RVS TECHNICAL CAMPUS – COIMBATORE

(*An Autonomous Institution*)

Approved by AICTE, New Delhi, Affiliated to Anna University, Chennai.
Recognized by UGC & Accredited by NAAC with 'A' Grade
Kumaran Kottam Campus, Kannampalayam, Coimbatore – 641 402

REGULATIONS 2024

CHOICE BASED CREDIT SYSTEM

B.E. ELECTRONICS AND COMMUNICATION ENGINEERING

I. PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

1. To provide the students with a strong foundation in the required sciences in order to pursue studies in Electronics and Communication Engineering.
2. To gain adequate knowledge to become good professional in electronic and communication engineering associated industries, higher education and research.
3. To develop attitude in lifelong learning, applying and adapting new ideas and technologies as their field evolves.
4. To prepare students to critically analyze existing literature in an area of specialization and ethically develop innovative and research oriented methodologies to solve the problems identified.
5. To inculcate in the students a professional and ethical attitude and an ability to visualize the engineering issues in a broader social context.

II. PROGRAM OUTCOMES (POs)

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 teamwork**: 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 broad estcon text of technological change.

III. PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO1: Design, develop and analyze electronic systems through application of relevant electronics, mathematics and engineering principles

PSO2: Design, develop and analyze communication systems through application of fundamentals from communication principles, signal processing, and RF System Design & Electro magnetics.

PSO3: Adapt to emerging electronics and communication technologies and develop innovative solutions for existing and newer problems

PEOs (1to5) mapped with POs and PSOs

PEO	PO												PSO		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
I.	3	3	2	2	2	2	-	-	-	-	-	3	3	2	3
II.	3	3	3	3	2	-	-	-	2	1	2	3	3	3	3
III.	3	2	3	3	3	-	-	-	2	2	-	3	3	3	3
IV.	3	3	3	3	2	-	-	3	-	-	-	2	2	2	2
V.	-	-	-	-	2	2	2	2	-	-	-	-	1	1	1

1-low, 2-medium, 3-high, '-'-no correlation

Mapping of Course Outcome and Programme Outcome																
Year	Sem	Course name	PO												PSO	
			1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
I	I	Induction Programme															
		Professional English-I	1.6	2.2	1.8	2.2	1.5	3	3	3	1.6	3	3	3	-	-	
		Matrices and Calculus	3	3	1	1	0	0	0	0	2	0	2	3	-	-	
		Engineering Physics	3	3	1.6	1.2	1.8	1	-	-	-	-	-	1	-	-	
		Engineering Chemistry	2.8	1.3	1.6	1	-	1.5	1.8	-		-	-	1.5	-	-	
		Problem Solving and Python Programming	2	3	3	3	2	-	-	-	-	-	2	2	3	3	
		தமிழர் மரபு /Heritage of Tamils															
		Problem Solving and Python Programming Laboratory	2	3	3	3	2	-	-	-	-	-	2	2	3	3	
		Physics and Chemistry Laboratory	3	2.4	2.6	1	1										
			2.6	1.3	1.6	1	1	1.4	1.8	-	-	-	-	1.3	-	-	
		English Laboratory	3	3	3	3	1	3	3	3	3	3	3	3	-	-	
	II	Professional English-II	3	3	3	3	2.75	3	3	3	2.2	3	3	3	-	-	-
		Statistics and Numerical Methods	3	3	1	1	1	0	0	0	2	0	2	3	-	-	-
		Physics for Electronics Engineering	3	2	1.4	1.5	2.5	2	3					1			
		Electrical and Instrumentation Engineering	2	1	1					1					-	-	-
		Engineering Graphics	3	1	2	-	2	-	-	-	-	3	-	2	2	2	-
		Circuit Analysis	3	3	3	2	-	-	-	1	-	1	-	-	-	-	-
		தமிழரும் தொழில் நுட்பமும் /Tamils and Technology															
		Engineering Practices Laboratory	3	2			1	1	1					2	2	1	1
		Circuits Analysis Laboratory	3	3	3	2	-	-	-	1	-	1	-	-	-	-	-
		Communication Laboratory/ Foreign Language [$]	2.4	2.8	3	3	1.8	3	3	3	3	3	3	3	-	-	-
II	III	Random Processes and Linear Algebra	3	3	0	0	0	0	0	0	3	0	0	2	-	-	-
		C Programming and Data Structures	2	2	1	2	2	1	1	-	1	1	1	2	2	2	2
		Signals and Systems	3	3	3	3	3	2	-	-	-	-	-	3	2	3	1
		Electronic Devices and Circuits	3	3	3	3	2	2	-	-	-	-	-	1	2	1	1

		Control Systems	3	3	3	3	2	2	-	-	-	-	2	3	3	3	3
		Digital Systems Design	3	2.6	2.6	2.3	-	2	-	-	-	-	2	2	3	3	2
		Electronic Devices and Circuits Laboratory	2	2	2.6	3	-	-	-	-	-	-	-	-	2	1	1
		C Programming and Data Structures Laboratory	2	2	1	2	2	1	1	-	1	1	1	2	2	2	2
		Skill Development course-I	3	2.6	2.5	2.25	2.8	-	-	-	1.0	1.0	1.0	1.2	3.0	1.6	2.4
		Electromagnetic Fields	2	2	2	2	2	2	1	-	-	1	1	2			
	IV	Embedded Systems and IOT Design	3	3	2.6	2.2	2.2	-	-	-	-	-	-	-	2.8	2.2	1.4
		Linear Integrated Circuits	1.4	2.5	3	2.2	-	-	-	-	-	-	1	3	2	1	1
		Digital Signal Processing	3	3	2	2	2	2	-	-	-	-	1	1	2	2	2
		Communication Systems	3	3	3	3	2.5	1	1	-	-	-	1	1			
		Environmental Sciences and Sustainability	2.8	1.8	1	1	-	2.2	2.4	-	-	-	-	1.8	-	-	-
		Communication Systems Laboratory	3	3	3	3	3	2.5	-	-	-	1	1	1			
		Linear Integrated Circuits Laboratory	2	3	3	3	2	-	-	-	-	-	1	1			
		Skill Development course -II	3.0	2.8	3.0	2.6	3.0	–	–	–	1.2	1.2	1.3	1.4	3.0	2.2	3.0
		Wireless Communication	3	3	2	2	2	2	-	-	-	-	-	1	3	1	2
III	**V**	VLSI and Chip Design	2	2	2	2	1	1.5	-	-	-	-	1	2	3	3	3
		Transmission lines and RF Systems	3	3	3	3	2	1	-	-	-	1	-	1	2	1	1
		VLSI Laboratory	2.2	2.2	2.2	2.2	1	-	-	-	-	-	1	1	2	2	2
		Telecommunication Switching and Transmission	3	2.6	2.8	2.2	1.2	-	-	-	-	-	-	2	2.8	2.4	2.2
	VI	Artificial Intelligence and Machine Learning	2	1	2	2	1	-	-	-	2	2	2	3	2	2	2
		Human Values and Ethics															
IV	**VII**	Summer internship															
		Project Work/ Internship															
	VIII																

1-low, 2-medium, 3-high, '-'-no correlation

B.E.ELECTRONICS AND COMMUNICATION ENGINEERING
CHOICE BASED CREDIT SYSTEM
CURRICULUM AND SYLLABI FOR SEMESTERS I TO VIII

SEMESTER I

S. NO.	COURSE CODE	COURSETITLE	CATE-GORY	PERIODSPER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	24UEN101	Professional English-I	HSMC	3	0	0	3	3
2.	24UMA102	Matrices and Calculus	BSC	3	1	0	4	4
3.	24UPH103	Engineering Physics	BSC	3	0	0	3	3
4.	24UCH104	Engineering Chemistry	BSC	3	0	0	3	3
5.	24UCS105	Problem Solving and Python Programming	ESC	3	0	0	3	3
6.	24UHT106	தமிழர் மரபு /Heritage of Tamils	HSMC	1	0	0	1	1
PRACTICALS								
7.	24UCS121	Problem Solving and Python Programming Laboratory	ESC	0	0	4	4	2
8.	24UPC121	Physics and Chemistry Laboratory	BSC	0	0	4	4	2
9.	24UEN121	English Laboratory[$]	EEC	0	0	2	2	1
			TOTAL	**16**	**1**	**10**	**27**	**22**

[$]Skill Based Course

SEMESTER II

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	24UEN201	Professional English-II	HSMC	2	0	0	2	2
2.	24UMA202	Statistics and Numerical Methods	BSC	3	1	0	4	4
3.	24UEC203	Physics for Electronics Engineering	BSC	3	0	0	3	3
4.	24UPH204	Electrical and Instrumentation Engineering	ESC	3	0	0	3	3
5.	24UGE205	Engineering Graphics	ESC	2	0	4	6	4
6.	24UTT206	Circuit Analysis	PCC	3	1	0	4	4
7.	24UEC207	தமிழரும் தொழில் நுட்பமும் /Tamils and Technology	HSMC	1	0	0	1	1
8.		NCC Credit Course Level 1[#]	-	2	0	0	2	2*
PRACTICALS								
9.	24UGE221	Engineering Practices Laboratory	ESC	0	0	4	4	2
10.	24UEC221	Circuits Analysis Laboratory	PCC	0	0	2	2	1
11.	24UEN221	Communication Laboratory/ Foreign Language [$]	EEC	0	0	4	4	2
			TOTAL	**17**	**1**	**14**	**33**	**26**

[#]NCC Credit Course level 1 is offered for NCC students only. The grades earned by the students will be recorded in the Mark Sheet, however the same shall not be considered for the computation of CGPA.
[$]Skill Based Course

SEMESTER III

S. NO.	COURSE CODE	COURSETITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	24UMA301	Random Processes and Linear Algebra	BSC	3	1	0	4	4
2.	24UCS301	C Programming and Data Structures	ESC	3	0	0	3	3
3.	24UEC301	Signals and Systems	PCC	3	1	0	4	4
4.	24UEC302	Electronic Devices and Circuits	PCC	3	0	0	3	3
5.	24UEC303	Control Systems	PCC	3	0	0	3	3
6.	24UEC311	Digital Systems Design	PCC	3	0	2	5	4
PRACTICALS								
7.	24UEC321	Electronic Devices and Circuits Laboratory	PCC	0	0	3	3	1.5
8.	24UCS321	C Programming and Data Structures Laboratory	PCC	0	0	3	3	1.5
9.	24UEC331	Skill Development Course -I	EEC	0	0	2	2	1
			TOTAL	**18**	**2**	**10**	**30**	**25**

SEMESTER IV

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	24UEC401	Electromagnetic Fields	PCC	3	0	0	3	3
2.	24UEC411	Networks and Security	PCC	3	0	2	5	4
3.	24UEC402	Linear Integrated Circuits	PCC	3	0	0	3	3
4.	24UEC412	Digital Signal Processing	PCC	3	0	2	5	4
5.	24UEC403	Communication Systems	PCC	3	0	0	3	3
6.	24UGE401	Environmental Sciences and Sustainability	BSC	2	0	0	2	2
7.		NCC Credit Course Level 2[#]		3	0	0	3	3[#]
PRACTICALS								
8.	24UEC421	Communication Systems Laboratory	PCC	0	0	3	3	1.5
9.	24UEC422	Linear Integrated Circuits Laboratory	PCC	0	0	3	3	1.5
10.	24UEC431	Skill Development Course -II	EEC	0	0	2	2	1
			TOTAL	**17**	**0**	**12**	**29**	**23**

[#]NCC Credit Course level 2 is offered for NCC students only. The grades earned by the students will be recorded in the Mark Sheet, however the same shall not be considered for the computation of CGPA.

SEMESTER V

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	24UEC511	Wireless Communication	PCC	3	0	2	5	4
2.	24UEC501	VLSI and Chip Design	PCC	3	0	0	3	3
3.	24UEC502	Transmission lines and RF Systems	PCC	3	0	0	3	3
4.		Professional Elective I	PEC	-	-	-	-	3
5.		Professional Elective II	PEC	-	-	-	-	3
6.		Professional Elective III	PEC	-	-	-	-	3
7.		Mandatory Course-I	MC	3	0	0	3	Non-credit course
PRACTICALS								
8.	24UEC521	VLSI Laboratory	PCC	0	0	4	4	2
			TOTAL	-	-	-	-	**21**

[&]Mandatory Course-Iist a Non-credit Course (Students hall selection course from the list given under Mandatory Course-I)

SEMESTER VI

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	24UEC611	Embedded Systems and IOT Design	PCC	3	0	2	5	4
2.	24UEC612	Artificial Intelligence and Machine Learning	ESC	3	0	2	5	4
3.		Open Elective–I*	OEC	3	0	0	3	3
4.		Professional Elective IV	PEC	-	-	-	-	3
5.		Professional Elective V	PEC	-	-	-	-	3
6.		Professional Elective VI	PEC	-	-	-	-	3
7.		Mandatory Course-II[&]	MC	3	0	0	3	Non-credit course
8.		NCC Credit Course Level 3[#]		3	0	0	3	3[#]
			TOTAL	-	-	-	-	**20**

***Open Elective–I shall be chosen from the list of open electives offered by other Programmes**

[&] Mandatory Course-II is a Non-credit Course (Student shall select one course from the list given under Mandatory Course-II)

[#]NCC Credit Course level 3 is offered for NCC students only. The grades earned by the students will be recorded in the Mark Sheet, however the same shall not be considered for the computation of CGPA

SEMESTER VII/ VIII*

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	24UGE701	Human Values and Ethics	HSMC	2	0	0	2	2
2.		Elective-Management[#]	HSMC	3	0	0	3	3
3.		Open Elective– II**	OEC	3	0	0	3	3
4.		Open Elective– III**	OEC	3	0	0	3	3
5.		Open Elective– IV**	OEC	3	0	0	3	3
PRACTICALS								
6.	24USI721	Summer internship	EEC	0	0	0	0	2
			TOTAL	**14**	**0**	**0**	**14**	**16**

***If students undergo internship in Semester VII, then the courses offered during semester VII will be offered during semester VIII.**

****Open Elective II-IV (ShallbechosenfromthelistofopenelectivesofferedbyotherProgrammes).**

[#] Elective- Managements hall be chosen from the Elective Management courses.

SEMESTER VIII/VII*

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
PRACTICALS								
1.	24UEC821	Project Work/ Internship	EEC	0	0	20	20	10
			TOTAL	**0**	**0**	**20**	**20**	**10**

***If students undergo internship in Semester VII, then the courses offered during semester VII will be offered during semester VIII.**

TOTAL CREDITS: 163

ELECTIVE–MANAGEMENT COURSES

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	24UGE3751	Principles of Management	HSMC	3	0	0	3	3
2.	24UGE3752	Total Quality Management	HSMC	3	0	0	3	3
3.	24UGE3753	Engineering Economics and Financial Accounting	HSMC	3	0	0	3	3
4.	24UGE3754	Human Resource Management	HSMC	3	0	0	3	3
5.	24UGE3755	Knowledge Management	HSMC	3	0	0	3	3
6.	24UGE3792	Industrial Management	HSMC	3	0	0	3	3

MANDATORY COURSES I*

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	24UMX3081	Introduction to Women and Gender Studies	MC	3	0	0	3	0
2.	24UMX3082	Elements of Literature	MC	3	0	0	3	0
3.	24UMX3083	Film Appreciation	MC	3	0	0	3	0
4.	24UMX3084	Disaster Risk Reduction and Management	MC	3	0	0	3	0

***Mandatory Courses are offered as Non - Credit Courses**

MANDATORY COURSES II*

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	24UMX3085	Well Being with Traditional Practices - Yoga, Ayurveda and Siddha	MC	3	0	0	3	0
2.	24UMX3086	History of Science and Technology in India	MC	3	0	0	3	0
3.	24UMX3087	Political and Economic Thought for a Humane Society	MC	3	0	0	3	0
4.	24UMX3088	State, Nation Building and Politics in India	MC	3	0	0	3	0
5.	24UMX3089	Industrial Safety	MC	3	0	0	3	0

***Mandatory Courses are offered as Non- Credit Courses**

PROFESSIONAL ELECTIVE COURSES: VERTICALS

Vertical I Semiconductor Chip Design and Testing	**Vertical II Signal Processing**	**Vertical III Bio Medical Technologies**	**Vertical IV Sensor Technologies and IoT**	**Vertical V Space Technologies**	**Vertical VI High Speed Communications**
Wide Band gap Devices	Advanced Digital Signal Processing	Wearable Devices	IoT Processors	Radar Technologies	Optical Communication& Networks
Validation and Testing Technology	Image Processing	Human Assist Devices	IoT Based System Design	Avionics Systems	Wireless Broad Band Networks
Low Power IC Design	Speech Processing	Therapeutic Equipment	Wireless Sensor Network Design	Positioning and Navigation Systems	4G/5G Communication Networks
VLSI Testing and Design For Testability	Software Defined Radio	Medical Imaging Systems	Industrial IoT and Industry 4.0	Satellite Communication	Software Defined Networks
Mixed Signal IC Design Testing	DSP Architecture and Programming	Brain Computer Interface and Applications	MEMS Design	Remote Sensing	Massive MIMO Networks
Analog IC Design	Computer Vision	Body Area Networks	Fundamentals of Nano electronics	Rocketry and Space Mechanics	Advanced Wireless Communication Techniques

PROFESSIONAL ELECTIVE COURSES: VERTICALS

VERTICAL 1: SEMICONDUCTOR CHIP DESIGN AND TESTING

S. NO.	COURSE CODE	COURS ETITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	24UCEC363	Wide Band gap Devices	PEC	2	0	2	4	3
2.	24UCEC361	Validation and Testing Technology	PEC	2	0	2	4	3
3.	24UCEC370	Low Power IC Design	PEC	2	0	2	4	3
4.	24UCEC362	VLSI Testing and Design For Testability	PEC	3	0	0	3	3
5.	24UCEC342	Mixed Signal IC Design Testing	PEC	2	0	2	4	3
6.	24UCEC334	Analog IC Design	PEC	2	0	2	4	3

VERTICAL 2: SIGNAL PROCESSING

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	24UCEC332	Advanced Digital Signal Processing	PEC	2	0	2	4	3
2.	24UCEC366	Image Processing	PEC	3	0	0	3	3
3.	24UCEC356	Speech Processing	PEC	2	0	2	4	3
4.	24UCEC355	Software Defined Radio	PEC	2	0	2	4	3
5.	24UCEC337	DSP Architecture and Programming	PEC	2	0	2	4	3
6.	24UCCS338	Computer Vision	PEC	2	0	2	4	3

VERTICAL 3: BIOMEDICAL TECHNOLOGIES

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	24UCBM370	Wearable Devices	PEC	3	0	0	3	3
2.	24UCBM352	Human Assist Devices	PEC	3	0	0	3	3
3.	24UCBM368	Therapeutic Equipment	PEC	3	0	0	3	3
4.	24UCBM355	Medical Imaging Systems	PEC	3	0	0	3	3
5.	24UCBM342	Brain Computer Interface and Applications	PEC	3	0	0	3	3
6.	24UCBM341	Body Area Networks	PEC	3	0	0	3	3

VERTICAL 4: SENSOR TECHNOLOGIES AND IOT

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	24UCEC369	IoT Processors	PEC	2	0	2	4	3
2.	24UCEC368	IoT Based Systems Design	PEC	3	0	0	3	3
3.	24UCEC365	Wireless Sensor Network Design	PEC	3	0	0	3	3
4.	24UCEC367	Industrial IoT and Industry4.0	PEC	2	0	2	4	3
5.	24UCEC340	MEMS Design	PEC	2	0	2	4	3
6.	24UCEC339	Fundamentals of Nano electronics	PEC	2	0	2	4	3

VERTICAL 5: SPACE TECHNOLOGIES

SL. NO.	COURSE CODE	COURSETITLE	CATE GORY	PERIODS PERWEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	24UCEC347	Radar Technologies	PEC	3	0	0	3	3
2.	24UCEC336	Avionics Systems	PEC	3	0	0	3	3
3.	24UCEC346	Positioning and Navigation Systems	PEC	3	0	0	3	3
4.	24UCEC352	Satellite Communication	PEC	3	0	0	3	3
5.	24UCEC348	Remote Sensing	PEC	3	0	0	3	3
6.	24UCEC351	Rocketry and Space Mechanics	PEC	3	0	0	3	3

VERTICAL 6: HIGH SPEED COMMUNICATIONS

SL. NO.	COURSE CODE	COURS ETITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	24UCEC345	Optical Communication &Networks	PEC	3	0	0	3	3
2.	24UCEC364	Wireless Broad Band Networks	PEC	3	0	0	3	3
3.	24UCEC331	4G/5G Communication Networks	PEC	2	0	2	4	3
4.	24UCEC354	Software Defined Networks	PEC	2	0	2	4	3
5.	24UCEC371	Massive MIMO Networks	PEC	2	0	2	4	3
6.	24UCEC333	Advanced Wireless Communication Techniques	PEC	3	0	0	3	3

OPEN ELECTIVES

(Students shall choose the open elective courses, such that the course contents are not similar to any other course contents/title under other course categories).

OPENELECTIVES – I

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	24UOAS351	Space Science	OEC	3	0	0	3	3
2.	24UOIE351	Introduction to Industrial Engineering	OEC	3	0	0	3	3
3.	24UOBT351	Food, Nutrition and Health	OEC	3	0	0	3	3
4.	24UOCE351	Environment and Social Impact Assessment	OEC	3	0	0	3	3
5.	24UOEE351	Renewable Energy System	OEC	3	0	0	3	3
6.	24UOEI351	Introduction to Industrial Instrumentation and Control	OEC	3	0	0	3	3
7.	24UOMA351	Graph Theory	OEC	3	0	0	3	3
8.	24UCCS355	Neural Networks and Deep Learning	OEC	2	0	2	4	3
9.	24UCCW332	Digital Marketing	OEC	2	0	2	4	3

OPENELECTIVES–II

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	24UOIE352	Resource Management Techniques	OEC	3	0	0	3	3
2.	24UOMG351	Fin tech Regulation	OEC	3	0	0	3	3
3.	24UOFD351	Holistic Nutrition	OEC	3	0	0	3	3
4.	24UAI3021	IT in Agricultural System	OEC	3	0	0	3	3
5.	24UOEI352	Introduction to Control Engineering	OEC	3	0	0	3	3
6.	24UOPY351	Pharmaceutical Nanotechnology	OEC	3	0	0	3	3
7.	24UOAE351	Aviation Management	OEC	3	0	0	3	3
8.	24UCCS342	Dev Ops	OEC	2	0	2	4	3
9.	24UCCS361	Robotic Process Automation	OEC	2	0	2	4	3

OPENELECTIVES–III

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	24UOHS351	English for Competitive Examinations	OEC	3	0	0	3	3
2.	24UOMG352	NGOs and Sustainable Development	OEC	3	0	0	3	3
3.	24UOMG353	Democracy and Good Governance	OEC	3	0	0	3	3
4.	24UCME365	Renewable Energy Technologies	OEC	3	0	0	3	3
5.	24UOME354	Applied Design Thinking	OEC	3	0	0	3	3
6.	24UMF3003	Reverse Engineering	OEC	3	0	0	3	3
7.	24UOPR351	Sustainable Manufacturing	OEC	3	0	0	3	3
8.	24UAU3791	Electric and Hybrid Vehicles	OEC	3	0	0	3	3
9.	24UOAS352	Space Engineering	OEC	3	0	0	3	3
10.	24UOIM351	Industrial Management	OEC	3	0	0	3	3
11.	24UOIE354	Quality Engineering	OEC	3	0	0	3	3
12.	24UOSF351	Fire Safety Engineering	OEC	3	0	0	3	3
13.	24UOML351	Introduction to Non-Destructive Testing	OEC	3	0	0	3	3
14.	24UOMR351	Mechatronics	OEC	3	0	0	3	3
15.	24UORA351	Foundation of Robotics	OEC	3	0	0	3	3
16.	24UOAE352	Fundamentals of Aeronautical Engineering	OEC	3	0	0	3	3
17.	24UOGI351	Remote Sensing Concepts	OEC	3	0	0	3	3
18.	24UOAI351	Urban Agriculture	OEC	3	0	0	3	3
19.	24UOEN351	Drinking Water Supply and Treatment	OEC	3	0	0	3	3
20.	24UOEE352	Electric Vehicle Technology	OEC	3	0	0	3	3
21.	24UOEI353	Introduction to PLC Programming	OEC	3	0	0	3	3
22.	24UOCH351	Nano Technology	OEC	3	0	0	3	3
23.	24UOCH352	Functional Materials	OEC	3	0	0	3	3
24.	24UOFD352	Traditional Indian Foods	OEC	3	0	0	3	3
25.	24UOFD353	Introduction to Food Processing	OEC	3	0	0	3	3
26.	24UOPY352	IPR for Pharma Industry	OEC	3	0	0	3	3
27.	24UOTT351	Basics of Textile Finishing	OEC	3	0	0	3	3
28.	24UOTT352	Industrial Engineering for Garment Industry	OEC	3	0	0	3	3
29.	24UOTT353	Basics of Textile Manufacture	OEC	3	0	0	3	3
30.	24UOPE351	Introduction to Petroleum Refining and Petrochemicals	OEC	3	0	0	3	3
31.	24UCPE334	Energy Conservation and Management	OEC	3	0	0	3	3
32.	24UOPT351	Basics of Plastics Processing	OEC	3	0	0	3	3
33.	24UCBM348	Foundation Skills in Integrated Product Development	OEC	3	0	0	3	3
34.	24UCBM333	Assistive Technology	OEC	3	0	0	3	3
35.	24UOMA352	Operations Research	OEC	3	0	0	3	3

36.	24UOMA353	Algebra and Number Theory	OEC	3	0	0	3	3
37.	24UOMA354	Linear Algebra	OEC	3	0	0	3	3
38.	24UOCE353	Lean Concepts, Tools and Practices	OEC	3	0	0	3	3
39.	24UOBT352	Basics of Microbial Technology	OEC	3	0	0	3	3
40.	24UOBT353	Basics of Bio molecules	OEC	3	0	0	3	3
41.	24UOBT354	Fundamentals of Cell and Molecular Biology	OEC	3	0	0	3	3

OPENELECTIVES–IV

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PERWEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	24UOHS352	Project Report Writing	OEC	3	0	0	3	3
2.	24UOMA355	Advanced Numerical Methods	OEC	3	0	0	3	3
3.	24UOMA356	Random Processes	OEC	3	0	0	3	3
4.	24UOMA357	Queuing and Reliability Modeling	OEC	3	0	0	3	3
5.	24UOMG354	Production and Operations Management for Entrepreneurs	OEC	3	0	0	3	3
6.	24UOMG355	Multivariate Data Analysis	OEC	3	0	0	3	3
7.	24UOME352	Additive Manufacturing	OEC	3	0	0	3	3
8.	24UCME343	New Product Development	OEC	3	0	0	3	3
9.	24UOME355	Industrial Design & Rapid Prototyping Techniques	OEC	3	0	0	3	3
10.	24UMF3010	Micro and Precision Engineering	OEC	3	0	0	3	3
11.	24UOMF354	Cost Management of Engineering Projects	OEC	3	0	0	3	3
12.	24UAU3002	Batteries and Management system	OEC	3	0	0	3	3
13.	24UAU3008	Sensors and Actuators	OEC	3	0	0	3	3
14.	24UOAS353	Space Vehicles	OEC	3	0	0	3	3
15.	24UOIM352	Management Science	OEC	3	0	0	3	3
16.	24UOIM353	Production Planning and Control	OEC	3	0	0	3	3
17.	24UOIE353	Operations Management	OEC	3	0	0	3	3
18.	24UOSF352	Industrial Hygiene	OEC	3	0	0	3	3
19.	24UOSF353	Chemical Process Safety	OEC	3	0	0	3	3
20.	24UOML352	Electrical , Electronic and Magnetic materials	OEC	3	0	0	3	3
21.	24UOML353	Nano materials and applications	OEC	3	0	0	3	3
22.	24UOMR352	Hydraulics and Pneumatics	OEC	3	0	0	3	3
23.	24UOMR353	Sensors	OEC	3	0	0	3	3
24.	24UORA352	Concepts in Mobile Robots	OEC	3	0	0	3	3
25.	24UMV3501	Marine Propulsion	OEC	3	0	0	3	3
26.	24UOMV351	Marine Merchant Vessels	OEC	3	0	0	3	3
27.	24UOMV352	Elements of Marine Engineering	OEC	3	0	0	3	3
28.	24UCRA332	Drone Technologies	OEC	3	0	0	3	3

29.	24UOGI352	Geographical Information System	OEC	3	0	0	3	3
30.	24UOAI352	Agriculture Entrepreneurship Development	OEC	3	0	0	3	3
31.	24UOEN352	Biodiversity Conservation	OEC	3	0	0	3	3
32.	24UOEE353	Introduction to control systems	OEC	3	0	0	3	3
33.	24UOEI354	Introduction to Industrial Automation Systems	OEC	3	0	0	3	3
34.	24UOCH353	Energy Technology	OEC	3	0	0	3	3
35.	24UOCH354	Surface Science	OEC	3	0	0	3	3
36.	24UOFD354	Fundamentals of Food Engineering	OEC	3	0	0	3	3
37.	24UOFD355	Food Safety and Quality Regulations	OEC	3	0	0	3	3
38.	24UOPY353	Nutraceuticals	OEC	3	0	0	3	3
39.	24UOTT354	Basics of Dyeing and Printing	OEC	3	0	0	3	3
40.	24UFT3201	Fibre Science	OEC	3	0	0	3	3
41.	24UOTT355	Garment Manufacturing Technology	OEC	3	0	0	3	3
42.	24UOPE353	Industrial safety	OEC	3	0	0	3	3
43.	24UOPE354	Unit Operations in Petro Chemical Industries	OEC	3	0	0	3	3
44.	24UOPT352	Plastic Materials for Engineers	OEC	3	0	0	3	3
45.	24UOPT353	Properties and Testing of Plastics	OEC	3	0	0	3	3
46.	24UCBM370	Wearable Devices	OEC	3	0	0	3	3
47.	24UCBM356	Medical Informatics	OEC	3	0	0	3	3
48.	24UOCE354	Basics of Integrated Water Resources Management	OEC	3	0	0	3	3
49.	24UOBT355	Biotechnology for Waste Management	OEC	3	0	0	3	3
50.	24UOBT356	Lifestyle Diseases	OEC	3	0	0	3	3
51.	24UOBT357	Biotechnology in HealthCare	OEC	3	0	0	3	3

SUMMARY

Name of the Programme : B.E. Electronics and Communication Engineering										
S. No	**Subject Area**	**Credits per Semester**								**Total Credits**
		I	**II**	**III**	**IV**	**V**	**VI**	**VII/VIII**	**VIII/VII**	
1	**HSMC**	**4**	**3**					**5**		**12**
2	**BSC**	**12**	**7**	**4**	**2**					**25**
3	**ESC**	**5**	**9**	**3**			**4**			**21**
4	**PCC**		**5**	**17**	**20**	**12**	**4**			**58**
5	**PEC**					**9**	**9**			**18**
6	**OEC**						**3**	**9**		**12**
7	**EEC**	**1**	**2**	**1**				**2**	**10**	**16**
8	**Non-Credit /(Mandatory)**					√	√			
Total		**22**	**26**	**25**	**22**	**21**	**20**	**16**	**10**	**162**

24UEN101 **PROFESSIONAL ENGLISH I** **L T P C**
3 0 0 3

COURSE OBJECTIVES:

- To improve the communicative competence of learners
- To learn to use basic grammatic structures in suitable contexts
- To acquire lexical competence and use them appropriately in a sentence and understand their meaning in a text
- To help learners use language effectively in professional contexts
- To develop learners' ability to read and write complex texts, summaries, articles, blogs, definitions, essays and user manuals.

UNIT I INTRODUCTION TO EFFECTIVE COMMUNICATION 1

What is effective communication? (Explain using activities) Why is communication critical for excellence during study, research and work? What are the seven C's of effective communication? What are key language skills? What is effective listening? What does it involve? What is effective speaking? What does it mean to be an excellent reader? What should you be able to do? What is effective writing? How does one develop language and communication skills? What does the course focus on? How are communication and language skills going to be enhanced during this course? What do you as a learner need to do to enhance your English language and communication skills to get the best out of this course?

INTRODUCTION TO FUNDAMENTALS OF COMMUNICATION 8

Reading - Reading brochures (technical context), telephone messages / social media messages relevant to technical contexts and emails. Writing - Writing emails / letters introducing oneself. Grammar - Present Tense (simple and progressive); Question types: Wh/ Yes or No/ and Tags. Vocabulary - Synonyms; One word substitution; Abbreviations & Acronyms (as used in technical contexts).

UNIT II NARRATION AND SUMMATION 9

Reading - Reading biographies, travelogues, newspaper reports, Excerpts from literature, and travel & technical blogs. Writing - Guided writing-- Paragraph writing Short Report on an event (field trip etc.) Grammar –Past tense (simple); Subject-Verb Agreement; and Prepositions. Vocabulary - Word forms (prefixes& suffixes); Synonyms and Antonyms. Phrasal verbs.

UNIT III DESCRIPTION OF A PROCESS / PRODUCT 9

Reading – Reading advertisements, gadget reviews; user manuals. Writing - Writing definitions; instructions; and Product /Process description. Grammar - Imperatives; Adjectives; Degrees of comparison; Present & Past Perfect Tenses. Vocabulary - Compound Nouns, Homonyms; and Homophones, discourse markers (connectives & sequence words).

UNIT IV CLASSIFICATION AND RECOMMENDATIONS 9

Reading – Newspaper articles; Journal reports –and Non-Verbal Communication (tables, pie charts etc,). Writing – Note-making / Note-taking (*Study skills to be taught, not tested); Writing recommendations; Transferring information from non-verbal (chart , graph etc, to verbal mode) Grammar – Articles; Pronouns - Possessive & Relative pronouns. Vocabulary - Collocations; Fixed
/ Semi fixed expressions.

UNIT V EXPRESSION 9

Reading – Reading editorials; and Opinion Blogs; Writing – Essay Writing (Descriptive or narrative). Grammar – Future Tenses, Punctuation; Negation (Statements & Questions); and Simple, Compound & Complex Sentences. Vocabulary - Cause & Effect Expressions – Content vs Function words.

TOTAL: 45 PERIODS

LEARNING OUTCOMES:

At the end of the course, learners will be able

CO1: To use appropriate words in a professional context

CO2: To gain understanding of basic grammatical structures and use them in right context.

CO3: To read and infer the denotative and connotative meanings of technical texts

CO4: To read and interpret information presented in tables, charts and other graphic forms

CO5: To write definitions, descriptions, narrations and essays on various topics

TEXT BOOKS:

1. English for Engineers & Technologists Orient Blackswan Private Ltd. Department of English, Anna University, (2020 edition)
2. English for Science & Technology Cambridge University Press, 2021. Authored by Dr. Veena Selvam, Dr. Sujatha Priyadarshini, Dr. Deepa Mary Francis, Dr. KN. Shoba, and Dr. Lourdes Joevani, Department of English, Anna University.

REFERENCES:

1. Technical Communication – Principles And Practices By Meenakshi Raman & Sangeeta Sharma, Oxford Univ. Press, 2016, New Delhi.
2. A Course Book On Technical English By Lakshminarayanan, Scitech Publications (India) Pvt. Ltd.
3. English For Technical Communication (With CD) By Aysha Viswamohan, Mcgraw Hill Education, ISBN : 0070264244.
4. Effective Communication Skill, Kulbhusan Kumar, RS Salaria, Khanna Publishing House.
5. Learning to Communicate – Dr. V. Chellammal, Allied Publishing House, New Delhi, 2003.
6.

ASSESSMENT PATTERN

Two internal assessments and an end semester examination to test students' reading and writing skills along with their grammatical and lexical competence.

CO's-PO's & PSO's MAPPING

CO	PO												PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	1	1	1	1	1	3	3	3	1	3	-	3	-	-	-
2	1	1	1	1	1	3	3	3	1	3	-	3	-	-	-
3	2	3	2	3	2	3	3	3	2	3	3	3	-	-	-
4	2	3	2	3	2	3	3	3	2	3	3	3	-	-	-
5	2	3	3	3	-	3	3	3	2	3	-	3	-	-	-
AVg.	**1.6**	**2.2**	**1.8**	**2.2**	**1.5**	**3**	**3**	**3**	**1.6**	**3**	**3**	**3**	**-**	**-**	**-**

- 1-low, 2-medium, 3-high, '-"- no correlation

Note: The average value of this course to be used for program articulation matrix.

24UMA102 **MATRICES AND CALCULUS** **L T P C**
3 1 0 4

COURSE OBJECTIVES:

- To develop the use of matrix algebra techniques that is needed by engineers for practical applications.
- To familiarize the students with differential calculus.
- To familiarize the student with functions of several variables. This is needed in many branches of engineering.
- To make the students understand various techniques of integration.
- To acquaint the student with mathematical tools needed in evaluating multiple integrals and their applications.

UNIT I MATRICES 9+3

Eigenvalues and Eigenvectors of a real matrix – Characteristic equation – Properties of Eigenvalues and Eigenvectors – Cayley - Hamilton theorem – Diagonalization of matrices by orthogonal transformation – Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms – Applications: Stretching of an elastic membrane.

UNIT II DIFFERENTIAL CALCULUS 9+3

Representation of functions - Limit of a function - Continuity - Derivatives - Differentiation rules (sum, product, quotient, chain rules) - Implicit differentiation - Logarithmic differentiation - Applications : Maxima and Minima of functions of one variable.

UNIT III FUNCTIONS OF SEVERAL VARIABLES 9+3

Partial differentiation – Homogeneous functions and Euler's theorem – Total derivative – Change of variables – Jacobians – Partial differentiation of implicit functions – Taylor's series for functions of two variables – Applications : Maxima and minima of functions of two variables and Lagrange's method of undetermined multipliers.

UNIT IV INTEGRAL CALCULUS 9+3

Definite and Indefinite integrals - Substitution rule - Techniques of Integration: Integration by parts, Trigonometric integrals, Trigonometric substitutions, Integration of rational functions by partial fraction, Integration of irrational functions - Improper integrals - Applications: Hydrostatic force and pressure, moments and centers of mass.

UNIT V MULTIPLE INTEGRALS 9+3

Double integrals – Change of order of integration – Double integrals in polar coordinates – Area enclosed by plane curves – Triple integrals – Volume of solids – Change of variables in double and triple integrals – Applications: Moments and centers of mass, moment of inertia.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

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

CO1 Use the matrix algebra methods for solving practical problems.

CO2 Apply differential calculus tools in solving various application problems.

CO3 Able to use differential calculus ideas on several variable functions.

CO4 Apply different methods of integration in solving practical problems.

CO5 Apply multiple integral ideas in solving areas, volumes and other practical problems.

TEXT BOOKS:

1. Kreyszig.E, "Advanced Engineering Mathematics", John Wiley and Sons, 10th Edition, New Delhi, 2016.
2. Grewal.B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 44th Edition, 2018.
3. James Stewart, "Calculus: Early Transcendentals", Cengage Learning, 8th Edition, New Delhi, 2015. [For Units II & IV - Sections 1.1, 2.2, 2.3, 2.5, 2.7 (Tangents problems only), 2.8, 3.1 to 3.6, 3.11, 4.1, 4.3, 5.1 (Area problems only), 5.2, 5.3, 5.4 (excluding net change theorem), 5.5, 7.1 - 7.4 and 7.8].

REFERENCES:

1. Anton. H, Bivens. I and Davis. S, " Calculus ", Wiley, 10th Edition, 2016
2. Bali. N., Goyal. M. and Watkins. C., "Advanced Engineering Mathematics", Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.,), New Delhi, 7th Edition, 2009.
3. Jain. R.K. and Iyengar. S.R.K., "Advanced Engineering Mathematics", Narosa Publications, New Delhi, 5th Edition, 2016.
4. Narayanan. S. and Manicavachagom Pillai. T. K.,"Calculus" Volume I and II, S. Viswanathan Publishers Pvt. Ltd., Chennai, 2009.
5. Ramana. B.V., "Higher Engineering Mathematics", McGraw Hill Education Pvt. Ltd, New Delhi, 2016.
6. Srimantha Pal and Bhunia. S.C, "Engineering Mathematics " Oxford University Press, 2015.
7. Thomas. G. B., Hass. J, and Weir. M.D, "Thomas Calculus", 14th Edition, Pearson India, 2018.
8. T. Veerarajan, Differential calculus, Yes Dee Publishing; 1st edition, 2020.

CO's-PO's & PSO's MAPPING

	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	3	1	1	0	0	0	0	2	0	2	3	-	-	-
CO2	3	3	1	1	0	0	0	0	2	0	2	3	-	-	-
CO3	3	3	1	1	0	0	0	0	2	0	2	3	-	-	-
CO4	3	3	1	1	0	0	0	0	2	0	2	3	-	-	-
CO5	3	3	1	1	0	0	0	0	2	0	2	3	-	-	-
Avg	3	3	1	1	0	0	0	0	2	0	2	3	-	-	-

24UPH103 **ENGINEERING PHYSICS** **L T P C**
3 0 0 3

COURSE OBJECTIVES:

- To make the students effectively to achieve an understanding of mechanics.
- To enable the students to gain knowledge of electromagnetic waves and its applications.
- To introduce the basics of oscillations, optics and lasers.
- Equipping the students to successfully understand the importance of quantum physics.
- To motivate the students towards the applications of quantum mechanics.

UNIT I MECHANICS 9

Multiparticle dynamics: Center of mass (CM) – CM of continuous bodies – motion of the CM – kinetic energy of system of particles. Rotation of rigid bodies: Rotational kinematics – rotational kinetic energy and moment of inertia - theorems of M .I –moment of inertia of continuous bodies – M.I of a diatomic molecule - torque – rotational dynamics of rigid bodies – conservation of angular momentum – rotational energy state of a rigid diatomic molecule - gyroscope - torsional pendulum – double pendulum –Introduction to nonlinear oscillations.

UNIT II ELECTROMAGNETIC WAVES 9

The Maxwell's equations - wave equation; Plane electromagnetic waves in vacuum, Conditions on the wave field - properties of electromagnetic waves: speed, amplitude, phase, orientation and waves in matter - polarization - Producing electromagnetic waves - Energy and momentum in EM waves: Intensity, waves from localized sources, momentum and radiation pressure - Cell-phone reception. Reflection and transmission of electromagnetic waves from a non-conducting medium- vacuum interface for normal incidence.

UNIT III OSCILLATIONS, OPTICS AND LASERS 9

Simple harmonic motion - resonance –analogy between electrical and mechanical oscillating systems - waves on a string - standing waves - traveling waves - Energy transfer of a wave - sound waves - Doppler effect. Reflection and refraction of light waves - total internal reflection - interference –Michelson interferometer –Theory of air wedge and experiment. Theory of laser – characteristics - Spontaneous and stimulated emission - Einstein's coefficients - population inversion - Nd-YAG laser, CO_2 laser, semiconductor laser –Basic applications of lasers in industry.

UNIT IV BASIC QUANTUM MECHANICS 9

Photons and light waves - Electrons and matter waves –Compton effect - The Schrodinger equation (Time dependent and time independent forms) - meaning of wave function - Normalization –Free particle - particle in a infinite potential well: 1D,2D and 3D Boxes- Normalization, probabilities and the correspondence principle.

UNIT V APPLIED QUANTUM MECHANICS 9

The harmonic oscillator(qualitative)- Barrier penetration and quantum tunneling(qualitative)- Tunneling microscope - Resonant diode - Finite potential wells (qualitative)- Bloch's theorem for particles in a periodic potential –Basics of Kronig-Penney model and origin of energy bands.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

After completion of this course, the students should be able to

CO1 Understand the importance of mechanics.

CO2 Express their knowledge in electromagnetic waves.

CO3 Demonstrate a strong foundational knowledge in oscillations, optics and lasers.

CO4 Understand the importance of quantum physics.

CO5 Comprehend and apply quantum mechanical principles towards the formation of energy bands.

TEXT BOOKS:

1. D.Kleppner and R.Kolenkow. An Introduction to Mechanics. McGraw Hill Education (Indian Edition), 2017.
2. E.M.Purcell and D.J.Morin, Electricity and Magnetism, Cambridge Univ.Press, 2013.
3. Arthur Beiser, Shobhit Mahajan, S. Rai Choudhury, Concepts of Modern Physics, McGraw- Hill (Indian Edition), 2017.

REFERENCES:

1. R.Wolfson. Essential University Physics. Volume 1 & 2. Pearson Education (Indian Edition), 2009.
2. Paul A. Tipler, Physic – Volume 1 & 2, CBS, (Indian Edition), 2004.
3. K.Thyagarajan and A.Ghatak. Lasers: Fundamentals and Applications, Laxmi Publications, (Indian Edition), 2019.
4. D.Halliday, R.Resnick and J.Walker. Principles of Physics, Wiley (Indian Edition), 2015.
5. N.Garcia, A.Damask and S.Schwarz. Physics for Computer Science Students. Springer- Verlag, 2012.
6. **G. Aruldhas, Engineering Physics, Published by PHI Learning, 2010**

CO's-PO's & PSO's MAPPING

CO's	PO's												PSO's		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	3	2	1	1	1	-	-	-	-	-	-	-	-	-
2	3	3	2	1	2	1	-	-	-	-	-	-	-	-	-
3	3	3	2	2	2	1	-	-	-	-	-	1	-	-	-
4	3	3	1	1	2	1	-	-	-	-	-	-	-	-	
5	3	3	1	1	2	1	-	-	-	-	-	-	-	-	-
AVG	3	3	1.6	1.2	1.8	1	-	-	-	-	-	1	-	-	-

1-Low,2-Medium,3-High,"-"-no correlation

Note: the average value of this course to be used for program articulation matrix.

24UCH104 **ENGINEERING CHEMISTRY** **L T P C**
3 0 0 3

COURSE OBJECTIVES:

- To inculcate sound understanding of water quality parameters and water treatment techniques.
- To impart knowledge on the basic principles and preparatory methods of nano materials.
- To introduce the basic concepts and applications of phase rule and composites.
- To facilitate the understanding of different types of fuels, their preparation, properties and combustion characteristics.
- To familiarize the students with the operating principles, working processes and applications of energy conversion and storage devices.

UN IT I **WATER AND ITS TREATMENT** **9**

Water: Sources and impurities, **Water quality parameters:** Definition and significance of-colour, odour, turbidity, pH, hardness, alkalinity, TDS, COD and BOD, flouride and arsenic. **Municipal water treatment:** primary treatment and disinfection (UV, Ozonation, break-point chlorination)**. Desalination of brackish water**: Reverse Osmosis. **Boiler troubles:** Scale and sludge, Boiler corrosion, Caustic embrittlement, Priming &foaming. **Treatment of boiler feed water**: Internal treatment (phosphate, colloidal, sodium aluminate and calgon conditioning) and External treatment – Ion exchange demineralisation and zeolite process.

UNIT II **NANOCHEMISTRY** **9**

Basics: Distinction between molecules, nano materials and bulk materials; **Size-dependent properties** (optical, electrical, mechanical and magnetic); **Types of nanomaterials**: Definition, properties and uses of – nanoparticle, nanocluster, nanorod, nanowire and nanotube. **Preparation of nano materials:** sol-gel, solvothermal, laser ablation, chemical vapour deposition, electrochemical deposition and electro spinning. **Applications** of nanomaterials in medicine, agriculture, energy, electronics and catalysis.

UNIT III **PHASE RULE AND COMPOSITES** **9**

Phase rule: Introduction, definition of terms with examples. One component system - water system; Reduced phase rule; Construction of a simple eutectic phase diagram - Thermal analysis; Two component system: lead-silver system - Pattinson process.

Composites: Introduction: Definition & Need for composites; **Constitution**: Matrix materials (Polymer matrix, metal matrix and ceramic matrix) and Reinforcement (fiber, particulates, flakes and whiskers). **Properties and applications of**: Metal matrix composites (MMC), Ceramic matrix composites and Polymer matrix composites. **Hybrid composites** - definition and examples.

UNIT IV **FUELS AND COMBUSTION** **9**

Fuels: Introduction: Classification of fuels; **Coal and coke**: Analysis of coal (proximate and ultimate), Carbonization, Manufacture of metallurgical coke (Otto Hoffmann method). **Petroleum and Diesel:** Manufacture of synthetic petrol (Bergius process), Knocking - octane number, diesel oil

- cetane number; **Power alcohol and biodiesel.**

Combustion of fuels: Introduction: Calorific value - higher and lower calorific values, Theoretical calculation of calorific value; **Ignition temperature**: spontaneous ignition temperature, Explosive range; **Flue gas analysis** - ORSAT Method. **CO_2 emission and carbon foot print.**

UNIT V ENERGY SOURCES AND STORAGE DEVICES 9

Stability of nucleus: mass defect (problems), binding energy; Nuclear energy: light water nuclear power plant, breeder reactor. **Solar energy conversion:** Principle, working and applications of solar cells**; Recent developments in solar cell materials. Wind energy; Geothermal energy; Batteries:** Types of batteries, Primary battery - dry cell, Secondary battery - lead acid battery and lithium-ion-battery; **Electric vehicles-working principles; Fuel cells:** H_2-O_2 fuel cell, microbial fuel cell; **Super capacitors:** Storage principle, types and examples.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

CO1 To infer the quality of water from quality parameter data and propose suitable treatment methodologies to treat water.

CO2 To identify and apply basic concepts of nano science and nanotechnology in designing the synthesis of nano materials for engineering and technology applications.

CO3 To apply the knowledge of phase rule and composites for material selection requirements.

CO4 To recommend suitable fuels for engineering processes and applications.

CO5 To recognize different forms of energy resources and apply them for suitable applications in energy sectors.

TEXT BOOKS:

1. P. C. Jain and Monica Jain, "Engineering Chemistry", 17th Edition, DhanpatRai Publishing Company (P) Ltd, New Delhi, 2018.
2. Sivasankar B., "Engineering Chemistry", Tata McGraw-Hill Publishing Company Ltd, New Delhi, 2008.
3. S.S. Dara, "A text book of Engineering Chemistry", S. Chand Publishing, 12th Edition, 2018.

REFERENCES:

1. B. S. Murty, P. Shankar, Baldev Raj, B. B. Rath and James Murday, "Text book of nanoscience and nanotechnology", Universities Press-IIM Series in Metallurgy and Materials Science, 2018.
2. O.G. Palanna, "Engineering Chemistry" McGraw Hill Education (India) Private Limited, 2nd Edition, 2017.
3. Friedrich Emich, "Engineering Chemistry", Scientific International PVT, LTD, New Delhi, 2014.
4. ShikhaAgarwal, "Engineering Chemistry-Fundamentals and Applications", Cambridge University Press, Delhi, Second Edition, 2019.
5. O.V. Roussak and H.D. Gesser, Applied Chemistry-A Text Book for Engineers and Technologists, Springer Science Business Media, New York, 2nd Edition, 2013.
6. N Krishnamurthy, P Vallinayagam, D. Madhavan, Engineering Chemistry, 3Rd Edition, published by PHI Learning.

CO's-PO's & PSO's MAPPING

CO	PO												PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	2	2	1	-	1	1	-	-	-	-	1	-	-	-
2	2	-	-	1	-	2	2	-	-	-	-	-	-	-	-
3	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-
4	3	1	1	-	-	1	2	-	-	-	-	-	-	-	-
5	3	1	2	1	-	2	2	-	-	-	-	2	-	-	-
Avg.	**2.8**	**1.3**	**1.6**	**1**	**-**	**1.5**	**1.8**	**-**		**-**	**-**	**1.5**	**-**	**-**	**-**

- 1-low, 2-medium, 3-high, '-"- no correlation

24UCS105 PROBLEM SOLVING AND PYTHON PROGRAMMING L T P C
3 0 0 3

COURSE OBJECTIVES:

- To understand the basics of algorithmic problem solving.
- To learn to solve problems using Python conditionals and loops.
- To define Python functions and use function calls to solve problems.
- To use Python data structures - lists, tuples, dictionaries to represent complex data.
- To do input/output with files in Python.

UNIT I COMPUTATIONAL THINKING AND PROBLEM SOLVING 9

Fundamentals of Computing – Identification of Computational Problems -Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion). Illustrative problems: find minimum in a list, insert a card in a list of sorted cards, guess an integer number in a range, Towers of Hanoi.

UNIT II DATA TYPES, EXPRESSIONS, STATEMENTS 9

Python interpreter and interactive mode, debugging; values and types: int, float, boolean, string, and list; variables, expressions, statements, tuple assignment, precedence of operators, comments; Illustrative programs: exchange the values of two variables, circulate the values of n variables, distance between two points.

UNIT III CONTROL FLOW, FUNCTIONS, STRINGS 9

Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: state, while, for, break, continue, pass; Fruitful functions: return values, parameters, local and global scope, function composition, recursion; Strings: string slices, immutability, string functions and methods, string module; Lists as arrays. Illustrative programs: square root, gcd, exponentiation, sum an array of numbers, linear search, binary search.

UNIT IV LISTS, TUPLES, DICTIONARIES 9

Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing - list comprehension; Illustrative programs: simple sorting, histogram, Students marks statement, Retail bill preparation.

UNIT V FILES, MODULES, PACKAGES 9

Files and exception: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, packages; Illustrative programs: word count, copy file, Voter's age validation, Marks range validation (0-100).

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Upon completion of the course, students will be able to

CO1: Develop algorithmic solutions to simple computational problems.
CO2: Develop and execute simple Python programs.
CO3: Write simple Python programs using conditionals and looping for solving problems.
CO4: Decompose a Python program into functions.
CO5: Represent compound data using Python lists, tuples, dictionaries etc.
CO6: Read and write data from/to files in Python programs.

TEXT BOOKS:

1. Allen B. Downey, "Think Python : How to Think like a Computer Scientist", 2nd Edition, O'Reilly Publishers, 2016.
2. Karl Beecher, "Computational Thinking: A Beginner's Guide to Problem Solving and programming", 1st Edition, BCS Learning & Development Limited, 2017.

REFERENCES:

1. Paul Deitel and Harvey Deitel, "Python for Programmers", Pearson Education, 1st Edition, 2021.
2. G Venkatesh and Madhavan Mukund, "Computational Thinking: A Primer for Programmers and Data Scientists", 1st Edition, Notion Press, 2021.
3. John V Guttag, "Introduction to Computation and Programming Using Python: With Applications to Computational Modeling and Understanding Data'', Third Edition, MIT Press 2021
4. Eric Matthes, "Python Crash Course, A Hands - on Project Based Introduction to Programming", 2nd Edition, No Starch Press, 2019.
5. https://www.python.org/
6. Martin C. Brown, "Python: The Complete Reference", 4th Edition, Mc-Graw Hill,2018.

COs- PO's & PSO's MAPPING

\CO's	PO's												PSO's		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	3	3	3	2	-	-	-	-	-	2	2	3	3	-
2	3	3	3	3	2	-	-	-	-	-	2	2	3	-	-
3	3	3	3	3	2	-	-	-	-	-	2	-	3	-	-
4	2	2	-	2	2	-	-	-	-	-	1	-	3	-	-
5	1	2	-	-	1	-	-	-	-	-	1	-	2	-	-
6.	2	2	-	-	2	-	-	-	-	-	1	-	2	-	-
Avg.	**2**	**3**	**3**	**3**	**2**	-	-	-	-	-	**2**	**2**	**3**	**3**	-

1 - low, 2 - medium, 3 - high, '-' - no correlation

24UCS121 PROBLEM SOLVING AND PYTHON PROGRAMMING LABORATORY L T P C
0 0 4 2

COURSE OBJECTIVES:

- To understand the problem solving approaches.
- To learn the basic programming constructs in Python.
- To practice various computing strategies for Python-based solutions to real world problems.
- To use Python data structures - lists, tuples, dictionaries.
- To do input/output with files in Python.

EXPERIMENTS:

Note: The examples suggested in each experiment are only indicative. The lab instructor is expected to design other problems on similar lines. The Examination shall not be restricted to the sample experiments listed here.

1. Identification and solving of simple real life or scientific or technical problems, and developing flow charts for the same. (Electricity Billing, Retail shop billing, Sin series, weight of a motorbike, Weight of a steel bar, compute Electrical Current in Three Phase AC Circuit, etc.)
2. Python programming using simple statements and expressions (exchange the values of two variables, circulate the values of n variables, distance between two points).
3. Scientific problems using Conditionals and Iterative loops. (Number series, Number Patterns, pyramid pattern)
4. Implementing real-time/technical applications using Lists, Tuples. (Items present in a library/Components of a car/ Materials required for construction of a building –operations of list & tuples)
5. Implementing real-time/technical applications using Sets, Dictionaries. (Language, components of an automobile, Elements of a civil structure, etc.- operations of Sets & Dictionaries)
6. Implementing programs using Functions. (Factorial, largest number in a list, area of shape)
7. Implementing programs using Strings. (reverse, palindrome, character count, replacing characters)
8. Implementing programs using written modules and Python Standard Libraries (pandas, numpy. Matplotlib, scipy)
9. Implementing real-time/technical applications using File handling. (copy from one file to another, word count, longest word)
10. Implementing real-time/technical applications using Exception handling. (divide by zero error, voter's age validity, student mark range validation)
11. Exploring Pygame tool.
12. Developing a game activity using Pygame like bouncing ball, car race etc.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

On completion of the course, students will be able to:

CO1: Develop algorithmic solutions to simple computational problems
CO2: Develop and execute simple Python programs.
CO3: Implement programs in Python using conditionals and loops for solving problems..
CO4: Deploy functions to decompose a Python program.
CO5: Process compound data using Python data structures.
CO6: Utilize Python packages in developing software applications.

TEXT BOOKS:

1. Allen B. Downey, "Think Python : How to Think like a Computer Scientist", 2nd Edition, O'Reilly Publishers, 2016.
2. Karl Beecher, "Computational Thinking: A Beginner's Guide to Problem Solving and Programming", 1st Edition, BCS Learning & Development Limited, 2017.

REFERENCES:

1. Paul Deitel and Harvey Deitel, "Python for Programmers", Pearson Education, 1st Edition, 2021.
2. G Venkatesh and Madhavan Mukund, "Computational Thinking: A Primer for Programmers and Data Scientists", 1st Edition, Notion Press, 2021.
3. John V Guttag, "Introduction to Computation and Programming Using Python: With Applications to Computational Modeling and Understanding Data'', Third Edition, MIT Press, 2021
4. Eric Matthes, "Python Crash Course, A Hands - on Project Based Introduction to Programming", 2nd Edition, No Starch Press, 2019.
5. https://www.python.org/
6. Martin C. Brown, "Python: The Complete Reference", 4th Edition, Mc-Graw Hill, 2018.

COs- PO's & PSO's MAPPING

CO's	PO's												PSO's		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	3	3	3	3	-	-	-	-	-	3	2	3	3	-
2	3	3	3	3	3	-	-	-	-	-	3	2	3	-	-
3	3	3	3	3	2	-	-	-	-	-	2	-	3	-	-
4	3	2	-	2	2	-	-	-	-	-	1	-	3	-	-
5	1	2	-	-	1	-	-	-	-	-	1	-	2	-	-
6	2	-	-	-	2	-	-	-	-	-	1	-	2	-	-
AVg.	**2**	**3**	**3**	**3**	**2**	-	-	-	-	-	**2**	**2**	**3**	**3**	-

1 - low, 2 - medium, 3 - high, '-' - no correlation

24UPC121 PHYSICS AND CHEMISTRY LABORATORY L T P C
0 0 4 2

PHYSICS LABORATORY : (Any Seven Experiments)

COURSE OBJECTIVES:

- To learn the proper use of various kinds of physics laboratory equipment.
- To learn how data can be collected, presented and interpreted in a clear and concise manner.
- To learn problem solving skills related to physics principles and interpretation of experimental data.
- To determine error in experimental measurements and techniques used to minimize such error.
- To make the student as an active participant in each part of all lab exercises.

1. Torsional pendulum - Determination of rigidity modulus of wire and moment of inertia of regular and irregular objects.
2. Simple harmonic oscillations of cantilever.
3. Non-uniform bending - Determination of Young's modulus
4. Uniform bending – Determination of Young's modulus
5. Laser- Determination of the wave length of the laser using grating
6. Air wedge - Determination of thickness of a thin sheet/wire
7. a) Optical fibre -Determination of Numerical Aperture and acceptance angle
   b) Compact disc- Determination of width of the groove using laser.
8. Acoustic grating- Determination of velocity of ultrasonic waves in liquids.
9. Ultrasonic interferometer – determination of the velocity of sound and compressibility of liquids
10. Post office box -Determination of Band gap of a semiconductor.
11. Photoelectric effect
12. Michelson Interferometer.
13. Melde's string experiment
14. Experiment with lattice dynamics kit.

TOTAL: 30 PERIODS

COURSE OUTCOMES:

Upon completion of the course, the students should be able to

CO1 Understand the functioning of various physics laboratory equipment.

CO2 Use graphical models to analyze laboratory data.

CO3 Use mathematical models as a medium for quantitative reasoning and describing physical reality.

CO4 Access, process and analyze scientific information.

CO5 Solve problems individually and collaboratively.

CO's-PO's & PSO's MAPPING

CO's	PO's												PSO's		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	2	3	1	1	-	-	-	-	-	-	-	-	-	-
2	3	3	2	1	1	-	-	-	-	-	-	-	-	-	-
3	3	2	3	1	1	-	-	-	-	-	-	-	-	-	-
4	3	3	2	1	1	-	-	-	-	-	-	-	-	-	-
5	3	2	3	1	1	-	-	-	-	-	-	-	-	-	-
AVG	3	2.4	2.6	1	1										

- **1-Low,2-Medium,3-High,"-"-no correlation**
- **Note: the average value of this course to be used for program articulation matrix.**

CHEMISTRY LABORATORY: (Any seven experiments to be conducted)

COURSE OBJECTIVES:

- To inculcate experimental skills to test basic understanding of water quality parameters, such as, acidity, alkalinity, hardness, DO, chloride and copper.
- To induce the students to familiarize with electroanalytical techniques such as, pH metry, potentiometry and conductometry in the determination of impurities in aqueous solutions.
- To demonstrate the analysis of metals and alloys.
- To demonstrate the synthesis of nanoparticles

1. Preparation of Na_2CO_3 as a primary standard and estimation of acidity of a water sample using the primary standard
2. Determination of types and amount of alkalinity in water sample.
   - Split the first experiment into two
3. Determination of total, temporary & permanent hardness of water by EDTA method.
4. Determination of DO content of water sample by Winkler's method.
5. Determination of chloride content of water sample by Argentometric method.
6. Estimation of copper content of the given solution by Iodometry.
7. Estimation of TDS of a water sample by gravimetry.
8. Determination of strength of given hydrochloric acid using pH meter.
9. Determination of strength of acids in a mixture of acids using conductivity meter.
10. Conductometric titration of barium chloride against sodium sulphate (precipitation titration)
11. Estimation of iron content of the given solution using potentiometer.
12. Estimation of sodium /potassium present in water using flame photometer.
13. Preparation of nanoparticles (TiO_2/ZnO/CuO) by Sol-Gel method.
14. Estimation of Nickel in steel
15. Proximate analysis of Coal

TOTAL: 30 PERIODS

COURSE OUTCOMES:

CO1 To analyse the quality of water samples with respect to their acidity, alkalinity, hardness and DO.

CO2 To determine the amount of metal ions through volumetric and spectroscopic techniques

CO3 To analyse and determine the composition of alloys.

CO4 To learn simple method of synthesis of nanoparticles

CO5 To quantitatively analyse the impurities in solution by electro analytical techniques.

TEXT BOOKS:

1. J. Mendham, R. C. Denney, J.D. Barnes, M. Thomas and B. Sivasankar, Vogel's Textbook of Quantitative Chemical Analysis (2009).

COs- PO's & PSO's MAPPING

CO	PO												PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	-	1	-	-	2	2	-	-	-	-	2	-	-	-
2	3	1	2	-	-	1	2	-	-	-	-	1	-	-	-
3	3	2	1	1	-	-	1	-	-	-	-	-	-	-	-
4	2	1	2	-	-	2	2	-	-	-	-	-	-	-	-
5	2	1	2	-	1	2	2	-	-	-	-	1	-	-	-
Avg.	**2.6**	**1.3**	**1.6**	**1**	**1**	**1.4**	**1.8**	**-**	**-**	**-**	**-**	**1.3**	**-**	**-**	**-**

- **1-low, 2-medium, 3-high, '-"- no correlation**

24UEN121	ENGLISH LABORATORY	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES:

- To improve the communicative competence of learners
- To help learners use language effectively in academic /work contexts
- To develop various listening strategies to comprehend various types of audio materials like lectures, discussions, videos etc.
- To build on students' English language skills by engaging them in listening, speaking and grammar learning activities that are relevant to authentic contexts.
- To use language efficiently in expressing their opinions via various media.

UNIT I INTRODUCTION TO FUNDAMENTALS OF COMMUNICATION 6

Listening for general information-specific details- conversation: Introduction to classmates - Audio / video (formal & informal); Telephone conversation; Listening to voicemail & messages; Listening and filling a form. Speaking - making telephone calls-Self Introduction; Introducing a friend; - politeness strategies-making polite requests, making polite offers, replying to polite requests and offers- understanding basic instructions (filling out a bank application for example).

UNIT II NARRATION AND SUMMATION 6

Listening - Listening to podcasts, anecdotes / stories / event narration; documentaries and interviews with celebrities. Speaking - Narrating personal experiences / events-Talking about current and temporary situations & permanent and regular situations* - describing experiences and feelings- engaging in small talk-describing requirements and abilities.

UNIT III DESCRIPTION OF A PROCESS PRODUCT 6

Listening - Listen to product and process descriptions; a classroom lecture; and advertisements about products. Speaking – Picture description- describing locations in workplaces- Giving instruction to use the product- explaining uses and purposes- Presenting a product- describing shapes and sizes and weights-talking about quantities(large & small)-talking about precautions.

UNIT IV CLASSIFICATION AND RECOMMENDATIONS 6

Listening – Listening to TED Talks; Listening to lectures - and educational videos. Speaking – Small Talk; discussing and making plans-talking about tasks-talking about progress- talking about positions and directions of movement-talking about travel preparations- talking about transportation-

UNIT V EXPRESSION 6

Listening – Listening to debates/ discussions; different viewpoints on an issue; and panel discussions. Speaking –making predictions- talking about a given topic-giving opinions- understanding a website-describing processes

TOTAL: 30 PERIODS

LEARNING OUTCOMES:

At the end of the course, learners will be able

CO1 To listen to and comprehend general as well as complex academic information

CO2 To listen to and understand different points of view in a discussion

CO3 To speak fluently and accurately in formal and informal communicative contexts

CO4 To describe products and processes and explain their uses and purposes clearly and accurately

CO5 To express their opinions effectively in both formal and informal discussions

ASSESSMENT PATTERN

- One online / app based assessment to test listening /speaking
- End Semester **ONLY** listening and speaking will be conducted online.
- Proficiency certification is given on successful completion of listening and speaking internal test and end semester exam.

COs- PO's & PSO's MAPPING

CO	PO												PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	3	3	3	1	3	3	3	3	3	3	3	-	-	-
2	3	3	3	3	1	3	3	3	3	3	3	3	-	-	-
3	3	3	3	3	1	3	3	3	3	3	3	3	-	-	-
4	3	3	3	3	1	3	3	3	3	3	3	3	-	-	-
5	3	3	3	3	1	3	3	3	3	3	3	3	-	-	-
AVg.	**3**	**3**	**3**	**3**	**1**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**-**	**-**	**-**

- 1-low, 2-medium, 3-high, '-"- no correlation

Note: The average value of this course to be used for program articulation matrix

24UEN201 **PROFESSIONAL ENGLISH II** **L T P C**

2 0 0 2

COURSE OBJECTIVES:

- To engage learners in meaningful language activities to improve their reading and writing skills
- To learn various reading strategies and apply in comprehending documents in professional context.
- To help learners understand the purpose, audience, contexts of different types of writing
- To develop analytical thinking skills for problem solving in communicative contexts
- To demonstrate an understanding of job applications and interviews for internship and placements

UNIT I MAKING COMPARISONS **6**

Reading - Reading advertisements, user manuals, brochures; Writing – Professional emails, Email etiquette - Compare and Contrast Essay; Grammar – Mixed Tenses, Prepositional phrases

UNIT II EXPRESSING CAUSAL RELATIONS IN SPEAKING AND WRITING **6**

Reading - Reading longer technical texts– Cause and Effect Essays, and Letters / emails of complaint, Writing - Writing responses to complaints. Grammar - Active Passive Voice transformations, Infinitive and Gerunds

UNIT III PROBLEM SOLVING **6**

Reading - Case Studies, excerpts from literary texts, news reports etc. Writing – Letter to the Editor, Checklists, Problem solution essay / Argumentative Essay. Grammar – Error correction; If conditional sentences

UNIT IV REPORTING OF EVENTS AND RESEARCH **6**

Reading –Newspaper articles; Writing – Recommendations, Transcoding, Accident Report, Survey Report Grammar – Reported Speech, Modals Vocabulary – Conjunctions- use of prepositions

UNIT V THE ABILITY TO PUT IDEAS OR INFORMATION COGENTLY **6**

Reading – Company profiles, Statement of Purpose, (SOP), an excerpt of interview with professionals; Writing – Job / Internship application – Cover letter & Resume; Grammar –Numerical adjectives, Relative Clauses.

TOTAL: 30 PERIODS

COURSE OUTCOMES:

At the end of the course, learners will be able

CO1 To compare and contrast products and ideas in technical texts.

CO2 To identify and report cause and effects in events, industrial processes through technical texts

CO3 To analyse problems in order to arrive at feasible solutions and communicate them in the written format.

CO4 To present their ideas and opinions in a planned and logical manner

CO5 To draft effective resumes in the context of job search.

TEXT BOOKS:

1. English for Engineers & Technologists (2020 edition) Orient Blackswan Private Ltd. Department of English, Anna University.
2. English for Science & Technology Cambridge University Press 2021.
3. Authored by Dr. Veena Selvam, Dr. Sujatha Priyadarshini, Dr. Deepa Mary Francis, Dr. KN. Shoba, and Dr. Lourdes Joevani, Department of English, Anna University.

REFERENCES:

1. Raman. Meenakshi, Sharma. Sangeeta (2019). Professional English. Oxford university press. New Delhi.
2. Improve Your Writing ed. V.N. Arora and Laxmi Chandra, Oxford Univ. Press, 2001, NewDelhi.
3. Learning to Communicate – Dr. V. Chellammal. Allied Publishers, New Delhi, 2003
4. Business Correspondence and Report Writing by Prof. R.C. Sharma & Krishna Mohan, Tata McGraw Hill & Co. Ltd., 2001, New Delhi.
5. Developing Communication Skills by Krishna Mohan, Meera Bannerji- Macmillan India Ltd. 1990, Delhi.

ASSESSMENT PATTERN

Two internal assessments and an end semester examination to test students' reading and writing skills along with their grammatical and lexical competence.

COs- PO's & PSO's MAPPING

CO	PO												PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	3	3	3	3	3	3	3	2	3	3	3	-	-	-
2	3	3	3	3	3	3	3	3	2	3	3	3	-	-	-
3	3	3	3	3	3	3	3	3	2	3	3	3	-	-	-
4	3	3	3	3	2	3	3	3	2	3	3	3	-	-	-
5	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**3**	**3**	**3**	**-**	**-**	**-**
AVg.	**3**	**3**	**3**	**3**	**2.75**	**3**	**3**	**3**	**2.2**	**3**	**3**	**3**	**-**	**-**	**-**

- 1-low, 2-medium, 3-high, '-"- no correlation

Note: The average value of this course to be used for program articulation matrix

24UMA202 STATISTICS AND NUMERICAL METHODS L T P C

3 1 0 4

COURSE OBJECTIVES:

- This course aims at providing the necessary basic concepts of a few statistical and numerical methods and give procedures for solving numerically different kinds of problems occurring in engineering and technology.
- To acquaint the knowledge of testing of hypothesis for small and large samples this plays an important role in real life problems.
- To introduce the basic concepts of solving algebraic and transcendental equations.
- To introduce the numerical techniques of interpolation in various intervals and numerical techniques of differentiation and integration this plays an important role in engineering and technology disciplines.
- To acquaint the knowledge of various techniques and methods of solving ordinary differential equations.

UNIT I TESTING OF HYPOTHESIS 9+3

Sampling distributions - Tests for single mean, proportion and difference of means (Large and small samples) – Tests for single variance and equality of variances – Chi square test for goodness of fit – Independence of attributes.

UNIT II DESIGN OF EXPERIMENTS 9+3

One way and two way classifications - Completely randomized design – Randomized block design – Latin square design - 2^2 factorial design.

UNIT III SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS 9+3

Solution of algebraic and transcendental equations - Fixed point iteration method – Newton Raphson method- Solution of linear system of equations - Gauss elimination method – Pivoting - Gauss Jordan method – Iterative methods of Gauss Jacobi and Gauss Seidel – Eigen values of a matrix by Power method and Jacobi's method for symmetric matrices.

UNIT IV INTERPOLATION, NUMERICAL DIFFERENTIATION AND NUMERICAL INTEGRATION 9+3

Lagrange's and Newton's divided difference interpolations – Newton's forward and backward difference interpolation – Approximation of derivates using interpolation polynomials – Numerical single and double integrations using Trapezoidal and Simpson's 1/3 rules.

UNIT V NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS 9+3

Single step methods: Taylor's series method - Euler's method - Modified Euler's method - Fourth order Runge-Kutta method for solving first order differential equations - Multi step methods: Milne's and Adams - Bash forth predictor corrector methods for solving first order differential equations.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

Upon successful completion of the course, students will be able to:

CO1 Apply the concept of testing of hypothesis for small and large samples in real life problems.

CO2 Apply the basic concepts of classifications of design of experiments in the field of agriculture.

CO3 Appreciate the numerical techniques of interpolation in various intervals and apply the numerical techniques of differentiation and integration for engineering problems.

CO4 Understand the knowledge of various techniques and methods for solving first and second order ordinary differential equations.

CO5 Solve the partial and ordinary differential equations with initial and boundary conditions by using certain techniques with engineering applications.

TEXT BOOKS:

1. Grewal, B.S., and Grewal, J.S., "Numerical Methods in Engineering and Science", Khanna Publishers, 10th Edition, New Delhi, 2015.
2. Johnson, R.A., Miller, I and Freund J., "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 8th Edition, 2015.

REFERENCES:

1. Burden, R.L and Faires, J.D, "Numerical Analysis", 9th Edition, Cengage Learning, 2016.
2. Devore. J.L., "Probability and Statistics for Engineering and the Sciences", Cengage Learning, New Delhi, 8th Edition, 2014.
3. Gerald. C.F. and Wheatley. P.O. "Applied Numerical Analysis" Pearson Education, Asia, New Delhi, 7th Edition, 2007.
4. Gupta S.C. and Kapoor V. K., "Fundamentals of Mathematical Statistics", Sultan Chand & Sons, New Delhi, 12th Edition, 2020.
5. Spiegel. M.R., Schiller. J. and Srinivasan. R.A., "Schaum's Outlines on Probability and Statistics ", Tata McGraw Hill Edition, 4th Edition, 2012.
6. Walpole. R.E., Myers. R.H., Myers. S.L. and Ye. K., "Probability and Statistics for Engineers and Scientists", 9th Edition, Pearson Education, Asia, 2010.

COs- PO's & PSO's MAPPING

	PO 01	**PO 02**	**PO 03**	**PO 04**	**PO 05**	**PO 06**	**PO 07**	**PO 08**	**PO 09**	**PO 10**	**PO 11**	**PO 12**	**PS O1**	**PS O2**	**PS O3**
CO1	3	3	1	1	1	0	0	0	2	0	2	3	-	-	-
CO2	3	3	1	1	1	0	0	0	2	0	2	3	-	-	-
CO3	3	3	1	1	1	0	0	0	2	0	2	3	-	-	-
CO4	3	3	1	1	1	0	0	0	2	0	2	3	-	-	-
CO5	3	3	1	1	1	0	0	0	2	0	2	3	-	-	-
Avg	3	3	1	1	1	0	0	0	2	0	2	3	-	-	-

24UPH204 PHYSICS FOR INFORMATION SCIENCE L T P C

3 0 0 3

COURSE OBJECTIVES:

- To make the students understand the importance in studying electrical properties ofmaterials.
- To enable the students to gain knowledge in semiconductor physics
- To instill knowledge on magnetic properties of materials.
- To establish a sound grasp of knowledge on different optical properties of materials, optical displays and applications
- To inculcate an idea of significance of nano structures, quantum confinement, ensuing nano device applications and quantum computing.

UNIT I ELECTRICAL PROPERTIES OF MATERIALS 9

Classical free electron theory - Expression for electrical conductivity – Thermal conductivity, expression - Wiedemann-Franz law – Success and failures - electrons in metals – Particle in a three dimensional box – degenerate states – Fermi- Dirac statistics – Density of energy states – Electron in periodic potential – Energy bands in solids – tight binding approximation - Electron effective mass – concept of hole.

UNIT II SEMICONDUCTOR PHYSICS 9

Intrinsic Semiconductors – Energy band diagram – direct and indirect band gap semiconductors – Carrier concentration in intrinsic semiconductors – extrinsic semiconductors - Carrier concentrationin N-type & P-type semiconductors – Variation of carrier concentration with temperature – variationof Fermi level with temperature and impurity concentration – Carrier transport in Semi conduct: random motion, drift, mobility and diffusion – Hall effect and devices – Ohmic contacts – Schottky diode.

UNIT III MAGNETIC PROPERTIES OF MATERIALS 9

Magnetic dipole moment – atomic magnetic moments- magnetic permeability and susceptibility - Magnetic material classification: diamagnetism – paramagnetism – ferromagnetism – anti ferromagnetism – ferrimagnetism – Ferromagnetism: origin and exchange interaction- saturation magnetization and Curie temperature – Domain Theory- M versus H behaviour – Hard and soft magnetic materials – examples and uses-– Magnetic principle in computer data storage – Magnetichard disc (GMR sensor).

UNIT IV OPTICAL PROPERTIES OF MATERIALS 9

Classification of optical materials – carrier generation and recombination processes - Absorption emission and scattering of light in metals, insulators and semiconductors (concepts only) - photo current in a P-N diode – solar cell - LED – Organic LED – Laser diodes – Optical data storage techniques.

UNIT V NANODEVICES AND QUANTUM COMPUTING 9

Introduction - quantum confinement – quantum structures: quantum wells, wires and dots — band gap of nanomaterials. Tunneling – Single electron phenomena: Coulomb blockade - resonant- tunneling diode – single electron transistor – quantum cellular automata - Quantum system for information processing - quantum states – classical bits – quantum bits or qubits –CNOT gate - multiple qubits – Bloch sphere – quantum gates – advantage of quantum computing over classical computing.

TOTAL :45 PERIODS

COURSE OUTCOMES:

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

CO1: Gain knowledge on classical and quantum electron theories, and energy band structures

CO2: Acquire knowledge on basics of semiconductor physics and its applications in various devices

CO3: Get knowledge on magnetic properties of materials and their applications in data storage,

CO4: Have the necessary understanding on the functioning of optical materials for optoelectronics

CO5: Understand the basics of quantum structures and their applications and basics of quantum computing

TEXT BOOKS:

1. Jasprit Singh, "Semiconductor Devices: Basic Principles", Wiley (Indian Edition), 2007.
2. S.O. Kasap. Principles of Electronic Materials and Devices, McGraw-Hill Education (IndianEdition), 2020.
3. Parag K. Lala, Quantum Computing: A Beginner's Introduction, McGraw-Hill Education (IndianEdition), 2020.

REFERENCES:

1. Charles Kittel, Introduction to Solid State Physics, Wiley India Edition, 2019.
2. Y.B.Band and Y.Avishai, Quantum Mechanics with Applications to Nanotechnology and
3. Information Science, Academic Press, 2013.
4. V.V.Mitin, V.A. Kochelap and M.A.Stroscio, Introduction to Nanoelectronics, CambridgeUniv.Press, 2008.
5. G.W. Hanson, Fundamentals of Nanoelectronics, Pearson Education (Indian Edition) 2009.
6. B.Rogers, J.Adams and S.Pennathur, Nanotechnology: Understanding Small Systems, CRCPress, 2014.

CO's-PO's & PSO's MAPPING

CO's	PO's												PSO's		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-
2	3	1	2	-	-	-	-	-	-	-	-	-	-	-	-
3	3	-	-	1	2	1	1	-	-	-	-	-	-	-	-
4	3	-	2	1	3	-	1	-	-	-	-	-	-	-	-
5	3	2	2	2	2	1	2	-	-	-	-	2	-	-	-
AVG	3	1.3	2	1.3	2.3	1	1.3	-	-	-	-	2	-	-	-

1-Low,2-Medium,3-High,"-"-no correlation

Note: the average value of this course to be used for program articulation matrix.

24UGE205 **ENGINEERING GRAPHICS** **L T P C**

2 0 4 4

COURSE OBJECTIVES:

The main learning objective of this course is to prepare the students for:

- Drawing engineering curves.
- Drawing freehand sketch of simple objects.
- Drawing orthographic projection of solids and section of solids.
- Drawing development of solids
- Drawing isometric and perspective projections of simple solids.

CONCEPTS AND CONVENTIONS (Not for Examination)

Importance of graphics in engineering applications — Use of drafting instruments — BIS conventions and specifications — Size, layout and folding of drawing sheets — Lettering and dimensioning.

UNIT I PLANE CURVES **6+12**

Basic Geometrical constructions, Curves used in engineering practices: Conics — Construction of ellipse, parabola and hyperbola by eccentricity method — Construction of cycloid — construction of involutes of square and circle — Drawing of tangents and normal to the above curves.

UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACE **6+12**

Orthographic projection- principles-Principal planes-First angle projection-projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method and traces. Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

UNIT III PROJECTION OF SOLIDS AND FREEHAND SKETCHING **6+12**

Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to one of the principal planes and parallel to the other by rotating object method. Visualization concepts and Free Hand sketching: Visualization principles —Representation of Three Dimensional objects — Layout of views- Freehand sketching of multiple views from pictorial views of objects.

Practicing three dimensional modeling of simple objects by CAD Software (Not for examination)

UNIT IV PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES 6+12

Sectioning of above solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other — obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids — Prisms, pyramids cylinders and cones.

Practicing three dimensional modeling of simple objects by CAD Software (Not for examination)

UNIT V ISOMETRIC AND PERSPECTIVE PROJECTIONS **6+12**

Principles of isometric projection — isometric scale —Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions - Perspective projection of simple solids-Prisms, pyramids and cylinders by visual ray method.

Practicing three dimensional modeling of isometric projection of simple objects by CAD Software (Not for examination)

TOTAL: (L=30+P=60) 90 PERIODS

COURSE OUTCOMES:

On successful completion of this course, the student will be able to

CO1 Use BIS conventions and specifications for engineering drawing.

CO2 Construct the conic curves, involutes and cycloid.

CO3 Solve practical problems involving projection of lines.

CO4 Draw the orthographic, isometric and perspective projections of simple solids.

CO5 Draw the development of simple solids.

TEXT BOOKS:

1. Bhatt N.D. and Panchal V.M., "Engineering Drawing", Charotar Publishing House, Rd 53 Edition, 2019.
2. Natrajan K.V., "A Text Book of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 2018.
3. Parthasarathy, N. S. and Vela Murali, "Engineering Drawing", Oxford University Press, 2015

REFERENCES:

1. Basant Agarwal and Agarwal C.M., "Engineering Drawing", McGraw Hill, 2nd Edition, 2019.
2. Gopalakrishna K.R., "Engineering Drawing" (Vol. I&II combined), Subhas Publications, Bangalore, 27th Edition, 2017.
3. Luzzader, Warren.J. and Duff,John M., "Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production, Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi, 2005.
4. Parthasarathy N. S. and Vela Murali, "Engineering Graphics", Oxford University, Press, New Delhi, 2015.
5. Shah M.B., and Rana B.C., "Engineering Drawing", Pearson Education India, 2nd Edition, 2009.
6. Venugopal K. and Prabhu Raja V., "Engineering Graphics", New Age International (P) Limited, 2008.

Publication of Bureau of Indian Standards:

1. IS 10711 — 2001: Technical products Documentation — Size and lay out of drawing sheets.
2. IS 9609 (Parts 0 & 1) — 2001: Technical products Documentation — Lettering.
3. IS 10714 (Part 20) — 2001 & SP 46 — 2003: Lines for technical drawings.
4. IS 11669 — 1986 & SP 46 —2003: Dimensioning of Technical Drawings.
5. IS 15021 (Parts 1 to 4) — 2001: Technical drawings — Projection Methods.

Special points applicable to End Semester Examinations on Engineering Graphics:

1. There will be five questions, each of either or type covering all units of the syllabus.
2. All questions will carry equal marks of 20 each making a total of 100.
3. The answer paper shall consist of drawing sheets of A3 size only. The students will be permitted to use appropriate scale to fit solution within A3 size.
4. The examination will be conducted in appropriate sessions on the same day

COs- PO's & PSO's MAPPING

CO	PO												PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	1	2		2					3		2	2	2	
2	3	1	2		2					3		2	2	2	
3	3	1	2		2					3		2	2	2	
4	3	1	2		2					3		2	2	2	
5	3	1	2		2					3		2	2	2	
Avg	**3**	**1**	**2**		**2**					**3**		**2**	**2**	**2**	
Low (1) ; Medium (2) ; High (3)															

24UEC203 **CIRCUIT ANALYSIS** **L T P C**

2 1 0 4

COURSE OBJECTIVES:

- To learn the basic concepts and behaviour of DC and AC circuits.
- To understandvariousmethodsofcircuit/networkanalysisusingnetworktheorems.
- To understand the transient and steady state response of the circuits subjected to DC excitations and AC with sinusoidal excitations.
- To learn the concept of coupling in circuits and topologies.

UNIT I DC CIRCUIT ANALYSIS 12

Basic Components of electric Circuits, Charge, current, Voltage and Power, Voltage and Current Sources, Ohms Law, Kirchoff's Current Law, Kirchoff's voltage law, The single Node – Pair Circuit, series and Parallel Connected Independent Sources, Resistors in Series and Parallel, voltage and current division, Nodal analysis, Mesh analysis.

UNIT II NETWORK THEOREM AND DUALITY 12

Useful Circuit Analysis techniques - Linearity and superposition, Thevenin and Norton Equivalent Circuits, Maximum Power Transfer, Delta-Wye Conversion. Duals, Dual circuits. Analysis using dependent current sources and voltage sources

UNIT III SINUSOIDAL STEADY STATE ANALYSIS 12

Sinusoidal Steady – State analysis , Characteristics of Sinusoids, The Complex Forcing Function, The Phasor, Phasor relationship for R, L, and C, impedance and Admittance, Nodal and Mesh Analysis, Phasor Diagrams, AC Circuit Power Analysis, Instantaneous Power, Average Power, apparent Power and Power Factor, Complex Power.

UNIT IV TRANSIENTS AND RESONANCE IN RLC CIRCUITS 12

Basic RL and RC Circuits, The Source- Free RL Circuit, The Source-Free RC Circuit, The Unit-Step Function, Driven RL Circuits, Driven RC Circuits, RLC Circuits, Frequency Response, Parallel Resonance, Series Resonance, Quality Factor.

UNITV COUPLED CIRCUITS AND TOPOLOGY 12

Magnetically Coupled Circuits, mutual Inductance, the Linear Transformer, the Ideal Transformer, An introduction to Network Topology, Trees and General Nodal analysis, Links and Loop analysis.

COURSEOUTCOMES

On successful completion of this course, the student will be able to

CO1: Apply fundamental laws and principles of DC circuit analysis to analyze electric circuits using nodal and mesh analysis techniques

CO2: Explain network theorems and duality concepts for analyzing linear electrical circuits

CO3: Apply phasor techniques to analyze sinusoidal steady-state AC circuits and power quantities.

CO4: Analyze transient response and resonance characteristics of RL, RC, and RLC circuits.

CO5: Analyze magnetically coupled circuits and transformers, and apply basic network topology concepts such as trees, loops, and general nodal analysis.

TOTAL:60 PERIODS

TEXTBOOKS:

1. Hayt Jack Kemmerly, Steven Durbin, "Engineering Circuit Analysis",Mc Graw Hill education, 9th Edition, 2018.
2. Charles K. Alexander & Mathew N.O.Sadiku, "Fundamentals of Electric Circuits", Mc Graw- Hill, 2nd Edition, 2003.
3. Joseph Edminister and Mahmood Nahvi, ―Electric Circuits, Schaum‘s Outline Series, Tata McGraw Hill Publishing Company, New Delhi, Fifth Edition Reprint 2016.

REFERENCES:

1. Robert.L. Boylestead, "Introductory Circuit Analysis", Pearson Education India, 12th Edition, 2014. David Bell, "Fundamentals of Electric Circuits", Oxford University press, 7thEdition, 2009.
2. John O Mallay, Schaum’s Outlines "Basic Circuit Analysis", The Mc Graw Hill companies, 2nd Edition, 2011
3. Allan H.Robbins, Wilhelm C.Miller, “Circuit Analysis Theory and Practice", Cengage Learning, Fifth Edition, 1st Indian Reprint 2013

CO’s-PO’s&PSO’sMAPPING

CO	PO 1	PO 2	PO 3	PO 4	PO5	PO 6	PO 7	PO 8	PO9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
1	3	2	1	1	-	-	-	1		1	-	-	-	-	-
2	3	3	2	2	-	-	-	1		1	-	-	-	-	-
3	3	3	3	3	-	-	-	1		1	-	-	-	-	-
4	3	3	3	3	-	-	-	1		1	-	-	-	-	-
5	3	3	3	2	-	-	-	1		1	-	-	-	-	-
6	**3**	**3**	**3**	**2**	**-**	**-**	**-**	**1**		**1**	**-**	**-**	**-**	**-**	**-**
CO	3	2	1	1	-	-	-	1		1	-	-	-	-	-

1 - low, 2 - medium, 3 - high, ‘-' - no correlation

24UEC207	ELECTRICAL AND INSTRUMENTATION ENGINEERING	L	T	P	C
		2	1	0	4

COURSE OBJECTIVES:

- To impart knowledge in types, construction and working of transformers
- To impart knowledge in types, construction and working of DC machines
- To impart knowledge in types, construction and working of AC rotating machines
- To introduce the functional elements and working of measuring instruments.
- To introduce the basics of power system and protection schemes

UNIT I TRANSFORMER 9

Introduction - Ideal and Practical Transformer – Phasor diagram-– Per Unit System – Equivalent circuit- Testing- Efficiency and Voltage Regulation– Three Phase Transformers –Applications- Auto Transformers, Advantages- Harmonics.

UNIT II DC MACHINES 9

Introduction – Constructional Features– Motor and Generator mode- EMF and Torque equation – Circuit Model – Methods of Excitation- Characteristics – Starting and Speed Control – Universal Motor- Stepper Motors – Brushless DC Motors- Applications

UNIT III AC ROTATING MACHINES 9

Principle of operation of three-phase induction motors – Construction –Types – Equivalent circuit, Speed Control - Single phase Induction motors -Construction– Types–starting methods. Alternator: Working principle–Equation of induced EMF – Voltage regulation, Synchronous motors- working principle- starting methods – Torque equation.

UNIT IV MEASUREMENTS AND INSTRUMENTATION 9

Functional elements of an instrument, Standards and calibration, Operating Principle, types - Moving Coil and Moving Iron meters, Measurement of three phase power, Energy Meter, Instrument Transformers-CT and PT, DSO- Block diagram- Data acquisition.

UNIT V BASICS OF POWER SYSTEMS 9

Power system structure -Generation , Transmission and distribution , Various voltage levels, Earthing – methods of earthing, protective devices- switch fuse unit- Miniature circuit breaker- moulded case circuit breaker- earth leakage circuit breaker, safety precautions and First Aid

TOTAL: 45 PERIODS

COURSE OUTCOMES:

After completing this course, the students will be able to

CO1: Analyze the construction, working and performance of transformers.

CO2: Explain the operating principles and characteristics of DC machines.

CO3: Describe the working principles and applications of AC rotating machines.

CO4: Apply the principles of electrical measurements and instrumentation.

CO5: Identify power system components, protective devices, and electrical safety practices.

TEXT BOOKS:

1. Kothari DP and I.J Nagrath, "Basic Electrical and Electronics Engineering", Second Edition, McGraw Hill Education, 2020
2. S. K, Bhattacharya, "Basic Electrical and Electronics Engineering", Second Edition, Pearson Education, 2017.
3. A.K.Sawhney,PuneetSawhney'ACourseinElectrical&ElectronicMeasurements& Instrumentation', Dhanpat Rai and Co, NewDelhi,2015.
4. C.L.Wadhwa,"Generation,DistributionandUtilisationofElectricalEnergy",NewAge International pvt.ltd.,2003

REFERENCES:

1. Kothari,D P and I. J Nagrath, "Basic Electrical Engineering", Fourth Edition, Mc Graw Hill Education, 2019
2. Mahmood Nahviand Joseph A. Edminister,"Electric Circuits",Schaum' Outline Series, McGraw Hill, 2002.
3. H.S.Kalsi,'ElectronicInstrumentation',TataMcGraw-Hill,NewDelhi,2010

CO's- PO's &PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	–	–	–	–	–	–	–	–	–	1	3	1	2
2	3	2	–	–	–	–	–	–	–	–	–	1	3	1	2
3	3	2	–	–	–	–	–	–	–	–	–	1	3	1	2
4	3	2	–	1	2	–	–	–	–	–	–	1	2	3	2
5	2	1	–	–	–	2	2	1	–	–	–	1	2	–	2
CO	**2.8**	**1.8**	**-**	1	2	2	2	**1**	**-**	**-**	**-**	1	2.6	1.5	2

1-low,2-medium,3-high,'-'-nocorrelation

24UGE221 ENGINEERING PRACTICES LABORATORY L T P C
0 0 4 2

COURSE OBJECTIVES:

The main learning objective of this course is to provide hands on training to the students in:

- Drawing pipe line plan; laying and connecting various pipe fittings used in common household plumbing work; Sawing; planning; making joints in wood materials used in common household wood work.
- Wiring various electrical joints in common household electrical wire work.
- Welding various joints in steel plates using arc welding work; Machining various simple processes like turning, drilling, tapping in parts; Assembling simple mechanical assembly of common household equipments; Making a tray out of metal sheet using sheet metal work.
- Soldering and testing simple electronic circuits; Assembling and testing simple electronic components on PCB.

GROUP – A (CIVIL & ELECTRICAL)

PART I CIVIL ENGINEERING PRACTICES 15

PLUMBING WORK:

a) Connecting various basic pipe fittings like valves, taps, coupling, unions, reducers,elbows and other components which are commonly used in household.
b) Preparing plumbing line sketches.
c) Laying pipe connection to the suction side of a pump
d) Laying pipe connection to the delivery side of a pump.
e) Connecting pipes of different materials: Metal, plastic and flexible pipes used inhousehold appliances.

WOOD WORK:

a) Sawing,
b) Planing and
c) Making joints like T-Joint, Mortise joint and Tenon joint and Dovetail joint.

Wood Work Study:

a) Studying joints in door panels and wooden furniture
b) Studying common industrial trusses using models.

PART II ELECTRICAL ENGINEERING PRACTICES 15

a) Introduction to switches, fuses, indicators and lamps - Basic switch board wiring with lamp, fan and three pin socket
b) Staircase wiring
c) Fluorescent Lamp wiring with introduction to CFL and LED types.
d) Energy meter wiring and related calculations/ calibration
e) Study of Iron Box wiring and assembly
f) Study of Fan Regulator (Resistor type and Electronic type using Diac/Triac/quadrac)
g) Study of emergency lamp wiring/Water heater

GROUP – B (MECHANICAL AND ELECTRONICS)

PART III MECHANICAL ENGINEERING PRACTICES 15

WELDING WORK:

a) Welding of Butt Joints, Lap Joints, and Tee Joints using arc welding.
b) Practicing gas welding.

BASIC MACHINING WORK:

a) (simple)Turning.
b) (simple)Drilling.
c) (simple)Tapping.

ASSEMBLY WORK:

a) Assembling a centrifugal pump.
b) Assembling a household mixer.
c) Assembling an air conditioner.

SHEET METAL WORK:

a) Making of a square tray

FOUNDRY WORK:

a) Demonstrating basic foundry operations**.**

PART IV ELECTRONIC ENGINEERING PRACTICES 15

SOLDERING WORK:

a) Soldering simple electronic circuits and checking continuity**.**

ELECTRONIC ASSEMBLY AND TESTING WORK:

a) Assembling and testing electronic components on a small PCB.

ELECTRONIC EQUIPMENT STUDY:

a) Study an elements of smart phone..
b) Assembly and dismantle of LED TV.
c) Assembly and dismantle of computer/ laptop

TOTAL: 60 PERIODS

COURSE OUTCOMES:

Upon completion of this course, the students will be able to:

CO1 Draw pipe line plan; lay and connect various pipe fittings used in common household plumbing work; Saw; plan; make joints in wood materials used in common household wood work.

CO2 Wire various electrical joints in common household electrical wire work.

CO3 Weld various joints in steel plates using arc welding work; Machine various simple processes like turning, drilling, tapping in parts; Assemble simple mechanical assembly of common household equipments; Make a tray out of metal sheet using sheet metal work.

CO4 Solder and test simple electronic circuits; Assemble and test simple electronic components.

COs- PO's & PSO's MAPPING

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	2			1	1	1					2	2	1	1
2	3	2			1	1	1					2	2	1	1
3	3	2			1	1	1					2	2	1	1
Avg	**3**	**2**			**1**	**1**	**1**					**2**	**2**	**1**	**1**
Low (1) ; Medium (2) ; High (3)															

24UEC221 CIRCUIT ANALYSIS LABORATORY L T P C

0 0 2 1

COURSE OBJECTIVES:

- To gain hands-on experience in Thevenin & Norton theorem, KVL & KCL, and Superposition Theorems.
- To understand the working of RL,RC and RLC circuits

List of Experiments:

1. Verifications of KVL & KCL.
2. Verifications of Thevenin & Norton theorem.
3. Verification of Superposition Theorem.
4. Verification of maximum power transfer Theorem
5. Determination of Resonance Frequency of Series &Parallel RLC Circuits.
6. Transient analysis of RL and RC circuits.

TOTAL: 30 PERIODS

COURSE OUTCOMES:

After successful completion of this laboratory course, the students will be able to:

CO1: Apply Kirchhoff's Voltage Law (KVL) and Kirchhoff's Current Law (KCL) to analyze electrical circuits.
CO2: Verify Thevenin's and Norton's theorems through experimental circuit analysis.
CO3: Demonstrate the superposition and maximum power transfer theorems using practical circuits.
CO4: Determine the resonance frequency of series and parallel RLC circuits through experimentation.
CO5: Analyze transient responses of RL and RC circuits under different switching conditions.

CO's-PO's&PSO'sMAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	–	–	–	–	–	–	1	1	–	1	3	1	-
2	3	2	–	1	–	–	–	–	1	1	–	1	3	1	-
3	3	2	–	1	–	–	–	–	1	1	–	1	3	1	-
4	3	2	–	1	–	–	–	–	1	1	–	1	3	1	-
5	3	2	–	2	1	–	–	–	1	1	–	1	3	2	-
CO	**3**	**2**	**-**	**1.2**	**1**	**-**	**-**	**-**	**1**	**1**	**-**	**1**	**2**	**1.2**	**-**

1-low,2-medium,3-high,'-'-nocorrelation

24UEN221 **COMMUNICATION LABORATORY** **L T P C**

0 0 4 2

COURSE OBJECTIVES

- To identify varied group discussion skills and apply them to take part in effective discussions in a professional context.
- To analyze concepts and problems and make effective presentations explaining them clearly and precisely.
- To be able to communicate effectively through formal and informal writing.
- To be able to use appropriate language structures to write emails, reports and essays
- To give instructions and recommendations that are clear and relevant to the context

UNIT I **12**

Speaking-Role Play Exercises Based on Workplace Contexts, - talking about competition- discussing progress toward goals-talking about experiences- talking about events in life- discussing past events-Writing: writing emails (formal & semi-formal).

UNIT II **12**

Speaking: discussing news stories-talking about frequency-talking about travel problems- discussing travel procedures- talking about travel problems- making arrangements-describing arrangements- discussing plans and decisions- discussing purposes and reasons- understanding common technology terms-Writing: - writing different types of emails.

UNIT III **12**

Speaking: discussing predictions-describing the climate-discussing forecasts and scenarios- talking about purchasing-discussing advantages and disadvantages- making comparisons- discussing likes and dislikes-discussing feelings about experiences-discussing imaginary scenarios Writing: short essays and reports-formal/semi-formal letters.

UNIT IV **12**

Speaking: discussing the natural environment-describing systems-describing position and movement-explaining rules-(example- discussing rental arrangements)- understanding technical instructions-Writing: writing instructions-writing a short article.

UNIT V **12**

Speaking: describing things relatively-describing clothing-discussing safety issues (making recommendations) talking about electrical devices-describing controlling actions- Writing: job application (Cover letter + Curriculum vitae)-writing recommendations.

TOTAL: 60 PERIODS

LEARNING OUTCOMES

At the end of the course, learners will be able

CO1 Speak effectively in group discussions held in ~~a~~ formal/semi formal contexts.

CO2 Discuss, analyse and present concepts and problems from various perspectives to arrive at suitable solutions

CO3 Write emails, letters and effective job applications.

CO4 Write critical reports to convey data and information with clarity and precision

CO5 Give appropriate instructions and recommendations for safe execution of tasks

Assessment Pattern

- One online / app based assessment to test speaking and writing skills
- Proficiency certification is given on successful completion of speaking and writing.

COs- PO's & PSO's MAPPING

CO	PO												PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	2	3	3	3	1	3	3	3	3	3	3	3	-	-	-
2	2	3	3	3	1	3	3	3	3	3	3	3	-	-	-
3	2	2	3	3	1	3	3	3	3	3	3	3	-	-	-
4	3	3	3	3	3	3	3	3	3	3	3	3	-	-	-
5	3	3	3	3	3	3	3	3	3	3	3	3	-	-	-
AVg.	**2.4**	**2.8**	**3**	**3**	**1.8**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**-**	**-**	**-**

- 1-low, 2-medium, 3-high, '-"- no correlation
- **Note:** The average value of this course to be used for program articulation matrix.

24UMA301 RANDOM PROCESSES AND LINEAR ALGEBRA L T P C

3 1 0 4

COURSE OBJECTIVES:

- To introduce the basic notions of vector spaces this will then be used to solve related problems.
- To understand the concepts of vector space, linear transformations, inner product spaces and orthogonalization.
- To provide necessary basic concepts in probability and random processes for applications such as random signals, linear systems in communication engineering.
- To provide necessary basics in probability that is relevant in applications such as random signals, linear systems in communication engineering.
- Tounderstandthebasicconceptsofprobability,oneandtwodimensionalrandom
- Variables and to introduce some standard distributions applicable to engineering which can describe real life phenomenon.

UNIT-I PROBABILITY AND RANDOM VARIABLES 9+3

Axioms of probability – Conditional probability – Baye's theorem - Discrete and continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential and Normal distributions - Functions of a random variable.

UNIT-II TWO-DIMENSIONAL RANDOM VARIABLES 9+3

Joint distributions – Marginal and conditional distributions – Covariance – Correlation and linear regression – Transformation of random variables – Central limit theorem (for independent and identically distributed random variables).

UNIT–III RANDOM PROCESSES 9+3

Classification–Stationary process–Markov process-Poisson process-Discrete parameter Markov chain –Chapman Kolmogorov equations (Statement only) -Limiting distributions.

UNIT-IV VECTOR SPACES 9+3

Vector spaces–Sub paces–Linear combinations and linear system of equations–Linear independence and linear dependence – Bases and dimensions.

UNIT-V LINEAR TRANSFORMATION AND INNER PRODUCT SPACES 9+3

Linear transformation - Null spaces and ranges - Dimension theorem - Matrix representation of linear transformations - Inner product - Norms - Gram Schmidt orthogonalization process - Adjoint of linear operations – Least square approximation.

TOTAL:60 PERIODS

COURSEOUTCOMES:

Upon successful completion of the course, students will be able to:

CO1: Explain the fundamental concepts of advanced algebra and their role in modern mathematics and applied contexts.

CO2: Demonstrate accurate and efficient use of advanced algebraic techniques.

CO3: Apply the concept of random processes in engineering disciplines.

CO4: Understand the fundamental concepts of probability with a thorough knowledge of standard distributions that can describe certain real-life phenomenon.

CO5: Understand the basic concepts of one and two dimensional random variables and apply them to model engineering problems.

TEXT BOOKS :

1. Gross, D., Shortle, J.F, Thompson, J.M and Harris. C.M., "Fundamentals of Queueing Theory", Wiley Student 4th Edition, 2014.
2. Ibe,O.C.,"FundamentalsofAppliedProbabilityandRandomProcesses",Elsevier,1stIndian Reprint, 2007.
3. Friedberg. A.H., Insel. A.J. and Spence. L., "Linear Algebra", Prentice Hall of India, New Delhi, 4th Edition, 2004.

REFERENCES:

1. Hsu, "Schaum's Outline of Theory and Problems of Probability, Random Variables and Random Processes", Tata McGraw Hill Edition, New Delhi, 2004.
2. Trivedi,K.S.,"ProbabilityandStatisticswithReliability,QueueingandComputerScience Applications", 2nd Edition, John Wiley and Sons, 2002.
3. Yates,R.D.and Goodman.D.J.,"ProbabilityandStochasticProcesses",2ndEdition,Wiley India Pvt. Ltd., Bangalore, 2012.
4. Kolman.B.Hill.D.R.,"IntroductoryLinearAlgebra",PearsonEducation,NewDelhi,First Reprint, 2009.
5. Kumaresan. S., "Linear Algebra – A Geometric Approach", Prentice – Hall of India, New Delhi, Reprint, 2010.
1. Strang.G.,"LinearAlgebraanditsapplications",Thomson(Brooks/Cole),NewDelhi,2005.

CO's-PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	0	0	0	0	0	0	3	0	0	2	-	-	-
CO2	3	3	0	0	0	0	0	0	3	0	0	2	-	-	-
CO3	3	3	0	0	0	0	0	0	3	0	0	2	-	-	-
CO4	3	3	0	0	0	0	0	0	3	0	0	2	-	-	-
CO5	3	3	0	0	0	0	0	0	3	0	0	2	-	-	-
CO6	3	3	0	0	0	0	0	0	3	0	0	2	-	-	-

1-low,2-medium,3-high, '-'-no correlation

24UCS301 C PROGRAMMING AND DATA STRUCTURES LTPC
3 0 0 3

COURSE OBJECTIVES:

- To introduce the basics of C programming language.
- To learn the concepts of advanced features of C.
- To understand the concepts of ADT sand linear data structures.
- To know the concepts of non-linear data structure and hashing.
- To familiarize the concepts of sorting and searching techniques.

UNITI C PROGRAMMING FUNDAMENTALS (8+1 SKILL) 9

Data Types – Variables – Operations – Expressions and Statements – Conditional Statements – Functions – Recursive Functions – Arrays – Single and Multi-Dimensional Arrays.

UNITII C PROGRAMMING-ADVANCED FEATURES (8+1 SKILL) 9

Structures – Union – Enumerated Data Types – Pointers: Pointers to Variables, Arrays and Functions – File Handling – Preprocessor Directives.

UNITIII LINEAR DATA STRUCTURES (8+1 SKILL) 9

Abstract Data Types (ADTs) – List ADT – Array-Based Implementation – Linked List – Doubly- Linked Lists – Circular Linked List – Stack ADT – Implementation of Stack – Applications – Queue ADT – Priority Queues – Queue Implementation – Applications.

UNITIVNON-LINEAR DATA STRUCTURES (8+1 SKILL) 9

Trees –Binary Trees –Tree Traversals –Expression Trees –Binary Search Tree –Hashing - Hash Functions – Separate Chaining – Open Addressing – Linear Probing– Quadratic Probing – Double Hashing – Rehashing.

UNITV SORTING AND SEARCHING TECHNIQUES (8+1SKILL) 9

Insertion Sort –Quick Sort–Heap Sort–Merge Sort–Linear Search–Binary Search.

TOTAL: 45 PERIODS

SKILL DEVELOPMENT ACTIVITIES (Group Seminar/Mini Project/Assignment/Content Preparation / Quiz/ Surprise Test / Solving GATE questions/ etc) 5

COURSEOUTCOMES:

CO1: Develop C programs for any real world/technical application.

CO2: Apply advanced features of C in solving problems.

CO3: Write functions to implement linear and non–linear data structure operations.

CO4: Suggest and use appropriate linear/non–linear data structure operations for solving a given problem.

CO5: Appropriately use sort and search algorithms for a given application.

CO6: Apply appropriate hash functions that result in a collision free scenario for data storage and retrieval.

TEXTBOOKS:

1. Mark Allen Weiss,"Data Structures and Algorithm Analysis in C", Second Edition, Pearson Education, 1997.
2. Reema Thareja,"ProgramminginC",SecondEdition,OxfordUniversityPress,2016.

REFERENCES:

1. BrianW.Kernighan, RobPike,"The Practice of Programming ",Pearson Education, 1999.
2. PaulJ.Deitel, Harvey Deitel,"C Howto Program", Seventh Edition, Pearson Education, 2013.
3. Alfred V.Aho,John E.Hopcroft, Jeffrey D.Ullman," Data Structures and Algorithms",Pearson Education,1983.
4. Ellis Horowitz, Sartaj Sahni and Susan Anderson, "Fundamentals of Data Structures", Galgotia, 2008.

List of Open Source Software/ Learning website:

https://www.coursera.org/specializations/data-structures-algorithms
https://nptel.ac.in/courses/112107243
https://nptel.ac.in/courses/112105598

CO's-PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	3	1	2	2	1	1	-	1	2	1	3	2	1	3
2	1	2	1	2	2	-	-	-	1	1	1	2	2	2	2
3	2	3	1	2	3	-	-	-	1	1	1	2	2	1	2
4	2	1	-	1	1	-	-	-	2	1	1	2	2	3	1
5	1	2	1	2	2	1	1	-	1	2	1	3	2	2	3
CO	2	2	1	2	2	1	1	-	1	1	1	2	2	2	2

1-low,2-medium,3-high,'-'-nocorrelation

24UEC301 SIGNALS AND SYSTEMS L T P C
3 1 0 4

COURSE OBJECTIVES:

- To understand the basic properties of signal & systems
- To know the methods of characterization of LTI systems in time domain
- To analyze continuous time signals and system in the Fourier and Laplace domain
- To analyze discrete time signals and system in the Fourier and Z transform domain

UNIT I CLASSIFICATION OF SIGNALS AND SYSTEMS 6+6

Standard signals- Step, Ramp, Pulse, Impulse, Real and complex exponentials and Sinusoids - Classification of signals – Continuous time (CT) and Discrete Time (DT) signals, Periodic & A periodic signals, Deterministic & Random signals, Energy & Power signals – Classification of systems-CT systems and DT systems– Linear& Non linear, Time-variant& Time-invariant, Causal & Non-causal, Stable & Unstable.

UNIT II ANALYSIS OF CONTINUOUS TIME SIGNALS 6+6

Fourier series for periodic signals - Fourier Transform – properties- Laplace Transforms and Properties

UNIT III LINEAR TIME INVARIANT CONTINUOUS TIME SYSTEMS 6+6

Impulse response - convolution integrals- Differential Equation- Fourier and Laplace transforms in Analysis of CT systems - Systems connected in series / parallel.

UNIT IV ANALYSIS OF DISCRETE TIME SIGNALS 6+6

Baseband signal Sampling–Fourier Transform of discrete time signals (DTFT)–Properties of DTFT - Z Transform & Properties

UNIT V LINEAR TIME INVARIANT-DISCRETE TIME SYSTEMS 6+6

Impulse response–Difference equations-Convolution sum- Discrete Fourier Transform and Z Transform Analysis of Recursive & Non-Recursive systems-DT systems connected in series and parallel.

TOTAL: 30+30PERIODS

COURSEOUTCOMES:

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

CO1: determine if a given system is linear/causal/stable

CO2: determine the frequency components present in a deterministic signal

CO3: characterize continuous LTI systems in the time domain and frequency domain

CO4: characterize discrete LTI systems in the time domain and frequency domain

CO5: compute the output of an LTI system in the time and frequency domains

TEXTBOOKS:

1. Oppenheim,WillskyandHamid,“SignalsandSystems”,2ndEdition,PearsonEducation, New Delhi, 2015.(Units I - V)
2. SimonHaykin,BarryVanVeen,“SignalsandSystems”,2ndEdition,Wiley,2002

REFERENCES:

1. B.P.Lathi,"PrinciplesofLinearSystemsandSignals",2nd Edition,Oxford,2009.
2. M.J.Roberts,"SignalsandSystemsAnalysisusingTransformmethodsandMATLAB", McGraw- Hill Education, 2018.
3. JohnAlanStuller,"AnIntroductiontoSignalsandSystems",Thomson,2007.

CO's-PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	-	3	-	3	2	-	-	-	-	-	3	-	-	1
2	3	-	3	-	-	2	-	-	-	-	-	3	-	3	-
3	3	3	-	-	3	2	-	-	-	-	-	3	2	-	-
4	3	3	-	-	3	2	-	-	-	-	-	3	-	3	1
5	3	3	-	3	3	2	-	-	-	-	-	3	-	3	1
CO	**3**	**3**	**3**	**3**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**3**	**2**	**3**	**1**

1-low,2-medium,3-high,'-'-nocorrelation

24UEC302 ELECTRONIC DEVICES AND CIRCUITS L TPC
3 0 0 3

COURSEOBJECTIVES:

- To give a comprehensive exposure to all types of devices and circuits constructed with discrete components. This helps to develop a strong basis for building linear and digital integrated circuits
- To analyze the frequency response of small signal amplifiers
- To design and analyze single stage and multi stage amplifier circuits
- To study about feedback amplifiers and oscillators principles
- To understand the analysis and design of multi vibrators

UNIT I SEMICONDUCTOR DEVICES 9

PN junction diode, Zener diode, BJT, MOSFET, UJT –structure, operation and V-I characteristics, diffusion and transition capacitance - Rectifiers – Half Wave and Full Wave Rectifier, Zener as regulator

UNIT II AMPLIFIERS 9

Load line, operating point, biasing methods for BJT and MOSFET**,** BJT small signal model – Analysis of CE, CB, CC amplifiers- Gain and frequency response –MOSFET small signal model– Analysis of CS, CG and Source follower – Gain and frequency response- High frequency analysis.

UNIT III MULTI STAGE AMPLIFIERS AND DIFFERENTIAL AMPLIFIER 9

Cascade amplifier, Differential amplifier– Common mode and Difference mode analysis – MOSFET input stages – tuned amplifiers – Gain and frequency response – Neutralization methods.

UNIT IV FEEDBACK AMPLIFIERS AND OSCILLATORS 9

Advantages of negative feedback –Voltage/Current, Series, Shunt feedback Amplifiers– positive feedback–Condition for oscillations, phase shift – Wien bridge, Hartley, Colpitts and Crystal oscillators.

UNIT V POWER AMPLIFIERS AND DC/DC CONVERTERS 9

Power amplifiers- class A-Class B-Class AB-Class C-Power MOSFET-Temperature Effect-Class AB Power amplifier using MOSFET –DC/DC convertors – Buck, Boost, Buck-Boost analysis and design.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

CO1: Explain the structure and working operation of basic electronic devices.

CO2: Design and analyze amplifiers.

CO3: Analyze frequency response of BJT and MOSFET amplifiers

CO4: Design and analyze feedback amplifiers and oscillator principles.

CO5: Design and analyze power amplifiers and supply circuits

TEXTBOOKS:

1. David A. Bell, "Electronic Devices and Circuits", Oxford Higher Education press, 5 th Edition, 2010.
2. RobertL.Boylestad and Louis Nasheresky,“Electronic Devices and Circuit Theory”,10th Edition, Pearson Education / PHI, 2008.

3. Adel .S. Sedra, Kenneth C. Smith, "Micro Electronic Circuits", Oxford University Press, 7th Edition, 2014.

REFERENCES:

1. Donald.A.Neamen,"Electronic Circuit Analysis and Design", Tata McGrawHill,3rdEdition, 2010.
2. D.Schillingand C .Belove, "Electronic Circuits",McGrawHill,3rdEdition,1989
3. MuhammadH .Rashid, "Power Electronics", Pearson Education/PHI,2004.

CO's-PO's & PSO's MAPPING

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
1	3	3	3	3	2	1	-	-	-	-	-	1	2	1	1
2	3	2	2	3	2	2	-	-	-	-	-	1	2	1	1
3	3	3	3	2	1	2	-	-	-	-	-	1	2	1	1
4	3	3	2	3	2	2	-	-	-	-	-	1	2	1	1
5	3	2	3	2	2	1	-	-	-	-	-	1	2	1	1
CO	**3**	**3**	**3**	**3**	**2**	**2**	-	-	-	-	-	**1**	**2**	**1**	**1**

1-low,2-medium,3-high,'-'-nocorrelation

24UEC303 **CONTROL SYSTEMS** **L T P C**
3 0 0 3

COURSEOBJECTIVES:

- To introduce the components and their representation of control systems
- To learn various methods for analyzing the time response, frequency response and stability of the systems.
- To learn the various approach for the state variable analysis.

UNITI SYSTEMS COMPONENTS AND THEIR REPRESENTATION **9**

Control System: Terminology and Basic Structure-Feed forward and Feedback control theory-Electrical and Mechanical Transfer Function Models-Block diagram Models-Signal flow graphs models-DC and AC servo Systems-Synchronous -Multivariable control system

UNITII TIME RESPONSEANALYSIS **9**

Transient response-steady state response-Measures of performance of the standard first order and second order system-effect on an additional zero and an additional pole-steady error constant and system- type number-PID control-Analytical design for PD, PI,PID control systems

UNITIII FREQUENCY RESPONSE AND SYSTEM ANALYSIS **9**

Closed loop frequency response-Performance specification in frequency domain-Frequency response of standard second order system- Bode Plot - Polar Plot- Nyquist plots-Design of compensators using Bode plots-Cascade lead compensation-Cascade lag compensation-Cascade lag-lead compensation

UNITIV CONCEPTS OF STABILITY ANALYSIS **9**

Concept of stability-Bounded - Input Bounded - Output stability-Routh stability criterion-Relative stability-Root locus concept-Guidelines for sketching root locus-Nyquist stability criterion.

UNITV CONTROLSYSTEMANALYSISUSINGSTATEVARIABLEMETHODS **9**

State variable representation-Conversion of state variable models to transfer functions-Conversion of transfer functions to state variable models-Solution of state equations-Concepts of Controllability and Observability-Stability of linear systems-Equivalence between transfer function and state variable representations-State variable analysis of digital control system-Digital control design using state feedback.

TOTAL: 45 PERIODS

COURSEOUTCOMES:

Upon successful completion of the course the student will be able to

CO1: Compute the transfer function of different physical systems.

CO2: Analyse the time domain specification and calculate the steady state error.

CO3: Illustrate the frequency response characteristics of open loop and closed loop system response.

CO4: Analyse the stability using Routh and root locus techniques.

CO5: Illustrate the state space model of a physical system and discuss the concepts of sampled data control system.

TEXTBOOK:

1. M.Gopal, "ControlSystem–Principles and Design", Tata Mc Graw Hill,4thEdition,2012.

REFERENCE:

1. J.Nagrathand M.Gopal, "Control System Engineering",New Age International Publishers,5th Edition, 2007.
2. K.Ogata,"Modern Control Engineering",PHI,5thEdition,2012.
3. S.K.Bhattacharya,"Control System Engineering",Pearson,3rdEdition,2013.
4. Benjamin.C.Kuo,"Automatic Control Systems",Prentice HallofIndia,7thEdition,1995.
5.

CO's-PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3	2	2	2	-	-	-	-	2	3	3	3	3
2	3	3	3	3	2	3	-	-	-	-	2	2	3	3	3
3	3	2	3	3	2	2	-	-	-	-	2	3	3	2	3
4	3	3	3	2	2	2	-	-	-	-	2	2	3	3	3
5	2	2	3	3	2	3	-	-	-	-	2	3	2	2	3
CO	3	3	3	3	2	2	-	-	-	-	2	3	3	3	3

1-low,2-medium,3-high,'-'-nocorrelation

24UEC311 **DIGITAL SYSTEM SDESIGN** **LTPC**
3 0 2 4

COURSEOBJECTIVES:

- To present the fundamentals of digital circuits and simplification methods
- To practice the design of various combinational digital circuits using logic gates
- To bring out the analysis and design procedures for synchronous and asynchronous Sequential circuits
- To learn integrated circuit families.
- To introduce semiconductor memories and related technology

UNIT BASIC CONCEPTS **9**

Review of number systems-representation-conversions, Review of Boolean algebra- theorems, sum of product and product of sum simplification, canonical forms min term and max term, Simplification of Boolean expressions-Karnaugh map, completely and incompletely specified functions, Implementation of Boolean expressions using universal gates, Tabulation methods.

UNIT II COMBINATIONAL LOGIC CIRCUITS **9**

Problem formulation and design of combinational circuits - Code-Converters, Half and Full Adders, Binary Parallel Adder – Carry look ahead Adder, BCD Adder, Magnitude Comparator, Decoder, Encoder, Priority Encoder, Mux/Demux, Case study: Digital trans-receiver / 8 bit Arithmetic and logic unit, Parity Generator/Checker, Seven Segment display decoder

UNITIII SYNCHRONOUS SEQUENTIAL CIRCUITS **9**

Latches, Flip flops – SR, JK, T, D, Master/Slave FF, Triggering of FF, Analysis and design of clocked sequential circuits – Design - Moore/Mealy models, state minimization, state assignment, lock - out condition circuit implementation - Counters, Ripple Counters, Ring Counters, Shift registers, Universal Shift Register. Model Development: Designing of rolling display/real time clock

UNITIV ASYNCHRONOUS SEQUENTIAL CIRCUITS **9**

Stable and Unstable states, output specifications, cycles and races, state reduction, race free assignments, Hazards, Essential Hazards, Fundamental and Pulse mode sequential circuits, Design of Hazard free circuits.

UNITV LOGIC FAMILIES ANDP ROGRAMMABLE LOGIC DEVICES **9**

Logic families-Propagation Delay, Fan –In and Fan-Out-Noise Margin-RTL,TTL,ECL, CMOS - Comparison of Logic families - Implementation of combinational logic/sequential logic design using standard ICs, PROM, PLA and PAL, basic memory, static ROM,PROM,EPROM,EEPROM EAPROM.

45 PERIODS

PRACTICAL EXERCISES: **30PERIODS**

1. Design of adders and subtractors &code converters.
2. Design of Multiplexers & Demultiplexers.
3. Design of Encoders and Decoders.
4. Design of Magnitude Comparators
5. Design and implementation of counters using flip-flops
6. Design and implementation of shift registers.

COURSEOUTCOMES:

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

CO1: Use Boolean algebra and simplification procedures relevant to digital logic.
CO2: Design various combinational digital circuits using logic gates.
CO3: Analyse and design synchronous sequential circuits.
CO4: Analyse and design asynchronous sequential circuits.
CO5: Build logic gates and use programmable devices

TOTAL: 75 PERIODS

TEXT BOOKS:

1. M. MorrisManoandMichaelD.Ciletti,'DigitalDesign',Pearson,5thEdition,2013.(Unit-I- V)

REFERENCES:

1. CharlesH.Roth,Jr,'Fundamentals of Logic Design',JaicoBooks,4thEdition,2002.
2. WilliamI.Fletcher,"An Engineering Approach to Digital Design", Prentice-Hall of India, 1980.
3. FloydT.L., "Digital Fundamentals", CharlesE.Merrilpublishingcompany,1982.
4. John.F. Wakerly,"Digital Design Principles and Practices, Pearson Education,4thEdition,2007.

CO's-PO's&PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	2	2	-	2	-	-	-	-	3	3	3	3	2
2	-	-	-	-	-	-	-	-	-	-	2	1	2	3	2
3	-	3	3	2	-	2	-	-	-	-	2	2	3	3	2
4	-	-	-	-	-	-	-	-	-	-	3	2	2	3	1
5	-	3	3	3	-	-	-	-	-	-	2	2	3	3	2
CO	**3**	**2.6**	**2.6**	**2.3**	**-**	**2**	**-**	**-**	**-**	**-**	**2**	**2**	**3**	**3**	**2**

1-low,2-medium,3-high,'-'-nocorrelation

24UEC321 ELECTRONIC DEVICES AND CIRCUITS LABORATORY L T P C
0 0 3 1.5

COURSEOBJECTIVES

- To learn the characteristics of PN Junction diode and Zener diode.
- To understand the operation of rectifiers and filters.
- To study the characteristics of amplifier.

LISTOF EXPERIMENTS

1. Characteristics of PN Junction Diode and Zener diode.
2. Full Wave Rectifier with Filters.
3. Design of Zener diode Regulator.
4. Common Emitter input-output Characteristics.
5. MOSFET Drain current and Transfer Characteristics.
6. Frequency response of CE and CS amplifiers.
7. Frequency response of CB and CC amplifiers.
8. Frequency response of Cascode Amplifier
9. CMRR measurement of Differential Amplifier
10. Class A Transformer Coupled Power Amplifier.

COURSEOUTCOMES

At the end of the laboratory course, the student will be able to understand the

CO1: Characteristics of PN Junction Diode and Zener diode.

CO2: Design and Testing of BJT and MOSFET amplifiers.

CO3: Operation of power amplifiers.

TOTAL:45 PERIODS

REFERENCE:

XYZ of Oscilloscope–Application note: Tektronix USA.

CO's-PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	2	3	3	2	1	-	-	-	-	-	1	2	1	1
2	2	2	3	3	2	1	-	-	-	-	-	1	2	1	1
3	2		2		1	1	-	-	-	-	-	1	2	1	1
4	-	-	-	-	3	1	-	-	-	-	-	1	2	1	1
5	-	-	-	-	2	1	-	-	-	-	-	1	2	1	1
CO	**2**	**2**	2.6	**3**	**2**	**1**	-	-	-	-	-	**1**	**2**	**1**	**1**

1-low,2-medium,3-high,'-'-nocorrelation

24UCS321 C PROGRAMMING AND DATA STRUCTURES LABORATORY L T P C
0 0 3 1.5

COURSEOBJECTIVES:

- To develop applications in C
- To implement linear and non-linear data structures
- To understand the different operations of search trees
- To get familiarized to sorting and searching algorithms

LISTOF EXPERIMENTS

1. PracticeofCprogrammingusingstatements,expressions,decisionmakinganditerative statements
2. Practice of C programming using Functions and Arrays
3. Implement C programs using Pointers and Structures
4. Implement C programs using Files
5. Development of real time C applications
6. Array implementation of List ADT
7. Array implementation of Stack and Queue ADTs
8. Linked list implementation of List, Stack and Queue ADTs
9. Applications of List, Stack and Queue ADTs
10. Implementation of Binary Trees and operations of Binary Trees
11. Implementation of Binary Search Trees
12. Implementation of searching techniques
13. Implementation of Sorting algorithms: Insertion Sort, Quick Sort, Merge Sort
14. Implementation of Hashing–any two collision techniques

TOTAL:45 PERIODS

COURSEOUTCOMES:

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

CO1: Use different constructs of C and develop applications

CO2: Write functions to implement linear and non-linear data structure operations

CO3: Suggest and use the appropriate linear/non-linear data structure operations for a given problem

CO4: Apply appropriate hash functions that result in a collision free scenario for data storage and Retrieval

CO5: Implement Sorting and searching algorithms for a given application

CO's-PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	3	1	2	2	1	1	-	1	2	1	3	2	1	3
2	1	2	1	2	2	-	-	-	1	1	1	2	2	2	2
3	2	3	1	2	3	-	-	-	1	1	1	2	2	1	2
4	2	1	-	1	1	-	-	-	2	1	1	2	2	3	1
5	1	2	1	2	2	1	1	-	1	2	1	3	2	2	3
Avg	2	2	1	2	2	1	1	-	1	1	1	2	2	2	2

1-low,2-medium,3-high,'-'-nocorrelation

24UEC331 **Skill Development Course I** **L T P C**
0 0 2 2

VLSI Front-End Design

Course Description

The Skill-Based Course on **VLSI Front-End Design: Verilog/VHDL Programming** provides students with practical knowledge and hands-on experience in hardware description languages (HDLs) and FPGA-based digital system design. The course introduces the fundamentals of VLSI front-end design flow, FPGA architecture, and EDA tools used in modern digital design industries. Students will learn to model combinational and sequential circuits using Verilog/VHDL, develop and simulate test benches, and implement digital designs on FPGA platforms. The course also covers synthesis, place-and-route, constraint mapping, FPGA programming, and hardware debugging techniques, enabling learners to bridge the gap between theoretical digital electronics and real-time hardware implementation.

Course Objectives

1. To introduce the fundamentals of VLSI front-end design flow, FPGA architecture, and Hardware Description Languages (Verilog/VHDL).
2. To develop the ability to design and simulate combinational and sequential digital circuits using HDL modeling techniques.
3. To provide practical exposure to FPGA synthesis, implementation, and programming using industry-standard EDA tools.
4. To enable students to perform hardware verification, debugging, and optimization of FPGA-based digital systems.

Module 1: Introduction to HDLs & FPGA Basics (2 Hours)

- Introduction to VLSI Design Flow (Front-End vs. Back-End)
- Introduction to Hardware Description Languages (Verilog and VHDL)
- FPGA Architecture Basics (CLBs, I/O Blocks, and Interconnects)
- EDA Tools: Introduction to Xilinx Vivado, ModelSim, or Quartus Prime [1, 2]

Module 2: Combinational Circuit Design (5 Hours)

- Writing RTL code for basic logic gates, Half Adder, and Full Adder
- Implementing Mux/Demux, Encoders, and Decoders
- Behavioral vs. Dataflow vs. Structural modeling styles
- Testbench creation and simulation [1, 2]

Module 3: Sequential Circuit Design (6 Hours)

- Writing RTL code for Flip-Flops (SR, D, JK, T) and Registers
- Design of synchronous and asynchronous counters
- Finite State Machines (FSMs): Mealy and Moore machine modeling
- State encoding techniques and reset conditions [1, 2, 3]

Module 4: FPGA Implementation & Hardware Debugging (7 Hours)

- Synthesis process, mapping, and Place & Route (P&R)
- Bit stream generation and FPGA programming (JTAG configuration)
- Constraint mapping (assigning I/O pins and clock frequencies)
- Hardware debugging using on-chip logic analyzers [1, 2]

Course Outcomes:

After successful completion of the course, the students will be able to:

- Understand the fundamentals of VLSI front-end design flow, FPGA architecture, and hardware description languages such as Verilog and VHDL.
- Develop RTL code for combinational logic circuits using different HDL modeling styles and perform functional simulation using test benches.
- Design and implement sequential circuits, counters, registers, and finite state machines using Verilog/VHDL.
- Apply synthesis, place-and-route, and FPGA programming techniques using industry-standard EDA tools.
- Perform hardware verification and debugging of FPGA-based digital systems using constraint mapping and on-chip debugging tools.

Recommended Textbooks & Software

- **Software Tools:** Xilinx Vivado (or Vitis), Intel Quartus, Model Sim
- **Reference Book:** *Verilog HDL: A Guide to Digital Design and Synthesis* by Samir Palnitkar
- **Reference Book:** *Digital Design: Principles and Practices* by John F. Wakerly

COs \ POs & PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	–	–	2	–	–	–	–	–	–	1	3	1	2
CO2	3	3	2	2	3	–	–	–	1	1	–	1	3	1	2
CO3	3	3	3	2	3	–	–	–	1	1	–	1	3	2	2
CO4	3	2	3	2	3	–	–	–	1	1	1	1	3	2	3
CO5	3	3	2	3	3	–	–	–	1	1	–	2	3	2	3

24UEC401 **ELECTRO MAGNETIC FIELDS** **LTPC**
3 0 0 3

COURSEOBJECTIVES:

- To impart knowledge on the basics of static electric field and the associated laws
- To impart knowledge on the basics of static magnetic field and the associated laws
- To give insight into coupling between electric and magnetic fields through Faraday's law, displacement current and Maxwell's equations
- To gain the behavior of the propagation of EM waves
- To study the significance of Time varying fields.

UNIT I INTRODUCTION **9**

Electromagnetic model, Units and constants, Review of vector algebra, Rectangular, cylindrical and spherical coordinate systems, Line, surface and volume integrals, Gradient of a scalar field, Divergence of a vector field, Divergence theorem, Curl of a vector field, Stoke's theorem, Null identities, Helmholtz's theorem, Verify theorems for different path, surface and volume.

UNIT II ELECTRO STATICS **9**

Electric field, Coulomb's law, Gauss's law and applications, Electric potential, Conductors in static electric field, Dielectrics in static electric field, Electric flux density and dielectric constant, Boundary conditions, Electro statics boundary value problems, Capacitance, Parallel, cylindrical and spherical capacitors, Electrostatic energy, Poisson's and Laplace's equations, Uniqueness of electrostatic solutions, Current density and Ohm's law, Electromotive force and Kirchhoff's voltage law, Equation of continuity and Kirchhoff's current law

UNIT III MAGNETO STATICS **9**

Lorentz force equation, Ampere's law, Vector magnetic potential, Biot-Savart law and applications, Magnetic field intensity and idea of relative permeability, Calculation of magnetic field intensity for various current distributions Magnetic circuits, Behaviour of magnetic materials, Boundary conditions, Inductance and inductors, Magnetic energy, Magnetic forces and torques

UNIT IV TIME-VARYING FIELDS AND MAXWELL's EQUATIONS **9**

Faraday's law, Displacement current and Maxwell-Ampere law, Maxwell's equations, Potential functions, Electromagnetic boundary conditions, Wave equations and solutions, Time-harmonic fields, Observing the Phenomenon of wave propagation with the aid of Maxwell's equations

UNIT V PLANE ELECTRO MAGNETIC WAVES **9**

Plane waves in lossless media, Plane waves in lossy media (low-loss dielectrics and good conductors), Group velocity, Electromagnetic power flow and Poynting vector, Normal incidence at a plane conducting boundary, Normal incidence at a plane dielectric boundary

COURSEOUTCOMES:

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

CO1: Relate the fundamentals of vector, co ordinate system to electromagnetic concepts

CO2: Analyze the characteristics of Electro static field

CO3: Interpret the concepts of Electric field in material space and solve the boundary conditions

CO4: Explain the concepts and characteristics of Magneto Static field in material space and solve boundary conditions.

CO5: Determine the significance of time varying fields

TOTAL:45 PERIODS

TEXTBOOKS

1. D.K.Cheng,Fieldandwaveelectromagnetics,2nded.,Pearson(India),2002
2. M.N.O.SadikuandS.V.Kulkarni,Principlesofelectromagnetics,6thed.,Oxford(AsianEditio n), 2015

REFERENCES

1. Edward C. Jordan & Keith G .Balmain, Electro magnetic waves and Radiating Systems, Second Edition, Prentice-Hall Electrical Engineering Series, 2012.
2. W.H.HaytandJ.A.Buck,Engineeringelectromagnetics,7thed.,McGraw-Hill(India), 2006
3. B.M.Notaros, Electromagnetics, Pearson: New Jersey, 2011

CO's-PO's & PSO's MAPPING

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

1-low,2-medium,3-high, '-'-no correlation

24UEC411 NETWORKS AND SECURITY L T P C
3 0 2 4

COURSE OBJECTIVES:

- To learn the Network Models and data link layer functions.
- To understand routing in the Network Layer.
- To explore methods of communication and congestion control by the Transport Layer.
- To study the Network Security Mechanisms.
- To learn various hardware security attacks and their counter measures**.**

UNITI NETWORK MODELS AND DATA LINK LAYER 9

Overview of Networks and its Attributes –Network Models–OSI,TCP/IP, Addressing – Introduction to Data link Layer – Error Detection and Correction – Ethernet(802.3)- Wireless LAN – IEEE 802.11, Bluetooth– Flow and Error Control Protocols – HDLC – PPP.

UNITII NETWORK LAYER PROTOCOLS 9

Network Layer – IPv4 Addressing – Network Layer Protocols (IP, ICMP and Mobile IP) Uni cast and Multicast Routing – Intra domain and Inter domain Routing Protocols – IPv6 Addresses – IPv6 – Datagram Format - Transition from IPv4 to IPv6.

UNITIII TRANSPORT AND APPLICATION LAYERS 9

Transport Layer Protocols – UDP and TCP Connection and State Transition Diagram - Congestion Control and Avoidance (DEC bit, RED)- QoS -Application Layer Paradigms – Client – Server Programming – Domain Name System – World Wide Web, HTTP, Electronic Mail.

UNITIV NETWORK SECURITY 9

OSI Security Architecture – Attacks – Security Services and Mechanisms – Encryption – Advanced Encryption Standard – Public Key Cryptosystems – RSA Algorithm – Hash Functions – Secure Hash Algorithm – Digital Signature Algorithm.

UNIT V HARDWARE SECURITY **9**

Introduction to hard ware security, Hardware Trojans, Side–Channel Attacks–Physical Attacks and Counter measures – Design for Security. Introduction to Blockchain Technology.

45 PERIODS

PRACTICAL EXERCISES: **30 PERIODS**

Experiments using C

1. Implement the Data Link Layer framing methods,
   i) Bit stuffing,(ii) Character stuffing
2. Implementation of Error Detection/Correction Techniques
   i) LRC,(ii)CRC,(iii)Hamming code
3. Implementation of Stop and Wait, and Sliding Window Protocols
4. Implementation of Go back- Nand Selective Repeat Protocols.
5. Implementation of Distance Vector Routing algorithm (Routing Information Protocol) (Bellman-Ford).
6. Implementation of Link State Routing algorithm (Open Shortest Path First) with 5 nodes (Dijkstra's).
7. Data encryption and decryption using Data Encryption Standard algorithm.
8. Data encryption and decryption using RSA (Rivest, Shamir and Adleman) algorithm.
9. Implement Client Server model using FTP protocol.

Experiments using Tool Command Language

1. Implement and realize the Network Topology-Star, Bus and Ring using NS2.
2. Implement and perform the operation of CSMA/CD and CSMA/CA using NS2.

COURSE OUTCOMES:

Upon successful completion of the course the student will be able to

CO1: Explain the Network Models, layers and functions.
CO2: Categorize and classify the routing protocols.
CO3: List the functions of the transport and application layer.
CO4: Evaluate and choose the network security mechanisms.
CO5: Discuss the hardware security attacks and counter measures.

TOTAL:75 PERIODS

TEXTBOOKS

1. Behrouz.A.Forouzan, Data Communication and Networking, Fifth Edition, TMH,2017.(Unit – I,II,III)
2. William Stallings, Cryptography and Network Security, Seventh Edition, Pearson Education, 2017(Unit- IV)
3. Bhunia Swarup, Hardware Security –AHands On Approach ,Morgan Kaufmann, First edition, 2018.(Unit – V).

REFERENCES

1. James.F.Kurose and Keith.W.Ross, Computer Networking – A Top – Down Approach, Sixth Edition, Pearson, 2017.
2. Doughlas.E.Comer,ComputerNetworksandInternetswithInternetApplications,Fourth Edition, Pearson Education, 2008.

24UEC402 LINEAR INTEGRATED CIRCUITS LTPC
3 0 0 3

COURSE OBJECTIVES:

- To introduce the basic building blocks of linear integrated circuits
- To learn the linear and non-linear applications of operational amplifiers
- To introduce the theory and applications of analog multipliers and PLL
- To learn the theory of ADC and DAC
- To introduce the concepts of waveform generation and introduce some special function ICs

UNIT I BASICS OF OPERATIONAL AMPLIFIERS 9

Current mirror and current sources, Current sources as active loads, Voltage sources, Voltage References, BJT Differential amplifier with active loads, Basic information about op-amps – Ideal Operational Amplifier - General operational amplifier stages -and internal circuit diagrams of IC 741, DC and AC performance characteristics, slew rate, Open and closed loop configurations – MOSFET Operational Amplifiers – LF155 and TL082.

UNIT II APPLICATIONS OF OPERATIONAL AMPLIFIERS 9

Sign Changer, Scale Changer, Phase Shift Circuits, Voltage Follower, V-to-I andI-to-V converters, adder, subtractor, Instrumentation amplifier, Integrator, Differentiator, Logarithmic amplifier, Antilogarithmic amplifier, Comparators, Schmitt trigger, Precision rectifier, peak detector, clipper and clamper, Low-pass, high-pass and band-pass Butterworth filters.

UNIT III ANALOG MULTIPLIER AND PLL 9

Analog Multiplier using Emitter Coupled Transistor Pair - Gilbert Multiplier cell – Variable transconductance technique, analog multiplier ICs and their applications, Operation of the basic PLL, Closed loop analysis, Voltage controlled oscillator, Monolithic PLL IC 565, application of PLL for AM detection, FM detection, FSK modulation and demodulation and Frequency synthesizing and clock synchronization

UNIT IV ANALOG TO DIGITAL AND DIGITAL TO ANALOG CONVERTERS 9

Analog and Digital Data Conversions ,D/A converter –specifications- weighted resistor type, R-2R Ladder type, Voltage Mode and Current-Mode *R - 2R* Ladder types - switches for D/A converters, high speed sample-and-hold circuits, A/D Converters – specifications - Flash type - Successive Approximation type - Single Slope type – Dual Slope type - A/D Converter using Voltage-to-Time Conversion - Over-sampling A/D Converters, Sigma – Delta converters.

UNIT V WAVEFORM GENERATORS AND SPECIAL FUNCTIONICS 9

Sine-wave generators, Multivibrators and Triangular wave generator, Saw-tooth wave generator, ICL8038 function generator, Timer IC 555, IC Voltage regulators – Three terminal fixed and adjustable voltage regulators - IC 723 general purpose regulator - Monolithic switching regulator, Low Drop – Out(LDO) Regulators - Switched capacitor filter IC MF10, Frequency to Voltage and Voltage to Frequency converters, Audio Power amplifier, Video Amplifier, Isolation Amplifier, Opto- couplers and fibre optic IC

COURSE OUTCOMES:

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

CO1: Design linear and nonlinear applications of OP–AMPS

CO2 : Design applications using analog multiplier and PLL

CO3 : Design ADC and DAC using OP – AMPS

CO4 : Generate waveforms using OP–AMP Circuits

CO5 : Analyze special function ICs

TOTAL:45 PERIODS

TEXTBOOK

1. 1.D.Roy Choudhry, Shail Jain, "Linear Integrated Circuits", New Age International Pvt. Ltd., 2018, Fifth Edition. (Unit I – V)
2. 2.Sergio Franco, "Design with Operational Amplifiers and Analog Integrated Circuits", 4thEdition, Tata Mc Graw-Hill, 2016 (Unit I – V)

REFERENCES

1. RamakantA.Gayakwad,"OP-AMPandLinearICs",4thEdition,PrenticeHall/Pearson Education, 2015
2. Robert F. Coughlin, Frederick F. Driscoll, "Operational Amplifiers and Linear Integrated Circuits", Sixth Edition, PHI, 2001.
3. S. Saliva Hanan &V.S. Kanchana Bhaskaran, "Linear Integrated Circuits", TMH, 2nd Edition, 4th Reprint, 2016.

CO's-PO's & PSO's MAPPING

C	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO1	PO1	PO1	PSO	PSO	PSO
1	2	-	-	-	-	-	-	-	-	-	1	-	2	1	1
2	2	3	3	2	-	-	-	-	-	-	-	-	2	1	1
3	1	-	-	2	-		-	-	-	-	-	-	2	1	1
4	1	-	-	2	-	-	-	-	-	-	-	-	2	1	1
5	1	2	3	3	-	-	-	-	-	-	-	3	2	1	1
C	**1.4**	**2.5**	**3**	**2.2**	-	-	-	-	-	-	**1**	**3**	**2**	**1**	**1**

1-low,2-medium,3-high,'-'-nocorrelation

24UEC412 DIGITAL SIGNAL PROCESSING LTPC 3024

COURSE OBJECTIVES:

- To learn discrete Fourier transform , properties of DFT and its application to linear filtering
- To understand the characteristics of digital filters, design digital IIR and FIR filters and apply these filters to filter undesirable signals in various frequency bands
- To understand the effects of finite precision representation on digital filters
- To understand the fundamental concepts of multirate signal processing and its applications
- **T**o introduce the concepts of adaptive filters and its application to communication engineering

UNIT I DISCRETE FOURIER TRANSFORM 9

Sampling Theorem, concept of frequency in discrete-time signals, summary of analysis & synthesis equations for FT & DTFT, frequency domain sampling, Discrete Fourier transform (DFT) - deriving DFT from DTFT, properties of DFT -periodicity, symmetry, circular convolution. Linear filtering using DFT. Filtering long data sequences - overlap save and overlap add method. Fast computation of DFT-Radix-2Decimation-in-time (DIT)Fast Fourier transform (FFT), Decimation-in-frequency (DIF) Fast Fourier transform (FFT). Linear filtering using FFT.

UNIT II INFINITE IMPULSE RESPONSE FILTERS 9

Characteristics of practical frequency selective filters. characteristics of commonly used analog filters- Butterworth filters, Chebyshev filters. Design of IIR filters from analog filters (LPF, HPF, BPF, BRF) – Approximation of derivatives, Impulse invariance method, Bilinear transformation.

Frequency transformation in the analog domain. Structure of IIR filter - direct form I, direct form II, Cascade, parallel realizations.

UNIT III FINITE IMPULSE RESPONSE FILTERS **9**

Design of FIR filters - symmetric and Anti-symmetric FIR filters - design of linear phase FIR filters using Fourier series method - FIR filter design using windows (Rectangular, Hamming and Hanning window), Frequency sampling method. FIR filter structures - linear phase structure, direct form realizations

UNIT IV FINITE WORD LENGTH EFFECTS **9**

Fixed point and floating point number representation-ADC-quantization-truncation and rounding - quantization noise - input / output quantization - coefficient quantization error – product quantization error - overflow error - limit cycle oscillations due to product quantization and summation - scaling to prevent overflow.

UNIT V DSP APPLICATIONS **9**

Multirate signal processing: Decimation, Interpolation, Sampling rate conversion by a rational factor – Adaptive Filters: Introduction, Applications of adaptive filtering to equalization-DSP Architecture- Fixed and Floating point architecture principles

45 PERIODS

PRACTICAL EXERCISES: 30 PERIODS

MATLAB/EQUIVALENTS OF TWARE PACKAGE/DSP PROCESSOR BASED IMPLEMENTATION

1. Generation of elementary Discrete-Time sequences
2. Linear and Circular convolutions
3. Autocorrelation and Cross Correlation
4. Frequency Analysis using DFT
5. Design of FIR filters(LPF/HPF/BPF/BSF)and demonstrates the filtering operation
6. Design of Butterworth and Chebyshev IIR filters (LPF/HPF/BPF/BSF) and demonstrate the filtering operations
7. Study of architecture of Digital Signal Processor
8. Perform MAC operation using various addressing modes
9. Generation of various signals and random noise
10. Design and demonstration of FIR Filter for Lowpass, Highpass, Bandpass and Band stop filtering
11. Design and demonstration of Butterworth and Chebyshev IIR Filters for Lowpass, High pass, Band pass and Band stop filtering
12. Implement an Up-sampling and Down-sampling operation in DSP Processor

COURSE OUTCOMES:

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

CO1: Apply DFT for the analysis of digital signals and systems
CO2: Design IIR and FIR filters
CO3: Characterize the effects of finite precision representation on digital filters
CO4: Design multirate filters
CO5: Apply adaptive filters appropriately in communication systems

TOTAL:75 PERIODS

TEXTBOOKS:

1. 1.JohnG.Proakis and Dimitris G.Manolakis,Digital Signal Processing–Principles, Algorithms and Applications, Fourth Edition, Pearson Education / Prentice Hall, 2007.
2. 2.A. V. Oppenheim, R.W. Schafer and J.R. Buck, ―Discrete-Time Signal Processing", 8thIndian Reprint, Pearson, 2004.

REFERENCES

1. EmmanuelC.Ifeachor&Barrie.W.Jervis,"DigitalSignalProcessing",SecondEdition, Pearson Education / Prentice Hall, 2002.
2. 2.Sanjit K. Mitra, "Digital Signal Processing – A Computer Based Approach", Tata Mc Graw Hill, 2007.
3. 3.Andreas Antoniou,"DigitalSignalProcessing",TataMcGrawHill,2006.

CO's-PO's &PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3	3	2	2	-	-	-	-	1	1	3	3	2
2	3	3	3	3	2	2	-	-	-	-	1	1	2	2	2
3	3	3	**2**	2	2	2	-	-	-	-	1	1	1	2	2
4	3	3	2	2	3	1	-	-	-	-	1	1	2	2	3
5	3	2	2	2	3	2	-	-	-	-	1	1	2	2	1
CO	**3**	**3**	**2**	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**1**	**1**	**2**	**2**	**2**

1-low,2-medium,3-high,'-'-nocorrelation

24UEC403 COMMUNICATION SYSTEMS L T P C
3 0 0 3

COURSE OBJECTIVES:

- To introduce Analog Modulation Schemes
- To impart knowledge in random process
- To study various Digital techniques
- To introduce the importance of sampling &quantization
- To impart knowledge in demodulation techniques
- To enhance the classroom teaching using smart connectivity instruments

UNIT I AMPLITUDE MODULATION **9**

Review of signals and systems, Time and Frequency domain representation of signals, Principles of Amplitude Modulation Systems-DSB, SSB and VSB modulations. Angle Modulation, Representation of FM and PM signals, Spectral characteristics of angle modulated signals. SSB Generation – Filter and Phase Shift Methods, VSB Generation – Filter Method, Hilbert Transform, Pre-envelope & complex envelope AM techniques, Superheterodyne Receiver.

UNIT II RANDOM PROCESS & SAMPLING **9**

Review of probability and random process. Gaussian and white noise characteristics, Noise in amplitude modulation systems, Noise in Frequency modulation systems. Pre-emphasis and De-emphasis, Threshold effect in angle modulation.

Low pass sampling – Aliasing- Signal Reconstruction-Quantization - Uniform & non-uniform quantization - quantization noise - Nyquist criterion- Logarithmic Companding –PAM, PPM, PWM, PCM – TDM, FDM

UNIT III DIGITAL TECHNIQUES **9**

Pulse modulation Differential pulse code modulation. Delta modulation, Noise considerations in PCM,, Digital Multiplexers, Channel coding theorem - Linear Block codes - Hamming codes - Cyclic codes - Convolutional codes - Viterbi Decoder

UNIT IV DIGITAL MODULATION SCHEME **9**

Geometric Representation of signals - Generation, detection, IQ representation, PSD & BER of Coherent BPSK, BFSK, & QPSK - QAM - Carrier Synchronization - Structure of Non-coherent Receivers Synchronization and Carrier Recovery for Digital modulation, Spectrum Analysis – Occupied bandwidth – Adjacent channel power, EVM, Principle of DPSK

UNIT V DEMODULATION TECHNIQUES **9**

Elements of Detection Theory, Optimum detection of signals in noise, Coherent communication with waveforms- Probability of Error evaluations. Baseband Pulse Transmission- Inter symbol Interference, Optimum demodulation of digital signals over band-limited channels.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course students will be able to

CO1: Gain knowledge in amplitude modulation techniques

CO2: Understand the concepts of Random Process to the design of communication systems

CO3: Gain knowledge in digital techniques

CO4: Gain knowledge in sampling and quantization

CO5: Understand the importance of demodulation techniques

TEXT BOOKS:

1. Simon Haykins," Communication Systems",Wiley,5th Edition,2009.(Unit I-V)
2. B.P. Lathi, "Modern Digital and Analog Communication Systems",4th Edition, Oxford University Press, 2011.

REFERENCES:

1. Wayner Tomasi, Electronic Communication System, 5th Edition, Pearson Education, 2008.
2. D. Roody, J. Coolen, Electronic Communications, 4th edition PHI2006
3. A.Papoulis, "Probability, Random variables and Stochastic Processes", McGraw Hill,3rd edition, 1991.
4. B.Sklar,"Digital Communications Fundamentals and Applications",2nd Edition Pearson Education 2007
5. HPHsu, Schaum Outline Series- "Analog and Digital Communications" TMH 2006
6. Couch.L., "Modern Communication Systems", Pearson,2001

CO's-PO's &PSO's MAPPING

CO	Pos											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
1	3	3	3	3	2	1	1	-	-	-	1	1
2	3	3	3	3	2	1	1	-	-	-	1	1
3	3	3	3	3	3	1	1	-	-	-	1	1
4	3	3	3	3	3	1	1	-	-	-	1	1
5	3	3	3	3	2	1	1	-	-	-	1	1
Avg	3	3	3	3	2.5	1	1	-	-	-	1	1

1-low,2-medium,3-high,'-'-nocorrelation

24UGE401 ENVIRONMENTAL SCIENCES AND SUSTAINABILITY LT P C
2 0 0 2

COURSE OBJECTIVES:

- To introduce the basic concepts of environment, ecosystems and biodiversity and emphasize on the biodiversity of India and its conservation.
- To impart knowledge on the causes, effects and control or prevention measures of environmental pollution and natural disasters.
- To facilitate the understanding of global and Indian scenario of renewable and nonrenewable resources, causes of their degradation and measures to preserve them.
- To familiarize the concept of sustainable development goals and appreciate the interdependence of economic and social aspects of sustainability, recognize and analyze climate changes, concept of carbon credit and the challenges of environmental management.
- To inculcate and embrace sustainability practices and develop a broader understanding on green materials, energy cycles and analyze the role of sustainable urbanization.

UNIT I ENVIRONMENT AND BIODIVERSITY 6

Definition, scope and importance of environment – need for public awareness. Eco-system and Energy flow– ecological succession. Types of biodiversity: genetic, species and ecosystem diversity– values of biodiversity, India as a mega-diversity nation–hot-spots of biodiversity– threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ.

UNIT II ENVIRONMENTAL POLLUTION 6

Causes, Effects and Preventive measures of Water, Soil, Air and Noise Pollutions. Solid, Hazardous and E-Waste management. Case studies on Occupational Health and Safety Management system (OHASMS). Environmental protection, Environmental protection acts .

UNIT III RENEWABLE SOURCES OF ENERGY 6

Energy management and conservation, New Energy Sources: Need of new sources. Different types new energy sources. Applications of- Hydrogen energy, Ocean energy resources, Tidal energy conversion. Concept, origin and power plants of geothermal energy.

UNIT IV SUSTAINABILITY AND MANAGEMENT 6

Development,GDP,Sustainability-concept,needsandchallenges-economic,socialandaspectsof sustainability-from unsustainability to sustainability-millennium development goals, and protocols- Sustainable Development Goals-targets, indicators and intervention areas Climate change- Global, Regional and local environmental issues and possible solutions-case studies.

Concept of Carbon Credit, Carbon Footprint. Environmental management in industry-A case study.

UNIT V SUSTAINABILITY PRACTICES **6**

Zero waste and R concept, Circular economy, ISO 14000 Series, Material Life cycle assessment, Environmental Impact Assessment. Sustainable habitat: Green buildings, Green materials, Energy efficiency, Sustainable transports. Sustainable energy: Non-conventional Sources, Energy Cycles- carbon cycle, emission and sequestration, Green Engineering: Sustainable urbanization-Socio- economical and technological change.

TOTAL:30 PERIODS

COURSE OUTCOMES:

CO1: To recognize and understand the functions of environment, ecosystems and biodiversity and their conservation.
CO2: To identify the causes, effects of environmental pollution and natural disasters and contribute to the preventive measures in the society.
CO3: To identify and apply the understanding of renewable and non-renewable resources and contribute to the sustainable measures to preserve them for future generations.
CO4: To recognize the different goals of sustainable development and apply them for suitable technological advancement and societal development.
CO5: To demonstrate the knowledge of sustainability practices and identify green materials, energy cycles and the role of sustainable urbanization.

TEXTBOOKS:

1. Anubha Kaushik and C. P. Kaushik's "Perspectives in Environmental Studies", 6th Edition, New Age International Publishers ,2018.
2. Benny Joseph, 'Environmental Science and Engineering', TataMcGraw-Hill, NewDelhi, 2016.
3. Gilbert M.Masters ,' Introduction to Environmental Engineering and Science',2nd edition, Pearson Education,2004.
4. Allen, D.T. and Shonnard, D. R., Sustainability Engineering: Concepts, Design and Case Studies, Prentice Hall.
5. Bradley. A.S; Adebayo, A.O., Maria, P. Engineering applications in sustainable design and development, Cengage learning.
6. Environment Impact Assessment Guidelines, Notification of GovernmentofIndia,2006.
7. Mackenthun,K.M, Basic Concepts in Environmental Management, Lewis Publication, London, 1998.

REFERENCES:

1. R.K.Trivedi, 'Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards', Vol. I and II,Enviro Media. 38 . edition 2010.
2. Cunningham,W.P.Cooper,T.H.Gorhani,' Environmental Encyclopedia', Jaico Publ., House, Mumbai, 2001.
3. Dharmendra S.Sengar,' Environmental law', Prentice hall of India PVT. LTD, NewDelhi, 2007.
4. Rajagopalan, R, 'Environmental Studies-From Crisis to Cure', Oxford University Press, Third Edition, 2015.
5. Erach Bharucha" Text book of Environmental Studies for Undergraduate Courses " Orient Blackswan Pvt. Ltd. 2013.

CO's-PO's & PSO's MAPPING

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	2	1	-	-	-	2	3	-	-	-	-	2	-	-	-
2	3	2	-	-	-	3	3	-	-	-	-	2	-	-	-
3	3	-	1	-	-	2	2	-	-	-	-	2	-	-	-
4	3	2	1	1	-	2	2	-	-	-	-	2	-	-	-
5	3	2	1	-	-	2	2	-	-	-	-	1	-	-	-
Avg.	2.8	1.8	1	1	-	2.2	2.4	-	-	-	-	1.8	-	-	-

1-low,2-medium,3-high,'-'-nocorrelation

24UEC421 COMMUNICATION SYSTEMS LABORATORY L T P C

0 0 3 1.5

COURSE OBJECTIVES:

- To study the AM & FM Modulation and Demodulation.
- To learn and realize the effects of sampling and TDM.
- To understand the PCM & Digital Modulation.
- To Simulate Digital Modulation Schemes.
- To Implement Equalization Algorithms and Error Control Coding Schemes.

LIST OF EXPERIMENTS

1. AM-Modulator and Demodulator
2. FM-Modulator and Demodulator
3. Pre-Emphasis and De-Emphasis.
4. Signal sampling and TDM.
5. Pulse Code Modulation and Demodulation.
6. Pulse Amplitude Modulation and Demodulation.
7. Pulse Position Modulation and Demodulation and Pulse Width Modulation and Demodulation.
8. Digital Modulation–ASK, PSK, FSK.
9. Delta Modulation and Demodulation.
10. Simulation of ASK, FSK, and BPSK Generation and Detection Schemes.
11. Simulation of DPSK, QPSK and QAM Generation and Detection Schemes.
12. Simulation of Linear Block and Cyclic Error Control coding Schemes.

TOTAL:45 PERIODS

COURSE OUTCOMES:

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

CO1: Design AM, FM & Digital Modulators for specific applications.

CO2: Compute the sampling frequency for digital modulation**.**

CO3: Simulate &validate the various functional modules of Communication system.

CO4: Demonstrate their knowledge in base band signaling schemes through implementation of digital modulation schemes.

CO5: Apply various channel coding schemes & demonstrate their capabilities towards the improvement of the noise performance of Communication system.

CO's-PO's & PSO's MAPPING

CO	POs											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
1	3	3	3	3	3	3	-	-	-	1	1	1
2	3	3	3	3	3	2	-	-	-	1	1	1
3	3	3	3	3	3	2	-	-	-	1	1	1
4	3	3	3	3	3	3	-	-	-	1	1	1
5	3	3	3	3	3	2	-	-	-	1	1	1
Avg	3	3	3	3	3	2.5	-	-	-	1	1	1

1-low,2-medium,3-high, '-'-no correlation

24UEC422 LINEAR INTEGRATED CIRCUITS LABORATORY LTPC
0031.5

COURSE OBJECTIVES:

- To gain hands on experience in designing electronic circuits
- To learn simulations of software used in circuit design
- To learn the fundamental principles of amplifier circuits
- To differentiate feedback amplifiers and oscillators.
- To differentiate the operation of various multivibrators

LIST OF EXPERIMENTS:

DESIGN AND ANALYSIS OF THE FOLLOWING CIRCUITS

1. Series and Shunt feedback amplifiers-Frequency response, Input and output impedance
2. RC Phase shift oscillator and Wein Bridge Oscillator
3. Hartley Oscillator and Colpitts Oscillator
4. RC Integrator and Differentiator circuits using Op-Amp
5. Clippers and Clampers
6. Instrumentation amplifier
7. Active low-pass, Highpass & Bandpass filters
8. PLL Characteristics and its use as frequency multiplier, clock synchronization
9. R-2R ladder type D-A converter using Op-Amp

SIMULATION USING SPICE (Using Transistor):

1. Tuned Collector Oscillator
2. Twin-T Oscillator/Wein Bridge Oscillator
3. Double and Stagger tuned Amplifiers
4. Bistable Multivibrator
5. Schmitt Trigger circuit with Predictable hysteresis
6. Analysis of power amplifier

Components and Accessories:

Transistors, Resistors, Capacitors, Inductors, diodes, Zener Diodes, Breadboards, Transformers.
SPICE Circuit Simulation Software: (any public domain or commercial software)
Note: Op-Amps uA741, LM301, LM311, LM324, LM317, LM723,7805,7812,2N3524,2N3525, 2N3391, AD 633, LM 555, LM 565 may be used

TOTAL:45 PERIODS

COURSE OUTCOMES:

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

CO1:Analyze various types of feedback amplifiers

CO2:Design oscillators, tuned amplifiers, wave-shaping circuits and multivibrators

CO3:Design and simulate feedback amplifiers, oscillators, tuned amplifiers, wave-shaping circuits and multivibrators, filters using SPICE Tool.

CO4:Design amplifiers, oscillators, D-A converters using operational amplifiers.

CO5:Design filters using op-amp and perform an experiment on frequency response

CO's-PO's & PSO's MAPPING

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

1-low,2-medium,3-high,'-'-nocorrelation

24UEC431 **Skill Development Course II** **L T P C**
0 0 2 2

Advanced VLSI Front-End Design and FPGA System Development

Course Description

This advanced-level skill-based course builds upon the fundamentals of Verilog/VHDL programming and FPGA implementation learned in the introductory course. The course focuses on advanced RTL design methodologies, hierarchical digital system design, memory and bus interfacing, advanced finite state machine implementation, and FPGA-based embedded system development. Students gain practical exposure to timing analysis, optimization techniques, verification methodologies, and integration of IP cores using industry-standard EDA tools. The course emphasizes real-time FPGA prototyping, debugging, and project-based learning to prepare students for careers in VLSI front-end design, FPGA development, and digital hardware verification.

Course Objectives

1. To provide advanced knowledge in RTL design methodologies, hierarchical digital system design, and reusable HDL coding techniques using Verilog/VHDL.
2. To develop the ability to design, verify, and optimize advanced sequential circuits, pipelined architectures, communication controllers, and FPGA-based embedded systems.
3. To enable students to perform FPGA system integration, memory interfacing, timing analysis, synthesis, and hardware debugging using industry-standard EDA tools.
4. To impart practical skills in FPGA prototyping, verification, and project-oriented implementation for real-time VLSI front-end and FPGA development applications.

Module 1: Advanced RTL Design Techniques (4 Hours)

- Review of Verilog/VHDL RTL coding practices
- Hierarchical and modular design methodology

- Parameterized modules and reusable design blocks
- Coding for synthesizable and optimized hardware
- Introduction to design constraints and timing concepts

Module 2: Advanced Sequential System Design (6 Hours)

- Pipelining and parallel processing concepts
- Advanced FSM design and optimization techniques
- UART, SPI, and I2C controller design using HDL
- Design of Arithmetic Logic Unit (ALU) and datapath circuits
- Clock management and reset synchronization techniques

Module 3: FPGA System Integration & Verification (7 Hours)

- Memory interfacing: RAM, ROM, FIFO implementation
- IP core generation and integration in FPGA
- Functional and timing simulation
- Introduction to HDL-based verification concepts
- Timing analysis and timing closure techniques

Module 4: FPGA Prototyping & Mini Project (8 Hours)

- FPGA implementation of embedded digital systems
- Constraint management and optimization
- Hardware debugging using Integrated Logic Analyzer (ILA)
- Power optimization and resource utilization analysis
- Mini project implementation using FPGA development boards

Course Outcomes:

After successful completion of the course, the students will be able to:

1. Design complex digital systems using advanced Verilog/VHDL coding techniques and hierarchical modeling approaches.
2. Develop and verify advanced sequential systems, pipelined architectures, and optimized FSM-based controllers.
3. Interface memory modules, communication peripherals, and IP cores with FPGA-based systems.
4. Analyze timing constraints, optimize RTL designs, and perform advanced synthesis and implementation using EDA tools.
5. Implement, test, and debug complete FPGA-based embedded applications through project-oriented learning.

Recommended Textbooks & Software
Software Tools

- Xilinx Vivado Design Suite
- Intel Quartus Prime
- ModelSim / QuestaSim

Reference Books

- Advanced Digital Design with the Verilog HDL
- FPGA Prototyping by Verilog Examples

- Digital System Design using VHDL

COs \ POs & PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	3	–	–	–	1	1	–	1	3	2	3
CO2	3	3	3	3	3	–	–	–	1	1	–	1	3	2	3
CO3	3	2	3	2	3	–	–	–	1	1	1	1	3	3	3
CO4	3	3	3	3	3	–	–	–	1	1	1	2	3	2	3
CO5	3	3	3	3	3	–	–	–	2	2	2	2	3	2	3