code	e 24CHE12/22 CIE Marks 50					
L: T : P :S	3:0:1:0	SEE Marks	50			
Hrs / Week	4+2	Total Marks	100			
Credits	04	Exam Hours	03			
Course outco	mes: At the end of the course, the student will be a	ble to				
CO1	Analyze the functioning of energy storage system	ns, corrosion mechani	sms, and sensor technologies			
	using fundamental electrochemical principles.					
CO2	Implement chemical techniques to control pollution and promote sustainability by understanding the					
	environmental impact of industrial processes.					
CO3	CO3 Apply knowledge of advanced materials in energy storage, display systems, and environmental monitoring.					
CO4	CO4 Develop problem-solving skills through numerical problems, design challenges, and applications in					
	electrochemistry, corrosion science, and nanotechnology.					
CO5 Understand the basic principles and applications of various engineering materials and fuels.						
Mapping of C	Course Outcomes to Program Outcomes.					
	DOL DOL DOL DOL DOL	DOE DOG DO	0 0010 0011 0012			

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

MODULE-1	Energy Conversion and Storage	C01	9 Hours
		CO2	
		CO5	

Fundamentals of Electrochemistry: Gibb's free energy, Single electrode potential, Galvanic cell, EMF, Reference electrode.

Derivation of Nernst equation and Numerical. Concentration cell and numericals.

Batteries: Introduction, classification, characteristics. Construction, working and applications of Zn- air and Li-ion battery

Fuel cell -Definition and classification. Construction, working and applications of solid oxide fuel cell (SOFC) Photo Voltaic Cells – Introduction. Construction and working of silicon solar cell and Dye-sensitized solar cell, Advantages and disadvantages of PV cells

Super Capacitors: Introduction and classification. Construction, working and applications of electro chemical double layer capacitors.

Laboratory Component:

1. Potentiometric estimation of Iron using std. potassium dichromate solution.

Self-study /	EMF measurement (Virtual lab: https://vlab.amrita.edu/index.php?sub=2&brch=190		
Applications			
Text Book	2,3,4,11&12		
MODULE-2	Corrosion Science Engineering	CO2	9 Hours
		CO4	
		CO5	

Corrosion Science: Electrochemical theory of corrosion. Types of corrosion - differential metal, differential aeration corrosion (pitting and waterline) and stress corrosion Caustic embrittlement. Factors influencing rate of corrosion- Nature of the metal, Relative anodic and cathodic areas and Nature of the corrosion product, selection and design of materials. Corrosion penetration rate (CPR) - Introduction and numerical problem.

Corrosion control techniques: – protective coatings – metal coatings (Anodic and Cathodic metal coatings taking Galvanization and Tinning as example). Inorganic coatings - Anodizing of aluminium. Cathodic protection by sacrificial anodic method and Impressed voltage method.

Metal Finishing - Introduction and technological importance. **Electro plating:** Introduction. Chromium plating and its applications. Electro less plating: Introduction, double sided PCB making using copper electro less plating. **Laboratory Component:** 1. Determination of percentage of iron in rust by external indicator method 1. Collect the literature on Eco friendly metal finishing techniques. Self-study 2. Calculate CPR practically. Text Book 1,2,7,11&12 **MODULE-3** Nano Materials, Display Systems and **CO1** 9 Hours **Analytical techniques CO3**

Nanomaterials: Introduction, Size dependent properties. Classification based on dimensions (0D, 1D, 2D and 3D. Bottom up and top down approach of nano material synthesis, Synthesis and applications of copper oxide nanoparticles by co-precipitation method, carbon nano tubes(CNTs) by chemical vapor deposition. Applications of gold nano particles in cancer treatment.

CO5

Display systems: Liquid crystals - Introduction, classification, properties and application in Liquid Crystal Displays (LCD's). LED display system working and applications. QLED display system working and applications. QLED display system working and applications.

Analytical Techniques: Introduction. Principle, instrumentation and applications of UV-Visible spectrophotometry and conductometry.

Laboratory Component:

- 1. Synthesis of Cuo/ ZnO nano material
- 2. Estimation of mixture of acids using standard NaOH by conductometry sensor.

Self-study	1. Spectrophotometry (Virtual lab https://vlab.amrita.edu/index.php?sub=2&brch=190)				
	2. Determination of unknown concentration of an analyte by using the Beer-Lambert Law				
	(Virtual lab: https://mas-iiith.vlabs.ac.in/exp/unknown-concentration-analyte/)				
Text Book	6,9 & 10				
MODULE-4	Chemistry of Pollution: Advanced Methods for Air CO1 9 Hours				
	and Water Treatment CO2				
		CO ₃			

Air pollution Management: Introduction to Primary and secondary air pollutants, Selective catalytic reduction of NOx, Chemical capturing of carbon dioxide, Electro static precipitation technique for the removal of particulate matter and smoke in mining industries.

Water treatment: Determination of chemical oxygen demand of Industry waste water sample, problems on it. Sewage treatment - primary and secondary methods. Softening of water by ion exchange method. Desalination of sea water by electro-dialysis. Construction and working of domestic water purifier. Role of reverse osmosis process in water purification. Photo catalytic dye degradation in water by TiO2 nano particles.

Laboratory Component:

- 1. Determination of total hardness of a sample of water by using standard EDTA Solution
- 2. Determination of chemical oxygen demand (COD) of the given industrial waste water sample.
- 3. Determination of total alkalinity of given water sample

Self-study	1. Water Analysis-Determination of Physical parameters			
/Applications	Virtual lab: https://vlab.amrita.edu/index.php?sub=2&brch=193			
	2. Water Analysis-Determination of Physical parameter			
	Virtual lab: https://vlab.amrita.edu/index.php?sub=2&brch=193			
Text Book	1,2,3,11,12 &13			
MODULE-5	Materials for Mechanical Engineering Applications CO3 9Hours			
	and Chemistry of Fuels CO4			
		CO5		

Materials for Mechanical Engineering Applications

Alloys: Introduction, classification, composition, properties and applications of Stainless Steel, Brass and Alnico.

Ceramics: Introduction, classification based on chemical composition, properties and applications of perovskites(CaTiO3).

Polymers: Introduction, methods of polymerization (condensation and free radical),

Introduction, Synthesis, properties and industrial applications of polyvinylchloride (PVC) and Teflon.

Chemistry of Fuels

Introduction to chemical fuels and classification.

Properties of fuels: Calorific value (GCV and NCV), Octane and Cetane number. Determination of calorific value of fuel using Bomb calorimeter- Numerical problems. knocking in IC engine and its mechanism. Anti-knocking agents. Unleaded petrol. Bio diesel - synthesis, properties and applications. Power alcohol- synthesis, properties and applications

Laboratory Component:

- 1. Estimation of amount of copper in E -waste by optical sensor
- 2. Estimation of mixture of acids using standard NaOH by conductometry sensor
- 3. Determination of pKa value of a weak acid using pH sensor
- 4. Determination of Viscosity coefficient of an organic liquid

Self-Study	1. Alloy Analysis (Brass) (Virtual lab: https://vlab.amrita.edu/index.php?sub=2&brch=193)
/Applications	
Text Book	1,2,5,11 &12

CIE Assessment Pattern (50 Marks – Theory and Lab)

			Marks Distribution				
	RBT Levels		Qualitative Assessment	Lab			
		25	05	20			
L1	Remember	5	-	-			
L2	Understand	10	2	10			
L3	Apply	5	2	5			
L4	Analyze	5	1	5			
L5	Evaluate						
L6	Create						

SEE Assessment Pattern (50 Marks – Theory)

	RBT Levels	Exam Marks Distribution (50)
L1	Remember	10
L2	Understand	20
L3	Apply	10
L4	Analyze	10
L5	Evaluate	-
L6	Create	

Suggested Learning Resources:

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

- 1. Wiley Engineering Chemistry, Wiley India Pvt. Ltd. New Delhi, 2013- 2nd Edition. 20.11.2022
- 2. Engineering Chemistry, Satyaprakash & Manisha Agrawal, Khanna Book Publishing, Delhi
- 3. A Text Book of Engineering Chemistry, Shashi Chawla, Danpat Rai prakashan.
- 4. Essentials of Physical Chemistry, Bahl&Tuli, S.Chand Publishing
- 5. Text Book of Polymer Science, F.W. Billmeyer, John Wiley & Sons, 4th Edition, 1999.
- 6. Nanotechnology A Chemical Approach to Nanomaterials, G.A. Ozin & A.C. Arsenault, RSC Publishing, 2005.
- 7. Corrosion Engineering, M. G. Fontana, N. D. Greene, McGraw Hill Publications, New York, 3rd Edition,
- 8. Linden's Handbook of Batteries, Kirby W. Beard, Fifth Edition, McGraw Hill, 2019.
- 9. OLED Display Fundamentals and Applications, Takatoshi Tsujimura, Wiley-Blackwell, 2012
- 10. Principles of Instrumental Analysis, Douglas A. Skoog, F. James Holler, Stanley R. Crouch Seventh

- Edition, Cengage Learning, 2020
- 11. Chemistry for Engineering Students, B. S. Jai Prakash, R. Venugopal, Sivakumaraiah & Pushpa Iyengar., Subash Publications, 5th Edition, 2014
- 12. "Engineering Chemistry", O. G. Palanna, Tata McGraw Hill Education Pvt. Ltd. New Delhi, Fourth Reprint, 2015.
- 13. Environmental Chemistry" by A.K. De
- 14. Electronic Waste Management: RSC Green Chemistry, Ronald E. Hester, Roy M. Harrison
- 15. Handbook of Chemical and Biological Sensors, R.F. Taylor, J.S. Schultz
- 16. Sensors and Transducers, D. Patranabis

Journal references

- 1. Design of materials for solid oxide fuel cells, permselective membranes, and catalysts for biofuel transformation into syngas and hydrogen based on fundamental studies of their real structure, transport properties, and surface reactivity, Current Opinion in Green and Sustainable Chemistry 2022, 33:100558.
- 2. Graphene and graphene oxide as new class of materials for corrosion control and protection: Present status and future scenario, <u>Progress in Organic Coatings</u>, <u>Volume 147</u>, October 2020, 105741.
- 3. Review on dye-sensitized solar cells (DSSCs): Advanced techniques and research trends, <u>Renewable and Sustainable Energy Reviews</u>, <u>Volume 68, Part 1</u>, February 2017, Pages 234-246
- 4. Photocatalytic degradation of organic pollutants using TiO2-based photocatalysts: A review, Journal of Cleaner Production 268 (2020) 121725.
- 5. Production, structural design, functional control, and broad applications of carbon nanofiber-based nanomaterials: A comprehensive review, <u>Chemical Engineering Journal</u>, <u>Volume 402</u>, 15 December 2020, 126189.

Web links and Video Lectures (e-Resources):

- https://youtu.be/2zr1-GKKet0 Demonstration of galvanic cell
- https://youtu.be/G5McJw4KkG8 Li-ion battery working
- ➤ https://youtu.be/PilpTDYtyIc Construction and working of SOFC fuel cell
- https://youtu.be/g1TfQ9rypHI Construction and working of dye sensitized solar cell
- https://youtu.be/f6WYxkhum-s Galvanizing of Steel
- https://www.youtube.com/watch?v=0yl35W0o9S0&t=118s Anodizing of Al
- https://www.youtube.com/watch?v=iLgiTAz86Hw Cr plating
- https://youtu.be/Ukc kc5OAhw PCB making
- ► https://youtu.be/JtdCLPOcz5Y CuO synthesis
- ► https://youtu.be/xAMhX3Drq14 OLED working
- https://youtu.be/aVdWqbpbv Y Working of reverse osmosis
- https://youtu.be/F7YKvhjNWsk Sewage treatment plant
- https://youtu.be/eH-LMwOU2fg Dissolved oxygen sensor
- ► https://youtu.be/ldlniZfA2X4 Gold extraction from e waste

- Video Demonstrations
- Practical experiments in lab
- Contents related activities (Activity-based discussions)
 - Flowcharts and Handout preparation by students
 - Group Discussion
 - Seminars

(EOD AIM) COE (CO(DO))							
(FOR AIML, CSE &CS(DS)) Course Code 24PHY12/22 CIE Marks 50							
L:T:P:S	3:0:1:0	SEE Marks					
Hrs / Week	4+2	Total Marks	100				
Credits	04	Exam Hours	03				
Course outcom	es: At the end of the course, the student will be a	ble to:	•				
CO1	Understand the principles of quantum mecha	nics, lasers, electronic mater	rials, sensors, physics in				
	animation and quantum computing.						
CO2	Apply mathematical techniques to solve physics-related problems within the context of quantum						
	mechanics, laser technology, electronic material physics, and quantum computing.						
CO3	Analyze various physical phenomena through the principles of wave mechanics, laser operation,						
	electronic material behavior and the functioning of sensors and quantum gates.						
CO4	Understand how physical principles are used in engineering technology.						
CO5	Develop problem-solving skills by tackling physics problems and apply theoretical						
	knowledge to practical situations and engineering challenges.						
Mapping of Co	urse Outcomes to Program Outcomes and I	Program Specific Outcom	ies:				

APPLIED PHYSICS FOR ENGINEERS

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

MODULE-1	QUANTUM MECHANICS	CO1 CO2 CO3, CO4 CO5	9 Hours
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Wave-Particle dualism, de-Broglie hypothesis, phase velocity, group velocity, relationship between phase velocity and group velocity, expression for de-Broglie wavelength from the concept of group velocity, Heisenberg's uncertainty principle, physical significance and application (broadening of spectral lines), Wave function Properties, Physical significance, derivation of Time independent Schrödinger wave equation, eigen value and eigen function, Application of Schrödinger Equation (one dimensional potential well) Numerical problems.

Laboratory Component:

- 1. Stefan' Law of Radiation
- 2. Determination of Planck's Constant

Self-study / Applications		Application of Heisenberg's principle –Finite potential well, Application of			
		Schrödinger Equation (free particle), Quantum tunnelling			
Text Book		1 &2			
MODULE-2	LASERS	FIRER OPTICS	CO1	9 Hours	

MODULE-2	LASERS & FIBER OPTICS	CO1	9 Hours
		CO2	
		CO3, CO4	
		CO5	

Introduction, Interaction of radiation with matter, expression for energy density at thermal equilibrium in terms of Einstein's coefficient, conditions and requisites of Laser, characteristics of laser, Quantum Dot Laser and their applications, Problems.

Principle and propagation of light in optical fibers, Numerical aperture and Acceptance Angle, Types of Optical fibers, Attenuation, Expression for attenuation co-efficient (derivation), application- point to point telecommunication network, Problems.

Laboratory Component:

- 1. Laser Diffraction: To determine the wavelength of Laser using grating
- 2. Particle Size Determination Using LASER
- 3. Numerical Aperture: To determine the numerical aperture of Optical Fiber

Self-study	Application of Lasers & Optical fiber endoscopy		
Text Book	3&4		
MODULE-3	CONDUCTORS, SEMICONDUCTORS &SUPERCONDUCTORS	CO1,CO2, CO3,CO4	9 Hours
		CO5	

Review of CFET (Qualitative), Quantum free electron theory, Fermi factor, variation of Fermi factor with Energy at T = 0K, T > 0K, Density of states (qualitative), Problems based on fermi factor.

Introduction of semiconductor physics, conductivity in an intrinsic semiconductor, mention of electron concentration in intrinsic semiconductor(Ne) and mention of Nh, expression for intrinsic carrier concentration ni from Law of mass action, expression for position of Fermi level in Intrinsic semiconductors, graphical discussion of variation of fermi level with temperature and concentration in intrinsic and extrinsic semiconductors, Hall Effect and expression for Hall coefficient in n and p type semiconductors(derivation) Application of Hall effect, Problems.

Introduction to Superconductors, Temperature dependence of resistivity, Meissner Effect, Critical Current, Types of Super Conductors, BCS theory(qualitative), Applications in Quantum Computing.

Laboratory Component:

- 1. Fermi Energy: To determine the Fermi energy of copper.
- 2. Resistivity: Four Probe method
- 3. Hall Effect: To measure Hall Coefficient of materials.

Self-study	Maglev, Squids		
/Applications			
Text Book	5&6		
MODULE-4	SENSORS AND PHYSICS OF ANIMATION	CO1,CO2,	9 Hours
		CO3,CO4	
		CO5	

Sensors: Difference between sensor, transmitter and transducer, working principle of sensors, sensor characteristics, Sensor classification, Sensor types and its applications, Biomedical sensors and Sensors in IOT Physics of Animation:

Taxonomy of physics-based animation methods, Frames, Frames per second, Size and Scale, Weight and strength, Motion and Timing in animations, Force and acceleration, The Odd rule, Odd rule scenarios, Motion Graphs, Examples of Character animation: Jumping, Parts of Jump, Jump Magnification, Stop Time, Walking: Strides and Steps, Walk Timing. Numerical Problems

Laboratory Component:

1. Photodiode Characteristics

Self-study /	Wearable Sensors		
Applications			
Text Book	7,8,9&10		
MODULE-5	QUANTUM COMPUTING	CO1,CO2,	9 Hours
		CO3 ,O4	
		CO5	

Introduction to Quantum Computing, Moore's law and its end, bits, Qbits, representation of qubit by Bloch sphere, quantum superposition, quantum entanglement, classical and quantum information comparison, difference between classical & quantum computing,

Matrix Operations: Pauli Matrices, Unitary Matrix, Row and Column Matrices, Transpose of Matrix, Orthogonality, Orthonormality

Quantum gates: Single Qubit Gates-NOT Gate, Pauli X, Y, and Z gates, Hadamard Gate, Phase Gate, T Gate

Multiple Qubit Gates- Controlled Gate, CNOT Gate (4 different input states), Controlled Z Gate, Toffoli Gate

Laboratory Comp	Laboratory Component 1. Qiskit tool (Demonstration)		
Self Study	Self Study IBM Quantum, Superconducting Qubits		
/Applications			
Text Book	11,12&13		

CIE Assessment Pattern (50 Marks – Theory and Lab)

			Marks Distribution	
RBT Levels		Test (s)	Qualitative Assessment	Lab
		25	05	20
L1	Remember	5	-	-
L2	Understand	5	-	-
L3	Apply	10	2	10
L4	Analyze	5	2	10
L5	Evaluate	-	1	-
L6	Create	-	-	-

SEE Assessment Pattern (50 Marks – Theory)

	RBT Levels	Exam Marks Distribution (50)
L1	Remember	10
L2	Understand	10
L3	Apply	10
L4	Analyze	10
L5	Evaluate	10
L6	Create	

Suggested Learning Resources:

Text Books:

- 1) Modern Physics by R Murugeshan, Kiruthiga Sivaprasath, S Chand Publishing, 18th ed. 2016
- 2) Concepts of Modern Physics, Arthur Beiser, 7th Edition, 2017, Tata McGraw Hill
- 3) Engineering Physics, D K Bhattacharya, poonam Tandon, Oxford university Press, 2015
- 4) Engineering Physics, B. K. Pandey and S. Chaturvedi, 1st edition, 2012, Cengage Publication
- 5) A Textbook of Solid State Physics, S.O. Pillai, 6th Edition, 2010, New Age International
- 6) Solid State Physics, C Kittel, 8th Edition, 2019, Wiley India
- 7)Measurement, Testing and Sensor Technology: Fundamentals and Application to Materials and Technical Systems 1st ed. 2018 Edition, by Horst Czichos, Springer
- 8)INTRODUCTION TO SENSORS AND TRANSDUCERS, Mr. M.Sivasubramanian, Notion Press, ISBN: 9798887339948
- 9)Sensors. Materials and Amplifiers, Springer, Berlin; New York, 2002 (ISBN: 3540422595).
- 10) Physics for Animators, Michele Bousquet with Alejandro Garcia, CRC Press, Taylor and Francis, 2016
- 11)Text Book Fundamentals of Quantum Computing by Venkateswaran Kasirajan, Springer, 2021, ISBN 978-
- 3-030-63688-3 ISBN 978-3-030-63689-0 (eBook) https://doi.org/10.1007/978- 3-030-63689-0
- 12)Quantum Computing -A beginners's Introduction, Parag K Lala, Indian Edition, McGraw Hill reprint 2020
- 13)Quantum Computing Fundamentals 5th Edition by Easttom, Pearson India, ISBN 9789356062597

Web links and Video Lectures (e-Resources):

- https://www.compadre.org/quantum/
- https://www.brown.edu/research/labs/mittleman/sites/brown.edu.research.labs.mittleman/files/u ploads/lecture2.pdf
- https://www.iitk.ac.in/stc/Publications/DGoswami/marked_Chapter_07.pdf
- https://www.youtube.com/watch?v= 40dpUzzfhA
- https://www.youtube.com/watch?v=QuR969uMICM&t=1s
- https://www.youtube.com/watch?v=vruYFOlM1-Q
- https://www.youtube.com/watch?v=5j37DOD8q4U&list=PLTkE7n2CwG PH09 q0Q7ttjqE2F9y PH09 q0Q7ttjqE2F9y https://www.youtube.com/watch?v=5j37DOD8q4U&list=PLTkE7n2CwG pH09 q0Q7ttjqE2F9y pH09 q0Q7ttjqE2F9y pH09 q0Q7ttjqE2F9y pH09 q0Q7ttjqE2F9y <a h
- https://www.youtube.com/watch?v=D8uMVrplSFA
- Quantum computing and networking w/ alkali atom qubit arrays | Qiskit Seminar Series w/ Mark Saffman - YouTube

Virtual Labs

• https://www.vlab.co.in/broad-area-physical-sciences

- https://bop-iitk.vlabs.ac.in/
- https://vlab.amrita.edu/index.php?sub=1&brch=189

- Video Demonstration of working of QD Laser
- Video demonstration of latest trends in Quantum Computing
- Contents related activities (Activity-based discussions)
 - > Flowcharts and Handout preparation by students
 - Group Discussion
 - > Seminars

	APPLIED PHYSICS FOR ENGINEERS (FOR ECE&EEE)				
Course Code	24PHY12/22	CIE Marks	50		
L: T:P:S	3:0:1:0	SEE Marks	50		
Hrs / Week	4+2	Total Marks	100		
Credits	04	Exam Hours	03		
Course outcome	es: At the end of the course, the student will be able to	D:			
CO1	Understand the principles of quantum mechanics, las	sers, electronic mat	erials, sensors, physics		
	in animation and dielectric and magnetic materials				
CO2	Apply mathematical techniques to solve physics	-related problems	within the context of		
	quantum mechanics, laser technology, electronic i	material physics, a	nd dielectric and		
	magnetic materials.				
CO3	Analyze various physical phenomena through the	e principles of wa	ave mechanics, laser		
	operation, electronic and magnetic material behavio	or and the functioni	ng of sensors.		
CO4	Understand how physical principles are used in engineering technology.				
CO5	Develop problem-solving skills by tackling phy knowledge to practical situations and engineer	•	nd apply theoretical		

Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:

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

MODULE-1	QUANTUM MECHANICS	CO1 CO2 CO3, CO4 CO5	9 Hours
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Wave-Particle dualism, de-Broglie hypothesis, phase velocity, group velocity, relationship between phase velocity and group velocity, expression for de-Broglie wavelength from the concept of group velocity, Heisenberg's uncertainty principle, physical significance and application (broadening of spectral lines), Wave function Properties, Physical significance, derivation of Time independent Schrödinger wave equation, eigen value and eigen function, Application of Schrödinger Equation (one dimensional potential well) Numerical problems.

Laboratory Component:

- 1. Stefan' Law of Radiation
- 2. Determination of Planck's Constant

Self-study / Applications		Application of Heisenberg's principle –Finite potential well,		
		Application of Schrödinger Equation	n (free particle), Quantu	m
		tunneling		
Text Book		1 &2		
MODULE-2	L	ASERS & FIBER OPTICS	CO1 CO2 CO3, CO4	9 Hours

Introduction, Interaction of radiation with matter, expression for energy density at thermal equilibrium in terms of Einstein's coefficient, conditions and requisites of Laser, characteristics of laser, Quantum Dot Laser and their applications, Problems.

Principle and propagation of light in optical fibers, Numerical aperture and Acceptance Angle, Types of Optical fibers, Attenuation, Expression for attenuation co-efficient (derivation), application-point to point telecommunication network, Problems.

Laboratory Component:

- 1. Laser Diffraction: To determine the wavelength of Laser using grating
- 2. Particle Size Determination Using LASER
- 3. Numerical Aperture: To determine the numerical aperture of Optical Fiber

Self-study	Application of Lasers & Optical fiber endoscopy		
Text Book	3 & 4		
MODULE-3	CONDUCTORS, SEMICONDUCTORS &SUPERCONDUCTORS	CO1 CO2 CO3 CO4 CO5	9 Hours

Review of CFET (Qualitative), Quantum free electron theory, Fermi factor, variation of Fermi factor with Energy at T = 0K, T > 0K, Density of states (qualitative), Problems based on fermi factor.

Introduction of semiconductor physics, conductivity in an intrinsic semiconductor , mention of electron concentration in intrinsic semiconductor(Ne) and mention of Nh, expression for intrinsic carrier concentration ni from Law of mass action, expression for position of Fermi level in Intrinsic semiconductors , graphical discussion of variation of fermi level with temperature and concentration in intrinsic and extrinsic semiconductors, Hall Effect and expression for Hall coefficient in n and p type semiconductors(derivation) Application of Hall effect, Problems.

Introduction to Superconductors, Temperature dependence of resistivity, Meissner Effect, Critical Current, Types of Super Conductors, BCS theory(qualitative), Applications in Quantum Computing.

Laboratory Component:

- 1. Fermi Energy: To determine the Fermi energy of copper.
- 2. Resistivity: Four Probe method
- 3. Hall Effect: To measure Hall Coefficient of materials.

Self-study	Maglev, Squids		
/Applications			
Text Book	5&6		
		CO1	
MODULE-4	SENSORS AND PHYSICS OF ANIMATION	CO ₂	9 Hours
MODULE-4		CO3, CO4	
		CO5	

Sensors: Difference between sensor, transmitter and transducer, working principle of sensors, sensor characteristics, Sensor classification, Sensor types and its applications, Biomedical sensors and Sensors in IOT Physics of Animation:

Taxonomy of physics-based animation methods, Frames, Frames per second, Size and Scale, Weight and strength, Motion and Timing in animations, Force and acceleration, The Odd rule, Odd rule scenarios, Motion Graphs, Examples of Character animation: Jumping, Parts of Jump, Jump Magnification, Stop Time, Walking: Strides and Steps, Walk Timing. Numerical Problems

Laboratory Component:

1. Photodiode Characteristics

Self-study /	Wearable Sensors		
Applications			
Text Book	7,8,9&10		
MODULE-5	DIELECTRIC AND MAGNETIC MATERIALS	CO1	9
		CO ₂	Hours
		CO3, CO4	
		CO5	

Dielectrics, types, polarization, types and temperature dependence of polarization, Polarizability, Internal field (Expression for One dimensional solid), Clausius-Mossotti equation (Derivation), Dielectric loss,

Expression for dielectric loss (derivation)Dielectric relaxation, frequency dependence of εr , Ferroelectrics – properties & applications -Piezoelectrics – properties and applications.

Introduction to magnetic materials: Paramagnetic, Diamagnetic and Ferromagnetic Materials-Properties, Ferromagnetic Domain theory, B-H curve, Soft and hard magnetic materials, applications, Problems on dielectrics.

Laboratory Component

Text Book

1.Dielectric constant: To determine the dielectric constant of given dielectric by charging and discharging method

Self Study	Magnetic Memory devices, Piezoelectric sensors and actuators
/Applications	

CIE Assessment Pattern (50 Marks – Theory and Lab)

11&12

			Marks Distribution			
RBT Levels		Test (s)	Qualitative Assessment	Lab		
		25	05	20		
L1	Remember	5	-	-		
L2	Understand	5	-	-		
L3	Apply	10	2	10		
L4	Analyze	5	2	10		
L5	Evaluate	-	1	-		
L6	Create	-	-	-		

SEE Assessment Pattern (50 Marks – Theory)

	RBT Levels	Exam Marks Distribution (50)
L1	Remember	10
L2	Understand	10
L3	Apply	10
L4	Analyze	10
L5	Evaluate	10
L6	Create	

Suggested Learning Resources:

Text Books:

- 1) Modern Physics by R Murugeshan, Kiruthiga Sivaprasath, 18th ed. 2016 S Chand Publishing,
- 2) Concepts of Modern Physics, Arthur Beiser, 7th Edition, 2017, Tata McGraw Hill
- 3) Engineering Physics, D K Bhattacharya, poonam Tandon, 2015, Oxford university Press,
- 4) Engineering Physics, B. K. Pandey and S. Chaturvedi, 1st edition, 2012, Cengage Publication
- 5)A Textbook of Solid State Physics, S.O. Pillai, 6th Edition, 2010, New Age International
- 6) Solid State Physics, C Kittel, 8th Edition, 2019, Wiley India
- 7)Measurement, Testing and Sensor Technology: Fundamentals and Application to Materials and Technical Systems 1st ed. 2018 Edition, by Horst Czichos, Springer
- 8)INTRODUCTION TO SENSORS AND TRANSDUCERS, Mr. M.Sivasubramanian, Notion Press, ISBN: 9798887339948
- 9)Sensors. Materials and Amplifiers, Springer, Berlin; New York, 2002 (ISBN: 3540422595).
- 10) Physics for Animators, Michele Bousquet with Alejandro Garcia, 2016, CRC Press, Taylor and Francis,
- 11) ENGINEERING PHYSICS Paperback January 2018 by S.P.Basavaraju, Subhas Stores
- 12) Applied Physics for Engineers Paperback January 2014 by Dr. P.K. Diwan, Wiley

Web links and Video Lectures (e-Resources):

- https://www.compadre.org/quantum/
- https://www.brown.edu/research/labs/mittleman/sites/brown.edu.research.labs.mittleman/files/uploads/lecture2.pdf
- https://www.iitk.ac.in/stc/Publications/DGoswami/marked Chapter 07.pdf
- https://www.youtube.com/watch?v= 40dpUzzfhA
- https://www.youtube.com/watch?v=QuR969uMICM&t=1s

- https://www.youtube.com/watch?v=vruYFOlM1-Q
- https://www.youtube.com/watch?v=5j37DOD8q4U&list=PLTkE7n2CwG_PH09_q0Q7ttjqE2F9vGeM3
- https://www.youtube.com/watch?v=D8uMVrplSFA
- Quantum computing and networking w/ alkali atom qubit arrays | Qiskit Seminar Series w/ Mark Saffman YouTube

Virtual Labs

- https://www.vlab.co.in/broad-area-physical-sciences
- https://bop-iitk.vlabs.ac.in/
- https://vlab.amrita.edu/index.php?sub=1&brch=189

- Video Demonstration of working of QD Laser
- Video demonstration of latest trends in Quantum Computing
- Contents related activities (Activity-based discussions)
 - Flowcharts and Handout preparation by students
 - > Group Discussion
 - Seminars

APPLIED PHYSICS FOR ENGINEERS (FOR ME)				
Course Code	24PHY12/22	CIE Marks	50	
L:T:P:S	3:0:1:0	SEE Marks	50	
Hrs / Week	4+2	Total Marks	100	
Credits	04	Exam Hours	03	
	Course outcomes: At the end of the course, the s	tudent will be able	to:	
CO1	Understand the principles of quantum mechanics, lasers, electronic materials, sensors, physics in			
	animation and Instrumentation physics.			
CO2	Apply mathematical techniques to solve physics-relate	ed problems within	n the context of quantum	
	mechanics, laser technology, electronic material physics, and Instrumentation physics.			
CO3	Analyze various physical phenomena through the principles of wave mechanics, laser operation,			
	electronic material behavior, material characterization and the functioning of sensors.			
CO4	Understand how physical principles are used in engineering technology.			
CO5	Develop problem-solving skills by tackling physic	s problems and a	pply theoretical	
	knowledge to practical situations and engineering			

Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:

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

		CO1	9 Hours
MODULE-1	OHANDIM MECHANICO	CO ₂	
	QUANTUM MECHANICS	CO3, CO4	
		CO5	

Wave-Particle dualism, de-Broglie hypothesis, phase velocity, group velocity, relationship between phase velocity and group velocity, expression for de-Broglie wavelength from the concept of group velocity, Heisenberg's uncertainty principle, physical significance and application (broadening of spectral lines), Wave function Properties, Physical significance, derivation of Time independent Schrödinger wave equation, eigen value and eigen function, Application of Schrödinger Equation (one dimensional potential well) Numerical problems.

Laboratory Component:

- 1. Stefan' Law of Radiation
- 2. Determination of Planck's Constant

Self-study / Applications	Application of Heisenberg's principle –Finite potential well, Application of
	Schrödinger Equation (free particle), Quantum tunnelling
Text Book	1 &2

TOAT DOOK	1 62		
		CO1	9 Hours
MODULE-2	LASERS & FIBER OPTICS	CO ₂	
		CO3, CO4	
		CO5	

Introduction, Interaction of radiation with matter, expression for energy density at thermal equilibrium in terms of Einstein's coefficient, conditions and requisites of Laser, characteristics of laser, Quantum Dot Laser and their applications, Problems.

Principle and propagation of light in optical fibers, Numerical aperture and Acceptance Angle, Types of Optical fibers, Attenuation, Expression for attenuation co-efficient (derivation), application-point to point telecommunication network, Problems

Laboratory Component:

- 1. Laser Diffraction: To determine the wavelength of Laser using grating
- 2. Particle Size Determination Using LASER
- 3. Numerical Aperture: To determine the numerical aperture of Optical Fiber

Self-study	Application of Lasers & Optical fiber endoscopy		
Text Book	3&4		
	CONDUCTORS, SEMICONDUCTORS	CO1	9 Hours
MODULE-3	&SUPERCONDUCTORS	CO ₂	
		CO ₃	
		CO4	
		CO5	

Review of CFET (Qualitative), Quantum free electron theory, Fermi factor, variation of Fermi factor with Energy at T = 0K, T > 0K, Density of states (qualitative), Problems based on fermi factor.

Introduction of semiconductor physics, conductivity in an intrinsic semiconductor, mention of electron concentration in intrinsic semiconductor(Ne) and mention of Nh, expression for intrinsic carrier concentration ni from Law of mass action, expression for position of Fermi level in Intrinsic semiconductors, graphical discussion of variation of fermi level with temperature and concentration in intrinsic and extrinsic semiconductors, Hall Effect and expression for Hall coefficient in n and p type semiconductors(derivation) Application of Hall effect, Problems.

Introduction to Superconductors, Temperature dependence of resistivity, Meissner Effect, Critical Current, Types of Super Conductors, BCS theory(qualitative), Applications in Quantum Computing.

Laboratory Component:

- 4. Fermi Energy: To determine the Fermi energy of copper.
- 5. Resistivity: Four Probe method
- 6. Hall Effect: To measure Hall Coefficient of materials.

Self-study	Maglev, Squids		
/Applications			
Text Book	5&6		
		CO1	9 Hours
MODILLE 4		CO ₂	
MODULE-4	SENSORS AND PHYSICS OF ANIMATION	CO3, CO4	
		CO5	

Sensors: Difference between sensor, transmitter and transducer, working principle of sensors, sensor characteristics, Sensor classification, Sensor types and its applications, Biomedical sensors and Sensors in IOT

Physics of Animation:

Taxonomy of physics-based animation methods, Frames, Frames per second, Size and Scale, Weight and strength, Motion and Timing in animations, Force and acceleration, The Odd rule, Odd rule scenarios, Motion Graphs, Examples of Character animation: Jumping, Parts of Jump, Jump Magnification, Stop Time, Walking: Strides and Steps, Walk Timing. Numerical Problems

Laboratory Component: 1. Photodiode Characteristics				
Self-study / Applications	Wearable Sensors			
Text Book	7,8,9&10			
MODULE-5	INSTRUMENTATION PHYSICS	CO1 CO2 CO3, CO4 CO5	9 Hours	

Instrumentation Physics

Introduction to materials – Nanomaterials- Synthesis, properties and applications, Composites-Types. Properties and applications Introduction to characterization techniques, XRD- Bragg's Law, X-ray Diffractometer, Particle size determination using XRD, XPS – Principle, instrumentation and application, AFM - Principle, instrumentation and application, SEM – Principle, instrumentation, Application and advantages. Problems on XRD

LABORATORY Component1. Particle Size Determination – Using LASER

Self-Study /Application s	TEM, FTIR
Text Book	11,12&13

CIE Assessment Pattern (50 Marks – Theory and Lab)

RBT Levels			Marks Distribution			
		Test (s)	Qualitative Assessment	Lab		
		25	05	20		
L1	Remember	5	-	-		
L2	Understand	5	-	-		
L3	Apply	10	2	10		
L4	Analyze	5	2	10		
L5	Evaluate	-	1	-		
L6	Create	-	-	-		

SEE Assessment Pattern (50 Marks – Theory)

RBT Levels		Exam Marks Distribution (50)
L1	Remember	10
L2	Understand	10
L3	Apply	10
L4	Analyze	10
L5	Evaluate	10
L6	Create	

Suggested Learning Resources:

Text Books:

- 1) Modern Physics by R Murugeshan, Kiruthiga Sivaprasath, S Chand Publishing, 18th ed. 2016
- 2) Concepts of Modern Physics, Arthur Beiser, 7th Edition, 2017, Tata McGraw Hill
- 3) Engineering Physics, D K Bhattacharya, poonam Tandon, Oxford university Press, 2015
- 4) Engineering Physics, B. K. Pandey and S. Chaturvedi, 1st edition, 2012, Cengage Publication
- 5)A Textbook of Solid State Physics, S.O. Pillai, 6th Edition, 2010, New Age International
- 6) Solid State Physics, C Kittel, 8th Edition, 2019, Wiley India
- 7)Measurement, Testing and Sensor Technology: Fundamentals and Application to Materials and Technical Systems 1st ed. 2018 Edition, by Horst Czichos, Springer
- 8)INTRODUCTION TO SENSORS AND TRANSDUCERS, Mr. M.Sivasubramanian, Notion Press, ISBN: 9798887339948
- 9)Sensors. Materials and Amplifiers, Springer, Berlin; New York, 2002 (ISBN: 3540422595).
- 10) Physics for Animators, Michele Bousquet with Alejandro Garcia, CRC Press, Taylor and Francis, 2016
- 11) Electron Microscopy and Analysis, ,Peter J. Goodhew, John Humphreys, Richard Beanland, 3rd Edition 2000, 272, Taylor and Francis.

ISBN 0-748-40968-8.

- 12)https://www.youtube.com/watch?v=nSuHuaNT8kE-Material Charecterization Part 1
- 13). https://www.youtube.com/watch?v=TnT7vXpsn6E-Material Charecterization Part2

Web links and Video Lectures (e-Resources):

- https://www.compadre.org/quantum/
- https://www.brown.edu/research/labs/mittleman/sites/brown.edu.research.labs.mittleman/files/up loads/lecture2.pdf
- https://www.iitk.ac.in/stc/Publications/DGoswami/marked Chapter 07.pdf
- https://www.youtube.com/watch?v= 40dpUzzfhA
- https://www.voutube.com/watch?v=OuR969uMICM&t=1s
- https://www.youtube.com/watch?v=vruYFOlM1-Q
- https://www.youtube.com/watch?v=5j37DOD8q4U&list=PLTkE7n2CwG PH09 q0Q7ttjqE2F9y GeM3
- https://www.youtube.com/watch?v=D8uMVrplSFA
- Quantum computing and networking w/ alkali atom qubit arrays | Qiskit Seminar Series w/ Mark Saffman YouTube

Virtual Labs

- https://www.vlab.co.in/broad-area-physical-sciences
- https://bop-iitk.vlabs.ac.in/
- https://vlab.amrita.edu/index.php?sub=1&brch=189

- Video Demonstration of working of QD Laser
- Video demonstration of latest trends in Quantum Computing
- Contents related activities (Activity-based discussions)
 - > Flowcharts and Handout preparation by students
 - > Group Discussion
 - > Seminars

ENGIN	EERING	SCIENC	CE COU	RSES (F	ESC)

		T		DATA	STRU					ı			
Course Cod	e	24CSE					E Mark			50			
L:T:P:S		2:0:0:0 SEE Marks 50											
Hrs / Week		3	Total Marks 100										
Credits		02					am Hou			03			
Course out	omes: A	t the end	of the c	ourse, th	ie studen	ıt will be	able to	:					
CO1		Understand the essentials of progr					-						
CO2			Use the concepts of Arrays and Functions to develop programs using C language Apply the concepts of Structures, Unions and Pointers to solve the given problem										
CO3				_				ointers t s of Stac			n problem		
CO4 CO5							•	a structui		tructure			
CO6					•			a given s		ta eleme	ents		
Mapping o	f Course					<u> </u>							
	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	-	2	2	-	-	-	-	-	-	-	-	
CO5	3	3	1	2	-	-	-	-	-	-	-	-	
CO6	3	3	2	2	-	-	-	-	-	-	-	3	
MODUL	E-1]	Program	ming E	ssential	S			CO	1		6 Hot	ırs	
Structure of Making, Bra		nd Loopi	ng State	ments.	to Char		s, mana	ging inp	ut and C			———	
MODULE-	2		and Fu			,	CO2				6 Hours		
One-Dimer		•				Declarat	ion, Init				0 110		
Built-in and		•			•					alue and	d Call by r	eference	
Recursion.			, -	8		-,8-	-,	,	5		, -		
Text Book		Text B	ook 1: (Chapter	8, 13, 14	. Text I	Book 2:	Chapter	1				
	3				d Pointe			CO			6 Ho	ırs	
MODULE-							in Struc			s.		· · · ·	
MODULE- Definition,													
Definition,	mg romi	cis, Deci	aranon,	minum	auon, ro	muer Ari	ınmenc	. romen					
	ilig Follit					inter Ari	ınmenc	. Follitel					
Definition, Understand		Text B	ook 1: (Chapter		inter Ari	umeuc	CO	4,		6 Ho	ırs	
Definition, Understand Text Book	4 f Data St	Text B Stacks tructures, ns, Evalu	ook 1: O and Qu Represation of	Chapter eues entation Postfix	9, 17 of a St Expressi	ack, Pri	mitive (CO- CO Operation	4, 5 ns on a				
Definition, Understand Text Book MODULE- Overview o Arithmetic I	4 f Data St	Text B Stacks tructures, ns, Evalue, Representation	ook 1: O and Qu Represation of	eues entation Postfix of a Qu	9, 17 of a St Expression	ack, Pri	mitive (CO- CO Operation	4, 5 ns on a				
Definition, Understand Text Book MODULE- Overview o Arithmetic I	4 f Data St Expression to Queue	Text B Stacks tructures, ins, Evalue, Represe	ook 1: (and Qu Represation of entation	entation Postfix of a Que	9, 17 of a St Expression Prints 5,6	ack, Pri	mitive (CO- CO Operation	4, 5 ns on a			ations o	

Text Book

Text Book 2: Chapter 9

			Marks Distribution					
	RBT Levels	Test (s)	Qualitative Assessment (s)	MCQ's				
		25	15	10				
L1	Remember	-	-	-				
L2	Understand	5	-	-				
L3	Apply	5	5	5				
L4	Analyze	10	5	5				
L5	Evaluate	5	5	-				
L6	Create	-	-	-				

SEE Assessment Pattern (50 Marks – Theory)

	RBT Levels	Exam Marks Distribution (50)
L1	Remember	-
L2	Understand	10
L3	Apply	15
L4	Analyze	15
L5	Evaluate	10
L6	Create	

Suggested Learning Resources:

Text Books:

- 1. Let Us C: Authentic guide to C Programming language 19th Edition Paperback Yashavant Kanetkar, 15 December 2022, ISBN: 9789389845693.
- **2.** Data Structures Through C 4th Edition, Yashavant Kanetkar, BPB Publications, March 2022, ISBN 978-93-5551-189-8.

Reference Books:

1. Data Structures And Algorithms Made Easy: Paperback, Narasimha Karumanchi, July 2023, ISBN: 9788193245286.

Web links and Video Lectures (e-Resources):

- https://youtu.be/wKoGImLA2KA?si=iN19IRhSTntmV2Mp
- https://youtu.be/AT14lCXuMKI?si=z vvUCUlsvBec5au
- https://youtu.be/si-KFFOW2gw?si=zkDv FzVPZgczeYm
- https://youtu.be/Db9ZYbJONHc?si=CDozOf3s0JMTs5kJ

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

• **Tricky Programs:** Tricky programs that can improve student's logical knowledge to solve complex problems with different methods. They can be individual or team-based.

https://www.includehelp.com/c-programming-puzzles-c-sundae-examples-solutions.aspx

Programming Puzzles: To become proficient in coding, students need to write clear, concise and correct programs. Students are given a set of programs on each module to enhance their programming skills. Primary task is to discover what each program prints.

https://efrei.poupa.net/Programmation%20en%20C/Cours/The_C_Puzzle_Book.pdf

- **Peer Teaching**: The students can be asked to teach and discuss specific topic or concept to their peers. This not only reinforces their own understanding but also encourages active engagement and collaboration.
- **Reflection and Discussion**: The students can be asked to present their learning of any topic with others. This will encourage students to reflect on their experiences and discuss what they learned. This promotes critical thinking and deeper understanding.

			D	ATA S	FRUCT	URES	USING	C LAB				
Course Cod	e 2	24CSL2	4			C	IE Mar	ks		50		
L:T:P:S	0:0:1:0 SEE Marks						50					
Hrs / Week	k 2 Total Marks						100					
Credits							03					
Course outc	omes: A	t the end	of the	course,	the stud	ent will	be able t	to:				
CO1		nplemen										
CO2										op C prog	grams	
CO3		nplemen										
CO4		pply sea										
Mapping of												DO16
601	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	-	3	-	-	-	3	3	-	3
CO2	3	3	3	-	3	-	-	-	3	3	-	3
CO3	3	3	3	-	3	-	-	-	3	3	-	3
C04	3	3	3	_	3	_		_	3	3	_	3
Prog. No.				Li	st of Ex	perime	nts		Н	ours	CO)s
						ART-A						
1	Write a	C progr	ram to fi	ind the 1	roots of	a quadra	atic equa	ition.		2	CO	1
2		C prog						between	1	2	CO	1
3	Write a	prograntement.						g switc	h	2	CO	1
4		C progr		nd both	the larg	est and	smallest	number	:	2	CO	2
5	Write a	C progr tion of T	am that				m the fol			2	CO	2
6	Write a	progran	n to swa	ip two n	numbers	using p	ointers.			2	CO	2
7	Write a program to swap two numbers using pointers. Create a structure named Book to store book details like title, author, and price. Write a C program to input details for three books, find the most expensive and the lowest priced books, and display their information.					;	2	СО	2			
8							2	СО	3			
	•				P	ART-B				· ·		
9	Write a	progran	n to eva	luate a 1	oostfix e	xpression	on using	a Stack		2	CO	3
10	Develop	o a progr ons: Enc	ram for	Queue t	hat perf	orms fol			'e	2	CO	
11	a) Writ	e a Prog	ram to p	erform		• •				2	CO	4

PART-C

Beyond Syllabus Virtual Lab Content (To be done during Lab but not to be included for CIE or SEE)

1. https://cse02-iiith.vlabs.ac.in/List%20of%20experiments.html

b) Write a program to perform binary search.

a) Write a Program to sort the numbers using Selection Sort.

b) Write a Program to sort the numbers using Bubble Sort.

12

2. https://ds1-iiith.vlabs.ac.in/List%20of%20experiments.html

CO4

2

CIE Assessment Pattern (50 Marks – Lab)

	DDT Lavels	Weekly Evaluation	Test
	RBT Levels	30	20
L1	Remember	-	1
L2	Understand	-	1
L3	Apply	10	10
L4	Analyze	10	10
L5	Evaluate	10	1
L6	Create	-	-

SEE Assessment Pattern (50 Marks – Lab)

	RBT Levels	Exam Marks Distribution (50)
L1	Remember	-
L2	Understand	-
L3	Apply	20
L4	Analyze	20
L5	Evaluate	10
L6	Create	-

Suggested Learning Resources:

Reference Books:

1. C Programming - Learn to Code, Sisir Kumar Jena, 2021, CRC Press, Taylor & Francis Group, ISBN: 978-1-032-03625-0.

	de 2	24CAD15/25						<mark>F DRAW</mark> IE Marl		- 5	50	
L:T:P:S		:0:1:0						EE Marl			50	
Hrs / Week	x 5						T	otal Mai	rks	1	.00	
Credits	0	3					E	xam Ho	urs	()3	
Course out	comes:	At the en	d of the	course, tl	he studei	nt will be	e able to:					
CO1	Ι	raw the o	bjects w	ith defini	ite shape	and dim	nensions					
CO2	F	Recognize and draw the shape and size of objects through diffe						ferent vic	ews			
CO3	Ι	Develop the lateral surfaces of the object										
CO4		Create the drawing views using CAD software										
CO5		Generate of						tions				
									# arvata	na thuas	ala ita	amambia
CO6		dentify the presentat		aiscipiina	ary eng	ineering	compo	nents o	r syster	ns throu	ign its	grapnic
Mapping o		•		Progran	n Outco	mes						
viapping o	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
CO5	3	3	-	-	3	-	-	-	-	-	-	3
CO6	3	3	TIONS	- OF DOI	3	TD A I.C.	-	-	-	- O1	-	3
MODULE		ROJECT					ні			01	8	Hours
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Multi-disciplinary applications and practice: Drawing Simple Mechanisms: Bicycles, Tricycles, Gear trains, Ratchets, two-wheeler cart & Four-wheeler carts to dimensions

Electrical Wiring and Lighting diagrams: Like Automatic fire alarm, call bell system, UPS system, Basic power distribution system using suitable software.

Basic Building Drawings: Simple Electronic Circuit Drawings, practice on layers' concept.

Applications	List the sheet metal drawing components used in automobile and aerospace application
Text Book	Text Book 1: 10.1-10.3

CIE Assessment Pattern (50 Marks – Theory) –

			Marks Distribution					
	RBT Levels	Test (s)	Qualitative Assessment (s)	Lab Internal				
		25	5	20				
L1	Remember	5	-	-				
L2	Understand	5	-	-				
L3	Apply	5	2	10				
L4	Analyze	5	2	10				
L5	Evaluate	5	1	-				
L6	Create	-	-	-				

SEE Assessment Pattern (50 Marks – Theory)

	RBT Levels	Exam Marks Distribution (50)
L1	Remember	10
L2	Understand	10
L3	Apply	10
L4	Analyze	10
L5	Evaluate	10
L6	Create	

Suggested Learning Resources:

Text Books:

- Engineering Drawing, Trymbaka Murthy, I.K International Publishing House Pvt Ltd, Bangalore, 2013. ISBN-13-9380578606
- 2. Machine Drawing, K. R. Gopala Krishna, Subhas Stores, Bangalore, 2005. ASIN: B074Y8HWKF

Reference Books:

- 1. French, Thomas E., Vierck, C. J. and Foster, R. J., Fundamental of Engineering Drawing & Graphics Technology, McGraw Hill Book Company (2005). ISBN-13-9780071004251
- A Textbook of Engineering Graphics by K. Venugopal & Prabhu Raj, New Age International, 2009. ISBN-13-9788122424577
- 3. Fundamentals of Engineering Drawing with an Introduction to Interactive Computer Graphics for Design and Production- Luzadder Warren J., Duff John M., Eastern Economy Edition, 2005- Prentice-Hall of India Pvt. Ltd., New Delhi. ISBN-13-9780134808499
- 4. Bhattacharya S. K., Electrical Engineering Drawing, New Age International publishers, second edition 1998, reprint 2005.
- 5. Chris Schroder, Printed Circuit Board Design using AutoCAD, Newnes, 1997.

Web links and Video Lectures (e-Resources):

Publications of Bureau of Indian Standards:

- 1. IS 10714 (Part 20) 2001 & SP 46 2003: Lines for technical drawings.
- 2. IS 11669 1986 & SP 46 2003: Dimensioning of Technical Drawings.
- 3. IS 15021 (Parts 1 to 4) 2001: Technical drawings Projection Methods.
 - https://nptel.ac.in/courses/112/103/112103019/

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

• Visit Manufacturing industries

ENGINEERING SCIENCE COURSES (ESC I&II)	I&II
	Page 49

Credits								ONICS					
Ites Week 3	Course Code	e	24ESC	131/231					CIE Ma	rks		50	
Course outcomes: At the end of the course, the student will be able to:	L:T:P:S)								50	
Course outcomes: At the end of the course, the student will be able to: CO1 Apply the principle of semiconductor device for real time applications CO2 Analyze the different concepts of number systems for digital circuits CO3 Construct combinational and sequential circuits using the basic logic gates CO4 Understand the principles and usage of Embedded systems CO5 Analyze the modulation techniques and relate with evolution of cellular communicatio systems CO6 Engage in independent learning as a member of a team, submit a report and use ICT for effective presentation of the study on assigned topics related to electronic systems. Mapping of Course Outcomes to Program Outcomes PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 CO1 3 -	Hrs / Week												
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CO4 2			-	-	-	-		-	-	-	-		-
CO5 3 3 2 1 2 1 -			3	-	-	-		-	-	-		-	-
MODULE-1 SEMICONDUCTOR DIODE AND TRANSISTOR CO1, 8 CO6 Hour Semiconductor Diodes and Applications: P-N Junction diode – its principle, characteristics and parameters Applications: Half-Wave Rectifier, Full Wave Rectifier (Two Diode, Bridge Rectifier), Zener diode as Voltage regulator. Bipolar Junction Transistor: BJT Operation, BJT Voltages and Currents, BJT as a switch, Common Emitter Characteristics, Numerical examples as applicable. Self-study Study the movement of electrons and holes in different regions of the BJT. Text Book Textbook 1: 1.6, 1.7, 2.2, 3.1, 3.2, 9.5, 4.1, 4.2, 4.4, 4.6 MODULE-2 FUNDAMENTALS OF TRANSISTORS AND OSCILLATORS IN ELECTRONICS MOSFET: Introduction to MOSFET theory, Operation and characteristics of Enhancement MOSFET for n- channel, MOSFET as a switch. Comparison between BJT and MOSFET. BJT as an Amplifier: Biasing DC load line, Need for biasing, Single stage CE amplifier using Voltage divide bias. Oscillator: Barkhausen criterion, Conceptual discussion of Crystal controlled oscillator. Self-study MOSFET as a Switch TextBook Textbook 1: 9.5, 5.1, 5.4, 6.4, 16.1, 16.9 MODULE-3 FUNDAMENTALS OF NUMBER SYSTEMS AND OGGILLATORS: Number Systems to other, Complement of Binary Numbers (1's and 2's), Binary subtraction using 1's and 2's complement. Digital Electronics: Logic gates, NAND and NOR as universal gates, Boolean Algebra Theorems, De Morgan's theorem, Algebraic Simplification. Applications Implement logic circuits using basic gates (AND, OR, NOT) and universal gates (NAND NOR) to build the core components of the electronic voting system. Text Book Textbook 2: 1.2, 1.3, 1.4, 1.5, 2.1, 2.2, 2.3, 2.4, 2.7 MODULE-4 CORE COMPONENTS OF DIGITAL AND CO3, 8 Hours			3	_	_	<u> </u>	<u> </u>	_	-	_		_	<u> </u>
Semiconductor Diodes and Applications: P-N Junction diode – its principle, characteristics and parameters Applications: Half-Wave Rectifier, Full Wave Rectifier (Two Diode, Bridge Rectifier), Zener diode as Voltage regulator. Bipolar Junction Transistor: BJT Operation, BJT Voltages and Currents, BJT as a switch, Common Emitter Characteristics, Numerical examples as applicable. Self-study Study the movement of electrons and holes in different regions of the BJT. Text Book Textbook 1: 1.6, 1.7, 2.2, 3.1, 3.2, 9.5, 4.1, 4.2, 4.4, 4.6 MODULE-2 FUNDAMENTALS OF TRANSISTORS AND OSCILLATORS IN ELECTRONICS CO6 MOSFET: Introduction to MOSFET theory, Operation and characteristics of Enhancement MOSFET for n-channel, MOSFET as a switch. Comparison between BJT and MOSFET. BJT as an Amplifier: Biasing DC load line, Need for biasing, Single stage CE amplifier using Voltage divide bias. Oscillator: Barkhausen criterion, Conceptual discussion of Crystal controlled oscillator. Self-study MOSFET as a Switch Text Book Textbook 1: 9.5, 5.1, 5.4, 6.4, 16.1, 16.9 MODULE-3 FUNDAMENTALS OF NUMBER SYSTEMS AND CO2, DIGITAL ELECTRONICS CO3, CO6 Number Systems: Introduction, Number Systems (Decimal, Binary, Hexadecimal, Octal), Conversion from one number system to other, Complement of Binary Numbers (1's and 2's), Binary subtraction using 1's and 2's complement. Digital Electronics: Logic gates, NAND and NOR as universal gates, Boolean Algebra Theorems, De Morgan's theorem, Algebraic Simplification. Applications Implement logic circuits using basic gates (AND, OR, NOT) and universal gates (NAND NOR) to build the core components of the electronic voting system. Text Book Textbook 2: 1.2, 1.3, 1.4, 1.5, 2.1, 2.2, 2.3, 2.4, 2.7				2	1	2	1	_	1	2		_	2
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Building blocks of a Digital system: Combinational circuits (Half Adder, Full Adder), Sequential circuits (SR Latch using NAND gates, Flip-Flops [SR, JK, D, T]).

Embedded Systems: Definition of an Embedded System, Embedded systems vs General Purpose Systems, Application of Embedded Systems, Purpose of Embedded systems, Characteristics of Embedded systems.

Applications	Design circuit boards integrating microcontrollers, sensors, actuat	Design circuit boards integrating microcontrollers, sensors, actuators, and communication				
modules.						
Text Book	Textbook 2: 4.3, 5.5, 6.2, 7.2					
	Reference book 1: 1.1, 1.2, 1.5, 1.6, 3.1					
MODULE-5	INTRODUCTION TO COMMUNICATION SYSTEMS	CO5,	8 Hours			
	AND CELLULAR TECHNOLOGIES	CO6				

Communication Systems: Introduction to communication systems, need for modulation, Principles of amplitude modulation, Introduction to angle modulation, FM and PM waveforms, Amplitude shift keying, Frequency shift keying, Phase shift keying.1G, 2G cellular telephone systems – GSM, 3G and 4G, Simplified block diagram of a digital radio system.

Case Study	Evolution of cellular networks from analog (1G) to digital (2G) and subsequent advancements in speed and data capabilities (3G and 4G).
Text Book	Textbook 3: 1.3, 1.4, 4.1, 4.2, 7.5, 9.3, 9.4, 9.5, Textbook 3: 19.3, 20.2, 20.4, 20.9.2, 9.1

CIE Assessment Pattern (50 Marks – Theory) –

	<u>, </u>	Marks Distribution						
	RBT Levels	Test (s)	Assignment	MCQ's	Mini Project			
		25	5	10	10			
L1	Remember	10	-	5	-			
L2	Understand	10	-	5	-			
L3	Apply	5	5	-	-			
L4	Analyze	-	-	-	5			
L5	Evaluate	-	-	-	-			
L6	Create	-	-	-	5			

SEE Assessment Pattern (50 Marks – Theory)

	RBT Levels	Exam Marks Distribution (50)
L1	Remember	20
L2	Understand	20
L3	Apply	10
L4	Analyze	-
L5	Evaluate	-
L6	Create	-

Suggested Learning Resources: Text Books:

- 1) Electronic Devices and Circuits, David. A. Bell, 5th edition, 2008, Oxford University Press, ISBN: 978-0195693409.
- 2) Digital Logic and Computer Design, M. Morris Mano, 5th edition, 2002, PHI, ISBN: 978-0131989269.
- 3) Electronic communication systems, Wayne Tomasi, 5th edition, 2001, Pearson.education, ISBN: 978-0130494924.

Reference Books:

- 1) Introduction to Embedded systems, Shibu K.V., 1st Edition, McGraw Hill Education, 2009, ISBN: 978-0070145894
- 2) Principles of Electronics, V. K. Mehta, 12th edition, 2020, S. Chand Publishing, ISBN: 978-9352838277

Web links and Video Lectures (e-Resources):

- https://www.rfpage.com/evolution-of-wireless-technologies-1g-to-5g-in-mobile- communication/
- MOSFET: https://archive.nptel.ac.in/courses/108/106/108106105/
- Basic Electronics: https://nptel.ac.in/courses/122106025
- Embedded system: https://nptel.ac.in/courses/108102045
- https://www.voutube.com/watch?v=bGxhPG3H5BQ

- ➤ Hands-On Component Identification
- > Group Projects
- > Group activity to Diagnose fault finding in basic simple electronic circuits.

	BASIC ELECTRICAL ENGINEERING							
Course Code	24ESC132/232	CIE Marks	50					
L:T:P:S	3:0:0:0	SEE Marks	50					
Hrs / Week	3	Total Marks	100					
Credits	03	Exam Hours	03					
Course outcomes	: At the end of the course, the student will be ab	le to:						
CO1	CO1 Understand the principle of operation, components, layout, environmental and social issues of various power plants.							
CO2	Recognize the energy properties of electric eand current.	elements and the technique	ues to measure voltage					
CO3	Analyze the active and passive elements and	performance parameters	s of ac circuits.					
CO4	CO4 Choose the proper type and specification of measuring procedure and instruments for different industrial, commercial, and domestic applications.							
CO5	Evaluate the basic operation and performance of electrical machines and can select appropriate machine for different purposes.							
CO6	Use the concepts of tariff and different safet	y measures of electrical a	appliances.					

Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:

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

MODULE-1 POWER PLANTS AND DC CIRCUITS CO1, CO2 8 Hours
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Power Generation:

Renewable and Non-Renewable energy resources - Hydel, Nuclear, Solar & wind power generation (Block Diagram approach) - Electrical power system structure-Single line diagram.

DC Circuits:

Ohm's Law and its limitations- KCL & KVL-series, parallel, series-parallel circuits-Simple Numerical

Text Book	Text Book 1: Chapter 1,2 & 3, Chapter 15 Text Book 5 : Cl	hapter 17, 1 & 2	
Self-Study	A case study of the power sector in India		
MODULE-2	AC CIRCUITS	CO3	8 Hours

A.C. Fundamentals:

Equation of AC Voltage and current, waveform, time period, frequency, amplitude, phase, phase difference, average value, RMS value, form factor, peak factor (only definitions)-Voltage and current relationship with phasor diagrams in R, L, and C Circuits- Series R-L, R-C, R-L-C circuits, concept of impedance and admittance, Concept of active, reactive, apparent, complex power and power factor

Three Phase Circuits:

Three phase AC quantity, advantages, and limitations-star and delta connection-relationship between line and phase quantities.

Text Book	Text Book 1:Chapter 7,8 & 9				
Self-Study	AC Electrical Circuit Analysis- Watching NPTEL video lecture series and Identification of				
	phase, Neutral and Earth wires for connection				
MODULE-3	ELECTRICAL MEASUREMENTS AND WIRING	CO4	8 Hours		

Measurement and Instrumentation:

Functional elements of measuring instruments – Types of measuring instruments – Standards, Errors, and calibration-Construction and working Principle of Permanent magnet moving coil and moving iron instruments-Attraction type, Single phase wattmeter and Single phase energy meter and digital meters.

Domestic Wiring:

Requirements, Types of wiring: Two way and three-way control of lamp.

Text Book	Text Book 1: Chapter 13 ;Text Book 4 : Chapter 15; Text Book 3 : Chapter 1,2
Self-study	Study of electrical safety measures and protective devices and Identification of phase,
	Neutral and Earth wires for connection

MODULE-4 ELECTRICAL MACHINES CO5 8 Hours

DC Generator:

Principle of operation-constructional details, types-induced EMF expression.

DC Motor:

Principle of operation, back emf and its significance- Torque equation, types of motors, Applications of DC machines.

Transformers:

Principle of operation, construction of single-phase transformers, Types, EMF equation and losses in transformer, Definition of regulation and efficiency.

Text Book	Text Book 1: Chapter 10,11 & 12; Text Book 2: Chapter 9 & 10	
Self-study	Watching NPTEL video lecture on Electrical Machines and Magnetic circuits	
MODULE-5	TARIFF CALCULATION AND ELECTRICAL CO6	8 Hours
	SAFETY	

Energy conservation and load calculation:

Energy conservation and its necessity-Power rating and load calculations of domestic appliances -tariff and its types.

Equipment Safety measures:

Working principle of Fuse and Miniature circuit breaker (MCB), merits and demerits, Personal safety measures -Electric Shock, Earthing and its types, Safety Precautions to avoid shock.

An over view of electric vehicles - block diagram approach.

Text Book	Text Book 1:782-796
Self-study	Case study on Electrical safety measures

CIE Assessment Pattern (50 Marks – Theory)

	•		Marks Distribution				
	RBT Levels	Test (s)	Qualitative Assessment (s)	MCQ's			
		25	15	10			
L1	Remember	5	5	3			
L2	Understand	10	5	2			
L3	Apply	5	5	5			
L4	Analyze	5	-	-			
L5	Evaluate	-	-	-			
L6	Create	-	-	-			

SEE Assessment Pattern (50 Marks – Theory)

	RBT Levels	Exam Marks Distribution (50)
L1	Remember	20
L2	Understand	20
L3	Apply	10
L4	Analyze	
L5	Evaluate	
L6	Create	

Suggested Learning Resources:

TEXT BOOKS:

- Basic Electrical Engineering by D C Kulshreshtha, Tata McGraw Hill, 2nd Edition 2019, ISBN-13: 978-9353167219
- 2) Principles of Electrical Engineering and Electronics, V.K. Mehta, S Chand Publishing, 2019, ISBN: ISBN: 9788121942980
- 3) Electrical and electronic measurements and instrumentation by A K Sawhney, Dhanpat Rai & Co. (P) Limited, 2015, ISBn-10: 8177001000, ISBN-13: 978-8177001006
- 4) Basic Electrical and Electronics Engineering, D P Kothari, I J Nagrath, Second Edition, McGraw Hill Publishers, 2020, ISBN-10: 9389811244,ISBN-13: 978-9389811247

Reference books:

- 1) Basic Electrical and Electronics Engineering, S.K. Bhattacharya, Pearson Education, 2017, ISBN: 9789332586505
- 2) A textbook of Electrical Technology by B.L. Theraja, S Chand Publication, 2014, ISBN: 8121924413

Web links and Video Lectures (e-Resources):

- 1. AC and DC circuits: https://www.youtube.com/watch?v=ERIToctYUcQ
- 2. Basic concepts and examples: https://youtu.be/3TR DS 7z2w
- 3. Ohm's Law, KVL, KCL: https://youtu.be/FjaJEo7knF4
- 4. Electrical measurements and instrumentation: https://www.youtube.com/watch?v=xLjk5DrScEU&list=PLt5syl71JKf3yk9h0mWg6vCNn1Jmb72JJ
- 5. Electrical machines: https://www.youtube.com/watch?v=KUSBS11qpX0&list=PLohtAIfLLw8cdi1iOLyLNX1f839KSXDn 1

- For active participation of students, instruct the students to prepare Flowcharts and Handouts
- Organizing Group wise discussions on different topics
- Problem solving approach
- Collaborative learning
- Seminars
- Experiential learning approach through lab sessions (Hardware/Software)

			BA	SIC M	ECHA	NICA	L EN(SINEE	RING					
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Hrs / Week	3						Total	Total Marks		100	100			
Credits	03								Exam	Hour	S	03		
Course outcom	es: At th	es: At the end of the course, the student will be able to:												
CO1	Apply	the c	oncept	s of co	nventi	onal a	nd non	-conve	ntiona	l energ	y syste	ems to	design	and
	develo	op alte	rnate s	source	of ene	rgy pro	oductio	n						
CO2	Under	stand	the wo	orking	of adv	anced	vehicle	techn	ologies	S				
CO3	Analy related			ent typ	es of I	C engi	nes an	d refrig	geratio	n syste	ms and	d solve	probl	ems
CO4	Apply	the c	oncept	s of ad	vanced with t	d techr he aid	ology of mo	and vis	sualize	vario	ıs way	s to cre	eate th	е
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CO3	3	3	2	_	_	_	_	_	_	_	_	-	_	+_
CO4	3	3	2	_	_	_	 	_	_	 	-	 	-	+
CO5	3	3	2	_	_	-	_	_	_	_	-	_	-	+
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Computer Numerical Control (CNC): Introduction, components of CNC, Open loop and closed loop systems, advantage of CNC, CNC Machining centre's and Turning centers. Applications of CNC, Advantages and disadvantages of CNC.

Introduction: Prototyping fundamentals, Historical development, Fundamentals of Rapid prototyping, Advantages and Limitations of Rapid Prototyping, Commonly used Terms, Classification of RP process, Rapid Prototyping Process Chain: Fundamental Automated Processes, Process Chain.

1 1	8
Applications	Industrial applications in the field of advanced manufacturing systems
Text Book	Text Book 2-Ch5, 3-Ch-1,2

MODULE-5 SMART MATERIALS

Introduction to Smart Materials, Principles of Piezoelectricty, Perovskyte Piezoceramic Materials, Single Crystals vs Polycrystalline Systems, Piezoelectric Polymers, Principles of Magnetostriction, Rare earth Magnetostrictive materials, Giant Magnetostriction and Magneto-resistance Effect, Introduction to Electro-active Materials, Electronic Materials, Electro-active Polymers, Ionic Polymer Matrix Composite (IPMC), Shape Memory Effect, Shape Memory Alloys, Shape Memory Polymers, Electro-rheological Fluids, Magneto Rheological Fluids

CO6

8Hours

Self Study	Study the different types of smart materials and its applicability
Text Book	Ref. 1, Ch-1,2

CIE Assessment Pattern (50 Marks – Theory)

			Marks Distribution				
	RBT Levels	Test (s)	Qualitative Assessment (s)	MCQ's			
		25	15	10			
L1	Remember	5	-	-			
L2	Understand	5	-	-			
L3	Apply	5	5	5			
L4	Analyze	5	5	5			
L5	Evaluate	5	5	-			
L6	Create	-	-	-			

SEE Assessment Pattern (50 Marks – Theory)

	· · · · · · · · · · · · · · · · · · ·			
	RBT Levels	Exam Marks Distribution (50)		
L1	Remember	10		
L2	Understand	10		
L3	Apply	10		
L4	Analyze	10		
L5	Evaluate	10		
L6	Create			

Suggested Learning Resources:

TEXT BOOKS:

- 1) Elements of Mechanical Engineering, Kestoor Praveen, M R Ramesh, Suggi Publishers
- 2) R S Khurmi and J K Gupta, A Text book Machine Design, EURASIA PUBLISHING HOUSE (PVT.) LTD.,

Reference Books

- 1) Brian Culshaw, Smart Structures and Materials, Artech House 2000
- 2) D.T Pham, S. S. Dony, "Rapid Manufacturing", Springer, 1st Edition,
- 3) Paul F Jacobs, "Rapid Prototyping & Manufacturing", Wohlers Associates, ASME Press,
- 4) S S Bhavikatti Elements of Civil Engineering and Mechanics, Fifth Edition, New Age International Pubhishers ISBN:978-81-224-3817-8
- 5) B.K. Kolhapure Elements of Civil Engineering and Engineering Mechanics, EBPB Publishers 8th edition ASIN: B073RRM9X1
- 6) 3. K. R. Gopalakrishna, Elements of Mechanical Engineering, Subhas Publications, Bangalore, 2017, ISBN-13: 5551234091781

• h	https://www.youtube.com/watch?v=GF5C8dH4f5o https://www.youtube.com/watch?v=0MeAZFFqmek&list=PLdLe0dTcWW-	
v i	1_dCcNGoAK8fx2PiS5gkVu	
	-Based Learning (Suggested Activities in Class)/ Practical Based learning	
• A	Automobile industry visit	
• I	C engine Lab Visit	
		Page 57

Web links and Video Lectures (e-Resources):

• https://www.youtube.com/watch?v=EVqBzOGQlkI

MMING LANGUA(ES I&II)

	PROBLEM SOLVING USING PYTHON				
Course Code	24PLC141/241	CIE Marks	50		
L:T:P:S	2:0:1:0	SEE Marks	50		
Hrs / Week	3+2	Total Marks	100		
Credits	03	Exam Hours	03		

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

CO1	Understand the fundamental concepts of Python and Apply the basic programming skills of
	Python Language in problem-solving.
CO2	Implement Python programs using different datatypes, Control statements loops and user-
	defined functions.
CO3	Analyze different string manipulation functions available in Python.
CO4	Analyze Exception handling functions available in Python.
CO5	Apply List, set, dictionary and Tuple concepts to design a Python program.
CO6	Create applications using Python programming language to solve real-world problems with
	files and OOPS concepts

Mapping of Course Outcomes to Program Outcomes

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

MODULE-1 BASICS OF PYTHON CO1 8 H

Algorithm and Flowchart, Elements of Python: Keywords, Identifiers, Variables, Data Types, Features. Operators and Expression: Assignment Statements, Numeric Expressions, Order of Evaluation, Operator Precedence, Type Conversions, Input Output Statement, Comments in Python.

Laboratory Components: (all programs must be done with Pseudo code and Flow chart)

- 1. Write a Python program that calculates the area of a circle based on the radius entered by the user.
- 2. Write a Python program that accepts an integer (n) and computes the value of n+nn+nnn.
- 3. Given two integer numbers, return their product only if the product is equal to or lower than 1000. Otherwise, return their sum.

Textbook	Textbook 1: 1.2		
MODULE-2	LOOPS ,CONTROL STATEMENTS AND FUNCTIONS	CO2	8 Hours

Loops and Control Statements: If, elif, Nested if, for, nested for, while continue, Break, Pass.

Functions: Advantage of Functions in Python, creating a Function, Function Calling, return statement, Arguments in function, Pass by Object Reference, Built-in Function, Lambda Functions, Map, Filter, Reduce functions, Recursive functions.

Laboratory Components: (all programs must be done with Pseudo code and Flow chart)

- 1) Write a Python program to create the multiplication table (from 1 to 10) of a number.
- Write a Python program to count the number of even and odd numbers in a series of numbers Sample numbers: numbers = (1, 2, 3, 4, 5, 6, 7, 8, 9)
- 3) Write a Python program to convert temperatures to and from Celsius and Fahrenheit. [Formula: c/5 = f-32/9 [where c = temperature in Celsius and f = temperature in Fahrenheit]

Self-study /	1.A game must be made from marbles of Five colors, yellow,	1.A game must be made from marbles of Five colors, yellow, blue, green, red and Violet						
Case Study /	where five marbles have to be kept one upon another. Write a python program using							
Applications	recursion, to find how many ways these marbles can be arranged.							
	2. Tower of Hanoi is a mathematical puzzle where we have the	nree rods and n disks.	The					
	objective of the puzzle is to move the entire stack to another	rod, obeying the follow	wing					
	simple rules: Here is a high-level outline of how to move a to	wer from the starting	pole to					
	the goal pole, using an intermediate pole:							
	Move a tower of height-1 to an intermediate pole, using the final pole.							
	Move the remaining disk to the final pole.							
	3. Move the tower of height-1 from the intermediate pole to the final pole using original pole							
Textbook	Textbook 1: 1.3,1.5,1.6,1.7,2:2.4							
MODULE-3	STRINGS AND EXCEPTION HANDLING	RINGS AND EXCEPTION HANDLING CO3, CO4 8 Hour						

Strings: Creating String in Python, Strings indexing and splitting, Reassigning Strings, Deleting the String, String Operators, Python String functions, slice operations.

Assertion and Exception Handling: Assertion usage in Python, Exception handling, try, except, raise, finally.

Laboratory Components: (all programs must be done with Pseudo code and Flow chart)

- 1) Write a Program to Accept a Hyphen Separated Sequence of Words as Input and Print the Words in a Hyphen-Separated Sequence after Sorting them Alphabetically
- 2) Given a string in python, count number of uppercase letters, lowercase letters and spaces in a string and toggle case the given string (convert lowercase to uppercase and vice versa).
- 3) Write a Python program that accepts a string and calculates the number of digits and letters. Sample Data: Python 3.6

Self-study /	A musical album company has 'n' number of musical albums. The PRO of this company							
Case Study /	wishes to do the following operations based on some scenarios:							
Case Study / Applications	Name of the album starts with 's' or 'S'.							
	Name of the album which contains 'jay' as substring.							
	Check whether the album name presents in the repository or not.							
	Count number of vowels and consonants in the given album name.							
Textbook	Textbook 1:1.5,1.8,2:2.8							
MODULE-4	LIST SET, DICTIONARY AND TUPLE	CO5	8 Hours					

List: Creating a List, List indexing and splitting, Python List Operations, List Built-in functions,

Tuple: Creating a tuple, Indexing, Deleting Tuple, Tuple operations, Tuple inbuilt functions.

Set: Creating a set, Python Set Operations, Python Built-in set methods.

Dictionary: Creating the dictionary, Properties of Keys and Values, Accessing the dictionary values, and adding dictionary values, Iterating Dictionary, Built in Dictionary functions.

Laboratory Components: (all programs must be done with Pseudo code and Flow chart)

- 1) Write a Python script to add a key to a dictionary. Sample Dictionary: {0: 10, 1: 20}
 - Write a Python program to remove an item from a set if it is present in the set.
- 2) Write a Python program to find repeated items in a tuple

2) Wille a	1 y thon program to find repeated items in a taple						
Self-study /	In a class of 50 numbers of students, 6 students are selected for the state cricket academy.						
Case Study /	the sports faculty of this school must report to the state cricket academy about the selected						
Applications	students' physical fitness. Here is one of the physical measures of the selected students';						
	Height in cm is given for those 6 selected students [153,162,148,167,175,151]. By						
	implementing functions, do the following operations.						
	The state academy selector must check whether the given height is present in the selected						
	students list or not.						
	State academy selector must order the height of students in an incremental manner.						
	State academy selector must identify the maximum height from the list.						

Textbook	Textbook 1: 1.10,1.11,1.12,2:2.5							
MODULE-5	FILES AND OBJECT-ORIENTED PROGRAMMING	CO6	8 Hours					
Files: Text files	Files: Text files, reading and writing files, format operator; command line arguments, modules, packages							
Object Oriente	d Programming: - creating python classes - Initializing object	ts, Objects and classe	·s -					
Abstraction – ov	verview of inheritance and its type, polymorphism							
Laboratory Co	mponents: (all programs must be done with Pseudo code an	nd Flow chart)						
1) Write a	Python program to count the number of lines in a text file							
2) Write a	Python program to append text to a file and display the text							
3) Write a	Python program to generate 26 text files named A.txt, B.txt, an	d so on up to Z.txt						
	1.Shuffle Deck of Cards							
Self-study /	To shuffle the deck of cards, use the shuffle module.							
Case Study /	Import the required module							
Applications	Declare a class named Cards which will have variables suites	and values, now inste	ead of					
	using self. Suites and self. Values are to be declared as global	variables.						
	Declare a class Deck that will have an empty list named myca	ardset, and the suites a	and values					
	will be appended to mycardset list.							
	Declare a class ShuffleCards along with a method named shuffle() that would check the							
	number of cards and then shuffle them.							
	To remove some cards, we will create a popCard() method in	ShuffleCards class.						
Textbook	Textbook 1:1.14 to 1.18,2:2.6,2.7,2.9							

CIE Assessment Pattern (50 Marks – Theory and Lab)

		Marks Distribution						
RBT Levels		Test (s)	Qualitative Assessment	Lab				
		25	05	20				
L1	Remember	5	1	-				
L2	Understand	5	1	-				
L3	Apply	5	5	10				
L4	Analyze	5	1	10				
L5	Evaluate	5	1	-				
L6	Create	5	1	-				

SEE Assessment Pattern (50 Marks – Theory)

RBT Levels	S	Exam Marks Distribution (50)
L1	Remember	10
L2	Understand	10
L3	Apply	10
L4	Analyze	10
L5	Evaluate	10
L6	Create	

Suggested Learning Resources:

Textbooks:

- 1) Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", Publisher: O'Reilly Publishers, 3rd Edition,24 May 2024,ISBN:978-1098155438
- 2) Guido van Rossum and Fred L. Drake Jr, "An Introduction to Python Revised and updated for Python 3.2", Publisher: Network Theory Ltd., 2011, ISBN-10: 1636390471, ISBN-13: 978-1636390475

Reference Books:

- 1) John V Guttag, "Introduction to Computation and Programming Using Python", Revised and expanded Edition, Publisher: MIT Press, 2023.
- 2) Robert Sedgewick, Kevin Wayne, Robert Dondero, "Introduction to Programming in Python: An Inter-disciplinary Approach", Publisher: Pearson India Education Services Pvt. Ltd., 2022.

- 3) Timothy A. Budd, "Exploring Python, Mc-Graw Hill Education (India) Private Ltd., 2021.
- 4). Kenneth A. Lambert, "Fundamentals of Python: First Programs, CENGAGE Learning, 2022.
- 5). Charles Dierbach, "Introduction to Computer Science using Python: A Computational Problem-Solving Focus, Wiley India Edition, 2023.
- 6). Paul Gries, Jennifer Campbell and Jason Montojo, "Practical Programming: An Introduction to Computer Science using Python 3, Pragmatic Programmers, LLC, 2022.

Web links and Video Lectures (e-Resources):

- 1) https://www.python.org/
- 2) https://www.codecademy.com/learn/learn-python-3
- 3) https://pynative.com/
- 4) https://www.programiz.com/python-programming
- 5) https://learnpython.com/
- 6) https://alison.com/course/a-python-course-for-complete-beginners
- 7) https://www.coursera.org/learn/python
- 8) https://www.edx.org/learn/computer-science/massachusetts-institute-of-technology-introduction-to-computer-science-and-programming-using-python

- 1) Contents related activities (Activity-based discussions)
- 2) For active participation of students, instruct the students to prepare Flowcharts and Handouts
- 3) Organizing Group wise discussions on issues
- 4) Seminars

PROBLEM SOLVING USING C							
Course Code	24PLC142/242	CIE Marks	50				
L:T:P:S	2:0:1:0	SEE Marks	50				
Hrs / Week	3+2	Total Marks	100				
Credits	03	Exam Hours	03				
Course outcomes: At the end of the course, the student will be able to:							

CO1	Illustrate basic concepts of C programming
CO2	Understand the use of control structures forgiven problems using C programming language.
CO3	Apply the concepts of looping, branching, and decision-making statements for a given problem
CO4	Develop the programs for array representation problems using C programming language
CO5	Demonstrate the ability to write C programs using pointers, structures, unions and arrays
CO6	Develop modular applications using C programming language

Mapping of Course Outcomes to Program Outcomes a

- 3	Trapping of Course Outcomes to 110gram Outcomes a												
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
ĺ	CO1	3	3	3	1	1	-	-	-	-	-	-	1
ĺ	CO2	3	3	3	1	1	-	-	-	-	-	-	1
ĺ	CO3	3	3	3	1	1	-	-	-	-	-	-	1
	CO4	3	3	3	1	1	-	-	-	-	-	-	1
	CO5	3	3	3	1	1	-	-	-	-	-	-	1
	CO6	3	3	3	1	1	-	-	_	_	-	-	1

MODULE-1 Introduction and Basic I/O in C

Basics: Program development in C, structured programming, using algorithm and flow chart.

Introduction: The C character set, Identifiers and keywords, Data types, Constants and variables, Expressions, Arithmetic operators, Unary, Relational, Logical, Assignment and conditional operators, Bitwise operators.

I/0 Functions: Formatted and unformatted Input/Output functions like printf(), Scanf(), Puts(), Gets() etc, The first C program

Laboratory Component:

- Write a C program to find sum and average of three numbers.
- Write a C program to find the sum of individual digits of a given positive integer.
- Write a C program to generate the first n terms of the Fibonacci sequence.

Text Book	Text Book 1: Chapter 1 & 2		
MODULE-2	Control Structures & Looping	CO2	08 hours
		CO3	

Control Structures: If, If-else, Switch case statements, While, For, Do-while loops, Break and continue statements, Goto, Return, Type conversion and type modifiers, Designing structured programs in C,

Laboratory Component:

- Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.
- Write a program to implement Arithmetic operations using switch case statement.

Text Book Text Book 1: Chapter 3, 4, 5		
MODULE-3 Arrays and Strings in C	CO4	08 hours

Arrays: Declaring and initializing arrays in C, Defining and processing 1D and 2D, arrays, Array applications, inserting and deleting elements of an array, Searching an element, Sorting of array.

Strings: Defining and initializing strings, Reading and writing a string, Processing of string, Character arithmetic, String manipulation functions and library functions of string,

Laboratory Component:

- Write a C program to perform the following:
- i) Addition of Two Matrices ii) To find transpose of a matrix iii) Multiplication of Two Matrices

Text Book 1: Chapter 13, 14, 15, 16

MODULE-4 Pointers & User defined Data Types in C CO5 08 hours

Pointers: Pointer declaration and initialization, Types of pointers- dangling, null, generic (void), Pointer expressions and arithmetic, Pointer operators, Operations on pointers, Passing pointer to a function, Pointer

08 hours

and 1D array, Dynamic memory management functions (malloc, calloc, realloc and free), Passing arrays to functions,

UDDT: Declaration of a structure, Definition and initialization of structures, Accessing structures, Structures and pointers, Nested structures, Declaration of a union.

Laboratory Component:

- Write a C program to swap two values using pointers
- Write a program to create a new matrix representing squares of elements in original matrix using pointers.

Text Book 1: Chapter 9

MODULE-5 Functions in C CO6 08 hours

Functions: User defined functions, Storage classes: Function prototypes, Function definition, Function call including passing arguments by value and passing arguments by reference, Math library functions, Recursive functions, Scope rules (local ,global scope), Storage classes in C namely auto, Extern, Register, Static storage classes.

Laboratory Component:

- Write a program containing a function to find factorial of a number.
- Write a program containing a function in C to convert a decimal number to a binary number.
- Write a program to input a number and print the number in words using a function.

Text Book 1: Chapter 8, 10

CIE Assessment Pattern (50 Marks – Theory and Lab)

RBT Levels		Marks Distribution				
		Test (s)	Qualitative Assessment	Lab		
		25	05	20		
L1	Remember	5	-	-		
L2	Understand	5	-	-		
L3	Apply	5	5	10		
L4	Analyze	5	-	10		
L5	Evaluate	5	-	-		
L6	Create	-	-	-		

SEE Assessment Pattern (50 Marks – Theory)

	RBT Levels	Exam Marks Distribution (50)
L1	Remember	10
L2	Understand	10
L3	Apply	10
L4	Analyze	10
L5	Evaluate	10
L6	Create	

Suggested Learning Resources:

Text Books:

1. Yashavant P. Kanetkar, "Let Us C", 16th Edition, 2019, BPB Publications, ISBN: 978- 93 8728-449-4.

Reference Books:

- 1. "Programming In C" By Ashok N. Kamthane, 3rd edition, Pearson, ISBN 9789332543553.
- 2. "Programming in ANSI C" by E. Balaguruswamy, 8th Edition, 2019, McGraw Hill Education, ISBN: 978-93-5316-513-0.

Web links and Video Lectures (e-Resources):

- 1. http://elearning.vtu.ac.in/econtent/courses/video/BS/14CPL16.html
- 2. https://nptel.ac.in/courses/106/105/106105171/

- Peer Teaching: The students can be asked to teach and discuss specific topic or concept to their peers. This not only reinforces their own understanding but also encourages active engagement and collaboration.
- **Reflection and Discussion**: The students can be asked to present their learning of any topic with others. This will encourage students to reflect on their experiences and discuss what they learned. This promotes critical thinking and deeper understanding.
- **Tricky Programs:** Tricky programs that can improve student's logical knowledge to solve complex problems with different methods. They can be individual or team-based.

BASIC WEB PROGRAMMING						
Course	ourse 24PLC143/243 CIE Marks 50					
Code						
L: T:P:S	2:0:1:0	SEE Marks	50			
Hrs / Week	3+2	Total Marks	100			
Credits	Credits 03 Exam Hours 03					
Course outco	mes: At the end of the course, the student w	ill be able to:				
CO1	Understand the concepts of HTML tags and elements to design a static webpage.					
CO2	Apply CSS to style the web pages and create responsive layouts.					
CO3	CO3 Apply JavaScript in HTML document to manipulate web page elements using the Document Object Model (DOM).					
CO4	Evaluate the strategies for working with arrays, strings, functions, and form handling in PHP.					
CO5	Examine file and directory management techniques in PHP.					
CO6	Analyze basic object-oriented programming	ng concepts and error ha	andling in PHP.			

Mapping of Course Outcomes to Program Outcomes

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

MODULE-1 Introduction to HTML and Web Basics CO1 8 Hours

Overview of web programming and HTML. Structure of HTML documents: headers, paragraphs, hyperlinks, images, lists, tables, and basic forms.

Laboratory Component:

- 1. Design a basic HTML web page with headings, paragraphs, images, and lists.
- 2. Build an HTML form with text fields, radio buttons, checkboxes, a dropdown menu, and a submit button
- 3. Design an HTML table with multiple rows, columns, and merged cells (colspan and rowspan).

Text Book Textbook 1: Chapters 1, 2

MODULE-2 CSS and HTML5 CO2 8 Hours

Explores basic CSS, including properties, syntax, and techniques for page layout, styling sections, and positioning elements. Introduces HTML5 fundamentals, including new elements, graphics with Canvas and SVG, and how CSS is used for styling in HTML5.

Laboratory Component:

- 1. Apply CSS to a web page to set properties such as color, font, and margins. Use CSS to style headings, paragraphs, and lists, and to create a layout.
- 2. Use CSS to design a web page with multiple sections. Implement techniques for floating elements, sizing, and positioning to create a responsive layout.
- 3. Use HTML5 elements like <canvas> and <svg> to add graphics to a web page. Apply CSS to style these elements and integrate them into the overall page design.

	8	188		
T 1-	Textbook 1: Chapters 3, 5			
Text Book	Textbook 2: Chapters 6, 7			
MODULE-3	JavaScript and DOM		CO3	8 Hours

Basic JavaScript: Syntax, program logic, arrays, strings, and functions. Introduction to the Document Object Model (DOM): Global DOM objects, DOM element objects, and the DOM tree.

Laboratory Component:

- 1. Write basic JavaScript code demonstrating syntax, program logic, and operations with arrays and strings.
- 2. Develop simple JavaScript functions to perform tasks and manipulate data.
- 3. Use JavaScript to interact with the DOM, modify DOM elements, and dynamically update a web page.

Text Book	Textbook 1: Chapter 7		
MODULE-4	PHP Basics	CO4	8 Hours

Introduction to PHP: Syntax, arrays, strings, and functions. Basic Form Handling in PHP: Building and processing forms, handling form data.

Laboratory Component:

- 1. Write PHP scripts to handle basic form data submission and processing.
- 2. Work with PHP arrays, strings, and functions.
- 3. Build an HTML form and use PHP to process the data submitted through the form.

Text Book	Textbook 2: Chapter 11		
MODULE-5	PHP Advanced Basics	CO5 CO6	8 Hours

File and Directory handling in PHP. Introduction to Object-Oriented Programming (OOP) in PHP: Classes, objects, and simple OOP concepts. Simple error handling and debugging in PHP.

Laboratory Component:

- 1. Use PHP's file and directory functions to manage files.
- 2. Develop a simple PHP application using basic OOP concepts.
- 3. Implement basic error handling in a PHP script.

Text Book Textbook 2: Chapter 12

CIE Assessment Pattern (50 Marks – Theory and Lab)

RBT Levels		Marks Distribution				
		Test (s)	Qualitative Assessment	Lab		
		25	05	20		
L1	Remember	5	-	-		
L2	Understand	5	-	-		
L3	Apply	5	5	10		
L4	Analyze	5	-	10		
L5	Evaluate	5	-	-		
L6	Create	_	-	-		

SEE Assessment Pattern (50 Marks – Theory)

	RBT Levels	Exam Marks Distribution (50)
L1	Remember	10
L2	Understand	10
L3	Apply	10
L4	Analyze	10
L5	Evaluate	10
L6	Create	-

Suggested Learning Resources:

Text Books:

- 1. Jeffrey C. Jackson, Web Technologies: A Computer Science Perspective, Prentice Hall, 2007. ISBN: 978-0136152000.
- 2. Deitel, Harvey M., Deitel, Paul J., and Nieto, Temi, Internet and World Wide Web How to Program, Prentice Hall, 5th Edition, 2011. ISBN: 978-0132151009.

Reference Books:

- 1. Marty Stepp, Jessica Miller, and Victoria Kirst, Web Programming, Step by Step Publication, 2nd Edition, 2009. ISBN: 978-0977279732.
- 2. Robin Nixon, Learning PHP, MySQL, JavaScript, CSS & HTML5: A Step-by-Step Guide to Creating Dynamic Websites, O'Reilly Media, 3rd Edition, 2014. ISBN: 978-1491918661.
- 3. Douglas E. Comer, The Internet Book: Everything You Need to Know About Computer Networking and How the Internet Works, 4th Edition, Prentice Hall, 2007. ISBN: 978-0132435674.
- 4. Kogent Learning Solutions Inc., Web Technologies: HTML, JavaScript, PHP, Java, JSP, ASP.NET, XML, and Ajax Black Book, Dreamtech Press, Recent Edition. ISBN: 978-8177228778.

Web links and Video Lectures (e-Resources):

- 1. https://www.w3schools.com/
- 2. https://www.freecodecamp.org/
- 3. https://www.coursera.org/browse/computer-science/web-development
- 4. https://www.khanacademy.org/computing/computer-programming/html-css
- 5. https://www.youtube.com/user/TechGuyWeb
- 6. https://www.php.net/manual/en/
- 7. https://www.w3.org/XML/

- **Build a Personal Portfolio Website:** Create a personal portfolio website using HTML, CSS, and PHP. Include multiple pages showcasing your skills, projects, and experiences, with dynamic content and interactive features like contact forms.
- Collaborate on Simple PHP-Based Projects: Work on collaborative projects such as a basic chat application or a mini blog. These projects should involve user interactions, data handling, and fundamental PHP functionalities.
- Analyze and Patch Basic Security Vulnerabilities: Identify common security issues in PHP applications, such as vulnerabilities in user input handling. Analyze sample PHP code for these issues and apply basic security measures to improve the application's security.
- Integrate Simple APIs into PHP Applications: Enhance PHP applications by integrating simple APIs, such as those for weather data or search functionalities. This involves fetching data from external sources and using it within your PHP application.
- Participate in Basic Hackathons: Engage in hackathons that focus on developing simple web applications using HTML, CSS, and PHP. These events offer opportunities to apply your skills in real-world scenarios, work on practical projects, and collaborate with others.

	TECHNOLOGY	
COURSES	I&II (ETC I &II)	
		Page 68

ROBOTICS AND AUTOMATION													
Course Code	24ET	24ETC151/251 CIE Marks 50											
L:T:P:S	3:0:0:	0				1	SEE Marks				50		
Hrs / Week	3					,	Total M	larks		100			
Credits	03												
Course outcomes: At the end of the course, the student will be able to:													
CO1		Inderstand the fundamental concepts of Robot anatomy											
CO2	Analy	Analyze various control systems involved in robotic configuration											
CO3	_	mplement the process of robot cell design and programming deployment											
CO4							mbly co		tion				
CO5	Demo	nstrate	robotic	utilizati	ion in v	arious o	domains						
CO6							ive to th	ne indus	stry				
Mapping of C	ourse C	Outcom	es to P	'rogran	n Outc	omes							
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	
CO1	3	1	2	-	2	-	-	-	-	-	-	1	
CO2	3	1	2	-	2	-	-	-	-	-	-	1	
CO3	3	1	2	-	2	-	-	-	-	-	-	1	
CO4	3	1	2	-	2	-	-	-	-	-	-	1	4
CO5	3	1	2	-	2	-	-	-	-	-	-	1	_
CO6	3	1	2	-	2	-	-	-	-	-	-	1	
MODULE-1 Robot anatomy Introduction to	and con	figuratio	on, basi	OF RO			cy, repea	atability	CO1 y, resolu			Hours freedo	m.
Self-study / Case Study / Applications	Indust	ry spec	ific cas	e studie	s explai	ining th	e variou	is confi	guratio	ns of ro	bot		
Text Book	Text E	Book 1:	2.1										
MODULE-2	DRIV ROBO	E SY OTICS	STEM	S AN	D GF	RIPPEI	RS IN		CO	2	8	Hours	
Mechanisms an system- hydraul Self-study / Case Study / Applications	ic, pneu Mini p	matic, a	and elec orepara	etric sys tion inv	olving o	drive sy	ferent m					ns. Driv	ve
Text Book				,3.8,5.1									
MODULE-3				TIC C	ELL D	DESIG	N AND	CO3	5		8	Hours	
miscellaneous s detection and re	Transducers and sensors in robots –tactile sensors, proximity and range sensors, robotic vision sensors, miscellaneous sensors, and areas of applicability. Robotic cell layout, work cell design and control, error detection and recovery, robot path control methods, robotic programming types, and languages, methods of robot programming												
Self-study / Case Study / Applications	_	project pand reco	•	tion by t	using va	arious r	obotic s	ensors,	Case st	tudy of	detectio	on of	
Text Book							2,7.3,11.						
MODULE-4	CONI	FIGUR	ATIO						CO4, (Hours	
Part presentation inspection autor													

inspection automation, and coding, operationsof preparatory codes (G codes) and miscellaneous codes (M codes) part programming deployment and demonstration.

Self-study /	Case studies on robot assembly cells in the automo	tive industry and sim	ulation of CNC
Case Study /	milling programs using G-code with the open-sourc	e software Tutor	
Applications			
Text Book	Text Book 1: 8.1,8.2,8.4,8.7,9.1, 15.1,15.2,15.3,15.5	5,15.7,15.8	
MODULE-5	ROBOT APPLICATIONS	CO5, CO6	8 Hours

Implementation of robots in industries— Machine loading/unloading Processing operation, Assembly and Inspection, applications of robots in medical, space, underwater, humanoid robots, and micro robots. Social issuesand the future of robotics. Demonstration on: Pick and Place robots, line following robots, and 3-axis CNC.

Self-study /	Demonstration of 3-axis CNC machine (Visit to Advanced Manufacturing lab.),
Case Study /	Demonstration of Pick and Place robots (Visit to Fanuc Robotics lab)
Applications	
Text Book	Text Book 1: 14.1,14.2,18.1,18.2,18.3,18.4,20.1,20.2,20.3,20.4

CIE Assessment Pattern (50 Marks – Theory)

			Marks Distribution									
	RBT Levels	Test (s)	Assignment	Quiz	Alternative Assessment							
		25	10	5	10							
L1	Remember	7.5	-	-								
L2	Understand	7.5	-	-								
L3	Apply	10	5	5	5							
L4	Analyze	-	5	-	5							
L5	Evaluate	-	-	-								
L6	Create	-	-	-								

SEE Assessment Pattern (50 Marks – Theory)

	RBT Levels	Exam Marks Distribution (50)
L1	Remember	15
L2	Understand	15
L3	Apply	20
L4	Analyze	-
L5	Evaluate	-
L6	Create	-

Suggested Learning Resources:

Text Books:

- **1.** Groover. M.P. Industrial Robotics, technology, programming, and application Mc-Graw Hill 2012.
- 2. S. K. Saha, "Introduction to Robotics", Tata McGraw-Hill Publishing Company Ltd. (2008).
- **3.** "Computer Numerically Controlled Machining handbook", James Madison, Industrial Press Inc., 1996, ISBN-978-0831130640

Reference Books:

- **1.** Fu, King Sun, Rafael C. Gonzalez, and CS George Lee. Robotics. IEEE Computer Society Press, 1993.
- 2. Klafter, Richard David, Thomas A. Chmielewski, and Michael Negin. "Integrated Approachto Robotic Engineering." (1993).
- 3. Asada, Haruhiko, and J-JE lotine. Robot analysis and control. John Wiley & Sons, 1991.
- **4.** Craig, John J. "Introduction to Robotics." (2005).

Web links and Video Lectures (e-Resources):

- https://www.youtube.com/watch?v=pwwVOpXrazs&list=PL4g1oAdmuCfqmYvURLzVFkMMUI7839biN
- https://www.youtube.com/watch?v=gizihSJ63o4&list=PL4g1oAdmuCfqmYvURLz VFkMMUI7839biN&index=2
- https://www.youtube.com/watch?v=BnzUXag1qx8&list=PL4g1oAdmuCfqmYvUR LzVFkMMUI7839biN&index=3
- https://www.youtube.com/watch?v=7mm4ig8Lyc8&list=PL4g1oAdmuCfqmYvUR LzVFkMMUI7839biN&index=5

- https://www.youtube.com/watch?v=RBD9LfLfkxA&list=PLQ3sZ7NCnFlEej8AW H BfO9W7xlirvK6l&index=43
- https://www.youtube.com/watch?v=E2nnohpDw5k&list=PLQ3sZ7NCnFlEej8AW H BfO9W7xlirvK6l&index=44
- https://www.youtube.com/watch?v=LGmvg0m1mJk&list=PLQ3sZ7NCnFlEej8A WH_BfO9W7xlirvK6l&index=45

- ➤ Visit to any Robot implemented manufacturing/assembly industry
- > Demonstration of Robot operations
- > Demonstration of working of Robot
- > Demonstration of Robot programming applied to a typical robot task
- ➤ Video demonstration of latest trends in mobility/robotics
- > Contents related activities (Activity-based discussions)
- For active participation of students, instruct the students to prepare Flowcharts and Handouts
- Organizing Group wise discussions on issues Seminars

		IN	TROD	UCTIC	ON TO	ELECT	TRIC V	EHIC	LES										
Course Code	24ET(24ETC152/252 CIE Marks 50																	
L:T:P:S	3:0:0:	3:0:0:0 SEE Marks									50								
Hrs / Week	3	Total Marks 100																	
Credits	03						Exan	Hours	5		03								
Course outcomes: At the end of the course, the student will be able to:																			
CO1		Understand the historical perspective and basic terminology of Electric Vehicles (EV).																	
CO2		Classify the different performance parameters of EV																	
CO3		Jse the different energy storage elements for various types of EV.																	
CO4		llustrate the performance of energy storage systems in electric vehicles.																	
CO5																			
	CO6 Demonstrate the overall building blocks of EV system Apping of Course Outcomes to Program Outcomes																		
Mapping of Co	PO1	PO2	PO3	rogran PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12							
CO1	3	2	103	104	103	2	1	100	10)	1010	1011	1							
CO2	3	2	-	_	-	2	1				-	1							
	_		-		-				-		-	1							
CO3	3	2	-	-	-	2	1	-	-	-	-	1							
CO4	3	2	-	-	-	2	1	-	-	-	-	1							
CO5	3	2	-	-	-	2	1	-	-	-	-	1							
CO6	3	2	-	_	-	2	1	-	-	-	-	1							
MODULE-1		INEER ELOPI		HILO	SOPH	Y OF E	EV		(C O 1	8	3 Hours							
Introduction ne	ed of e	lectric	drive.	Histori	cal dev	elopme	nt Rec	ent dev	elopmo	ent, De	velopme	nt trends							
Applications Text Book					of Elec		hicles a	and its A	Applica	ations.									
MODULE-2	PARA	AMET	ERS		CTRIC					CO2		8 Hours							
solenoids, AC &	& DC m	otors &	genera	ators EV								Electrical terms- current AC and DC voltage, Power, conductors, insulators, resisters, relays, capacitors, solenoids, AC & DC motors & generators EV parameters, Weight and size parameters, Force parameters,							
Case Study	Case s	tudre o		Energy parameters, Performance parameters,															
									meters										
				aramet		its Per	forman	ce Para	meters	•									
Text Book MODULE-3	Text B BASIC	Book 1: CS CTRIC	2.1, 2.2 OF VEHI	earamete 2, 2.4 to A B CCLE (1	2.15 ATTEI BOEV	RY-OP	ERAT	ED	CC	03, CO		8 Hours							
Text Book MODULE-3 Advantages and Flywheel energ EV-Starting Dr	Text B BASIC ELEC d disadv sy storage iving an	Book 1: CS CTRIC vantage ge, Maj nd Brak	2.1, 2.2 OF VEHI es, Maj or parts ting, Ba	Paramet 2, 2.4 to A B CLE (I for comes, control	2.15 ATTEI BOEV nponent oller, Ir agnosis	RY-OP) as of B nverter/ & Prec	OEV, (conver	Comparter, Regs, Self-	CC rison v generat diagnos	O3, CO with IC ive Bra	engine	vehicles							
Text Book MODULE-3 Advantages and Flywheel energ EV-Starting Dr Self-study	Text B BASIC ELEC d disadv y storag iving an Self-st	Book 1: CS CTRIC vantage ye, Maj nd Brak tudy or	2.1, 2.2 OF VEHI es, Maj or parts ting, Ba n the ty	Paramete 2, 2.4 to A B CLE (I or coms, control pes of I	2.15 ATTEI BOEV apponent oller, Ir agnosis Electric	RY-OP) cs of Boundaries nverter/ & Precovenicle	OEV, (conver	Comparter, Regs, Self-	CC rison v generat diagnos	O3, CO with IC ive Bra	engine	vehicles							
Text Book MODULE-3 Advantages and Flywheel energ EV-Starting Dr. Self-study Text Book	Text B BASIC ELEC d disadv sy storag iving an Self-st Text B	Book 1: CS CTRIC vantage ge, Maj nd Brak tudy or Book 2:	2.1, 2.2 OF VEHI es, Maj or parts ting, Ba in the ty 3.2, 3.3	carameter 2, 2.4 to A B. CLE (Information Control Cont	ATTEI BOEV ponent oller, Ir agnosis Electric	RY-OP or of Boundaries es of Boundaries verter/ & Precovehicle	OEV, oconver	Comparter, Regs, Self-	CC rison v generat diagnos	vith IC ive Brastics.	engine	vehicles riving.Ar							
Text Book MODULE-3 Advantages and Flywheel energ EV-Starting Dr. Self-study Text Book MODULE-4	Text B BASIC ELEC d disadv sy storag iving an Self-st Text B ENER	Book 1: CS CTRIC vantage yantage ge, Maj ad Brak tudy or Book 2: RGY S	2.1, 2.2 OF VEHI es, Maj or parts ring, Ba n the ty 3.2, 3.3 TORA	Parameter 2, 2.4 to A B. CLE (1) for companie Diameter 5, 3, 3, 5, 3 GE TE	ATTEI BOEV ponenti oller, Ir agnosis Electric .7, 3.10	RY-OP as of B nverter/ & Preceive hick	OEV, oconvertautions in In	Compa ter, Reg s, Self-dian M	rison v generat diagnos	vith IC ive Brastics.	engine king, Di	vehicles riving.Ar							
Text Book MODULE-3 Advantages and Flywheel energ EV-Starting Dr. Self-study Text Book MODULE-4 Battery basics of Metal hydride), charging characters	Text B BASIC ELEC d disadv sy storag iving an Self-st Text B ENEF different High deteristics	Book 1: CS CTRIC vantage ge, Maj nd Brak tudy or Book 2: RGY S t types ischarge s, Batte	2.1, 2.2 OF VEHI es, Maj or parts ing, Ba the ty 3.2, 3.3 TORA of batt ge capa ery char	carameter 2, 2.4 to A B. CLE (Information Diameter) (Information Dia	ATTEI BOEV ponent coller, Ir agnosis Electric .7, 3.10 ECHNO lead-ac Battery i	RY-OP as of B averter/ & Prec vehicle DLOGY id batte rating, indicati	OEV, oconver autions es in In	Comparter, Regs, Self-odian M	rison v generat diagnos arket	vith IC ive Brastics. CO5 e, Lithin Battery	engine king, Di	vehicles riving.Ar 8 Hours Nickel							
Text Book MODULE-3 Advantages and Flywheel energ EV-Starting Dr. Self-study Text Book MODULE-4 Battery basics of Metal hydride), charging characters	Text B BASIC ELEC d disadv sy storag iving an Self-st Text B ENEF different High deteristics	Book 1: CS CTRIC vantage ge, Maj nd Brak tudy or Book 2: RGY S t types ischarge s, Batte	2.1, 2.2 OF VEHI es, Maj or parts ing, Ba the ty 3.2, 3.3 TORA of batt ge capa ery char	carameter 2, 2.4 to A B. CLE (Information Diameter) (Information Dia	ATTEI BOEV ponent oller, Ir agnosis Electric .7, 3.10 ECHNO lead-ac Battery	RY-OP as of B averter/ & Prec vehicle DLOGY id batte rating, indicati	OEV, oconver autions es in In	Comparter, Regs, Self-odian M	rison v generat diagnos arket	vith IC ive Brastics. CO5 e, Lithin Battery	engine king, Di	vehicles riving.Ar 8 Hours Nickel							
Text Book MODULE-3 Advantages and Flywheel energ EV-Starting Dr. Self-study Text Book MODULE-4 Battery basics of Metal hydride), charging characters Case Study Text Book	Text B BASIC ELEC d disadv sy storage iving an Self-st Text B ENEF different High deteristics Case s	Book 1: CS CTRIC vantage ge, Maj nd Brak tudy or Book 2: RGY S t types lischarg s, Batte study o	2.1, 2.2 OF VEHI es, Maj or parts ring, Ba n the ty 3.2, 3.3 TORA of batt ge capa ery char n differ 6.2, 6.3	carameter 2, 2.4 to A B CLE (I for communication Diameter Diameter 2, 3.5, 3 GE TF terries (I citors, I regers, B rent EV B, 6.5, 6	ATTEI BOEV aponent oller, Ir agnosis Electric .7, 3.10 ECHNC lead-ac Battery attery battery .7, Tex	RY-OP as of Benverter/ & Preceive hick DLOGY id batter rating, indicating y manu	OEV, oconver autions in In	Comparter, Reg	rison v generat diagnos arket Alkalin neters, ad devi	vith IC ive Brastics. CO5 e, Lithin Battery ces 0.7	engine king, Di	vehicles riving.Ar 8 Hours Nickel ging &							
Text Book MODULE-3 Advantages and Flywheel energ EV-Starting Dr Self-study Text Book MODULE-4 Battery basics of Metal hydride), charging charact Case Study Text Book MODULE-5	Text B BASIC ELEC d disadv sy storag iving an Self-st Text B ENEF different High d cteristics Case s Text B	Book 1: CS CTRIC vantage ge, Maj nd Brak tudy or Book 2: RGY S t types ischarge s, Batte study o Book 1:	2.1, 2.2 OF VEHI es, Maj or parts ring, Ba n the ty 3.2, 3.3 TORA of batt ge capa ery char n differ 6.2, 6.3	carameter 2, 2.4 to A B. CLE (1) for compassion Diameter 2, 3, 3.5, 3 GE TE teries (1) citors, 1 regers, Brent EV B, 6.5, 6 UEL C	D 2.15 ATTEL BOEV Inponent oller, In agnosis Electric 1.7, 3.10 ECHNO lead-ac Battery in battery in the batte	RY-OP as of B averter/ & Preceive hick Color vehicle avehicle avehicle	OEV, oconver autions es in In Y ery, Lit Battering met facture 2: 10.1	Comparter, Regs, Self-odian M hium/ Ay paran hods ar rs , 10.3,	rison v generat diagnos arket Alkalin neters, ad devid	vith IC ive Brastics. CO5 e, Lithin Battery ces 0.7 CO6	engine king, Dr	vehicles riving.Ar 8 Hours Nickel ging &							
Text Book MODULE-3 Advantages and Flywheel energ EV-Starting Dr. Self-study Text Book MODULE-4 Battery basics of Metal hydride), charging characters Case Study Text Book	Text B BASIC ELEC d disadvery storage iving an Self-st Text B ENEF difference, High deteristics Case s Text B exteristics cteristics choric acceptance	Book 1: CS Vantage ge, Maj nd Brak tudy or Book 2: RGY S t types lischarg s, Batte study o Book 1:	or parts ing, Ba the ty 3.2, 3.3 TORA of batt ge capa ery char n differ 6.2, 6.3 F cell type cell, n	rarametro de la companya de la contro del contro de la contro del contro de la contro del contro de la contro	ponential of the second	RY-OP as of Benverter/ & Preceive hick DLOGY id batter rating, indicatify manuatt Book I cell, p	OEV, convergations in In	Comparter, Regist, Self-odian Minum/ Ay paran hods ares, 10.3, exchange	rison v generat diagnos arket Alkalin neters, ad devi-	vith IC ive Brastics. CO5 e, Lithing Battery ces 0.7 CO6 brane,	engine king, Dr	vehicles riving.Ar 8 Hours Nickel ging & 8 Hours ethanol							

Text Book	Text Book 2: 12.1 to 12.10

	·		Marks Distribution							
	RBT Levels	Test (s)	Qualitative Assessment (s)	MCQ's						
		25	15	10						
L1	Remember	5	-	3						
L2	Understand	10	5	5						
L3	Apply	5	5	2						
L4	Analyze	5	5	-						
L5	Evaluate	-	-	-						
L6	Create	-	-	-						

SEE Assessment Pattern (50 Marks – Theory)

	RBT Levels	Exam Marks Distribution (50)
L1	Remember	10
L2	Understand	10
L3	Apply	10
L4	Analyze	10
L5	Evaluate	10
L6	Create	

Suggested Learning Resources:

Text Books:

- MehrdadEhsani, Yimin Gao, sebastien E. Gay and Ali Emadi, Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design, Boca Raton: CRC Press, 2018. ISBN-13: 918-3236390415
- 2) Iqbal Husain, Electric and Hybrid Vehicles: Design Fundamentals, Boca Raton: CRC Press,2011, ISBN-13: 978-1636390475
- 3) Tariq Muneer and Irene Illescas García, "The automobile, In Electric Vehicles: Prospects and Challenges", Elsevier, 2017

Reference Books:

- 1) AuliceScibioh M. and Viswanathan B., Fuel Cells Principles and Applications, India: University Press, 2009
- 2) James Larminie and John Loury, Electric Vehicle Technology-Explained, New York: John Wiley & Sons Ltd., 2012.
- 3). James Larminie and John Loury, Electric Vehicle Technology-Explained, New York: John Wiley & Sons Ltd., 2012.

Web links and Video Lectures (e-Resources):

- https://youtu.be/3E1SXG7VkQk
- https://youtu.be/A3fHQsIkYeU
- https://youtu.be/iihYXx79QiE
- https://youtu.be/A565YNXItLg
- https://youtu.be/NnI7oJFvru8

- ➤ Video demonstration of latest trends in Electric Vehicles
- > Contents related activities (Activity-based discussions)
- For active participation of students, instruct the students to prepare Flowcharts and Handouts
- Organizing Group wise discussions on issues
- ➤ Seminars/Self-study reports on Electric Vehicles

		FUN	NDAMI	ENTAL	S OF I	NTER	NET O	FTHIN	GS (Io	T)			
Course Code	24ET	C153/2	53				CIE	Marks		50			
L: T:P:S	3:0:0:	0					SEE	Marks		50			
Hrs / Week	3						Tota	l Mark	S	10	0		
Credits	03 Exam Hours 03												
Course outcom	ies: At th	ne end o	of the co	ourse, th	e stude	nt will l	e able t	to:					
CO1		Describe the evolution of IoT, IoT networking components, and addressing strategies in IoT.											
CO2	Classi	Classify various sensing devices and actuator types.											
CO3	Demoi	Demonstrate the processing in IoT.											
CO4	Explai	n Asso	ciated Io	T Tech	nologie	es							
CO5	Under	stand th	ne archit	ecture o	of IoT A	Applicat	ions.						
CO6	Analy	ze futur	e trends	in IoT.									
Mapping of C	ourse O	utcom	es to P	rogram	Outco	mes							
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	
CO1	1	1	1	1	2	2	-	2	-	-	-	1	
CO2	1	1	1	1	2	2	-	2	-	-	-	1	
CO3	1	1	1	1	2	2	-	2	-	-	-	1	
CO4	1	1	1	1	2	2	-	2	-	-	ı	1	
CO5	1	1	1	1	2	2	-	2	-	-	-	1	
CO6	1	1	1	1	2	2	-	2	-	-	-	1	
Introduction, N Enabling IoT ar Text Book	nd the Co	omplex		pendenc	e of Te	chnolog						lution c	101
MODULE-2	IOT	ENCH	NG AN	D A CT	TIATI	ON			CO	2		8 Hou	
Introduction, S Actuators, Actu	ensors, S	Sensor	Charac	teristics	, Senso		viations	s, Sensi			nsing C		
Text Book			$\frac{\text{uator C}}{2.2, 2.3}$										
MODULE-3	IOT F	PROCI				IES A	ND		CO3,	CO4		8 Hou	irs
Data Format, In Considerations,	nportanc	e of Pro			Proces	sing To	pologie	s, IoT I	Device I	Design a	and Sele	ection	
Text Book	Text B	Book 2:	3.1, 3.3	, 3.5, 3.	7, 3.10								
MODULE-4			ED IO		_	OGIES	<u> </u>		CC)5		8 Hou	ırs
Cloud Computing Cloud Impleme IOT CASE STUAgricultural IoT	ntation, S JDIES:	Sensor-	Cloud:	Sensors	s-as-a-S		s, Servio	ce- Leve	el Agree	ement in	Cloud	Compu	ting,
Text Book						t Rool	2.101	10 2 1	0.5.10	7			
MODULE-5	IOT TREN	CASI	6.1, 6.3 E STU	, 6.3, 6. J DIES	AND		2: 10.1, FURE	10.5, 1	0.3, 10. CO			8 Hou	irs
Vehicular IoT – Healthcare IoT	- Introdu	ction.	Case St	udies Io	T Anal	ytics – 1	ntroduc	tion			I		
Text Book			12.1 to			, <u> </u>							
	1												

		Marks Distribution							
	RBT Levels	Test (s)	Qualitative Assessment (s)	Quiz					
		25	15	10					
L1	Remember	5	-	5					
L2	Understand	5	5	5					
L3	Apply	5	5	-					
L4	Analyze	5	5	-					
L5	Evaluate	5	-	-					
L6	Create	_	-	-					

SEE Assessment Pattern (50 Marks – Theory)

	RBT Levels	Exam Marks Distribution (50)
L1	Remember	10
L2	Understand	20
L3	Apply	10
L4	Analyze	10
L5	Evaluate	
L6	Create	

Suggested Learning Resources:

Text Books:

- 1. Sudip Misra, Anandarup Mukherjee, Arijit Roy, "Introduction to IoT", Cambridge University Press 2021.
- 2. Satish Jain, "Internet of Things and its Applications", BPB Publications (1 January 2020).
- 3. S. Misra, C. Roy, and A. Mukherjee, 2020. Introduction to Industrial Internet of Things and Industry 4.0. CRC Press.

Reference Books:

- 1. Vijay Madisetti and Arshdeep Bahga, "Internet of Things (A Hands-on- Approach)",1st Edition, VPT, 2014.
- 2. Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1st Edition, Apress Publications, 2013.

Web links and Video Lectures (e-Resources):

- https://onlinecourses.nptel.ac.in/noc22 cs53/preview
- https://onlinecourses.nptel.ac.in/noc22 cs52/preview
- https://www.coursera.org/specializations/iot

- Visit to Industry
- ➤ Demo of IOT and Industry 4.0 concepts
- > IOT related Project Based Learning

Course	Code	24ETC	C154/254				NOLOG (CIE Marl	ks	50	50		
L: T:P:		3:0:0:0						EE Mar		50			
Hrs / W		3					Т	otal Ma	rks	100			
Credits		03					F	Exam Hours 03					
Course	outcome	es: At the	end of th	ne course	, the stud	lent will	be able to						
С	O1	Unders	stand dro	ne conce	pts and to	erminolo	gy						
C	O2	Unders	stand the	regulatio	ns that a	re define	d for usa	ge of dro	nes				
С	О3	Descri	be the ste	ps for dr	one desig	gn							
С	O4	Unders	stand the	technica	l characte	eristics o	f drones						
C	O5	Descri	be the pro	ocess for	drone fa	brication	ļ						
C	O6	Discus	s the algo	orithm fo	r drone p	rogramn	ning						
Mappii	ng of Co	urse Out	tcomes t	o Progr	am Out								
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	
CO1	3	3	_	-	-	-	-	-		-	-	-	
CO2	3	3	_	-	-	-	-	-	_	-	-	-	
CO3	3	3	_	-	-	-	-	-	_	-	-	-	
CO4	3	3	-	-	-	-	-	-	-	-	-	-	
CO5	3	3	-	-	-	-	-	-	-	-	-	-	
CO6	3	3	-	-	-	-	-	-	-	-	-	-	
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MODU			ODUCT						CO	<i>)</i>		Hours	
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Self-study /	Self-Study:						
Case Study /	Online Courses: Platforms like Udemy, Coursera, and edX offer courses on drone						
Applications	technology, regulations, and applications.						
	Books and Publications: Explore texts cover	ering drone design, prog	gramming, and				
	commercial uses.						
	 Forums and Communities: Engage with description exchange knowledge and tips. 	lrone enthusiasts and pr	rofessionals to				
	Case Study:						
	Amazon Prime Air: Study Amazon's drone de	elivery service and its tea	chnological				
	challenges.	or j 201 / 100 with 102 to	, mile i e green				
	DJI's Agricultural Solutions: Examine DJI's d	lrones used in precision a	agriculture for				
	crop monitoring and spraying.	•					
	Emergency Response: Analyze drones' roles in	in disaster relief efforts a	and search-				
	and-rescue operations.						
Text Book	Text Book 1: 6.1, 6.3, 6.5, 6.7, Text Book 2: 10.1, 10.3						
MODULE-5	DRONE TECHNOLOGY AND	CO5	8 Hours				
	ENTREPRENEURSHIP	CO6	L				
	e drone industry to show the potential for boosting entre		technology and				
	Drone Technology as a tool for social inclusion, Future o	f drones					
Self-study / Case	1						
Study /	Explore online resources, case studies, and industry r	eports on drone technolo	gy,				
Applications	entrepreneurship, and social impact.						
	Applications: Experiment with drone technology through DIY proj	iaata an iain drana nalata	nd aguraga and				
	communities to gain practical insights and network w						
Text Book	Text Book 2: 12.1 to 12.10	illi illuusu y protessioilai	.5.				
1 CAT BOOK	1 CAL BOOK 2. 12.1 to 12.10						

			Marks Distribution						
	RBT Levels	Test (s)	Qualitative Assessment (s)	MCQ's					
		25	15	10					
L1	Remember	5	-	-					
L2	Understand	5	-	-					
L3	Apply	5	5	5					
L4	Analyze	5	5	5					
L5	Evaluate	5	5	-					
L6	Create	-	-	-					

SEE Assessment Pattern (50 Marks – Theory)

	RBT Levels	Exam Marks Distribution (50)
L1	Remember	10
L2	Understand	10
L3	Apply	10
L4	Analyze	10
L5	Evaluate	10
L6	Create	

Suggested Learning Resources:

Reference Books/Text Books:

- 1) Theory, Design, and Applications of Unmanned Aerial Vehicles- by A. R. Jha, 2016
- 2) Handbook of Unmanned Aerial Vehicles- Editors: Valavanis, K., Vachtsevanos, George J., 2014

Web links and Video Lectures (e-Resources):

- https://www.youtube.com/user/flitetest
- https://www.youtube.com/c/readysetdrone
- https://www.youtube.com/watch?v=qBx-uCaAltM
- https://www.youtube.com/watch?v=TO7qa8oCACI&list=PLgiealSjeVyx3t4N9GroE29SbVwhYrOtL
- https://www.youtube.com/watch?v=9c769xiEXn0&list=PLFW6lRTa1g83B1HdU2mece6QLeBrtspL7
- https://www.youtube.com/watch?v=49RMSb4ht-I
- https://www.youtube.com/watch?v=j9nTBG8oa8M
- https://www.youtube.com/watch?v=t0CR4rPt2Fg
- https://www.youtube.com/watch?v=0w4BjJkkf5A

- Provide drone kits and guide students through the assembly process. Discuss the purpose of each part (e.g., motors, flight controller, propellers) and how they contribute to drone operation. Students can also learn basic maintenance tasks like battery care and propeller replacement.
- ➤ Use drone flight simulators or virtual reality (VR) platforms where students can practice flying drones in a controlled environment. Introduce basic manoeuvres (e.g., take off, landing, hovering) and progress to more advanced techniques (e.g., turns, altitude control).
- Assign students to plan and execute a mapping mission using drones equipped with cameras. They can learn to capture aerial images, process them using software (e.g., Pix4D, Drone Deploy), and create 2D/3D maps or models of a designated area (e.g., school campus, local park). Discuss the applications of drone mapping in agriculture, urban planning, and environmental monitoring.
- > Set up an indoor or outdoor obstacle course using various objects (e.g., hoops, cones, obstacles). Students can take turns navigating the course with drones, practicing precision flying and manoeuvring around obstacles.
- Task students with capturing aerial photos or videos of specific subjects or events (e.g., school events, natural landscapes). Teach principles of composition, lighting, and storytelling through visuals. Students can edit and present their work, discussing the creative and technical decisions made during the process.
- ➤ Pose engineering challenges such as designing a payload delivery mechanism, improving drone stability in adverse weather conditions, or modifying drones for specific purposes (e.g., search and rescue, environmental monitoring). Encourage students to brainstorm ideas, prototype designs, and test their solutions.

		F	UNDA	MENTA	ALS OF	CYBE	R SEC	URITY				
Course Code	24ET	C155/25		· · · · · · · · · · · · · · · · · · ·	ILS OI		E Mark			50		
L:T:P:S	3:0:0:						E Marl			50		
Hrs / Week	3					To				100		
Credits	03					Ex	am Hoi	urs	0)3		
	Cou	Course outcomes: At the end of the course, the student will be able to:										
CO1	Under	stand th	e funda	mental c	oncepts	and lav	s of cy	bercrim	e			
CO2	Famili	iarize cy	bercrim	e termii	nologies	and per	spective	es				
CO3	Under	stand C	yber Of	fenses a	nd Botn	ets						
CO4	Under	stand th	e variou	ıs tools a	and met	hods use	d in cyl	bercrim	es			
CO5		•			•	nishing a	•					
CO6						puter Fo	rensics					
Mapping of Cour	rse Out	comes t	o Prog	ram Oı	itcomes	S						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	-	-	-	-	-	2	-	-	_	1
CO2	2	2	-	-	-	-	-	2	-	-	-	1
CO3	2	2	-	-	-	-	-	2	-	-	-	1
CO4	2	2	-	-	-	-	-	2	-	-	-	1
CO5	2	2	-	-	-	-	-	2	-	-	-	1
CO6	2	2	-	-	-	-	-	2	-	-	-	1
MODULE-1	INTR	ODUC	TION	TO CY	BER C	RIME		CO 1	, CO2		8 Ho	urs
Cybercrime: Defin Classifications of C	Cybercri	mes, An	Indian	Perspec	tive, Ha	cking ar						minais?
Text Book				to 1.4,2	.1 to 2.3	3					0.77	
MODULE-2		ER OF			. 1 5		G 1		03		8 Ho	
Introduction, How	crimina	ils plan	the atta	acks, So	cial En	gıneerın	g, Cybe	er Stalk	ıng, Cyl	bercate	& cyber	crimes.
Botnets: The fuel f				5,2.1 to	2.4							
MODULE-3						SED I	N	C	O 4		8 Ho	nure
MODULE-3		ERCRI		ETHO.					04		0 110	our s
Introduction, Proxy			_		_				•		Worms,	Trozen
Horses and Backdo								on wire	less netv	vorks.		
Self-study / Case Study	Case S	Study or	differe	nt types	of cybe	r crimes						
Text Book				4.4 to 4.			ı					
MODULE-4				DENTI					O5		8 H	
Introduction, meth phishing toolkits an			- I	C 1	_			ar phisł	ning, typ	pes of p	phishing	scams,
Case Study	Case S	Study or	differe	nt types	of phisl	hing sca	ms					
Text Book		Book 1:			•							
MODULE-5		ERSTA ENSIC		G COM	IPUTE	R		C	O 6		8 H	ours
Introduction, Histo Forensics, Cyber Fo	rical Ba	ckgroun	d of Cyl			_						•
forensics Text Book	Tevt F	Book 1:	6.1 to 6	5								
TOAT DOOK	ICALI	JUUK I.	0.1 10 0.									

			Marks Distribution						
	RBT Levels	Test (s)	Qualitative Assessment (s)	MCQ's					
		25	15	10					
L1	Remember	5	1	-					
L2	Understand	10	5	-					
L3	Apply	5	5	5					
L4	Analyze	5	5	5					
L5	Evaluate	-	-	-					
L6	Create	-	-	-					

SEE Assessment Pattern (50 Marks – Theory)

	RBT Levels	Exam Marks Distribution (50)
L1	Remember	10
L2	Understand	20
L3	Apply	10
L4	Analyze	10
L5	Evaluate	
L6	Create	

Suggested Learning Resources:

Text Books:

- 1. Nina Godbole, Sunit Belapur, "Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives", Wiley India Publications, copyright 2011, reprint 2015
- 2. Jennifer L. Bayuk, Jason Healey, Paul Rohmeyer, "Cyber Security Policy Guidebook" Wiley Publications.

Reference book:

1. James Graham, Richard Howard, Ryan Olsan, "Cyber Security Essentials" CRC Press.

Web links and Video Lectures (e-Resources):

- 1. https://www.mastersindatascience.org/resources/cybersecurity-resource-guide/
- 2. https://www.aicte-india.org/CyberSecurity
- 3. https://cybersecurityventures.com/industry-news/

- Demonstration of Phishing and Identity Theft
- Demonstration of Tools and Methods used in Cyber Crime
- Demonstration of Cyber Crimes
- Contents related activities (Activity-based discussions)
 - > For active participation of students, instruct the students to prepare Flowcharts and Handouts
 - ➤ Organizing Group wise discussions on issues
 - ➤ Seminars

Course Code	24ETC	C156/2	56				C	CIE Ma	rks		50					
L:T:P:S	3:0:0:0)					S	EE Ma	ırks		50					
Hrs / Week	3						T	otal M	arks		100)				
Credits	03						E	Cxam H	ours		03					
Course outcomes: A	At the end	ne end of the course, the student will be able to:							to:							
CO1	Demor	emonstrate the synthesis of nanoparticles by various techniques														
CO2	Explain					_				•	nonarti	cles				
CO3	Classif								1124110	11 01 110	порши					
CO4	Discuss	·							and c	onversi	ion					
CO5	Assess															
CO6	Discuss															
Mapping of Cours							•									
wrapping or Cours	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10		PO12				
CO1	3	3	-	-	-	-	-	-	-	-	-	-				
CO2	3	3	-	-	-	-	-	-	-	-	-	-				
CO3	3	3	-	-	-	-	-	-	-	-	-	-				
CO4	3	3	-	-	-	-	-	-	-	-	-	-				
CO5	3	3	-		-	-	-	-	-	-	-	-				
CO6	3	3	-	-	-	-	-	-	-	-	-	-				
MODULE-1				ON TO)				24ET	C156/2	256.1	8	Hours			
Nanotechnology,			ATER													
Self-study / Case Study / Application	s				-r					for Nar						
Text Book		Book 1		7 A 70 Y C	NI OF				245	T C 1 F 4	C 10 E C 0		0			
MODULE-2				ZATIC)N OF				24£	TC156	0/250.2	4	8 Hour			
Dania unimaintan an			TERI		M:		т. Т		ian E	14	Misses					
Basic principles ar Electron Microscop							•					_				
imaging modes, con										. 1 0100		веоре	annere			
Basic principles of										quation	, nume	ericals	on Deby			
Scherrer equation	, Optica	l Spec	ctrosco	py- In	strume	ntation	and	applic	ation	of IR,	UV/V	VIS (I	Band ga			
measurement)			2			• -										
Self-study / Case		study (of vario	ous nan	omate	rial cha	racteri	sation '	Techni	iques						
Study / Application		D 1 1	2.4.2	720/	- 1 - 2	5251										
Text Book MODULE-3				.7,3.8,5 CD MA			•		245	TC156	(1)56.2)	8			
WIODULE-3	CAI	XDUN	DASE	J NIA	IEKIA	ALS			24E	10130	0/230.3	,	o Hour			
Introduction, Synth	esis. Pro	perties	(elec	trical.	Electro	onic a	nd Me	echanic	al), a	nd An	plication	ons of				
SWCNT, MWCNT																
									•							
nanodiamonds.								.1 .								
	Case	study o	of Carb	on bas	ed nan	omater	ial Syr	Case study of Carbon based nanomaterial Synthesis								
Self-study / Case		study (of Carb	on bas	ed nan	omater	ial Syr	ithesis								
Self-study / Case Study / Application	s								11.3,1	1.4,11.:	5,11.6					
nanodiamonds. Self-study / Case Study / Application Text Book MODULE-4	s Text	Book 1	: 6.1,6		5.4,6.5,	6.6,7.1		3,11.1,		1.4,11.: CTC15		4	8			
Self-study / Case Study / Application Text Book	Text I	Book 1	: 6.1,6 CHNC	.2,6.3,6	6.4,6.5, Y IN	6.6,7.1 E	,7.2,7.	3,11.1,				4	8 Hour			
Self-study / Case Study / Application Fext Book MODULE-4 Solar cells: First gener	Text I	Book 1 NOTE ORAGE	: 6.1,6 CHNC E AND	.2,6.3,0 DLOGY CON n and th	5.4,6.5, Y IN VERS	,6.6,7.1 N EN	,7.2,7. NERG	3,11.1, Y	24E	TC15	6/256.4		Hour			
Self-study / Case Study / Application Fext Book MODULE-4	Text I	Book 1 NOTE ORAGE	: 6.1,6 CHNC E AND	.2,6.3,0 DLOGY CON n and th	5.4,6.5, Y IN VERS	,6.6,7.1 N EN	,7.2,7. NERG	3,11.1, Y	24E	TC15	6/256.4		Ho			

materials, Separators
Fuel Cells: Introduction, construction, working of fuel cells and nanotechnology in hydrogen exchange membranes

Rechamber of Fuel Cells: Introduction, construction, working of fuel cells and nanotechnology in hydrogen storage and proton exchange membranes

Page | 81

Self-study / Case	Case studies of Nanotechnology in Energy storage	ge and conversion	
Study / Applications			
Text Book	Text Book 1: 8.1,8.2,8.4,8.7,9.1, 15.1,15.2,15.3,	15.5,15.7,15.8	
MODULE-5	APPLICATIONS OF	24ETC156/256.5,	8
	NANOTECHNOLOGY	24ETC156/256.6	Hours

Nanotech Applications and Recent Breakthroughs: Introduction, Significant Impact of Nanotechnology and Nanomaterial, Medicine and Healthcare Applications, Biological and Biochemical Applications (Nano biotechnology), Electronic Applications (Nano electronics), Computing Applications (Nano computers), Chemical Applications (Nano chemistry), Optical Applications (Nano photonics), Agriculture and Food Applications, Recent Major Breakthroughs in Nanotechnology.

Self-study / Case	Case study of Applications of Nanotechnology
Study / Applications	
Text Book	Text Book 1: 14.1,14.2,18.1,18.2,18.3,18.4,20.1,20.2,20.3,20.4

CIE Assessment Pattern (50 Marks – Theory)

		Marks Distribution							
RBT Levels		Test (s)	Assignment	Quiz	Alternative Assessment				
		25	10	5	10				
L1	Remember	7.5	-	-					
L2	Understand	7.5	-	-					
L3	Apply	10	5	5	5				
L4	Analyze	-	5	-	5				
L5	Evaluate	-	-	-					
L6	Create	-	-	-					

SEE Assessment Pattern (50 Marks – Theory)

	RBT Levels	Exam Marks Distribution (50)
L1	Remember	15
L2	Understand	15
L3	Apply	20
L4	Analyze	-
L5	Evaluate	-
L6	Create	-

Suggested Learning Resources:

Text Books:

- 1. Nano Materials A.K. Bandyopadhyay/ New Age Publishers, 2009
- 2. Nanocrystals: Synthesis, Properties and Applications C.N.R. Rao, P. John Thomas and G. U. Kulkarni, Springer Series in Materials Science, 2007
- **3.** Nano Essentials- T. Pradeep/TMH, 2007,Peter J. F. Harris, Carbon nanotube science: synthesis, properties, and applications,Cambridge University Press, 2011

Reference Books:

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

Web links and Video Lectures (e-Resources):

- https://www.youtube.com/watch?v=PNElByWIGNc
- https://www.youtube.com/watch?v=qUEbxTkPIWI
- https://www.youtube.com/watch?v=lFYs3XDu4fQ
- https://www.youtube.com/watch?v=Lpju0DTY8 g
- https://www.youtube.com/watch?v=G6MIQIIIozg&list=PLLy 2iUCG87BMH9aXArALEv eH f63kQu
- https://www.youtube.com/watch?v=-gdILnzYZEg

- Visit to any Nano Technology implemented manufacturing/assembly industry
- > Demonstration of Nano material synthesis operations
- > Demonstration of working of Nano material synthesis machines
- Demonstration of Nano material synthesis applied to a typical case study
- Video demonstration of latest trends in nanotechnology
- Contents related activities (Activity-based discussions)
- For active participation of students, instruct the students to prepare Flowcharts and Handouts
- Organizing Group wise discussions on issues
- Seminars

	.		REN	EWAB	LE EN	ERGY						
Course Code	24ETC15	7/257						Marks		50		
L:T:P:S	3:0:0:0						_	Marks		50		
Hrs / Week	3						Total Marks 100					
Credits		03 Exam Hours 03										
Course outcome												
CO1	Understan		•									
CO2	Analyze e	conomi	c aspect	ts of var	ious ren	ewable	energy	sources	in natio	nal and	Global	level
CO3	Analyze tl	he work	ing and	constru	ction of	solar ce	ells					
CO4	Identify a					• •		turbine	8			
CO5	Understan		•									
CO6	Evaluate t						energy,	such as	its pred	ictabilit	y and lo	ow
Mapping of Co							ogram	Specifi	c Outc	omes:		
	DO1	DO3	DO2	DO4	DO5	DO.	DO7	DO0	DOA	DO10	DO11	DO12
CO1	PO1 3	PO2 2	PO3	PO4	PO5	PO6	PO7 2	PO8	PO9	PO10	PO11	PO12
CO2	3	2	-	-	-	-	2	-		-	-	-
CO2	3	2	_	_		_	2	_	<u> </u>		-	_
CO4	3	2	_	_	_	_	2	_		_	_	_
CO5	3	2	-	-	-	-	2	_	-	-	-	-
CO6	3	2	-	-	-	-	2	-	-	-	-	-
MODULE-1	INTROD SOURCE		N TO I	RENEW	ABLE	ENER	GY			O1 O2	8	Hours
Renewable energy Advantages-Lim	itations-Nat											
Self-study	Industrial	annlica	tions of	Penerre	hle ene	rov cour	rees and	non ren	awahla	enerov	cources	
Text Book	Text Book					igy sour	ces and	11011-1011	CWabic	chergy	<u>sources</u>	
MODULE-2	SOLAR			,, 1. 1, 1.	<u> </u>				C	CO3		8 Hours
Historical perspersolar Cell-Modu Collectors-therm	le-array- ma	terials-s	series-pa	arallel (Connect	ion-I-V	and P-	V Char	acteristi	ics-Sola	r	meters of
case-study	Case studi											
Text Book	Text Bool			3, 2.4, 2	.5, 3.1,	3.2, 3.3,	3.4, 3.5	5				
MODULE-3	WIND E	NERGY	7						C	CO4		8 Hours
fundamentals of Advantages and	Wind power-factors influencing wind and nature of wind-principle of wind energy conversion- types of wind-fundamentals of power generation In wind Turbine, classification of wind turbine-working of wind turbine-Advantages and disadvantages of wind mills-Applications of wind energy. Self-study Industrial applications of Wind energy											
Self-study Text Book	Text Book											
MODULE-4	BIOMAS		0.2, 0.3	,, ∪. ¬, ∪.	<i>J</i>				(CO5		8 Hours
Biomass as Re			ources-l	oiomass	resour	ces- tvi	oes of	biomas				
techniques: Hydr –Pyrolysis-Appl	rolysis, enzy ications.	yme & a	icid hyd	rolysis,	Anaerol	bic dige						
Self-study	Industrial					gy						
Text Book MODULE-5	Text Book					SCA 61	STFM	s l		CO6		8 Hours
Tidal energy electrical conversion systems- Energy from tides, basic principle of tidal power-single basin and double basin tidal power plants- advantages- limitation and scope of tidal energy.												

Geothermal electrical energy conversion systems-estimation and nature of geothermal energy-geothermal sources						
and resources-adv	and resources-advantages- disadvantages and applications of geothermal energy.					
Self-study	Case studies on Tidal energy and geothermal energy in India					
Text Book	Text Book 2:8 .1, 8.2, 8.3, 8.4,8.5, 8.6					

RBT Levels			Marks Distribution						
		Test (s)	Qualitative Assessment (s)	MCQ's					
		25	15	10					
L1	Remember	4	-	-					
L2	Understand	4	-	-					
L3	Apply	6	3	5					
L4	Analyze	8	7	5					
L5	Evaluate	3	5	-					
L6	Create	=	-	-					

SEE Assessment Pattern (50 Marks – Theory)

	RBT Levels	Exam Marks Distribution (50)
L1	Remember	10
L2	Understand	10
L3	Apply	10
L4	Analyze	10
L5	Evaluate	10
L6	Create	

Suggested Learning Resources:

Text Books:

- 1) Non-conventional Energy Sources, G D Rai -2017, Khanna Publishers, ISBN:978817409073, 9788174090737
- 2) Renewable energy-S C Bhatia, R.K Gupta-2019, Woodhead Publishing India in Energy, ISBN-139788193644607, 978-8193644607

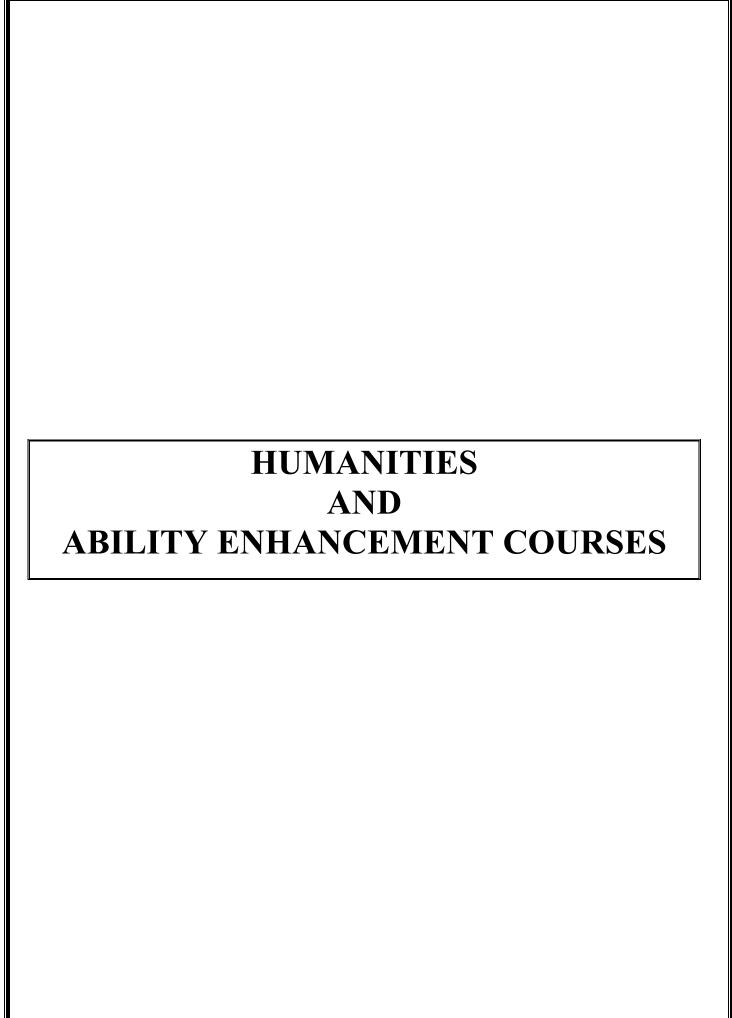
Reference Books:

- 1) Solar Photovoltaics: Fundamentals, Technologies and Applications, Chetan Singh Solanki,3rd Edition, Kindle Edition, 2015, PHI Learning, ISBN-10 9788120351110, ISBN-13 978-8120351110
- 2) Renewable Energy Resources by John Twidell, Julie Alexander, 4thEdition, Routledge,2021,ISBN 9781032269252
- 3) Wind Power Technology, Joshua Earnest, Sthuthi' Rachel, 2019,PHI learning, ISBN-10 938802849X, ISBN-13 978-9388028493

Web links and Video Lectures (e-Resources):

- https://www.youtube.com/watch?v=FDng0LU2zpI
- https://www.youtube.com/watch?v=f0p0Fria5TY
- https://www.youtube.com/watch?v=Ps6Rn-i9t1Y
- https://www.youtube.com/watch?v=1-2TyKqP84o
- https://www.youtube.com/watch?v=LJul3ZYSb9M

- Video demonstration of latest trends in Renewable energy sources, non-renewable energy sources
- Contents related activities (Activity-based discussions)
 - For active participation of students, instruct the students to prepare Flowcharts and Handouts
 - Organizing Group wise discussions on issues
 - Seminars



L:T:P:	Code	24ENG	16		MMUN	10/11/1	E ENG	CIE Ma	rks		50	
		1:0:0:0						SEE Ma			50	
Hrs / W		2									100	
Credits		01									2	
		01 Exam Hours 2										
	outcom	•										
CO1			ize the gr									
CO2		Enhance	e English	ı vocabu	lary and	languag	e profici	ency for	better co	mmunica	ıtion skil	ls.
CO3		Demons	strate cor	versatio	nal skill	s using s	ituationa	al vocabu	lary			
CO4		Learn a	bout tech	niques c	of inform	ation tra	nsfer th	rough pre	sentation	1		
Mappi	ng of C	ourse Oi	itcomes	to Prog	ram Ou	itcomes	and Pr	ogram S	Specific	Outcom	es:	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	_	-	-	_	-	-	_	_	3	3	_	2
CO2	-	-	-	-	-	-	-	-	3	3	-	2
CO3	-	-	-	-	-	-	-	-	3	3	-	2
CO4	-	-	-	-	-	-	-	-	3	3	-	2
MODU		Error l								CO1	3	3 Hours
		s in Englis										
		s in Englis			_							
Activity	y: Self-i	ntroducti	on - talk	ing abou	ut self, a	mbition	, hobbie	s, likes,	dislikes,	skills an	d achiev	ements
Know c	lassmate	es/ Role	Unde	erstand c	lifferent	wavs of	f self-in	troductio	n: Learr	about o	thers and	<u> </u>
olay						•		list com				
	ce Book		1,2,3									
MODU			, ,	rror Det	ection I	I		(CO1			3 Hour
								(CO2			
Commo	n Errors	in Englis	sh - Verb	S								
Auxilia	ry Verbs	3										
		greement										
Activity	y: Story	telling										
Story		Using a	appropria	ite tense	s and ca	ses as p	er Subje	ect Verb	Agreem	ent		
•												
telling												
telling Referen	ce	1,2,3										
telling Referen Book		1,2,3										
telling Referen Book		1,2,3	Q	uestion	Tags &	Forms				CO1		3 Hour
telling Referen Book		1,2,3	Q	uestion	Tags &	Forms				CO2		3 Hour
telling Referen Book MODU	JLE-3				Tags &	Forms						3 Hour
telling Referen Book MODU	n forms	with 5Ws	s and 1H			Forms				CO2		3 Hour
telling Referen Book MODU Questio Questio	n forms	with 5Ws and tags	s and 1H with Aux	xiliary V	erbs	Forms				CO2		3 Hour
telling Referen Book MODU Questio Questio	n forms	with 5Ws	s and 1H with Aux	xiliary V	erbs	Forms				CO2		3 Hour
Referen Book MODU Questio Questio Use of I	n forms n forms Do/ Don	with 5Ws and tags 't and Do	s and 1H with Aux oes/ Does	tiliary Vo n't/ Has/	erbs /Have	Forms				CO2		3 Hour
Referen Book MODU Questio Questio Use of I	n forms n forms Do/ Don	with 5Ws and tags 't and Do	s and 1H with Aux	tiliary Vo n't/ Has/	erbs /Have	Forms				CO2		3 Hour
Referen Book MODU Questio Questio Use of I Situatio convers	n forms n forms Do/ Don nal ations	with 5Ws and tags 't and Do	s and 1H with Aux oes/ Does	ciliary Vo n't/ Has/	erbs /Have	Forms				CO2		3 Hour
Referen Book MODU Questio Questio Use of I Situatio convers / Role p	n forms n forms Do/ Don nal ations	with 5Ws and tags 't and Do	s and 1H with Aux oes/ Does	ciliary Vo n't/ Has/	erbs /Have	Forms				CO2		3 Hour
Referen Book MODU Questio Questio Use of I Situatio convers / Role p Referen	n forms n forms Do/ Don nal ations	with 5Ws and tags 't and Do	s and 1H with Aux oes/ Does	ciliary Vo n't/ Has/	erbs /Have	Forms				CO2		3 Hour
Referen Book MODU Questio Questio Use of I Situatio convers / Role p Referen book	n forms n forms Do/ Don nal ations lay nce	with 5Ws and tags 't and Do	s and 1H with Aux pes/ Does tand art	kiliary Vo n't/ Has/ of questi	erbs /Have ioning	Forms				CO2 CO3		
Referen Book MODU Questio Questio Use of I Situatio convers / Role p Referen	n forms n forms Do/ Don nal ations lay nce	with 5Ws and tags 't and Do	s and 1H with Aux pes/ Does tand art	ciliary Vo n't/ Has/	erbs /Have ioning	Forms				CO2 CO3		
Questio Questio Questio Use of I Situatio convers / Role p Referen book	n forms n forms Do/ Don nal ations lay nce	with 5Ws and tags 't and Do Unders 1,2,3	s and 1H with Aux pes/ Does tand art	kiliary Vo n't/ Has/ of questi	erbs /Have ioning	Forms				CO2 CO3		
Referen Book MODU Questio Questio Use of I Situatio convers / Role p Referen book MODU	n forms n forms Do/ Don nal ations lay nce ULE-4	with 5Ws and tags 't and Do Unders 1,2,3	s and 1H with Aux pes/ Does tand art of	xiliary Von't/ Has/ of questi	erbs /Have ioning					CO2 CO3		3 Hour
Questio Questio Questio Use of I Situatio convers / Role p Referer book MODU	n forms n forms Do/ Don nal ations lay nce ULE-4	with 5Ws and tags are taged to the taged t	s and 1H with Aux pes/ Does tand art of	xiliary Von't/ Has/ of questi	erbs /Have ioning					CO2 CO3		
Question Que	n forms n forms Do/ Don nal ations lay nce ULE-4 neration ing a sp ore Spec	with 5Ws and tags 't and Do Unders 1,2,3 technique eech - preech	s and 1H with Aux pes/ Does tand art of	xiliary Von't/ Has/ of questi	erbs /Have ioning tion					CO2 CO3		
Referen Book MODU Questio Questio Use of I Situatio convers / Role p Referen book MODU Idea ger Organis Extemp Express	n forms n forms Do/ Don nal ations lay nce ULE-4 neration sing a sp ore Specing opin	with 5Ws and tags are taged to the taged t	s and 1H with Aux pes/ Does tand art of	xiliary Von't/ Has/ of questi	erbs /Have ioning tion					CO2 CO3		

Review of	Listening to understand		
TEDx talk			
presentation			
Reference	1,2,3		
Book			
MODULE-5	Presentation Skills	CO2	3 Hours
		CO3	
		CO4	
Presentation Ski	ills, Overcoming stage fear, Body language		
Interview and	To be able to speak on Cue Card topics, Compare	and contrast ideas etc.,	
Presentation			
Reference	1,2,3		
Book			

		Marks Distribution				
	RBT Levels	Test (s)	Alternative Assessment (s)			
		25	25			
L1	Remember	-	-			
L2	Understand	10	10			
L3	Apply	10	5			
L4	Analyze	5	10			
L5	Evaluate	-	-			
L6	Create	-	-			

SEE Assessment Pattern (50 Marks – Viva Voce)

	RBT Levels	Exam Marks Distribution (50)
L1	Remember	10
L2	Understand	10
L3	Apply	20
L4	Analyze	10
L5	Evaluate	
L6	Create	

Suggested Learning Resources:

REFERENCE BOOKS:

- 1. Grammar Practice Activities by Penny Ur, Cambridge University Press
- 2. Intermediate English Grammar by Raymond Murphy, Cambridge University Press
- 3. A Final Course of Grammar & Composition PC Wren & H. Martin by S Chand.

- Participate in role plays and presentations
- Watch TEDx videos and review
- Listen to POD Casts
- Participate in JAM sessions
- Use every opportunity in the class to communicate
- Actively participate in Group Discussions.

				ESSION	AL WR	ITING S	SKILLS	S IN ENG				
Course		24ENG26						CIE Marks 50				
L:T:P:S		1:0:0:0						SEE Marks 50				
Hrs / W	eek	2 Total Marks									100	
Credits 01 Exam Hours 2 Course outcomes: At the end of the course, the student will be able to:												
CO1 Recall strategies to improve vocabulary												
	CO2 Outline the different purposes and various styles of writing.											
							-	_	1.			
CO								lls of read	ding.			
CO ₂		Acquire	1 ,		•		ınicatioı	n skills				
Mappin		ourse Ou						ı			1	T
	PO1	PO2	PO3	PO4	PO5	PO6		PO7	PO8	PO9	PO10	PO11
CO1	-	-	-	-	-	-		-	-	3	3	-
CO2	-	-	-	-	-	-		-	-	3	3	-
CO3 CO4	-	-	-	-	-	-		-	-	3	3	-
CO4	-	-	-	-	-	<u> - </u>		-	-	3	<u> </u>	-
MODU	LE-1	Vocabu	larv						(CO1	3	Hours
1,1020		, ocubu	itti y							CO3		Hours
										CO4		
Ways to	enhan	ce vocabu	lary, voc	abulary i	n contex	t, One-w	ord sub	stitution,	Antonyn	ns and Sy	nonyms	
Practice	Exerci	ise	Hom	ophone	s and Ho	monym	5					
Reference			1,2,3	-								
MODUL	E-2	Nat	ture and	Style of	f sensibl	e writin	g:		(CO2	3	Hours
										CO4		
_	_	ciples of				_				_		f Proper
Punctuat	ion, Er	rors due to	o Indianis	m in Eng	glish Cor	nmunica	tion, Cr	eating Co	herence	and Cohe	esion,	
Story		Thought	t flow, id	ea genei	ration, se	entence s	tructure	e				
writing												
Reference	ee	1,2,3,4										
Book	IF 2	Вомоди	anh Waid	·ina					CO2	C	04 3	Пония
MODU		Paragra n, Expans	ion of ide	ung eac Eve	ancion o	f prover	oc Poro	graph w	CO2	enort Wr		Hours
Activity		_	ion or ide	as, Exp	ansion o	i prover	58, F af a	grapii wi	rung, K	eport wr	ning	
Movie re	eview	Compre	hension a	and artic	ulation							
D 4		1 2 2 4										
Referen	ce	1,2,3,4										
book MODU		Reading	g Compr	chansia	n					CO3	2	Hours
		rehension				ective re-	ading S	Sentence				
U		rrections	,				O *		arrangel	IICIIIS CA		1 1actice
Practice	1100 00	RC pass		, ouiiiii	un izing a	ana para	pinasiii	5				
Exercise	•	KC pass	ages									
Reference		1,2,3,4										
Book	-											
MODU	LE-5	Commu	ınication	Skills f	or Emp	loyment	•			CO2 CO4	3	Hours
		ns, Types	of officia	al/emplo	yment/bu	isiness L	etters, E	Email wri			ctive res	ume for
employn	nent,											
Resume writing		Underst descript		rent type	es of resi	ume wri	ing and	l connect	resume	writing t	to Job	
Reference	e	1,2,3										
Book		, ,-										
DOOK												

	`	Marks Distribution				
	RBT Levels	Test (s)	Alternative Assessment (s)			
		25	25			
L1	Remember	_	-			
L2	Understand	10	10			
L3	Apply	10	5			
L4	Analyze	5	10			
L5	Evaluate	-	-			
L6	Create	-	-			

SEE Assessment Pattern (50 Marks – Theory)

	RBT Levels	Exam Marks Distribution (50)
L1	Remember	10
L2	Understand	10
L3	Apply	20
L4	Analyze	10
L5	Evaluate	
L6	Create	

Suggested Learning Resources:

REFERENCE BOOKS:

- 1. Basic Business Communication, Flately & Lesikar, Tata Mc Graw Hil, 10th Edition.
- 2. Business Communication, P.D Chaturvedi & Mukesh Chaturvedi, Pearson Education.
- 3. The Skill of Communicating, Bill Scott & Helen Wilkie, Jacob Books.
- 4. Communication Skills: A Workbook. Sanjay Kumar, Pushpa Lata

- Story writing
- Paragraph writing
- Movie review writing
- Story building around key words
- Report writing for all the events of college

		CONS	TITUT.	ION O	F INDI	A AND	PROF	ESSIO	NAL E	THICS		
Course Co	ode	24CIP1	7/27				CIE M	arks			50)
L: T:P:S		2:0:0:0					SEE M	Iarks			50)
Hrs. / We	ek	2					Total N	Marks			10	00
Credits		01					Exam	Hours			02	2
Course ou	itcome	es: At the	end of the	he cours	e, the stu	ıdent wi	ll be able	e to:			•	
CO1		Understa			backgro	ound, ke	y influer	ices, and	l founda	tional str	ructure o	f the
		Indian C										
CO2		Analyze the Fundamental Rights, Duties, and the Directive Principles of State Policy, including their implementation and significance.										
CO3	Explain the structure, powers, and functions of the Union and State governments, including the roles of the Executive, Legislature, and Judiciary. Comprehend the importance of professional ethics in Engineering, including social											ncluding
CO4		Comprel responsi								, includi	ng social	1
CO5		Understa						analyze	the land	l mark ju	dgemen	ts.
Mapping	of Co	urse Out	tcomes	to Prog	ram Ou	itcomes	•					
GO 1	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	3	-	-	-	-
CO2	3	-	-	-	-		3	3	-	-	-	-
CO3	3	-	-	-	-	3	-	-	-	-	-	-
CO4 CO5		-	-	-	-	-	-	3	3	3	-	-
COS			_	-	-	-	-	3	_	3	-	-
MODUL	E-1	INTRO INDIA	DUCTI	ON TO	CONS	TITUT	ION O	F	CO	1	3 H	lours
Self-study Study / Ap	plicat		•]	s demod Duty of I Gender I	Union G Equality	overnme & Law.	rm of govent towar	rds State		nment.		
Text Book			1									
MODUL		UNION							CO			Hours
Compositi Significan Power & F Auditor Go	t terms Tunctio	used in I n of Subo	Parliame ordinate	nt, powe Court ar	ers and for	unctions Court. S	of Supre	eme Cou	ırt, <mark>Publ</mark>	ic Interes	st Litigat	
Self-study Case Study Application	/ y /	Seminar • .	on: Why is to Position Juvenile	the num of Pres justice:	ber of w ident in a comp	omen's Parliam parison a	position entary s across di equality	ystem of fferent	of Gover countrie	rnment.		
Text Book		1 AMENI ELECT PROVI	DMENT	rs and	PROC	EDUR	E,		CO		31	Iours
Election la												
Amendme				mergen	cy Provi	isions, ty	pes of E	mergen	cies and	its conse	equences	S.
Self-study Case Study Application	y /	•]	Election	dence			_			emocrac cture D	-	Judicia

	Recent Developments in Respects to Judicial Appointments.							
Text Book	1							
MODULE-4	ETHICS AND PROFESSIONALISM IN	CO4	3 Hours					
	ENGINEERING.							

Introduction to Professional Ethics: Definition and importance of professional ethics. Codes of ethics for Engineers. Case studies on ethical dilemmas. Engineers' Responsibility to Society: Responsibility of Engineers, Impediments to responsibility. Clash of ethics. Ethics in Engineering Practice: Workplace ethics: honesty, integrity, and transparency. Conflicts of interest and whistle blowing. Case studies on workplace ethics

Self-study /	Seminar on:		
Case Study /	Engineers and Society.		
Applications	• The role of ethics in professional practice.		
	The importance of professional ethics in do workplace.	eveloping trust an	d respect in the
	The Importance of Ethics in Engineering.		
Text Book	2,3 &4		
MODULE-5	Cyber Law and Cyber Crimes	CO5	3 Hours

Internet and Need for Cyber Laws, Types and Causes for Cyber Crimes, Cyber Crimes Landmark Judgements in India and the Information Technology Act 2000.

111 111010 00110 0110	inicinimuten 100miciegj 1100 2000.
Self-study /	Seminar on:
Case Study /	Major Types of Cyber Crimes and Their Legal Implications.
Applications	 Challenges in Enforcing Cyber Laws Across Jurisdictions.
Text Book	5

CIE Assessment Pattern (50 Marks – Theory)

		Marks D	Distribution
	RBT Levels	Test (s)	Alternate assessment
		25	25
L1	Remember	10	-
L2	Understand	10	10
L3	Apply	5	10
L4	Analyze	-	5
L5	Evaluate	-	-
L6	Create	-	-

SEE Assessment Pattern (50 Marks – Theory)

	RBT Levels	Exam Marks Distribution (50)
L1	Remember	20
L2	Understand	20
L3	Apply	10
L4	Analyze	<u>_</u>
L5	Evaluate	-
L6	Create	-

Suggested Learning Resources:

Text Books:

- 1.Durga Das Basu: "Introduction to the constitution" 19th/20th Edn., or 2008, Lexis Nexis; Twentieth edition (2011)
- 2.Shubham Singles, Charles E.Haries: Constitution of India and Professional Ethics. Latest Edition-2018, Cengage Learning India Private Limited (2019)
- 3.M. Govindarajan, Natarajan, V.S. Senthilkumar," Engineering Ethics", Prentice Hall India Learning Private Limited (2013)
- 4. Winston, M., & Edelbach, R. (2011). Society, Ethics, and Technology. Stamford, Connecticut: Cengage Learning.
- 5.Cyber Security and Cyber Laws Alfred Basta and et al Cengage Learning India 2018 Reference Books **Reference Books**:
- 1.M.V. Pylee." An Introduction to Constitution of India". Vikas Publishing 2002.

- 2. Chandrachud, Y. V. Durga Das Basu Shorter Constitution of India 13th ed, Nagpur Wadhwa & Co. 2005.
- 3.Singh, M. P. Shukla V. N. Constitution of India, 10th ed. Lucknow: Eastern Book Co., 2001. 2. 4. Basu, D. D. Constitutional Law of India, 7th ed. Nagpur: Wadhwa, 1998.
- 5. Jain, M. P. Indian Constitutional Law, 5th ed. Nagpur: Wadhwa & Co., 2003
- 6.M. Govindarajan, Natarajan, V.S. Senthilkumar," Engineering Ethics", Prentice Hall India Learning Private Limited (2013)
- 7. Tavani, H. T. (2010). Ethics and Technology: Controversies, Questions, and Strategies for Ethical Computing. New York, NY: John Wiley & Sons.

Web links and Video Lectures (e-Resources):

• https://Iddashboard.legislstive.gov.in/sites/default/files/COI...pdf

- > Peer Presentation
- ➤ Usage of ICT tools.
- > Flipped classroom.
- > Seminars.

Course Code				ALF	INE	N A IV	NAD			1		
	24KBK							Marks			50	
L:T:P:S	1:0:0:0							Marks			50	
Hrs / Week	2							al Marl			100	
Credits	01			6.11				m Hou)2	
Course Outco							ient w	ill be a	able to): 		
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CO2		munica				gu a ge						
CO3		simpl										
CO4	Pron	ounce	Kanna	ıda wo	rds							
CO – PO Map	· , -						,					
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012
CO1	-	-	-	-	-	-	-	3	-	3	-	-
CO2	-	-	-	-	-		-	3	-	3	-	-
CO3	-	-	-	-	-	-	-	3	-	3	-	-
CO4	-	-	-	-	-	-	-	3	-	3	-	-
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2) Balake	Bhasheya	Prayoj	ana									
•	va Bhasha l			rato								
Self-study / Cas	e Study	Make a	a chart	of Eng	lish, Hii	ndi, Kai	ınada I	Languag	ge			
/ Applications Text Book		1&2										
MODULE-2	Kanna		haram	ala ha	a au II	hhara	no			CO1		3Hours
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1) Kannada A	_ Akshara M		habet	and P	ronund					CO2		
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2) Ottakkasha3) Kannada k	_ Akshara M aragalu agunita	ale		and P	ronund					CO2		
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2) Ottakkasha 3) Kannada k 4) Vergiya ma 5) Nama pada Self-study / Case Study / Applications Text Book MODULE-3	Akshara Maragalu tagunita attu Averga, Servana Any for 1&2 Sambh (Kannashaneg	ale giya Vyn ma, Gur mal let ashan ada in gagi Kar	jana na matt ter or I eyalli Conve	u Parim Design Kanna ersatio Padaga	nana Vao adverti da n) la paric	chaka, Sement	ankhya board	in Kanı	a Pada nada	gala Pari	3	
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2) Ottakkasha 3) Kannada k 4) Vergiya ma 5) Nama pada Self-study / Case Study / Applications Text Book MODULE-3 1) Sambh 2) Sambh 3) Namap nama p 4) Kale m	Akshara Maragalu tagunita attu Averga, Servana Any for 1&2 Sambh (Kannashanegashashanegadagala S	ale giya Vyn ma, Gur mal let ashan ada in gagi Kan yalli kan samban	jana na matt ter or I eyalli Conve nnada I nnada I dartak	u Parim Design Kanna ersatio Padaga padaga a Roop	da n) la paric la pram agalu, S	chaka, Sement	Sankhya Board Kanna aspada	in Kanı ıda wor Prashn	a Pada nada ()	gala Pari	tion)	3 Hours
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2) Ottakkasha 3) Kannada k 4) Vergiya ma 5) Nama pada Self-study / Case Study / Applications Text Book MODULE-3 1) Sambh 2) Sambh 3) Namap nama p 4) Kale m 5) Hannus Self-study /	Akshara Maragalu tagunita attu Averga, Servana Any for 1&2 Sambh (Kannashaney badagala Sadagalu tarak Write ti	ale giya Vyn ma, Gur mal let ashan ada in gagi Kar yalli kar samban ayada h karigalu he Conv le: a) Do	jana na matt ter or I eyalli Conve nnada dartak agu kri hagu versati octor a /TU stu	u Parim Design Kanna ersatio Padaga padaga a Roop iyapada Tindi th on betw nd Pati ident a	da n) la paric la pram agala vi ninisuga veen an ent nd VTU	chaka, Sement haya hukyate andeha vida pr ala hesa ny two p	ankhya board Kanna aspada akaraga arugalu person	in Kanı ıda wor Prashn	a Pada nada ds in c egalu r	gala Pari	cion) mbhadav	3 Hours

- 1) Kannada Bhasheya mahatva
- 2) Kannada Sahitya Charitre
- 3) Adunika kannada Sahitya
- 4) Jnanapeeta Prashasti Vijeta 8 Sahitigalu

Self-study /	Give a pictorial representation of any topic of the Sylla	bus	
Case Study /			
Applications			
Text Book	1&2		
MODULE-5	Karnataka Rajya mattu Rajyada bagge Kuritada	CO2	3Hours
	Mahitagalu (Karnataka State and General	CO4	
	Information about the State)		

- 1) Karnataka Rajyada Udaya
- 2) Karnataka Rajyada Prekshaniya Stalagalu
- 3) Karnataka Rajyada Pramukha Jala nayana pradeshagalu
- 4) Pramukha Anekattugalu
- 5) Karnataka Rajyada 3 Bhougolika Pradeshagalu
- 6) Karnataka da Kelavu Janapriya Samskruthika Kalegalu

Self-study /	Write a case study on growth and development on Kannada in India.
Case Study /	
Applications	
Text Book	1&2

		M	arks Distribution
RBT Levels		Test (s)	Qualitative Assessment (s)
		25	25
L1	Remember	10	10
L2	Understand	10	10
L3	Apply	5	5
L4	Analyze	-	-
L5	Evaluate	-	-
L6	Create	-	-

SEE Assessment Pattern (50 Marks - Theory)

	RBT Levels	Exam Marks Distribution (50)
L1	Remember	20
L2	Understand	20
L3	Apply	10
L4	Analyze	
L5	Evaluate	
L6	Create	

Suggested Learning Resources:

Text Books

- 1) Balake Kannada (Usage of Kannada) Dr. L. Thimmesh
- 2) Vyavaharika Kannada Prof. V Keshavamurthy

Reference Books:

- 1) Karnataka Samskruthi M. Chidananda Murthy
- 2) Kannada Bhasha kai pidi Sagamesha savadatti Mata
- 3) Mataduva Kannada Kannada Sahitya Parishat Bangalore (2016)

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

Make the groups of 4 students they should speak on any current topic in Kannada or present the talk show.

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Course Code	24KS		/27					CIE Ma			50			
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Hrs / Week	2							_					100	
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24KSK17/27 2.	ಕನ್ನಡ	ಭಾಷಾ	ಬರಹದ	ಲ್ಲಿನ ದೊ	ೕಷಗಳು.	, ನಿವಾರಣ	ಣೆ ಮತ್ತು	ಲೇಖನ ಚ	ಕಿಹ್ನೆಗಳನು	್ನ ಅರಿತುಕೆ	೧ಳ್ಳುವರು.			
24KSK17/27 3.				_	•	-		ಸುವಳಿಕೆ ಪಡ						
24KSK17/27 4.			ಾಂತ್ರಿಕ ವಿ ಮತ್ತು ಪ್ರಚ					ಹಲವಾರ ಸ್ಥವರು.) ವಿಷಯ	ುಗಳನ್ನು ಕ	ಪರಿಚಯ :	ಮಾಡಿಕೊಳ	ಭ್ಛವರು	
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24KSK17/27	3.								3		3			
24KSK17/27	4.								3		3			
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೧. ಕರ್ನಾಟಕ ಸಂಸ್ಕೃತಿ, –	ಹಂಪ ನಾ	ಗರಾಜ	ಯ್ಯ						24	KSK17,	/27 2.			
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೧. ಕರ್ನಾಟಕ ಸಂಸ್ಕೃತಿ, –	– ಒಂದು	ಅಪೂ	ರ್ವ ಚರಿತ್ರೆ		ω		ಯೂರ್ತಿ		24	KSK17,	727 2.			
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೧. ಕರ್ನಾಟಕ ಸಂಸ್ಕೃತಿ, – ೨. ಕರ್ನಾಟಕ ಏಕೀಕರಣ, ೩. ಆಡಳಿತ ಭಾಷೆಯಾಗಿ ಕ Self-study / Case S	– ಒಂದು ಕನ್ನಡ – ರ	ಅಪೂ ತಾ. ಎ ಕನ್ನಡ ಕರ್ನಾ ಸಾಂಸ	ರ್ಷ ಚರಿತ್ರೆ ಎಲ್. ತಿಮ್ಮೆ ನಾಡು -ಟಕ ಏಕಿ ಸ್ಕೃತಿಕ ಕನ	್ಮೀಶ್ ಮತ್ತ ನುಡಿ ಸಂ ೀಕರಣದ ನೃಡ ಪಠ್ಯ	ತ್ತು ಪ್ರೊ. ಕಿ ಎಸ್ಕೃತಿಯ ಲ್ಲಿ ಹೋ ಪುಸ್ತಕದ	ದಿ. ಕೇಶವಾ ಬಗ್ಗೆ ಪ್ರ ರಾಡಿದ ರ ಲೇಖಕ	ಬಂಧ ರ ವ್ಯಕ್ತಿಗಳ १ ರು :	<u>,</u> , , , , , , , , ,	ಾಂದಿಗೆ ಪ	ಯಾಹಿತಿ ಸಂ	ಂಗ್ರಹ			
೧. ಕರ್ನಾಟಕ ಸಂಸ್ಕೃತಿ, – ೨. ಕರ್ನಾಟಕ ಏಕೀಕರಣ, ೩. ಆಡಳಿತ ಭಾಷೆಯಾಗಿ ಕ Self-study / Case S / Applications	– ಒಂದು ಕನ್ನಡ – ರ	ಅಪೂ ತಾ. ಎ ಕನ್ನಡ ಕರ್ನಾ ಸಾಂಸ	ರ್ಷ ಚರಿತ್ರೆ ಎಲ್. ತಿಮ್ಮೆ ನಾಡು -ಟಕ ಏಕಿ ಸ್ಕೃತಿಕ ಕನ	್ಮೀಶ್ ಮತ್ತ ನುಡಿ ಸಂ ೀಕರಣದ ನೃಡ ಪಠ್ಯ	ತ್ತು ಪ್ರೊ. ಕಿ ಎಸ್ಕೃತಿಯ ಲ್ಲಿ ಹೋ ಪುಸ್ತಕದ	ದಿ. ಕೇಶವಾ ಬಗ್ಗೆ ಪ್ರ ರಾಡಿದ ರ ಲೇಖಕ	ಬಂಧ ರ ವ್ಯಕ್ತಿಗಳ १ ರು :	ಚನೆ ನಾವಚಿತ್ರದೊ ಕಟಣೆ : ಪ್ರ	ಾಂದಿಗೆ ಪ	ಯಾಹಿತಿ ಸಂ	ಂಗ್ರಹ			
೧. ಕರ್ನಾಟಕ ಸಂಸ್ಕೃತಿ, – ೨. ಕರ್ನಾಟಕ ಏಕೀಕರಣ, ೩. ಆಡಳಿತ ಭಾಷೆಯಾಗಿ ಕ Self-study / Case S / Applications	– ಒಂದು ಕನ್ನಡ – ರ Study	ಅಪೋ ತಾ. ಎ ಕನ್ನಡ ಕರ್ನಾ ಸಾಂಸ ಡಾ.	ರ್ಷ ಚರಿತ್ರೆ ಎಲ್. ತಿಮ್ಮೆ ತ ನಾಡು - ಟಕ ಏಕಿ ಸ್ಕೃತಿಕ ಕನ ಎಲ್. ತಿ:	್ಮಶ್ ಮತ್ತ ನುಡಿ ಸಂ ಆಕರಣದ ನ್ನಡ ಪಠ್ಯ ಮ್ಮೇಶ, ಪ	ತ್ತು ಪ್ರೊ. ಕಿ ಎಸ್ಕೃತಿಯ ಲ್ಲಿ ಹೋ ಪುಸ್ತಕದ	ದಿ. ಕೇಶವಾ ಬಗ್ಗೆ ಪ್ರ ರಾಡಿದ ರ ಲೇಖಕ	ಬಂಧ ರ ವ್ಯಕ್ತಿಗಳ १ ರು :	<u>,</u> , , , , , , , , ,	ಾಂದಿಗೆ ಪ	ಯಾಹಿತಿ ಸಂ	ಂಗ್ರಹ . ಬೆಳಗಾವಿ	41	Iours	
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೧. ಕರ್ನಾಟಕ ಸಂಸ್ಕೃತಿ, – ೨. ಕರ್ನಾಟಕ ಏಕೀಕರಣ, ೩. ಆಡಳಿತ ಭಾಷೆಯಾಗಿ ಕ Self-study / Case S / Applications Text Book MODULE-2 ಭಾಗ – ೨	– ಒಂದು ನನ್ನಡ – ರ Study ಕಾವ್ಯಭಾ	ಅಪ್ಯೂ ತಾ. ಎ ಕನ್ನಡ ಕರ್ನಾ ಸಾಂಸ ಡಾ.	ರ್ವ ಚರಿತ್ರೆ ಎಲ್. ತಿಮ್ಮ ಕ ನಾಡು - ಟಕ ಏಕಿ - ಬಕ ಏಕಿ ಎಲ್. ತಿ: - ಧುನಿಕ ಪ	್ಮೀಶ್ ಮತ್ತ ನುಡಿ ಸಂ ೀಕರಣದ ಸ್ನಡ ಪಠ್ಯ ಮ್ಮೇಶ, ಪ ೊರ್ಮ)	್ತು ಪ್ರೊ. ಟಿ ೧ಸ್ಕೃತಿಯ ಲ್ಲಿ ಹೋ ಮಸ್ತಕದ ಮೈ.ವಿ. ಕ	ದಿ. ಕೇಶವಾ ಬಗ್ಗೆ ಪ್ರ ರಾಡಿದ ರ ಲೇಖಕ ರ ಲೇಖಕ	ಬಂಧ ರ ವ್ಯಕ್ತಿಗಳ ಃ ರು : ಾರ್ತಿ, ಪ್ರ	ಧಾವಚಿತ್ರದೊ ಕಟಣೆ : ಪ್ರ	ಸಾರಾಂಗ 2	ಯಾಹಿತಿ ಸಂ	ರಗ್ರಹ . ಬೆಳಗಾವಿ 7/27 1.	41	lours	
೧. ಕರ್ನಾಟಕ ಸಂಸ್ಥತಿ, – ೨. ಕರ್ನಾಟಕ ಏಕೀಕರಣ, ೩. ಆಡಳಿತ ಭಾಷೆಯಾಗಿ ಕ Self-study / Case S / Applications Text Book MODULE-2 ಭಾಗ – ೨ 4. ವಚನಗಳು – ಬಸಕ	– ಒಂದು ಕನ್ನಡ – ರ Study ಕಾವ್ಯಭಾ ವಣ್ಣ, ಅಕ್ಕ	ಅಪ್ಯೂ ತಾ. ಎ ಕನ್ನಡ ಕರ್ನಾ ಡಾ. ಾಗ (ಆ ಮಹಾರ	ರ್ಷ ಚರಿತ್ರೆ ಎಲ್. ತಿಮ್ಮೆ ಕ ನಾಡು - ಟಕ ಏಕಿ - ಏಕಿ ಎಲ್. ತಿಂ - ಧುನಿಕ ಪ ವೇವಿ, ಅಂ	್ಮೀಶ್ ಮತ್ತ ನುಡಿ ಸಂ ನೀಕರಣದ ಸ್ನಡ ಪತ್ಯ ಮ್ಮೇಶ, ತ ಸೂರ್ವ)	ಶ್ತ ಪ್ರೊ. & ಸ್ಕೃತಿಯ ಲ್ಲಿ ಹೋ ಪುಸ್ತಕದ ಪ್ರೊ.ವಿ. ಕ	ದಿ. ಕೇಶವಾ ಬಗ್ಗೆ ಪ್ರ ರಾಡಿದ : ರೇಖಕ ಕೇಶವಮು	ಬಂಧ ರ ವ್ಯಕ್ತಿಗಳ ಃ ರು : ಾರ್ತಿ, ಪ್ರ	ಧಾವಚಿತ್ರದೊ ಕಟಣೆ : ಪ್ರ	ಸಾರಾಂಗ 2	ಯಾಹಿತಿ ಸಂ . ವಿ.ತಾ.ವಿ 4KSK17	ರಗ್ರಹ . ಬೆಳಗಾವಿ 7/27 1.	41	łours	
೧. ಕರ್ನಾಟಕ ಸಂಸ್ಕೃತಿ, – ೨. ಕರ್ನಾಟಕ ಏಕೀಕರಣ, ೩. ಆಡಳಿತ ಭಾಷೆಯಾಗಿ ಕ Self-study / Case S / Applications Text Book MODULE-2 ಭಾಗ – ೨	– ಒಂದು ಕನ್ನಡ – ರ Study ಕಾವ್ಯಭಾ ವಣ್ಣ, ಅಕ್ಕ	ಅಪ್ಯೂ ತಾ. ಎ ಕನ್ನಡ ಕರ್ನಾ ಡಾ. ಾಗ (ಆ ಮಹಾರ	ರ್ಷ ಚರಿತ್ರೆ ಎಲ್. ತಿಮ್ಮೆ ಕ ನಾಡು - ಟಕ ಏಕಿ - ಏಕಿ ಎಲ್. ತಿಂ - ಧುನಿಕ ಪ ವೇವಿ, ಅಂ	್ಮೀಶ್ ಮತ್ತ ನುಡಿ ಸಂ ನೀಕರಣದ ಸ್ನಡ ಪತ್ಯ ಮ್ಮೇಶ, ತ ಸೂರ್ವ)	ಶ್ತ ಪ್ರೊ. & ಸ್ಕೃತಿಯ ಲ್ಲಿ ಹೋ ಪುಸ್ತಕದ ಪ್ರೊ.ವಿ. ಕ	ದಿ. ಕೇಶವಾ ಬಗ್ಗೆ ಪ್ರ ರಾಡಿದ : ರೇಖಕ ಕೇಶವಮು	ಬಂಧ ರ ವ್ಯಕ್ತಿಗಳ ಃ ರು : ಾರ್ತಿ, ಪ್ರ	ಧಾವಚಿತ್ರದೊ ಕಟಣೆ : ಪ್ರ	ಸಾರಾಂಗ 2	ಯಾಹಿತಿ ಸಂ . ವಿ.ತಾ.ವಿ 4KSK17	ರಗ್ರಹ . ಬೆಳಗಾವಿ 7/27 1.	41	lours	
೧. ಕರ್ನಾಟಕ ಸಂಸ್ಕೃತಿ, – ೨. ಕರ್ನಾಟಕ ಏಕೀಕರಣ, ೩. ಆಡಳಿತ ಭಾಷೆಯಾಗಿ ಕ Self-study / Case S / Applications Text Book MODULE-2 ಭಾಗ – ೨ 4. ವಚನಗಳು – ಬಸಕ 5. ಕೀರ್ತನೆಗಳು – ಎಂ	– ಒಂದು ಕನ್ನಡ – ರ Study ಕಾವ್ಯಭಾ ವಣ್ಣ, ಅಕ್ಕ	ಅಮಾಣಿ ತಾ. ಎ ಕನ್ನಡ ಕರ್ನಾ ಡಾ. ಬಾಗ (ಆ ಮಹಾಣಿ ಪ್ರೆ ಎಂಬ	ರ್ಷ ಚರಿತ್ರೆ ಪರ್ ಚರಿತ್ರೆ ಪ್ರಾಲ್. ತಿಮ್ಮೆ ನಾಡು ಕಟಕ ಏಕಿ ಕನ್ನ ಎಲ್. ತಿಪ್ಪಿ ಪ್ರಾಲ್. ತಿಪ್ಪಿ ಪ್ರಾಲ್. ತಿಪ್ಪಿ ಪ್ರಾಲ್. ತಿಪ್ಪಿ ಪ್ರಾಲ್ ಪ್ರಾರ್ಥಿ ಪ್ರಾಲ್ ಪ್ರಾಲಿ ಪ್ರಾಲ್ ಪ್ರಾಲಿ ಪ್ರಾಲ್ ಪ್ರಾಲ್ ಪ್ರಾಲ್ ಪ್ರಾಲ್ ಪ್ರಾಲಿ ಪ್ರಾಲಿ ಪ್ರಾಲ್ ಪ್ರಾಲಿ ಪ್ರಿ ಪ್ರಾಲಿ ಪ್ರಾಲಿ ಪ್ರಾಲಿ ಪ್ರಾಲಿ ಪ್ರಾಲಿ ಪ್ರಾಲಿ ಪ್ರಿಸ್ ಪ್ರಾಲಿ ಪ್ರಿ ಪ್ರಾಲಿ ಪ್ರಾಟಿ ಪ್ರಾಟಿ ಪ್ರಾಟಿ ಪ್ರಾಟಿ ಪ್ರಾಟಿ ಪ್ರಾಟಿ ಪ್ರಾಟಿ ಪ್ರಾಟಿ ಪ್ರಾಟಿ ಪ	್ಮೀಶ್ ಮತ್ತ ನುಡಿ ಸಂ ಕೀಕರಣದ ಸ್ನಡ ಪತ್ಯ ಮ್ಮೇಶ, ಪ ಮ್ಮೇಶ, ಪ ಲ್ಲಮಪ್ರಭು – ಮರಂ	ಶ್ತ ಪ್ರೊ. ಟ ಸ್ಕೃತಿಯ ಲ್ಲಿ ಹೋ ಪುಸ್ತಕದ ಪ್ರೊ.ವಿ. ಕ	ದಿ. ಕೇಶವಾ ಬಗ್ಗೆ ಪ್ರ ರಾಡಿದ : ರೇಖಕ ಕೇಶವಮು ಕ್ಕೆ ಮಾರ ಸರು	ಬಂಧ ರ ವ್ಯಕ್ತಿಗಳ ಬ ರು : ಾರ್ತಿ, ಪ್ರ ಯ್ಯ, ಜೇ	ನಾವಚಿತ್ರದೊ ಕಟಣೆ : ಪ್ರ ಡರ ದಾಸಿತ	ಸಾರಾಂಗ 2	ಯಾಹಿತಿ ಸಂ . ವಿ.ತಾ.ವಿ 4KSK17	ರಗ್ರಹ . ಬೆಳಗಾವಿ 7/27 1.	41	lours	
೧. ಕರ್ನಾಟಕ ಸಂಸ್ಥತಿ, – ೨. ಕರ್ನಾಟಕ ಏಕೀಕರಣ, ೩. ಆಡಳಿತ ಭಾಷೆಯಾಗಿ ಕ Self-study / Case S / Applications Text Book MODULE-2 ಭಾಗ – ೨ 4. ವಚನಗಳು – ಬಸಂ 5. ಕೀರ್ತನೆಗಳು – ಎಂಬ	– ಒಂದು	ಅಪ್ಟು ತಾ. ಎ ಕನ್ನಡ ಸಾಂಸ ಡಾ. ವಾಗ (ಆ ಮಹಾರ ರೆದು ಸ	ವ್ಯ ಚರಿತ್ರೆ ಪ್ರಕ್ಷಣೆ ಕಿನ್ನೆ ಪ್ರಕ್ಷಣೆ ಪ್ರಕ್ಣಣೆ ಪ್ರಕ್ಷಣೆ	್ಮೀಶ್ ಮತ್ತ ನುಡಿ ಸಂ ೀಕರಣದ ಸ್ನೇಡ ಪಠ್ಯ ಮ್ಮೇಶ, ಪ ಗೂರ್ವ) ಲ್ಲಮಪ್ರಭು – ಮರಂ ಯ ಕೊಡು	ಶ್ತು ಪ್ರೊ. ಟಿ ರಸ್ಟ್ರತಿಯ ಲ್ಲಿ ಹೋ ಪುಸ್ತಕದ ಪ್ರೊ.ವಿ. ಕ ರಾ. ಆಯ್ದ ರಾದರದಾ ರಾ ಹರಿಯೆ	20. ಕೇಶವಾ ಬಗ್ಗೆ ಪ್ರ ರಾಡಿದ : ರ ಲೇಖಕ ಕೇಶವಮು ಕ್ಕೆ ಮಾರ ಸರು	ಬಂಧ ರ ವ್ಯಕ್ತಿಗಳ ಬ ರು : ಾರ್ತಿ, ಪ್ರ ಯ್ಯ, ಜೇ	ನಾವಚಿತ್ರದೊ ಕಟಣೆ : ಪ್ರ ಡರ ದಾಸಿತ	ಸಾರಾಂಗ 2	ಯಾಹಿತಿ ಸಂ . ವಿ.ತಾ.ವಿ 4KSK17	ರಗ್ರಹ . ಬೆಳಗಾವಿ 7/27 1.	41	Hours	
೧. ಕರ್ನಾಟಕ ಸಂಸ್ಕೃತಿ, – ೨. ಕರ್ನಾಟಕ ಏಕೀಕರಣ, ೩. ಆಡಳಿತ ಭಾಷೆಯಾಗಿ ಕ Self-study / Case S / Applications Text Book MODULE-2 ಭಾಗ – ೨ 4. ವಚನಗಳು – ಬಸಕ 5. ಕೀರ್ತನೆಗಳು – ಎಂ	– ಒಂದು	ಅಪ್ಟು ತಾ. ಎ ಕನ್ನಡ ಕರ್ನಾ ಡಾ. ವಾಗ (ಆ ಮಹಾರ ರೆದು ಸ	ರ್ವಚರಿತ್ರೆ ಪರ್ವಚರಿತ್ರೆ ಪರ್. ತಿಮ್ಮೆ ಕ ನಾಡು ಕಟಕ ಏಕಿ ಪ್ರತಿಕ ಕನ ಎಲ್. ತಿ: ಮುವಿರಲ್ಲ ಭುವಿರಲ್ಲ ಭುವಿರಲ್ಲ ಸೇವೆಯನ್ ಇ – ಸಂ	್ಮೀಶ್ ಮತ್ತ ನುಡಿ ಸಂ ಆಕರಣದ ಸ್ನಡ ಪಠ್ಯ ಮ್ಮೇಶ, ಪ ಮಾರ್ಹ) ಲ್ಲಮಪ್ರಭು – ಮರಂ ಹುರು ಕೊಡು ತ ಶಿಶುನ	ಶ್ತು ಪ್ರೇ. ಟಿ ರಾಸ್ಟ್ರತಿಯ ಲ್ಲಿ ಹೋ ಪುಸ್ತಕದ ಪ್ರೊ.ವಿ. ಕ ರಾದರದಾ ರಾದರದಾ ಈ ಪರಿಯೆ	20. ಕೇಶವಾ ಬಗ್ಗೆ ಪ್ರ ರಾಡಿದ : ರ ಲೇಖಕ ಕೇಶವಮು ಕಿಕ್ಕಿ ಮಾರ ಸರು ೨ – ಕಣ ಘರು	ಬಂಧ ರ ವ್ಯಕ್ತಿಗಳ ಬ ರು : ಾರ್ತಿ, ಪ್ರ ಯ್ಯ, ಜೇ	ನಾವಚಿತ್ರದೊ ಕಟಣೆ : ಪ್ರ ಡರ ದಾಸಿತ	ಸಾರಾಂಗ 2	ಯಾಹಿತಿ ಸಂ . ವಿ.ತಾ.ವಿ 4KSK17	ರಗ್ರಹ . ಬೆಳಗಾವಿ 7/27 1.	41	Hours	
	– ಒಂದು	ಅಪ್ಟು ತಿತ್ತಾ. ತಿತ್ತಿಕನ್ನಡ ಕರ್ನಾ. ಪಾ. ಆತ್ತಿಕನ್ನಡ ತಿರ್ವಾ ಕರ್ನಾ ಕರ್ನಾ ತಿರ್ವಾ ಕರ್ನಾ ಕರಾ ಕರ್ನಾ ಕರ್ನಾ ಕರಾ ಕರ್ನಾ ಕರ್ನಾ ಕರ್ನಾ ಕರ್ನಾ ಕ್ರಾ ಕ್ರಾ ಕ್ರಾ ಕ್ರಾ ಕ್ರಾ ಕ್ರಾ ಕ್ರಾ ಕ್ರ	ರ್ವಚರಿತ್ರೆ ಪರ್ವಚರಿತ್ರೆ ಪರ್. ತಿಮ್ಮೆ ಕ ನಾಡು ಕಟಕ ಏಕಿ ಪ್ರತಿಕ ಕನ ಎಲ್. ತಿ: ಮುವಿರಲ್ಲ ಭುವಿರಲ್ಲ ಭುವಿರಲ್ಲ ಸೇವೆಯನ್ ಇ – ಸಂ	್ಮೀಶ್ ಮತ್ತ ನುಡಿ ಸಂ ನೀಕರಣದ ಸ್ನಡ ಪಠ್ಯ ಮ್ಮೇಶ, ಪ ಮಾರ್ವ) ಲ್ಲಿಮಪ್ರಭು – ಪುರಂ ಯ ಕೊಡು ತ ಶಿಶುನ ಗೆ ಸಾವ	ಶ್ತು ಪ್ರೇ. ಟಿ ನಸ್ಟ್ರತಿಯ ಲ್ಲಿ ಹೋ ಪುಸ್ತಕದ ಪ್ರೊ.ವಿ. ಕೆ ಂದರದಾ; ಹರಿಯೆ ಕೊಡಬೇ ಕೊಡಬೇ	20. ಕೇಶವಾ ಬಗ್ಗೆ ಪ್ರ ರಾಡಿದ : ರ ಲೇಖಕ ಕೇಶವಮು ಕಿಕ್ಕಿ ಮಾರ ಸರು ೨ – ಕಣ ಘರು	ಬಂಧ ರ ವ್ಯಕ್ತಿಗಳ ಬ ರು : ಾರ್ತಿ, ಪ್ರ ಯ್ಯ, ಜೇ	ನಾವಚಿತ್ರದೊ ಕಟಣೆ : ಪ್ರ ಡರ ದಾಸಿತ	ಸಾರಾಂಗ 2	ಯಾಹಿತಿ ಸಂ . ವಿ.ತಾ.ವಿ 4KSK17	ರಗ್ರಹ . ಬೆಳಗಾವಿ 7/27 1.	41	Iours	
	- ಒಂದು	ಅಪೂ ತಾ. ಎ ಕನ್ನಡ ಕರ್ನಾ ಡಾ. ಮಹಾರ ್ಲೈ ಎಂಬ ರೆದು ಸ ಾಡಿರಣ್ ಪಡರಣ ಪಡರಣ ಪಡರಣ ವಚನಕ	ವ್ ಚರಿತ್ರೆ ಪ್ರಕ್ಷಣೆ ಚಿನ್ನೆ ಪ್ರಕ್ಷಣೆ ಪ್ರಕ್ಣಣೆ ಪ್ರಕ್ಷಣೆ ಪ್	್ಮೀಶ್ ಮತ್ತ ನುಡಿ ಸಂ ನೀಕರಣದ ನ್ನಡ ಪತ್ಯ ಮ್ಮೇಶ, ಪ ತುಮಪ್ರಭು - ಮರಂ ಮೆ ಕೊಡು ತ ಶಿಶುನ ಗೆ ಸಾವ ಚನಗಳ	ಶ್ತು ಪ್ರೊ. ಟಿ ಸ್ಕೃತಿಯ ಲ್ಲಿ ಹೋ ಪುಸ್ತಕದ ಪ್ರೊ.ವಿ. ಕೆ ಎಂದರದಾ ಎಂಹರಿಯೆ ಕೂಡಬೇ ಸಂಗ್ರಹ	ದಿ. ಕೇಶವಾ ಬಗ್ಗೆ ಪ್ರ ರಾಡಿದ : ರ ಲೇಖಕ ಕೇಶವಮು ಕ್ಕೆ ಮಾರ ಸರು ೧ – ಕಣ ಭರು ಡ	ಬಂಧ ರ ವ್ಯಕ್ತಿಗಳ ಬ ರು : ರಾರ್ತಿ, ಪ್ರ ಯ್ಯ, ಜೇ	ನಾವಚಿತ್ರದೊ ಕಟಣೆ : ಪ್ರ ಡರ ದಾಸಿತ	ಾಂದಿಗೆ ಪ ಸಾರಾಂಗ 2 2 ಯಯ್ಯ,	ಯಾಹಿತಿ ಸಂ . ವಿ.ತಾ.ವಿ 4KSK17 4KSK17	ಂಗ್ರಹ . ಬೆಳಗಾವಿ //27 1. //27 2.		lours	
	- ಒಂದು	ಅಪೂ ತಾ. ಎ ಕನ್ನಡ ಕರ್ನಾ ಡಾ. ಮಹಾರ ್ಲೈ ಎಂಬ ರೆದು ಸ ಾಡಿರಣ್ ಪಡರಣ ಪಡರಣ ಪಡರಣ ವಚನಕ	ವ್ ಚರಿತ್ರೆ ಪ್ರಕ್ಷಣೆ ಚಿನ್ನೆ ಪ್ರಕ್ಷಣೆ ಪ್ರಕ್ಣಣೆ ಪ್ರಕ್ಷಣೆ ಪ್	್ಮೀಶ್ ಮತ್ತ ನುಡಿ ಸಂ ನೀಕರಣದ ನ್ನಡ ಪತ್ಯ ಮ್ಮೇಶ, ಪ ತುಮಪ್ರಭು - ಮರಂ ಮೆ ಕೊಡು ತ ಶಿಶುನ ಗೆ ಸಾವ ಚನಗಳ	ಶ್ತು ಪ್ರೊ. ಟಿ ಸ್ಕೃತಿಯ ಲ್ಲಿ ಹೋ ಪುಸ್ತಕದ ಪ್ರೊ.ವಿ. ಕೆ ಎಂದರದಾ ಎಂಹರಿಯೆ ಕೂಡಬೇ ಸಂಗ್ರಹ	ದಿ. ಕೇಶವಾ ಬಗ್ಗೆ ಪ್ರ ರಾಡಿದ : ರ ಲೇಖಕ ಕೇಶವಮು ಕ್ಕೆ ಮಾರ ಸರು ೧ – ಕಣ ಭರು ಡ	ಬಂಧ ರ ವ್ಯಕ್ತಿಗಳ ಬ ರು : ರಾರ್ತಿ, ಪ್ರ ಯ್ಯ, ಜೇ	ನಾವಚಿತ್ರದೊ ಕಟಣೆ : ಪ್ರ ಡರ ದಾಸಿತ	ಾಂದಿಗೆ ಪ ಸಾರಾಂಗ 2 2 ಯಯ್ಯ,	ಯಾಹಿತಿ ಸಂ . ವಿ.ತಾ.ವಿ 4KSK17 4KSK17	ಂಗ್ರಹ . ಬೆಳಗಾವಿ //27 1. //27 2.		Hours	
	- ಒಂದು ನನ್ನಡ - ರ Study ಕಾವ್ಯಭಾ ವಣ್ಣ, ಅಕ್ಕೂ ಲ್ಲಾನು ಬ್ಯ ಬಗಿಲನು ತೆಡೆಯ ನೊಡಿಯ ನೊಡಿಯ ನೊಡಿಯ ನೊಡೆತುತ್ತುತ್ತುತ್ತುತ್ತುತ್ತುತ್ತುತ್ತುಕ್ಕೂ ಸಮೂಪ	ಅಪ್ಟು ತಿಪ್ಪು ತಿಪ್ಪು ತಿಪ್ಪು ತಿಪ್ಪು ತಿಪ್ಪು ತಿಪ್ಪು ತಿಪ್ಪು ತಿಪ್ಪುತ್ತ ತಮ್ಮ ತಮ್ಮ ತಮ್ಮ ತಮ್ಮ ತಮ್ಮ ತಮ್ಮ ತಮ್ಮ	ವರ್ಷ ಚರಿತ್ರೆ ಪರ್. ತಿಮ್ಮೆ ನಾಡು ಕಟಕ ಏಕಿ ಪರ್. ತಿಪ್ಪೆ ಪರ್, ಅಂ ಬುವಿರಲ್ಲ ಬಡವರಿಗೆ ಕಾರರ ವರ್ತನ ಗಾಯ ನ್ನಡ ಪಠ್ಯ ನಿರ್ವಹಣೆ ನಿರ್ವಹಣೆ ಸಂದರ್ಭ ನಿರ್ವಹಣೆ ಸಂದರ್ಭ ನಿರ್ವಹಣೆ ಸಂದರ್ಧ ನಿರ್ವಹಣೆ ಸಿರ್ವಹಣೆ ಸಿರ್ದಹಣೆ ಸಿರ್ದಹಣೆ ಸಿರ್ದಹಣೆ ಸಿರ್ದಹಣೆ ಸಿರದಹಣೆ ಸಿರ್ದಹಣೆ ಸಿರದಹಣೆ ಸಿರ್ದಹಣೆ ಸಿರ್ದಹಣೆ ಸಿರ್ದಹಣೆ ಸಿರ್ದಹಣೆ ಸಿರ್ದಹಣೆ ಸಿರ್ದಹಣೆ ಸಿರದಹಣೆ ಸಿರ್ದಹಣೆ ಸಿರ್ದಹಣೆ ಸಿರ್ದಹಣೆ ಸಿರ್ದಹಣೆ ಸಿರ್ದಹಣೆ ಸಿರ್ದಹಣೆ ಸಿರಿಗಹಣೆ ಸಿರಿಗಹಣೆ ಸಿರಿಗಹಣೆ ಸಿರ್ದಹಣೆ ಸಿರಿಗಹಣೆ ಸಿ	್ಮೀಶ್ ಮತ್ತ ನುಡಿ ಸಂ ಸ್ಕೇಕರಣದ ಸ್ನೇಡ ಪಠ್ಯ ಮ್ಮೇಶ, ಪ ಮ್ಮೇಶ, ಪ ಮ್ಮಾತ್ರ ಲ್ಲಮಪ್ರಭು – ಮರಂ ಮ ಕೊಡು ತ ಶಿಶುನ ನೆ ಸಾವ ಚನಗಳ ವಿನಗಳ ಮನಗಳ	ಶ್ಚಿ ಪ್ರೇ. ಟಿ ಪ್ರಾಪ್ತಿ ಪ್ರಿ ಪ್ರೇಖಕ್ ಪ್ರಾಪ್ತಿ ಪ್ರೀ. ಪ್ರಿಪ್ತಿ ಪ್ರೀ. ಪ್ರಿಪ್ತಿ ಪ್ರೀ. ಪ್ರಿಪ್ತಿ ಪ್ರಿಸ್ತಿ ಪ್ರಿಪ್ತಿ ಪ್ರಿಸ್ತಿ ಪ್ರಿಪ್ತಿ ಪ್ರಿಸ್ತಿ ಪ್ರಿಸ್ಟಿ ಪ್ರಿಸ್ತಿ ಪ್ರಿಸ್ಟಿ ಪ್ರಿಸ್ತಿ ಪ್ರಿಸ್ತಿ ಪ್ರಿಸ್ಟಿ ಪ್	ಿ. ಕೇಶವಾ ಬಗ್ಗೆ ಪ್ರ ರಾಡಿದ : ರ ಲೇಖಕ ಕ್ಕೆ ಮಾರ ಸರು ಂ – ಕಾ ಪರು ಡ ಗೂ ತತ್ವವ ಸರು :	ಬಂಧ ರ ವ್ಯಕ್ತಿಗಳ ಬ ರು : ಕಾರ್ತಿ, ಪ್ರ ಯ್ಯ. ಜೇ ನಕದಾಸರು	ನಾವಚಿತ್ರದೊ ಕಟಣೆ : ಪ್ರ ಡರ ದಾಸಿತ	ಾಂದಿಗೆ ತ ಸಾರಾಂಗ 2 2. ಮಯ್ಯ,	ನಾಹಿತಿ ಸಂ . ವಿ.ತಾ.ವಿ 4KSK17 4KSK17	ಂಗ್ರಹ . ಬೆಳಗಾವಿ 7/27 1. /27 2. ಎೂಹ ಗಾಂ		Hours	

MODULE-3	ಕಾವ್ಯಭಾಗ (ಆಧುನಿಕ)	24KSK17/27 2.	7 Hours
ಭಾಗ – ೩		24KSK17/27 3.	110010
೮. ಮಂಕು ತಿಮ್ಮನ ಕ	rg – ಡಿ.ವಿ.ಜಿ.	<u> </u>	
೯. ಕುರುಡು ಕಾಂಚಾಣ	o – ದ.ರಾ. ಬೇಂದ್ರೆ		
೧೦. ಹೊಸಬಾಳಿನ ಗೀ	ತೆ – ಕುವೆಂಪು		
೧೧. ಹೆಂಡತಿಯ ಕಾಗಾ	ವ – ಕೆ.ಎಸ್. ನರಸಿಂಹಸ್ವಾಮಿ		
೧೨. ಮಬ್ಬಿನಿಂದ ಮುಣ	ಲ್ಪಿಗೆ – ಜಿ.ಎಸ್. ಶಿವರುದ್ರಪ್ಪ		
೧೩. ಅಮರ ಈ ಮರ	– ಚಂದ್ರಶೇಖರ ಕಂಬಾರ		
೧೪. ಚೋಮನ ಮಕ್ಕಳ	³ ಹಾಡು – ಸಿದ್ಧಲಿಂಗಯ್ಯ		
Self-study /	ಪ್ರಸಿದ್ಧ ಕನ್ನಡ ಕವಿಗಳ ಭಾವ ಚಿತ್ರದೊಂದಿಗೆ ಮಾಹಿತಿ ಸಂಗ್ರಹ		
Case Study /			
Applications			
Text Book	ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ ಪಠ್ಯ ಮಸ್ತಕದ ಲೇಖಕರು :	- 0)	
	ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ, ಪ್ರೊವಿ. ಕೇಶವಮೂರ್ತಿ, ಪ್ರಕಟಣೆ : ಪ್ರಸಾರಾಂಗ. ೩).ತಾ.ವಿ. ಬೆಳಗಾವಿ	
MODULE-4	ತಾಂತ್ರಿಕ ವ್ಯಕ್ತಿ ಪರಿಚಯ ಕಥೆ ಮತ್ತು ಪ್ರವಾಸ ಕಥನ	24KSK17/27 2.	3 Hours
ಭಾಗ – ೪		24KSK17/27 4.	
Self-study / Case Study / Applications Text Book	ಗಿರಿಜನ ಪರ್ವತ – ಹಿ.ಚಿ. ಬೋರಲಿಂಗಯ್ಯ ಸರ್. ಎಂ. ವಿಶ್ವೇಶ್ವರಯ್ಯನವರ ಭಾವಚಿತ್ರದೊಂದಿಗೆ ಕರ್ನಾಟಕದಲ್ಲಿ ಅವರು ಸಂಗ್ರಹ ಯುಗಾದಿ ಹಾಗೂ ಪ್ರಸಿದ್ಧ ಹಬ್ಬಗಳ ಬಗ್ಗೆ ಪ್ರಬಂಧ ರಚಿಸುವುದು ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ ಪಠ್ಯ ಮಸ್ತಕದ ಲೇಖಕರು : ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ, ಮ್ರೊ.ವಿ. ಕೇಶವಮೂರ್ತಿ, ಪ್ರಕಟಣೆ : ಪ್ರಸಾರಾಂಗ. ತಿ		ಳ ಮಾಹಿತಿ
MODULE-5 ಭಾಗ – ೫	ವಿಜ್ಞಾನ ಮತ್ತು ತಂತ್ರಜ್ಞಾನ	24KSK17/27 2. 24KSK17/27 4.	4Hours
೧೮. ಕರಕುಶಲ ಕಲೆಗಳ	 ು ಮತ್ತು ಪರಂಪರೆಯ ವಿಜ್ಞಾನ		
೧೯. 'ಕ' ಮತ್ತು 'ಬಿ'	ಬರಹ ತಂತ್ರಾಂಶಗಳು		
೨೦. ಕನ್ನಡ ಕಂಪ್ಯೂಟರ	ಶ್ ಶಬ್ದಕೋಶ,		
೨೧. ತಾಂತ್ರಿಕ ಪದಕೋ	र्ष्ट		
Self-study /	ಕರಕುಶಲ ಕಲೆಗಳ ಮಾಹಿತಿ ಸಂಗ್ರಹಿಸುವುದು		
	ಕನ್ನಡ ಕಂಪ್ಯೂಟರ್ ಶಬ್ದಕೋಶದ ಪಟ್ಟಿ ಮಾಡುವುದು		
Case Study /	_		
Applications			
Text Book	ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ ಪಠ್ಯ ಮಸ್ತಕದ ಲೇಖಕರು : ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ, ಪ್ರೊ.ಎ. ಕೇಶವಮೂರ್ತಿ, ಪ್ರಕಟಣೆ : ಪ್ರಸಾರಾಂಗ. ತ	ು.ತಾ.ವಿ. ಬೆಳಗಾವಿ	

ನಿರಂತರ ಆಂತರಿಕ ಮೌಲ್ಯಮಾಪನ

			rks Distribution
RBT Levels		Test (s)	Qualitative Assessment (s)
			25
L1	Remember	10	10
L2	Understand	10	10
L3	Apply	5	5
L4	Analyze	-	-
L5	Evaluate	-	-
L6	Create	-	-

SEE Assessment Pattern (50 Marks - Theory)

ಸೆಮಿಸ್ಟರ್ ಎಂಡ್ ಪರೀಕ್ಷೆ

RBT Levels		Exam Marks Distribution (50)
L1	Remember	20
L2	Understand	20
L3	Apply	10
L4	Analyze	
L5	Evaluate	
L6	Create	

Suggested Learning Resources:

ಪಠ್ಯ ಮಸ್ತಕಗಳು (Text Books) ಸಂಪಾದಕರು

- 1) ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ ಡಾ. ಹಿ.ಚಿ. ಬೋರಲಿಂಗಯ್ಯ, ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ್
- 2) ಕರ್ನಾಟಕ ಸಂಸ್ಕೃತಿ ಪ್ರೋ. ಹಂಪ ನಾಗರಾಜಯ್ಯ
- 3) ಡಾ.ಸರ್.ಎಂ. ವಿಶ್ವೇಶ್ವರಯ್ಯ ವ್ಯಕ್ತಿ ಮತ್ತು ಐತಿಹ್ಯ ಎ.ಎನ್.ಮೂರ್ತಿರಾವ್
- 4) ಕರಕುಶಲ ಕಲೆಗಳು ಮತ್ತು ಪರಂಪರೆಯ ವಿಜ್ಞಾನ ಕರೀಗೌಡ ಬೀಚನಹಳ್ಳಿ

ಪರಾಮರ್ಶನ ಗ್ರಂಥಗಳು (Reference Books)

- 1) ಕರ್ನಾಟಕ ಸಂಸ್ಕೃತಿ ಸಮೀಕ್ಷೆ ಹೆಚ್. ತಿಪ್ಪೇರುದ್ರಸ್ವಾಮಿ
- 2) ಕರ್ನಾಟಕ ಏಕೀಕರಣಕ್ಕೆ ದುಡಿದ ಮಹನೀಯರುಗಳು ಸುವರ್ಣ ಕರ್ನಾಟಕ ಮಾಲೆ ಕನ್ನಡ ಅಭಿವೃದ್ಧಿ ಪ್ರಾಧಿಕಾರ
- 3) ಕನ್ನಡ ಭಾಷಾ ಕೈಪಿಡಿ : ಸಂಗಮೇಶ ಸವದತ್ತಿ ಮಠ ರೂಪ ರಶ್ಮಿ ಪ್ರಕಾಶನ, ಗುಲ್ಗರ್ಗ 1995
- 4) 'ಶತಮಾನದ ಮರುಷ ವಿಶ್ವೇಶ್ವರಯ್ಯ' ಕೆ.ಎಂ. ವೆಂಕಟಕೃಷ್ಣ ರಾವ್, ಪ್ರಕಟಣೆ ಪ್ರಸಾರಾಂಗ ವಿತಾವಿ.
- 5) ಅಪೂರ್ವ ಪಶ್ಚಿಮ ಶಿವರಾಮ ಕಾರಂತರು 1953
- 6) ವಿಜ್ಞಾನ ಕಥಾ ಪ್ರಪಂಚ ಸವಿತಾ ಶ್ರೀನಿವಾಸ್
- 7) ಪರಿಸರ ವಿಜ್ಞಾನ ಸಾಹಿತ್ಯ ನಾಗೇಶ್ ಹೆಗ್ಗಡೆ
- 8) ಕಂಪ್ಯೂಟರ್ ತಂತ್ರಜ್ಞಾನ, ಪದವಿವರಣ ಕೋಶ ಟಿ.ಜಿ. ಶ್ರೀನಿಧಿ, ಕನ್ನಡ ಅಭಿವೃದ್ಧಿ ಪ್ರಾಧಿಕಾರ, ವಿಧಾನಸೌಧ, ಬೆಂಗಳೂರು 560001.

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

ವಚನ ಗಾಯನ ಗೋಷ್ಟಿ ನಡೆಸುವುದು ತತ್ವಪದಗಳ ಸಮೂಹ ಗಾಯನ ನಡೆಸುವುದು

ಜನಪದ ಗೀತೆಗಳ ಸಮೂಹ ಗಾಯನ ಹಾಗೂ ವಿವಿಧ ಜಾನಪದ ಕಲೆಗಳ ಪ್ರದರ್ಶನ

ಕರ್ನಾಟಕದ ಏಕೀಕರಣ ಚಳುವಳಿಯಲ್ಲಿ ಹೋರಾಡಿದ ಮಹನೀಯರುಗಳ ವ್ಯಕ್ತಿ ಜೀವನ ಭಾವ ಚಿತ್ರದೊಂದಿಗೆ ಪ್ರದರ್ಶಿಸುವುದು ಸರ್. ಎಂ. ವಿಶ್ವೇಶ್ವರಯ್ಯ ವ್ಯಕ್ತಿ ಮತ್ತು ಐತಿಹ್ಯವನ್ನು ನಾಟಕ ರೂಪದಲ್ಲಿ ಪ್ರದರ್ಶನ ಮಾಡುವುದು

]	ENGIN	EERIN	G INNO	OVATION	ONS IN	HEAL	TH CA	RE			
Course Code	e 2	4EIH18/								Marks	50)	
L:T:P:S	1	0:0:0							SEE	Marks	50)	
Hrs / Week	1	1 Total M						Marks	10	00			
Credits	0	1							Exan	1 Hours	03	3	
Course outc	omes:	At the e	nd of th	e course	, the stu	dent wi	ll be able	e to:	•		•		
CO1	U	nderstan	d health	care sys	stems ar	nd engin	eering ir	novati	ons				
CO2	A	nalyze n	nedical	devices	and tech	nologie	S						
CO3	Е	valuate t	he impa	ct of dig	gital hea	lth and	telemedi	cine					
CO4	U	nderstan	d advan	ced the	rapeutic	technol	ogies an	d their	applicati	ons			
CO5	D	evelop e	thical a	nd innov	vative so	olutions	for healt	hcare c	hallenge	es			
Mapping of	Cour												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	
CO1	3	-	2	-	-	3	-	-	-	-	-	-	
CO2	3	-	-	-	3	-	-	-	-	-	-	-	
CO3	3	-	2	-	3	-	-	-	-	-	-	-	
CO4	3	-	3	-	3	-	-	-	-	-	-	-	
CO5	-	-	-	-	-	-	-	3	-	-	-	-	
MODULE-		VTROD		ON TO	HEAL	THCA	RE		C	:O1		3 Hou	rs
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Overview of					_				ncare sy	stems,	Major c	namenge	es in
healthcare, th		_	_		_		-		1 '1		1.		
Historical Pe	_					_	-					technol	logy,
Evolution of								ng healt	hcare in	novatio	1S		
SELF-STUD	ΟY	Ca	ase stud	ies of s	uccessf	ul innov	ations						
Text Book		1					_				1		
MODULE-		IOMEI			NEERII	NG AN	D			CO2		3 Hot	irs
Basics of Bio		IEDICA			action to	hiomac	lical and	inaarin	a Vov.	race and	annliaa	tions C	oroor
paths in bion				· muou	uction to	Diomec	ncai eng	meem	g, Key a	ieas and	арриса	nons, C	areer
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Medical De								_		_			_
Innovations	ın med	ical ima	ging (M	RI, CI,	ultraso	una), A	avances	ın diag	nostic to	ois (lab	-on-a-cr	np, wear	rable
sensors)	- 1 -												
Self-study		areer op	portunit	ies in he	ealth car	e for en	gineers						
Text Book	2												
MODULE-		IGITA								203	77 1.1	3 Hot	
Digital Heal		ennologi	es: Intro	duction	to digit	ai neaitr	ı, Mobile	e neaitr	(m Hea	itn) app	s, Healti	1 inform	atics
and data anal	•	.	3.5 .			6 .			C" .			6 . 1 1	1.1
Telemedicin				_	Overvie	ew of te	elemedic	ıne, Be	enefits a	nd chall	lenges o	of telehe	ealth,
Innovations in remote patient monitoring.													
Self-study		Case study on telemedicine and remote Monitoring											
Text Book		3 ADVANCED THERAPEUTIC CO4 3 Hours											
MODULE-		DVAN(ECHN('EUTI	U			(CO4		3 Hou	irs
Biotechnolo					g: Rasi	ics of 1	piotechn	ology	Genetic	engine	ering a	nd CRI	SPR
technology,			_		_			о <u>го</u> ду,	Sometic	ongine	ornig a	CIXI	
Robotics an			_			ice in a	iroery o	nd rah	ahilitatio	n Artif	ficial in	telligen	e in
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Self-study Text Book	A	pplication	OHS OF A	M in ne	aiui car	t.							
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MODULE-5 INNOVATION, ETHICS, AND CO5 3 Hours FUTURE DIRECTIONS

Innovation and Entrepreneurship in Healthcare: Pathways from innovation to market

Case studies of successful healthcare start-ups, Funding and support for healthcare innovations

Ethics, Privacy, and Future Trends: Ethical considerations in healthcare innovations, Privacy and security of health data, Future trends and emerging technologies in healthcare

Self-study	Presenting innovative ideas related to health care.
Text Book	5&6

CIE Assessment Pattern (50 Marks – Theory and Lab)

		Marks Distribution				
	RBT Levels	Test (s)	Qualitative Assessment			
		25	25			
L1	Remember	5	5			
L2	Understand	10	10			
L3	Apply	10	10			
L4	Analyze					
L5	Evaluate					
L6	Create					

SEE Assessment Pattern (50 Marks – Theory)

	RBT Levels	Exam Marks Distribution (50)
L1	Remember	10
L2	Understand	20
L3	Apply	20
L4	Analyze	
L5	Evaluate	
L6	Create	

Suggested Learning Resources: Text Books

- 1. Engineering and Technology for Healthcare (IEEE Press) 1st Edition
- 2. Biomedical Engineering: Bridging Medicine and Technology By W. Mark Saltzman · 2009, Cambridge University Press.
- **3.** Digital Health: Scaling Healthcare to the World by Homero Rivas and Katarzyna Wac , Springer International Publishing
- **4.** Handbook of Research on Biomedical Engineering Education and Advanced Bioengineering Learning Interdisciplinary Concepts · Volume 2 By Ziad O. Abu-Faraj · 2012
- **5.** The Innovator's Prescription: A Disruptive Solution for health care by Clayton M. Christensen, Jerome H. Grossman Jason Hwang · 2008, McGraw-Hill Education
- 6. Health Care Information Systems: A Practical Approach for Health Care Management By Karen A. Wager, Frances W. Lee, John P. Glaser · 2022, Wiley publications

Reference Books:

- 1) Bio design: The Process of Innovating Medical Technologies by Paul G. Yock, Stefanos Zenios, Josh Makower, Todd J. Brinton, Uday N. Kumar, and Lyn Denend
- 2) Medical Device Technologies: A Systems Based Overview Using Engineering Standards by Gail Baura
- 3) Healthcare Technology Management A Systematic Approach by Francis Hegarty
- 4) Biomedical Engineering: Bridging Medicine and Technology by W. Mark Saltzman

Web links and Video Lectures (e-Resources):

- https://www.coursera.org/learn/wo-pmo-healthcareinnovation#outcomes
- https://www.futurelearn.com/courses/innovation-in-healthcare
- https://www.coursera.org/learn/guide-to-healthcare-innovation-principles-and-practice
- Harvard University: Biodesign: Image of Harvard University: Biodesign website
- https://www.researchgate.net/publication/376324410 ENGINEERING_INNOVATIONS_IN_HEAL THCARE A REVIEW OF DEVELOPMENTS IN THE USA
- https://eih.uw.edu/projects
- https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8508443/

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

Case studies/Seminars/Presentation /patenting of innovative ideas

Course		24EDM		_ ,_,	, _ , _ ,		CIE		. ,	MENT 50		
Course Code		Z4EDIVI	10/40				CIE			30		
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Hrs / V		1						Marks		100		
Credits		01 Exam Hours 02										
Course	outcom	nes: At the	e end of	the cours	se, the stu	udent wil	ll be able	e to:				
CO1		Analyze the structure and function of various ecosystems and the importance of biodiversity.										
CO2				ces in e	nergy sy	ystems a	nd disa	ster mar	agemer	nt.		
CO3						nd preveractices.		easures	of envir	ronmenta	al pollut	ion, and
CO4			gate glol	bal envi	ronment	tal issue		oundwa	ter prob	olems, al	ong wit	h their
CO5						lation in	India.					
Mannir	ng of C	ourse Ou	tcomes	to Progr	am Outo	ome.						
PPII	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3			PO4				PO8			POH	
CO1	3	2	-	-	-	1	2	-	-	-	-	-
CO ₂	3	-	2	2	-	1	2	+	-	-	+-	-
CO3	3	2		-	-	-	2	1	-	-	-	-
CO ₅	3	2	+-	+-	+-	+-	2	1	 -	+-	-	-
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Self-stu				of biodiv	ersity							
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MODU	LE-2	G-2 Advances in Energy Systems and Disaster Management						CO2 3 Hours			nours	
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Solar, C Disaste Disaste	r Mana r Mana	_									ought, C	Glacial I

Waste Management Waste Management & Public Health Aspects: Bio-medical Wastes; Solid waste; Hazardous wastes; Industrial and Municipal Sludge.

MODULE-3 Environmental pollution and Waste Management

Text Book

Environmental pollution

Environmental (Case-studies)

Text Book :2

Case Study	Environmental pollution			
Text Book	Text Book :1			
MODULE-4	Global Environmental Concerns	CO4	3 Hours	

Environmental Pollution -Water, soil, air (Sources, Impacts, Corrective and Preventive measures, Relevant

CO3

3 Hours

Global Environmental Concerns

Global Environmental Concerns (Concept, policies and case-studies): Ground water

depletion/recharging, Climate Change; Acid Rain; Ozone Depletion; Radon and Fluoride problem in drinking water; Resettlement and rehabilitation of people, Environmental Toxicology.

Presentation	Effect of pollution on climate change			
Text Book	Text book:2			
MODULE-5	Environmental acts	CO5	3 Hours	

Environmental acts

The Indian Forest Act 1927; The Wildlife (Protection) Act 1972; The Water (Prevention

and Control of Pollution) Act 1974; The Forests (Conservation) Act 1980; The Air (Prevention

and Control of Pollution) Act 1981; The Environment (Protection) Act 1986; Noise Pollution (Regulation and Control) Rules 2000; Eco marks.

Case Study	Environmental acts
Text Book	Reference books:1,2,

Text Book Reference books:1,2,3 CIE Assessment Pattern (50 Marks – Theory)

	37	Test (s)	Qualitative Assessment (s)
	RBT Levels	` '	
		25	25
L1	Remember	5	5
L2	Understand	10	10
L3	Apply	5	5
L4	Analyze	5	5
L5	Evaluate	-	
L6	Create		-

SEE Assessment Pattern (50 Marks – Theory)

RBT Levels		Exam Marks Distribution (50)
L1	Remember	10
L2	Understand	20
L3	Apply	10
L4	Analyze	10
L5	Evaluate	-
L6	Create	1

Suggested Learning Resources:

Text Books

- 1. Environmental studies, Benny Joseph, Tata Mcgraw-Hill 2nd edition 2012
- 2.Environmental studies, S M Prakash, pristine publishing house, Mangalore 3rd edition-2018

Reference Books: -

- 1. Benny Joseph, Environmental studies, Tata Mcgraw-Hill 2nd edition 2009
- 2. M.Ayi Reddy Textbook of environmental science and Technology, BS publications 2007
- 3. Dr. B.S Chauhan, Environmental studies, university of science press 1st edition

Web links and Video Lectures (e-Resources):

- 1.https://sdgs.un.org/goals
- 2. https://archive.nptel.ac.in/courses/109/105/109105190/

- 1. Visit to a local area to document environmental assets-river/ forest/ grassland/ hill/ mountain
- 2. Visit to a local polluted site urban / rural / industrial / agricultural
- 3.Study of common plants, insects, and birds
- 4. Study of simple ecosystems-pond, river, hill slopes, etc (Field work equal to 5 lecture hours)

