R.M.K. ENGINEERING COLLEGE
AUTONOMOUS INSTITUTIONS
B.E. ELECTRONICS AND INSTRUMENTATION ENGINEERING
REGULATIONS -2020
CHOICE BASED CREDIT SYSTEM

PROGRAMME EDUCATIONAL OBJECTIVES

Bachelors of Electronics and Instrumentation Engineering curriculum is designed to prepare the graduates having attitude and knowledge to

I. Encompass strong foundation in fundamentals of Electronics and Instrumentation required to analyze problems concerned with industry and society.
II. Acquire knowledge in recent technological developments in the field of Electronics and Instrumentation Engineering.
III. Develop professional and ethical outlook, effective communication skill and team spirit.
IV. Attain proficiency in identifying, formulating and developing optimal solution for societal growth.

PROGRAMME OUTCOMES (POs)

The graduates will have ability to

a. Apply the knowledge of Mathematics, Science, Engineering Fundamentals, and an Engineering Specialization to the solution of complex engineering problems.
b. Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of Mathematics, Natural Sciences, and Engineering Sciences.
c. 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.
d. 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.
e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
f. 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.
g. Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable

development.

h. Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

i. Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

j. 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.

k. 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.

l. Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PEOs & POs

The B.E. Electronics and Instrumentation Engineering Program outcomes leading to the achievement of the objectives are summarized in the following Table.

Programme Educational Objectives	**Programme Outcomes**											
	a	b	c	d	E	F	g	h	i	j	k	l
I	✓	✓				✓	✓	✓	✓	✓	✓	✓
II			✓	✓	✓	✓	✓	✓			✓	✓
III						✓	✓	✓	✓	✓		
IV				✓	✓	✓	✓	✓				

Sem	**Name of the subject**	**PROGRAM OUTCOMES**											
		a	b	c	d	E	f	g	h	i	j	k	l
I	Communicative English & Life Skills		✓							✓	✓		✓
	Engineering Mathematics I	✓	✓	✓	✓	✓	✓	✓					✓
	Computer Aided Engineering Graphics	✓		✓		✓					✓		
	Environmental Science and Engineering	✓	✓				✓	✓			✓		✓
	Problem solving and C	✓	✓	✓						✓			✓

	Programming												
	Core I - Basic Civil & Mechanical Engineering	✓	✓	✓		✓	✓	✓	✓				
	C Programming Lab	✓	✓	✓						✓			✓
	Interpersonal Skills – Listening, Speaking, Reading and Writing Lab									✓	✓		✓
II	Technical English									✓		✓	✓
	Engineering Mathematics II	✓	✓	✓	✓	✓	✓						✓
	Physics for Electronics Engineering	✓	✓	✓	✓								
	Engineering Chemistry	✓	✓				✓	✓					✓
	Core II –Basic Electronics and Instrumentation Engineering	✓	✓	✓			✓	✓					✓
	Core III - Electric Circuit Analysis	✓	✓	✓	✓	✓							✓
	Physics & Chemistry Laboratory	✓	✓			✓				✓			✓
	Advanced C Programming Lab	✓	✓	✓					✓	✓	✓		✓
	Basic Engineering and Circuits Laboratory	✓	✓	✓						✓			✓
III	Transforms and Partial Differential Equations	✓	✓	✓	✓								✓
	Instrument Transducers	✓	✓	✓					✓	✓	✓		✓
	Electrical and Electronic Measurements	✓	✓		✓	✓							✓
	Electrical Machines	✓	✓	✓	✓		✓					✓	
	Electronic Circuits	✓	✓	✓	✓	✓	✓	✓	✓				✓
	Object Oriented Programming	✓	✓	✓									
	Devices and	✓	✓	✓	✓								

	Machines lab												
	Mini project	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Object Oriented Programming Laboratory	✓	✓	✓					✓	✓	✓		✓
	Aptitude & Coding Skills - I	✓	✓							✓	✓		
IV	Numerical Methods	✓	✓	✓	✓								
	Digital Principles and System Design	✓	✓	✓									
	Industrial Instrumentation	✓	✓	✓	✓			✓	✓	✓	✓		✓
	Control System Design	✓	✓	✓	✓	✓	✓						✓
	Linear Integrated Circuits	✓	✓	✓	✓		✓	✓	✓	✓		✓	✓
	Universal Human Values II- Understanding Harmony						✓	✓	✓	✓	✓	✓	✓
	Linear and Digital Integrated Circuits Lab					✓	✓						✓
	Measurements and Transducers Lab					✓	✓						✓
	Foundation Lab on Internet of Things	✓	✓	✓	✓	✓	✓		✓				✓
	Aptitude & Coding Skills-II	✓	✓							✓	✓		

R.M.K. ENGINEERING COLLEGE
AUTONOMOUS INSTITUTIONS
B.E. ELECTRONICS AND INSTRUMENTATION ENGINEERING
REGULATIONS -2020
CHOICE BASED CREDIT SYSTEM
I - VIII SEMESTERS CURRICULA & I, II, III and IV SEMESTER- SYLLABI

SEMESTER - I

S.No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	20EL101	Communicative English & Life Skills	HS	2	2	0	0	2
2.	20MA101	Engineering Mathematics I	BS	5	3	2	0	4
3.	20ME103	Computer Aided Engineering Graphics	ES	6	2	0	4	4
4.	20CH102	Environmental Science and Engineering	HS	3	3	0	0	2
5.	20GE101	Problem solving and C Programming	ES	3	3	0	0	3
6.	20CM106	Core I - Basic Civil & Mechanical Engineering	ES	3	3	0	0	3
PRACTICALS								
7.	20GE111	C Programming Lab	ES	4	0	0	4	2
8.	20EL112	Interpersonal Skills – Listening, Speaking, Reading and Writing Lab	HS	4	0	0	4	2
9.		Induction Program	MC	3 Weeks	-	-	-	-
			TOTAL	**30**	**16**	**2**	**12**	**22**

SEMESTER - II

S.No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	20EL201	Technical English	HS	2	2	0	0	2
2.	20MA201	Engineering Mathematics II	BS	5	3	2	0	4
3.	20PH102	Physics for Electronics Engineering	BS	3	3	0	0	3
4.	20CH101	Engineering Chemistry	BS	3	3	0	0	3
5.	20EI201	Core II –Basic Electronics and Instrumentation Engineering	ES	3	3	0	0	3
6.	20EE202	Core III - Electric Circuit Analysis	ES	5	3	2	0	4
PRACTICALS								
7.	20PC111	Physics & Chemistry Laboratory	BS	4	0	0	4	2
8.	20CS212	Advanced C Programming Lab	ES	4	0	0	4	2
9.	20EM211	Basic Engineering and Circuits Laboratory	ES	4	0	0	4	2
			TOTAL	**33**	**17**	**4**	**12**	**25**

SEMESTER - III

S.No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	20MA301	Transforms and Partial Differential Equations	BS	5	3	2	0	4
2.	20EI301	Instrument Transducers	PC	3	3	0	0	3
3.	20EI302	Electrical and Electronic Measurements	PC	5	3	2	0	4
4.	20EI303	Electrical Machines	ES	3	3	0	0	3
5.	20EC302	Electronic Circuits	ES	3	3	0	0	3
6.	20CS302	Object Oriented Programming	ES	3	3	0	0	3
PRACTICALS								
7.	20EI311	Devices and Machines lab	ES	4	0	0	4	2
8.	20EI312	Mini project	EEC	2	0	0	2	1
9.	20CS311	Object Oriented Programming Laboratory	ES	4	0	0	4	2
10.	20CS313	Aptitude & Coding Skills -I	EEC	2	0	0	2	1
			TOTAL	**34**	**18**	**4**	**12**	**26**

SEMESTER - IV

S.No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	20MA403	Numerical Methods	BS	5	3	2	0	4
2.	20EI401	Digital Principles and System Design	PC	3	3	0	0	3
3.	20EI402	Industrial Instrumentation	PC	3	3	0	0	3
4.	20EI403	Control System Design	PC	5	3	2	0	4
5.	20EE304	Linear Integrated Circuits	PC	3	3	0	0	3
6.	20GE301	Universal Human Values II-Understanding Harmony	HS	4	2	2	0	3
PRACTICALS								
7.	20EI411	Linear and Digital Integrated Circuits Lab	PC	4	0	0	4	2
8.	20EI412	Measurements and Transducers Lab	PC	4	0	0	4	2
9.	20EC312	Foundation Lab on Internet of Things	EEC	2	0	0	2	1
10.	20CS414	Aptitude & Coding Skills-II	EEC	2	0	0	2	1
			TOTAL	**35**	**17**	**6**	**12**	**26**

SEMESTER - V

S.No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	20CS201	Data structures	ES	3	3	0	0	3
2.	20EC402	Microprocessors and Microcontrollers	PC	3	3	0	0	3
3.	20EE603	Digital Signal Processing	PC	5	3	2	0	4
4.	20EI501	Process Control	PC	5	3	2	0	4
5.		Professional Elective I	PE	3	3	0	0	3
6.		Open Elective-I	OE	3	3	0	0	3
PRACTICALS								
7.	20EI511	Process Control Lab	PC	4	0	0	4	2
8.	20EI512	Internship	EEC	0	0	0	0	1
9.	20EC411	Microprocessors and Microcontrollers Lab	PC	4	0	0	4	2
10.	20CS512	Advanced Aptitude & CodingSkills -I	EEC	2	0	0	2	1
			TOTAL	**32**	**18**	**4**	**10**	**26**

SEMESTER - VI

S.No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	20EI601	Factory Automation	PC	5	3	2	0	4
2.	20EI602	Industrial Internet of Things	PC	5	3	2	0	4
3.	20EI603	Communication Engineering	ES	5	3	2	0	4
4.	20EC602	Embedded Systems	PC	3	3	0	0	3
5.		Professional Elective II	PE	3	3	0	0	3
6.		Professional Elective III	PE	3	3	0	0	3
PRACTICALS								
7.	20EI611	Industrial Instrumentation and IoT Lab	PC	4	0	0	4	2
8.	20EI612	Industrial Automation Lab	PC	4	0	0	4	2
9.	20CS614	Advanced Aptitude & CodingSkills -II	EEC	2	0	0	2	1
			TOTAL	**34**	**18**	**6**	**10**	**26**

SEMESTER - VII

S.No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	20EI701	Medical Instrumentation	PC	3	3	0	0	3
2.	20EI702	Industrial Data Networks	PC	3	3	0	0	3
3.		Professional Elective IV	PE	3	3	0	0	3
4.		Professional Elective V	PE	3	3	0	0	3
5.		Professional Elective VI	PE	3	3	0	0	3
6.		Open Elective-II	OE	3	3	0	0	3
PRACTICALS								
7.	20EI711	Instrumentation System Design Lab	PC	4	0	0	4	2
8.	20EI712	Embedded and Robotics lab	PC	4	0	0	4	2
			TOTAL	**26**	**18**	**0**	**8**	**22**

SEMESTER - VIII

S.No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
PRACTICALS								
1.	20EI811	Project Work	EEC	20	0	0	20	10
			TOTAL	**20**	**0**	**0**	**20**	**10**

*Course from the curriculum of other UG Programmes.

PROFESSIONAL ELECTIVE - I

S.No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	20EI901	Introduction to Process data Analytics	PE	3	3	0	0	3
2.	20EI902	Analytical Instrumentation	PE	3	3	0	0	3
3.	20EI903	Robotics and Automation	PE	3	3	0	0	3
4.	20CS914	Operating Systems	PE	3	3	0	0	3
5.	20IT928	Introduction to Innovation, IP Management & Entrepreneurship	PE	3	3	0	0	3

PROFESSIONAL ELECTIVE - II

S.No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	20EI904	Reliability and Safety Engineering	PE	3	3	0	0	3
2.	20EI905	Electric Vehicle Control Systems	PE	3	3	0	0	3
3.	20EI906	Cyber security for Industrial Automation	PE	3	3	0	0	3
4.	20EI907	Power Electronics and Drives	PE	3	3	0	0	3
5.	20IT927	Indian Constitution	PE	3	3	0	0	3

PROFESSIONAL ELECTIVE - III

S.No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	20EI908	Fault diagnosis and Tolerance	PE	3	3	0	0	3
2.	20EI909	Introduction to Image and Video Processing	PE	3	3	0	0	3
3.	20EI910	Adaptive Control	PE	3	3	0	0	3
4.	20EE916	Systems Programming (HCL)	PE	3	3	0	0	3
5.	20IT917	Essence of Indian Traditional Knowledge	PE	3	3	0	0	3

PROFESSIONAL ELECTIVE - IV

S.No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	20EI911	Instrumentation Standards and Calibration	PE	3	3	0	0	3
2.	20EI912	Instrumentation in Process Industries	PE	3	3	0	0	3
3.	20EE931	Automotive Software Engineering Course (KPIT)	PE	3	3	0	0	3
4.	20ME927	Total Quality Management	PE	3	3	0	0	3
5.	20EC601	VLSI Design	PE	3	3	0	0	3

PROFESSIONAL ELECTIVE - V

S.No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	20EI913	System Identification	PE	3	3	0	0	3
2.	20AI401	Artificial Intelligence	PE	3	3	0	0	3
3.	20CE906	Principles of Management	PE	3	3	0	0	3
4.	20EC903	Introduction to Nano Science and Nano Technology	PE	3	3	0	0	3
5.	20CE918	Professional Ethics and Human Values	PE	3	3	0	0	3

PROFESSIONAL ELECTIVE - VI

S.No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	20EI914	Project Management and Finance	PE	3	3	0	0	3
2.	20EI915	Advanced Process Control	PE	3	3	0	0	3
3.	20EI916	Fibre Optics and Laser Instrumentation	PE	3	3	0	0	3
4.	20EE924	Linux Kernel and Device Drivers (HCL)	PE	3	3	0	0	3
5.	20CS917	Data science Fundamentals	PE	4	2	0	2	3

HUMANITIES AND SOCIAL SCIENCES (HS)

S.No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	20EL101	Communicative English & Life Skills	HS	2	2	0	0	2
2.	20CH102	Environmental Science and Engineering	HS	3	3	0	0	2
3.	20EL112	Interpersonal Skills – Listening, Speaking, Reading and Writing Lab	HS	4	0	0	4	2
4.	20EL201	Technical English	HS	2	2	0	0	2
5.	20GE301	Universal Human Values II- Understanding Harmony	HS	4	2	2	0	3

BASIC SCIENCES (BS)

S.No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	20MA101	Engineering Mathematics I	BS	5	3	2	0	4
2.	20MA201	Engineering Mathematics II	BS	5	3	2	0	4
3.	20PH102	Physics for Electronics Engineering	BS	3	3	0	0	3
4.	20CH101	Engineering Chemistry	BS	3	3	0	0	3
5.	20PC111	Physics & Chemistry Laboratory	BS	4	0	0	4	2
6.	20MA301	Transforms and Partial Differential Equations	BS	5	3	2	0	4
7.	20MA404	Numerical Methods	BS	5	3	2	0	4

ENGINEERING SCIENCES (ES)

S.No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	20ME103	Computer Aided Engineering Graphics	ES	6	2	0	4	4
2.	20GE101	Problem solving and C Programming	ES	3	3	0	0	3
3.	20CM106	Core I - Basic Civil & Mechanical Engineering	ES	3	3	0	0	3
4.	20GE111	C Programming Lab	ES	4	0	0	4	2
5.	20EI201	Core II –Basic Electronics and Instrumentation Engineering	ES	3	3	0	0	3
6.	20EE202	Core III - Electric Circuit Analysis	ES	5	3	2	0	4
7.	20CS212	Advanced C Programming Lab	ES	4	0	0	4	2
8.	20EM211	Basic Engineering and Circuits Laboratory	ES	4	0	0	4	2
9.	20EI303	Electrical Machines	ES	3	3	0	0	3
10.	20EC302	Electronic Circuits	ES	3	3	0	0	3
11.	20CS302	Object Oriented Programming	ES	3	3	0	0	3
12.	20EI311	Devices and Machines lab	ES	4	0	0	4	2
13.	20CS311	Object Oriented Programming Laboratory	ES	4	0	0	4	2

14.	20CS201	Data structures	ES	3	3	0	0	3
15.	20EI603	Communication Engineering	ES	5	3	2	0	4

PROFESSIONAL CORE (PC)

S.No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	20EI301	Instrument Transducers	PC	3	3	0	0	3
2.	20EI302	Electrical and Electronic Measurements	PC	5	3	2	0	4
3.	20EI401	Digital Principles and System Design	PC	3	3	0	0	3
4.	20EI402	Industrial Instrumentation	PC	3	3	0	0	3
5.	20EI403	Control System Design	PC	5	3	2	0	4
6.	20EE304	Linear Integrated Circuits	PC	3	3	0	0	3
7.	20EI411	Linear and Digital Integrated Circuits Lab	PC	4	0	0	4	2
8.	20EI412	Measurements and Transducers Lab	PC	4	0	0	4	2
9.	20EC402	Microprocessors and Microcontrollers	PC	3	3	0	0	3
10.	20EE603	Digital Signal Processing	PC	5	3	2	0	4
11.	20EI501	Process Control	PC	5	3	2	0	4
12.	20EI511	Process Control Lab	PC	4	0	0	4	2
13.	20EC411	Microprocessors and Microcontrollers Lab	PC	4	0	0	4	2
14.	20EI601	Factory Automation	PC	5	3	2	0	4
15.	20EI602	Industrial Internet of Things	PC	5	3	2	0	4
16.	20EC602	Embedded Systems	PC	3	3	0	0	3
17.	20EI611	Industrial Instrumentation and IoT Lab	PC	4	0	0	4	2
18.	20EI612	Industrial Automation Lab	PC	4	0	0	4	2
19.	20EI701	Medical Instrumentation	PC	3	3	0	0	3
20.	20EI702	Industrial Data Networks	PC	3	3	0	0	3
21.	20EI711	Instrumentation System Design Lab	PC	4	0	0	4	2
22.	20EI712	Embedded and Robotics lab	PC	4	0	0	4	2

EMPLOYABILITY ENHANCEMENT COURSES (EEC)

S.No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	20EI312	Mini project	EEC	2	0	0	2	1
2.	20CS313	Aptitude & Coding Skills - I	EEC	2	0	0	2	1
3.	20EC312	Foundation Lab on Internet of Things	EEC	2	0	0	2	1
4.	20CS414	Aptitude & Coding Skills-II	EEC	2	0	0	2	1
5.	20EI512	Internship	EEC	0	0	0	0	1
6.	20CS512	Advanced Aptitude & Coding Skills -I	EEC	2	0	0	2	1
7.	20CS614	Advanced Aptitude & Coding Skills - II	EEC	2	0	0	2	1
8.	20EI811	Project Work	EEC	20	0	0	20	10

SUMMARY

	SUBJECT CATEGORY	SEMESTER								TOTAL CREDITS
		I	II	III	IV	V	VI	VII	VIII	
1.	**HS**	6	2		3					11
2.	**BS**	4	12	4	4					24
3.	**ES**	12	11	13		3	4			43
4.	**PC**			7	17	15	15	10		64
5.	**PE**					3	6	9		18
6.	**OE**					3		3		6
7.	**EEC**			2	2	2	1		10	17
8.	**MC**	-	-	-	-	-	-	-	-	-
		22	**25**	**26**	**26**	**26**	**26**	**22**	**10**	**183**

20EL101 COMMUNICATIVE ENGLISH & LIFE SKILLS L T P C

2 0 0 2

OBJECTIVES:

- Strengthen their basic reading and writing skills.
- Comprehend listening contexts competently.
- Improve their speaking skills to speak fluently in real contexts.
- Develop vocabulary of a general kind and enhance their grammatical accuracy.

UNIT I COMMUNICATION BASICS 6

Listening - short texts- short formal and informal conversations. Speaking- introducing oneself - exchanging personal information. Reading- practice in skimming-scanning and predicting. Writing-completing sentences- developing hints-free writing – Everyday expressions-collocations. Life Skills- Overview of Life Skills: significance of life skills.

UNIT II COMMUNICATION INTERMEDIATE 6

Listening- telephonic conversations. **Speaking** – sharing information of a personal kind—greeting – taking leave. **Reading**–short comprehension passages -pre-reading-post reading-comprehension questions (multiple choice questions and /or short questions/ open-ended questions) - **Writing** –paragraph writing- topic sentence- main ideas, short narrative descriptions using some suggested vocabulary and structures. **Life skills**– Self-awareness: definition, need for self-awareness; Coping with Stress and Emotions.

UNIT III COMMUNICATION VANTAGE 6

Listening – listening to longer texts and filling up the table - **Speaking**- asking about routine actions and expressing opinions. **Reading**- Long texts (cloze reading) - **Writing**- jumbled sentences - product description - use of reference words and discourse markers. Grammar – Tenses - phrasal verbs - Wh– Questions, yes or no questions and direct / indirect questions– countable &uncountable nouns – modal verbs. **Life skills** – Assertiveness vs Aggressiveness

UNIT IV SYNERGISTIC COMMUNICATION 6

Listening- listening to dialogues or conversations and completing exercises based on them - **Speaking**- speaking about oneself- speaking about one's friend –**Reading**- different types of texts- magazines -**Writing**- letter writing, informal or personal letters-e-mails-conventions of personal email - Language development - synonyms – antonyms. **Life Skills**–Problem Solving Techniques.

UNIT V COMMUNICATION HIGHER 6

Listening – listening to TED talks - **Speaking** – role play – **Reading**- Biographies –**Writing**-writing short essays (analytical & issue-based essays) – dialogue writing. **Life Skills**– Leadership & Decision making.

TOTAL: 30 PERIODS

OUTCOMES:

- Read articles of a general kind in magazines and newspapers efficiently and identify different life skills.
- Participate efficiently in informal conversations and develop an awareness of the self and apply well-defined techniques to cope with emotions and stress.
- Comprehend conversations and short talks delivered in English.
- Write short essays of a general kind and personal letters and emails in English.
- Develop vocabulary of a general kind by enriching their reading skills.
- Use appropriate thinking and problem- solving techniques to solve new problems.

TEXT BOOKS:

1. Kumar, Suresh E and Sreehari,P. Communicative English.Orient Black Swan, 2007.
2. Richards, C. Jack. Interchange Students' Book-2 New Delhi: CUP,2015.

REFERENCES:

1. Bailey, Stephen. Academic Writing: A practical guide for students. New York: Rutledge,2011.
2. Dhanavel, S P. English and Soft Skills, Volume Two, Orient Black Swan, ISBN 978 93 528769142.
3. Elbow, Peter. Writing Without Teachers. London: Oxford University Press, 1973. Print.
4. Larry James, The First Book of Life Skills; First Edition, Embassy Books, 2016.
5. Larsen, Kristine, Stephen Hawking: A Biography, Greenwood:Publishing Group,2005.
6. Redston, Chris & Gillies Cunningham Face2Face (Pre-intermediate Student 's Book & Workbook) Cambridge University Press, New Delhi: 2005.

20MA101 ENGINEERING MATHEMATICS I L T P C

3 2 0 4

OBJECTIVES:

- Explain the concepts of matrix algebra.
- Make the students understand the idea of curvature, evolutes and envelopes.
- Impart the knowledge of functions of several variables.
- Introduce the concepts of Gamma and Beta integral.
- Develop an understanding on the basics of multiple integrals.

UNIT I MATRICES 9+6

Eigenvalues and Eigenvectors of a real matrix – Characteristic equation – Properties of eigenvalues and eigenvectors – Statement and applications of Cayley-Hamilton Theorem – Diagonalization of matrices by orthogonal transformation – Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms.

UNIT II APPLICATIONS OFDIFFERENTIALCALCULUS 9+6

Curvature in Cartesian and Polar Co-ordinates–Centreandradiusofcurvature–Circleofcurvature–Evolutes– Envelopes (excluding Evolute as envelope of normals).

UNIT III FUNCTIONS OFSEVERALVARIABLES 9+6

Limits – Continuity – Partial derivatives (excluding Euler's theorem) – Total derivative – Differentiation of implicit functions – Jacobian and properties – Taylor's series for functions of two variables – Maxima and minima of functions of two variables – Lagrange's method of undetermined multipliers.

UNIT IV GAMMA, BETA INTEGRALS AND APPLICATIONS 9+6

Gamma and Beta Integrals – Properties – Relation between Gamma and Beta functions, Evaluation of integrals using Gamma and Beta functions.

UNIT V MULTIPLEINTEGRALS 9+6

Double integrals – Change of order of integration – Double integrals in polar coordinates – Area enclosed by plane curves – Triple integrals – Volume of solids.

TOTAL: 75 PERIODS

OUTCOMES:

- Diagonalize a matrix by orthogonal transformation.
- Determine the Evolute and Envelope of curves.
- Examine the maxima and minima of function of several variables.
- Apply Gamma and Beta integrals to evaluate improper integrals.
- Evaluate the area and volume by using multiple integrals.

TEXT BOOKS:

1. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley and Sons,

10th Edition, New Delhi, 2016.
2. B.S. Grewal, “Higher Engineering Mathematics”, Khanna Publishers, New Delhi, 43rd Edition, 2014.
3. T. Veerarajan, “Engineering Mathematics”, Tata McGraw Hill, 2nd Edition, New Delhi, 2011.

REFERENCES:

1. M. K. Venkataraman, “Engineering Mathematics, Volume I”, 4th Edition, The National Publication Company, Chennai, 2003.
2. Sivaramakrishna Dass, C. Vijayakumari, “Engineering Mathematics”, Pearson Education India, 4th Edition 2019.
3. H. K. Dass, and Er. Rajnish Verma, “Higher Engineering Mathematics”, S. Chand Private Limited, 3rd Edition 2014.
4. B.V. Ramana, “Higher Engineering Mathematics”, Tata McGraw Hill Publishing Company,6th Edition, New Delhi, 2008.
5. S.S. Sastry, “Engineering Mathematics", Vol.I&II, PHI Learning PrivateLimited,4th Edition, New Delhi, 2014.

20ME103 COMPUTER AIDED ENGINEERING GRAPHICS L T P C

2 0 4 4

OBJECTIVES:

- To develop in students, graphic skills for communication of concepts, ideas and design of Engineering products.
- To expose them to existing national standards related to technical drawings.

UNIT I INTRODUCTION TO CONVENTIONS IN ENGINEERING DRAWING AND CAD COMMANDS 18

Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning. Introduction to CAD commands- CAD user interface- coordinate systems, object selection methods, selection of units and precession. Sketching – line, circle, arc, polygon, rectangle and ellipse. Working with object snaps, layers and object properties. Editing the objects – copy, move, trim, extend, working with arrays, mirror, scale, hatch, fillet and chamfer. Conversion of simple pictorial diagrams to orthographic view using CAD software.

UNIT II PLANE CURVES 16

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 III PROJECTION OF POINTS, LINES AND PLANE SURFACES 18

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 IV PROJECTION OF SOLIDS AND PROJECTION OF SECTIONEDSOLIDS 20

Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to one of the principal planes by rotating object method. 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.

UNIT V DEVELOPMENT OF SURFACES AND ISOMETRIC PROJECTION 18

Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids cylinders and cones. 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.

TOTAL: 90 PERIODS

OUTCOMES:

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

- Illustrate the fundamentals and standards of engineering drawing and apply the concepts of orthographic projections using CAD software.
- Interpret and construct various plane curves.
- Develop orthographic projections of points, lines and plane surfaces.
- Make use of concepts in projection to draw projections of solids and interpret the concept in section of solids.
- Interpret and visualize development of surfaces.
- Interpret and visualize isometric projection of simple solids.

TEXT BOOKS:

1. Natarajan K.V.,"A text book of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 33rd Edition, 2020.
2 Venugopal K. and Prabhu Raja V., "Engineering Graphics", New Age International (P) Limited, 15th Edition, 2019.

REFERENCES:

1. Bhatt N.D. and Panchal V.M., "Engineering Drawing", Charotar Publishing House, 2012.
2. Basant Agarwal and Agarwal C.M., "Engineering Drawing", Tata McGraw Hill Publishing Company Limited, New Delhi, 2nd Edition, 2013.
3. Engineering Drawing Practice for Schools and Colleges SP: 46, BIS, 2003.
4. Luzzader, Warren.J. and Duff,John M., "Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production, Eastern Economy 11 th Edition, Prentice Hall of India Pvt. Ltd, New Delhi, 1993.
5. Parthasarathy N.S and Vela Murali, "Engineering Graphics", Oxford University, Press, New Delhi, 2015.
6. Shah M.B., and Rana B.C., "Engineering Drawing", Pearson, 2nd Edition, 2009

20CH102 ENVIRONMENTAL SCIENCE AND ENGINEERING L T P C

3 0 0 2

OBJECTIVES:

The goal of this course is to enlighten and sensitize the students on environmental conservation and social issues. The course is designed to:

- Appreciate the natural resources of environment which are inherently created for supporting life.
- Learn scientific and technological solutions to current day pollution issues.
- Study the interrelationship between living organisms and environment
- Understand the integrated themes of biodiversity.
- Appreciate the importance of environment by assessing its impact on the human world; envision the surrounding environment, its functions and its value.

UNIT I NATURAL RESOURCES 11

Introduction - scope and importance of environment – need for public awareness.
Forest resources- Use and over-exploitation, deforestation - timber extraction, mining, dams and their effects on forests and tribal people. **Water resources** - Use and over- utilization of surface and ground water, conflicts over water, dams-benefits and problems. **Mineral resources**- Use and exploitation, environmental effects of extracting and using mineral resources. **Food resources**- World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity. **Energy resources** - Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. **Land resources**- Land as a resource, land degradation, soil erosion and desertification – role of an individual in conservation of natural resources - case studies.

UNIT II POLLUTION AND ITS MANAGEMENT 11

Pollution – causes, effects and control measures - Air pollution- Water pollution - Soil pollution - Marine pollution - Noise pollution - Thermal pollution - Nuclear hazards - nuclear accidents and holocaust - role of an individual in prevention of pollution –case studies.
Waste management- causes, effects and control measures of municipal solid wastes, e- waste, plastic waste.

UNIT III ECOSYSTEMS AND BIODIVERSITY 9

Introduction to ecosystems – structure and function of an ecosystem – energy flow in the ecosystem – ecological succession – food chains, food webs and ecological pyramids - types, characteristic features, structure and functions of -Forest ecosystem - Grassland ecosystem -Desert ecosystem -Aquatic ecosystems (lakes, oceans)

Introduction to biodiversity–types (genetic, species and ecosystem diversity) –values of biodiversity – threats to biodiversity - endangered and endemic species – conservation of biodiversity (in-situ and ex-situ conservation)- India as a mega-diversity nation – hot-spots of biodiversity in India

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT 8

Sustainable development – sustainable development goals - water conservation, rain water harvesting, watershed management – resettlement and rehabilitation - consumerism and waste products, value education.

Disaster management- floods, drought, earthquake, tsunami, cyclone and landslides - case studies.

Environmental ethics-issues and possible solutions – environment protection act – air (prevention and control of pollution) act – water (prevention and control of pollution) act – wildlife protection act – forest conservation act.

UNIT V HUMAN POPULATION AND THE ENVIRONMENT 6

Introduction - population growth, variation among nations, population explosion, family welfare programme – women and child welfare - environment and human health –endemic/epidemic/pandemic, COVID – 19, HIV / AIDS– role of information technology in environment and human health – environmental impact assessment- case studies.

TOTAL: 45 PERIODS

OUTCOMES:

- Illustrate the importance and conservation of natural resources.
- Assess the impact of various pollutants and suggest appropriate pollution control methods.
- Explain the basic structure of ecosystem and the conservation of biodiversity.
- Analyze the social issues related to environment and recommend suitable solutions.
- Investigate the trends in population explosion and assess its impact.

TEXT BOOKS:

1. Anubha Kaushik and C. P. Kaushik, “Perspectives in environmental studies”, New Age International, 6th edition, 2018.
2. Benny Joseph, “Environmental Science and Engineering”, Tata McGraw-Hill, New Delhi, 2017.
3. Gilbert M. Masters, Wendell P. Ela “Introduction to Environmental Engineering and Science”, 3rd edition, Pearson Education, 2015.

REFERENCES:

1. William P. Cunningham and Mary Ann Cunningham, “Environmental Science: A Global Concern”, McGraw Hill, 14th edition, 2017.
2. G. Tyler Miller and Scott E. Spoolman, “Environmental Science”, Cengage Learning India Pvt. Ltd., Delhi, 14th edition, 2014.
3. ErachBharucha, “Textbook of Environmental Studies”, Universities Press Pvt. Ltd., Hyderabad, 2nd edition, 2015.

20GE101 PROBLEM SOLVING AND C PROGRAMMING L T P C

3 0 0 3

OBJECTIVES:

- To make the students understand the fundamentals of problem-solving using Algorithm and Flowchart
- To teach the basic programming constructs for solving simple problems
- To introduce the basic concepts of arrays and strings
- To acquaint the students about functions, pointers, structures and their relationship
- To impart knowledge on the concepts of file handling

UNIT I INTRODUCTION TO ALGORITHM AND C 9

Introduction to Computer System – Block diagram, Program Development Life Cycle

General problem solving concepts: Algorithm and Flowchart for problem solving with Sequential Logic Structure, Decisions and Loops.

Imperative languages: Introduction to imperative language, syntax and constructs of a specific language (ANSI C), Applications

Types, Operators: Variable Names, Data Type and Sizes (Little Endian Big Endian), Constants, Declarations, Basic I/O using scanf, printf, Operators – Types, Precedence, Associativity, Proper variable naming and Hungarian Notation.

UNIT II CONTROL FLOW STATEMENTS 7

Control Flow with discussion on structured and unstructured programming: Statements and Blocks, If-Else-If, Switch, Loops – while, do, for, break and continue, goto labels, structured and unstructured programming.

UNIT III ARRAYS AND FUNCTIONS 10

Arrays and Strings – Initialization, Declaration – One Dimensional and Two Dimensional arrays – Linear search, Binary Search, Matrix Operations (Addition and Subtraction)

Basics of functions, parameter passing and returning type, C main return as integer, External, Auto, Local, Static, Register Variables, Scope Rules, Block structure, Initialisation, Recursion, Pre-processor, Standard Library Functions and return types.

UNIT IV STRUCTURES AND POINTERS 10

Basic Structures, Structures and Functions, Array of structures.

Pointers and address, Pointers and Function Arguments, Pointers and Arrays, Address Arithmetic, character Pointers and Functions, Pointer Arrays, Pointer to Pointer, Initialisation of Pointer Arrays, Command line arguments, Pointer to functions, complicated declarations and how they are evaluated.

Pointer of structures, Self-referential structures, Table look up, typedef, unions, Bit-fields

UNIT V FORMATTED I/O AND FILE PROCESSING 9

Formatted Output – fprintf, Formated Input – fscanf, Variable length argument list
Files - file access including FILE structure, fopen, fread, fwrite, stdin, sdtout and stderr, File Types – Text, Binary - Error Handling including exit, perror and error.h, Line I/O, related miscellaneous functions.

TOTAL: 45 PERIODS

OUTCOMES:

- Develop algorithmic solutions to simple computational problems
- Develop simple applications using basic constructs
- Write programs using arrays and strings
- Design and implement applications using functions, pointers and structures.
- Design applications using sequential and random access file processing.

TEXT BOOKS:

1. Brian W Kernighan and Dennis M Ritchie, The C Programming Language, Pearson Education India, 2nd Edition, 2015.
2. Anita Goel and Ajay Mittal, "Computer Fundamentals and Programming in C", Dorling Kindersley (India) Pvt. Ltd., Pearson Education in South Asia, 2011.

REFERENCES:

1. B. Gottfried, Programming with C, Schaum Outline Series, Fourth Edition, 2018
2. Herbert Schildt, C: The Complete Reference, McGraw Hill, Fourth Edition, 2017
3. YashavantKanetkar, Let Us C, BPB Publications, 16th Edition, 2018.
4. Reema Thareja, "Programming in C", 2nd Edition, Oxford University Press, 2018.
5. Zed A. Shaw, "Learn C the Hard Way: Practical Exercises on the Computational Subjects You Keep Avoiding (like C)", (Zed Shaw's Hard Way Series), 1st Edition, Addison-Wesley Professional, 2015.

20CM106	CORE I - BASIC CIVIL & MECHANICAL ENGINEERING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To introduce various fields of civil engineering with emphasize on measurements, materials and structural components
- To provide an exposure on various applications of Engines, power plants, refrigerator and air conditioning systems

UNIT I OVERVIEW OF CIVIL ENGINEERING 12

Overview of Civil Engineering- Civil Engineering contributions to the welfare of Society – Specialized sub disciplines in Civil Engineering – Structural, Construction, Geotechnical, Environmental, Transportation and Water Resources Engineering. Surveying: Objects – classification – principles – measurements of distances – angles – leveling – determination of areas– contours - examples. Civil Engineering Materials: Bricks – stones – sand – cement – concrete – steel - timber – modern materials.

UNIT II BUILDING COMPONENTS AND STRUCTURES 13

Overview of Civil Engineering- Civil Engineering contributions to the welfare of Society – Specialized sub disciplines in Civil Engineering – Structural, Construction, Geotechnical, Environmental, Transportation and Water Resources Engineering. Surveying: Objects – classification – principles – measurements of distances – angles – leveling – determination of areas– contours - examples. Civil Engineering Materials: Bricks – stones – sand – cement – concrete – steel - timber – modern materials.

UNIT III INTRODUCTION TO MECHANICAL ENGINEERING AND AIR STANDARD CYCLES 10

a. **Overview of Mechanical Engineering:** Mechanical Engineering contributions to the welfare of Society –Specialized sub disciplines in Mechanical Engineering - Production, Automobile, Energy Engineering - Introduction and classification of Engineering materials.
b. **Air Standard Cycles:** Otto, Diesel, Dual &Brayton Cycle - Analysis & Optimization. Components of Diesel and Gas Turbine power plants. Combined Cycle Power Plants. Integrated Gasifier based Combined Cycle systems.

UNIT IV INTERNAL COMBUSTION ENGINES ANDPOWER PLANTS 15

Rankine cycle - improvisations, Classification of Power Plants - Internal combustion engines as automobile power plant – Working principle of Petrol and Diesel Engines – Four stroke and two stroke cycles – Comparison of four stroke and two stroke engines – Working principle of steam, Gas, Diesel, Hydro - electric and Nuclear Power plants. Binary Cycles and Cogeneration systems.

UNIT V PUMPS, REFRIGERATION AND AIRCONDITIONING SYSTEM 10

Working principle of Boilers, Turbines, Reciprocating Pumps (single acting and double acting) and Centrifugal Pumps

Terminology of Refrigeration and Air Conditioning. Principle of vapor compression and absorption system–Layout of typical domestic refrigerator–Window and Split type room Air conditioner.

TOTAL: 60 PERIODS

OUTCOMES:

- Apply the knowledge on Civil engineering fundamentals for practical applications
- Understand various building components, structures and infrastructural facilities.
- Elaborate the mechanical engineering fundamentals for practical applications and Air standard cycles.
- Identify the components used in power plant cycle.
- Interpret the working principles of petrol and diesel engine.
- Elaborate the components of refrigeration and Air conditioning cycle.

TEXT BOOKS:

1. Shanmugam G and Palanichamy M S, "Basic Civil and Mechanical Engineering", Tata McGraw Hill Publishing Co., New Delhi. 2018.

REFERENCES:

1. Palanikumar, K. Basic Mechanical Engineering, ARS Publications,2010.
2. Ramamrutham S., "Basic Civil Engineering", Dhanpat Rai Publishing Co. (P) Ltd.2004.
3. Seetharaman S., "Basic Civil Engineering", Anuradha Agencies, 2005.
4. ShanthaKumarSRJ., "Basic Mechanical Engineering", Hi-tech Publications, Mayiladuthurai, 2000.
5. Venugopal K. and Prahu Raja V., "Basic Mechanical Engineering", Anuradha Publishers, Kumbakonam,2007.
6. Rajput, R.K., "Thermal Engineering", Laxmi Publications, 2010.

20GE111	C PROGRAMMING LAB	L	T	P	C
		0	0	4	2

OBJECTIVES:

- To make the students write simple programs using basic constructs
- To familiarize the concepts of strings, pointers, functions and structures
- To equip the students on the knowledge of file processing concepts

LIST OF EXPERIMENTS

1. Constructing Flow charts using RAPTOR tools.
2. Programs using I/O statements and expression
3. Write a program to find whether the given line is horizontal or vertical.
4. Write a program to calculate the distance between two points p1(x1,y1), p2(x2,y2).
5. Write a program to calculate the force for the given mass and acceleration.
6. Write a program to calculate the Young's modulus.
7. Write a program to calculate the type of solution based on its pH value.
8. Write a program to temperature conversion (Fahrenheit to Celsius and vice versa)
9. Programs using decision-making constructs.
10. Write a program to find whether the given year is leap year or Not? (Hint: not every centurion year is a leap. For example 1700, 1800 and 1900 is not a leap year)
11. Design a calculator to perform the operations, namely, addition, subtraction, multiplication, division and square of a number.
12. Check whether a given number is Armstrong number or not?
13. Given a set of numbers like, find sum of weights based on the following conditions.
    - 5 if it is a perfect cube.
    - 4 if it is a multiple of 4 and divisible by 6.
    - 3 if it is a prime number.

    Sort the numbers based on the weight in the increasing order as shown below
    <10,its weight>, <36,its weight>, <89,its weight>
14. Populate an array with height of persons and find how many persons are above the average height.
15. Populate a two dimensional array with height and weight of persons and compute the BodyMass Index of the individuals.
16. Given a string ―a$bcd./fg‖ find its reverse without changing the position of special characters.(Example input:a@gh%;j and output:j@hg%;a)
17. Convert the given decimal number into binary, octal and hexadecimal numbers using user

18. From a given paragraph perform the following using built-in functions:
    a. Find the total number of words.
    b. Capitalize the first word of each sentence.
    c. Replace a given word with another word.
19. Solve towers of Hanoi using recursion.
20. Sort the list of numbers using pass by reference.
21. Generate salary slip of employees using structures and pointers. Create a structure Employee with the following members:
    EID, Ename, Designation, DOB, DOJ, Basicpay
    Note that DOB and DOJ should be implemented using structure within structure.
22. Compute internal marks of students for five different subjects using structures and functions.
23. Insert, update, delete and append telephone details of an individual or a company into a telephone directory using random access file.
24. Count the number of account holders whose balance is less than the minimum balance using sequential access file.
25. Mini project: Create a ―Railway reservation system with the following modules
    - Booking
    - Availability checking
    - Cancellation
    - Prepare chart

TOTAL: 60 PERIODS

OUTCOMES

- Write programs for simple applications making use of basic constructs, arrays andstrings.
- Develop programs involving functions, recursion, pointers, and structures.
- Create applications using sequential and random access file processing.

TEXT BOOKS:

1. Brian W Kernighan and Dennis M Ritchie, The C Programming Language, PearsonEducation India, 2nd Edition, 2015.
2. Anita Goel and Ajay Mittal, "Computer Fundamentals and Programming in C", Dorling Kindersley (India) Pvt. Ltd., Pearson Education in South Asia, 2011.

REFERENCES:

1. B. Gottfried, Programming with C, Schaum Outline Series, Fourth Edition, 2018
2. Herbert Schildt, C: The Complete Reference, McGraw Hill, Fourth Edition, 2017
3. YashavantKanetkar, Let Us C, BPB Publications, 16th Edition, 2018.
4. Reema Thareja, "Programming in C", 2nd Edition, Oxford University Press, 2018.
5. Zed A. Shaw, "Learn C the Hard Way: Practical Exercises on the Computational Subjects You Keep Avoiding (like C)", (Zed Shaw's Hard Way Series), 1st Edition, Addison-Wesley Professional, 2015.

20EL112	INTERPERSONAL SKILLS – LISTENING, SPEAKING, READING AND WRITING LAB	L	T	P	C
		0	0	4	2

OBJECTIVES:

- Equip and Strengthen the English language skills
- Provide guidance and practice to engage in specific academic speaking activities and enhance writingskills with specific reference to technical writing.
- Improve general and academic listening skills and develop critical thinking skills Develop their project, proposal writingandeffective presentation skills.

UNIT I **12**

Listening as a key skill- its importance- speaking - pronunciation basics -Reading - Strategies for effective reading - Writing -Write a descriptive paragraph - Predicting content using photos and title.

UNIT II **12**

Listen for information – Speaking- conversation starters: small talk - Reading - Use of graphic organizers to review and aid comprehension. Writing - Write an opinion paragraph

UNIT III **12**

Listening - listen for detail Speaking - deliver a five-minute talk -Reading - speed reading techniques - Writing –Analytical Essay.

UNIT IV **12**

Listening - Being an active listener: giving verbal and non-verbal feedback – Speaking - participating in a group discussion - summarizing academic readings-Reading - Genre and Organization of Ideas – Writing - Email writing - Job application

UNIT V **12**

Listening - directions and instructions in academic and business contexts - Speaking- group/pair presentations -Reading - Critical reading and thinking -Writing - letter of recommendation - Vision statement

TOTAL: 60 PERIODS

OUTCOMES:

- Listen and respond appropriatelyin conversations both formal and informal
- Participate in group discussions
- Make effective presentations
- Write different types of essays and winning job applications.
- Read and evaluate texts critically.
- Display critical thinking in various professional contexts.

TEXT BOOKS:

1. Brooks, Margret. Skills for Success. Listening and Speaking. Level 4 Oxford University Press, Oxford: 2011.
2. Richards, C. Jack. & David Bholke. Speak Now Level 3. Oxford University Press, Oxford: 2010.

REFERENCES:

1. Elbow, Peter. Writing Without Teachers. London: Oxford University Press, 1973. Print.
2. Hughes, Glyn and Josephine Moate. Practical English Classroom. Oxford University Press: Oxford, 2014.
3. Ladousse, Gillian Porter. Role Play. Oxford University Press: Oxford, 2014
4. Richards C. Jack. Person to Person (Starter). Oxford University Press: Oxford, 2006.
5. Vargo, Mari. Speak Now Level 4. Oxford University Press: Oxford, 2013.

20EL201	TECHNICAL ENGLISH	L	T	P	C
		2	0	0	2

OBJECTIVES:

- Develop strategies and skills to enhance their ability to read and comprehend engineering and technology texts.
- Foster their ability to write convincing job applications and effective reports.
- Demonstrate their speaking skills to make technical presentations, participate ingroup discussions.
- Strengthen their listening skill which will help them comprehend lectures and talks in their areas of specialization.

UNIT I INTRODUCTION - TECHNICAL ENGLISH 6

Listening- Listening to talks mostly of a scientific/technical nature and completing information-gap exercises- **Speaking** –Asking for and giving directions- **Reading** – reading short technical texts from journals- newspapers- **Writing**- purpose statements – extended definitions – writing instructions – checklists – recommendations-Vocabulary Development-technical vocabulary. Language Development –subject verb agreement - compound words.

UNIT II READING AND STUDY SKILLS 6

Listening- Listening to longer technical talks and completing exercises based on them-**Speaking** -describing a process-**Reading**– reading longer technical texts- identifying the various transitions in a text- paragraphing- **Writing**- interpreting charts, graphs- Vocabulary Development-vocabulary used in formal letters/emails and reports Language Development-impersonal passive voice, numerical adjectives.

UNIT III TECHNICAL WRITING AND GRAMMAR 6

Listening- Listening to classroom lectures/ talks on engineering/technology -**Speaking** – introduction to technical presentations- **Reading** – longer texts both general and technical, practice in speed reading; **Writing**-Describing a process, use of sequence words- Vocabulary Development- sequence words- Misspelled words. Language Development- embedded sentences

UNIT IV REPORT WRITING 6

Listening- Listening to documentaries and making notes. **Speaking** – mechanics of presentations-**Reading** – reading for detailed comprehension- **Writing**- Report Writing (accident and survey) - minutes of a meeting - Vocabulary Development- finding suitable synonyms-paraphrasing-. Language Development-reported speech.

UNIT V GROUP DISCUSSION AND JOB APPLICATIONS 6

Listening- TED talks; **Speaking** –participating in a group discussion -**Reading**– reading and understanding technical articles **Writing**– email etiquette- job application – cover letter – Résumé preparation (via email and hard copy)- Vocabulary Development- verbal analogies -

Language Development- clauses- if conditionals.

TOTAL :30 PERIODS

OUTCOMES :

- Read technical texts and write area- specific texts effortlessly.
- Listen and comprehend lectures and talks in their area of specialization successfully.
- Speak appropriately and effectively in varied formal and informal contexts.
- Write reports and winning job applications.

TEXT BOOKS:

1. Booth-L. Diana, Project Work, Oxford University Press, Oxford: 2014.
2. Sudharshana.N.P and Saveetha C. English for Technical Communication. Cambridge University Press: New Delhi, 2016.

REFERENCES:

1. Grussendorf, Marion, English for Presentations, Oxford University Press, Oxford: 2007.
2. Herbert, A. J. The Structure of Technical English.Longman.1976.
3. Kumar, Suresh. E. Engineering English. Orient Black swan: Hyderabad,2015.
4. Means, L. Thomas and Elaine Langlois, English & Communication for Colleges. Cengage Learning, USA: 2007.
5. Raman, Meenakshi and Sharma, Sangeetha- Technical Communication Principles and Practice. Oxford University Press: New Delhi,2014.

20MA201 ENGINEERING MATHEMATICS II L T P C

3 2 0 4

OBJECTIVES:

- Explain various techniques in solving ordinary differential equations.
- Make the students understand the concepts of vector differentiation and integration.
- Introduce the concepts of Laplace transforms and its applications.
- Develop an understanding on analytic function, conformal mapping and complex integration.

UNIT I ORDINARYDIFFERENTIALEQUATIONS 9+6

Higher order linear differential equations with constant coefficients – Method of variation of parameters – Cauchy's and Legendre's linear equations – Simultaneous first order linear equations with constant coefficients**.**

UNIT II VECTORCALCULUS 9+6

Gradient, divergence and curl (excluding vector identities) – Directional derivative – Irrotational and solenoidal vector fields – Vector integration – Green's theorem in a plane, Gauss divergence theorem and Stoke's theorem (Statement only) –Simple applications involving cubes and rectangular parallelopipeds.

UNIT III LAPLACE TRANSFORMS 9+6

Laplace transforms – Sufficient condition for existence – Transform of elementary functions – Basic properties – Transforms of derivatives and integrals of functions – Derivatives and integrals of transforms –Transforms of unit step function and impulse functions – Transform of periodic functions. Inverse Laplace transform – Convolution theorem (Statement only) – Initial and final value theorems– Solution of linear ordinary differential equation of second order with constant coefficients using Laplace transformation techniques.

UNIT IV COMPLEX DIFFERENTIATIONAND CONFORMAL MAPPING 9+6

Functions of a complex variable – Analytic functions: Necessary conditions – Cauchy-Riemann equations and sufficient conditions (Statement only) – Harmonic and orthogonal properties of analytic function – Harmonic conjugate – Construction of analytic functions – Conformal mapping: $w = z+k$, kz, $1/z$, $z^2$and bilinear transformation.

UNIT V COMPLEXINTEGRATION 9+6

Complex integration – Statement and applications of Cauchy's integral theorem and Cauchy's integral formula – Taylor's and Laurent's series expansions – Singular points – Residues – Statement and applications of Cauchy's residue theorem – Evaluation of real definite integrals as contour integrals around unit circle and semi-circle (excluding poles on the real axis).

TOTAL: 60 PERIODS

OUTCOMES:

- Solve the higher order linear differential equations.
- Determine the gradient of a scalar field, divergence and curl of a vector fields and interpret their physical meaning and evaluate line, surface and volume integrals by vector integration.
- Apply Laplace Transforms method for solving linear ordinary differential equation.
- Construct ananalytic function and analyze conformal mapping.
- Evaluate the real integrals using complex integration.

TEXT BOOKS:

1. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley and Sons, 10th Edition, New Delhi, 2016.
2. B.S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, NewDelhi, 43rd Edition,2014.
3. T. Veerarajan, "Engineering Mathematics", Tata McGraw Hill, 2nd Edition, New Delhi, 2011.

REFERENCES:

1. M. K. Venkataraman, "Engineering Mathematics, Volume II", 4thEdition, The National Publication Company, Chennai, 2003.
2. SivaramakrishnaDass, C. Vijayakumari, "Engineering Mathematics", Pearson Education India, 4thEdition 2019.
3. H. K. Dass, and Er. Rajnish Verma, "Higher Engineering Mathematics", S. Chand Private Limited, 3rd Edition 2014.
4. B.V. Ramana, "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company,6th Edition, New Delhi, 2008.
5. S.S. Sastry, "Engineering Mathematics", Vol. I & II, PHI Learning Private Limited, 4th Edition, New Delhi, 2014.

20PH102 PHYSICS FOR ELECTRONICS ENGINEERING L T P C

3 0 0 3

OBJECTIVES:

- To educate the fundamental important concepts in physics and to apply the knowledge in solving scientific and engineering problems.
- To impart the basic concepts of conducting materials, semiconducting materials, opto and nano electronic devices, light propagation in waveguides and electro-magnetostatics and electrodynamics.

UNIT I CONDUCTINGMATERIALS 9

Classical free electron theory - Expression for electrical conductivity -Four probe method-determination of resistivity -Expression for Thermal conductivity- Wiedemann-Franz law - Success and failures of CFT -Effect of temperature on Fermi function - Density of energy states- Carrier concentration in metals and average energy of an electron at 0 K – Energy bands in solids.

UNIT II SEMICONDUCTING MATERIALS 9

Intrinsic semiconductors – Energy band diagram – Direct and indirect band gap semiconductors – Carrier concentration in intrinsic semiconductors – determination of band gap - Extrinsic semiconductors - n-type and p-type semiconductors (qualitative) – Variation of Fermi level with temperature and impurity concentration – Hall effect and its applications.

UNIT III OPTO AND NANO ELECTRONIC DEVICES 9

Carrier generation and recombination processes in semiconductors (concepts only) –LED-Organic LED- Photodetectors- Photodiodes -Solar cell – Electron density in bulk material (qualitative) -Size dependence of Fermi energy- Band gap of nanomaterial -Quantum confinement-Quantum structures -Density of states in quantum well, quantum wire and quantum dot structures - Quantum dot lasers.

UNIT IV LASER AND FIBRE OPTICS 9

Population of energy levels, Einstein's A and B coefficients- derivation – Resonant cavity, optical amplification (qualitative) – Semiconductor lasers: homojunction and heterojunction – Engineering applications in communication.

Fibre optics -principle, numerical aperture and acceptance angle, V-number – Types of optical fibre (Material, Refractive index and Mode) – Losses in optical fibre - Fibre optic communication -Fibre optic sensors (pressure and displacement).

UNIT V ELECTRO-MAGNETOSTATICS AND ELECTRODYNAMICS 9

Electrostatics*:* Coulomb's law - Gauss's law, Applications of Gauss's law (qualitative) - Maxwell's equation-I (equation only) - Electric field in matter: dielectrics, electric

polarization, electric permittivity and susceptibility, relative permittivity, Types of polarization (electronic, ionic, orientation and space charge) - Internal field – Derivation - Clausius-Mossotti equation.

Magnetostatics: Biot-Savart law and its applications (qualitative) – Ampere's law and its applications (qualitative)-Lorentz force-Maxwell's equation-II (equations only).

Electrodynamics: Faraday's law of induction, Lenz law - Maxwell's equations-III and IV (equations only) – Electromagnetic waves in dielectric medium -Electromagnetic waves in vacuum.

TOTAL: 45 PERIODS

OUTCOMES:

- estimate the conducting properties of materials based on CFE and QFE theories and understand the formation of energy band structures.
- understand the basic properties of semiconducting materials and apply the concepts to determine Hall coefficient.
- elucidate the principle and working of various opto and nanoelectronic devices and their applications.
- attain basic knowledge on the concepts of lasers and apply in fibre optic communication.
- correlate electric and magnetic field behavior of electro-magnetostatics and electrodynamics.
- understand the concepts of conducting materials, semiconducting materials and apply the same to determine resistivity and band gap, explicate the principle and working of opto and nanoelectronic devices and analyze Maxwell's equation in different forms (differential and integral) in Electro-Magnetostatics and Electrodynamics.

TEXT BOOKS:

1. M.N. Avadhanulu and P.G. Kshirsagar, "A Textbook of Engineering Physics", S. Chand and Company, New Delhi, 2014.
2. R.K. Gaur and S.L. Gupta, "Engineering Physics", Dhanpat Rai Publications (P) Ltd., Eighth Edition, New Delhi, 2001.
3. B.K. Pandey and S. Chaturvedi, "Engineering Physics", Cengage Learning India, 2012.
4. A. Marikani, "Materials Science", PHI Learning Private Limited, Eastern Economy Edition, 2017.
5. R. Wolfson, "Essential University Physics", Volume 1 and 2 with Mastering Physics, Global Edition, 3rd Edition, Pearson 2017.
6. S. O. Kasap, "Principles of Electronic Materials and Devices", McGraw-Hill Education, 2007.
7. David J Griffiths, "Introduction to Electrodynamics", Pearson Education India Learning Private Limited;, 4 th edition, 2015.
8. "J. D Kraus", "Electromagnetics", McGraw-Hill Inc. 4th edition, 1992.

REFERENCES:

1. J. Singh, “Semiconductor Optoelectronics: Physics and Technology”, McGraw-Hill Inc., 1995.
2. S.M. Sze, “Semiconductor Devices: Physics and Technology”, Second Edition,Wiley 2008.
3. R. E. Hummel, “Electronic Properties of Materials”, Springer, 2001.
4. G. W. Hanson, “Fundamentals of Nanoelectronics”, Pearson Education, 2008.
5. B.Rogers, J. Adams, P. Sumitha, “Nanotechnology: Understanding Small Systems”, CRC Press, 2014.
6. D. Halliday, R.Resnick and J. Walker , “Fundamentals of Physics”, Wiley Publications, 2008.
7. R. A. Serway and J. W. Jewett, “Physics for Scientists and Engineers”, Volume 5, Chapters 40-46, 8th Edition, Cengage Learning, 2010.
8. P. M. Fishbane, S. Gasiorowicz, S. Thornton, “Physics for Scientists and Engineers”, 3rd Edition, Chapters 1-40, 2005.

20CH101 ENGINEERING CHEMISTRY L T P C

3 0 0 3

OBJECTIVES:

- Understand the role of chemistry in everyday life.
- Develop an understanding of the basic concepts of electro chemistry and its applications.
- Learn the principles and generation of energy in different types of batteries, fuel cells, nuclear reactors, solar cells and wind mills.
- Make them acquire basic knowledge of polymers, their classification and the applications of speciality polymers in engineering and technology.
- Understand the preparation, properties and applications of nanomaterials in various fields.

UNIT I CHEMISTRY IN EVERYDAY LIFE 8

Importance of chemistry in everyday life- food additives - types (colours, preservatives, flavours and sweeteners), effects - food adulteration– types of adulteration (intentional, incidental)- effects of food adulterants –cosmetics and personal care products (fairness creams, perfumes, deodorants, shampoos)- effects – beverages-classification – carbonated beverages – nutritive values and effects.

Water – impurities – industrial uses of water – hardness, external treatment (demineralization) – desalination (reverse osmosis).

UNIT II ELECTROCHEMISTRY 10

Introduction – terminology-conductance of electrolytes- specific conductance, equivalent conductance, molar conductance-factors affecting conductance- origin of electrode potential-single electrode potential, standard electrode potential-measurement of single electrode potential-reference electrodes (standard hydrogen electrode, calomel electrode) - electrochemical series, applications –measurement of EMF of the cell – Nernst equation (derivation), numerical problems.

Chemical sensors – principle of chemical sensors- breath analyzer and Clark oxygen analyzer.

UNIT III ENERGY STORAGE DEVICES AND ENERGY SOURCES 9

Batteries – primary battery (alkaline battery) -secondary battery (Pb-acid battery, Ni-metal hydride battery, Li-ion battery) - fuel cells (H_2-O_2 fuel cell).

Nuclear Energy –nuclear reactions –fission, fusion, differences, characteristics– nuclear chain reactions –light water nuclear reactor – breeder reactor.

Renewable energy sources-solar energy – thermal conversion (solar water heater and heat collector) - photovoltaic cell– wind energy.

UNIT IV POLYMERS 9

Introduction – monomer, functionality, degree of polymerization – classification based on sources and applications – effect of polymer structure on properties - types of polymerization (addition, condensation) - thermoplastic and thermosetting resins – preparation, properties and

applications of Teflon, polyvinyl chloride, polycarbonate, Bakelite.

Special polymers - biodegradable polymers - properties and applications of polycaprolactone, polyhydroxyalkanoate – properties and applications of electrically conducting polymers (poly aniline, polyvinylidene fluoride).

UNIT V NANOCHEMISTRY 9

Introduction –synthesis – top-down process (laser ablation, chemical vapour deposition), bottom-up process (precipitation, electrochemical deposition)– properties of nanomaterials – types (nanorods, nanowires, nanotubes-carbon nanotubes, nanocomposites).

Applications of carbon nanotubes – applications of nanomaterials in electronics, information technology, medical and healthcare, energy, environmental remediation, construction and transportation industries.

TOTAL : 45 PERIODS

OUTCOMES:

- Illustrate the role of chemistry in everyday life and the industrial uses of water.
- Construct electrochemical cells and to determine the cell potential.
- Compare and analyse the different energy storage devices and to explain potential energy sources.
- Classify different types of polymeric materials and to discuss their properties and applications.
- Explain basic concepts of nano chemistry and to enumerate the applications of nanomaterials in engineering and technology.

TEXT BOOKS:

1. P. C. Jain and Monika Jain, "Engineering Chemistry", 17th edition, Dhanpat Rai Publishing Company Pvt. Ltd., New Delhi, 2018.
2. Prasanta Rath, "Engineering Chemistry", 1st edition, Cengage Learning India Pvt. Ltd., Delhi, 2015.

REFERENCES:

1. S. S. Dara and S. S. Umare, "A Textbook of Engineering Chemistry", 12th edition, S. Chand & Company, New Delhi, 2010.
2. Kirpal Singh, "Chemistry in daily life", 3rd edition, PHI Learning Pvt. Ltd., 2012.
3. J. C. Kuriacose and J. Rajaram, "Chemistry in Engineering and Technology", Volume-1 & Volume -2, Tata McGraw-Hill Education Pvt. Ltd., 2010.
4. Geoffrey A.Ozin, Andre C. Arsenault, Ludovico Cademartiri, "Nanochemistry: A Chemical Approach to Nanomaterials", 2nd edition, RSC publishers, 2015.
5. Prasanna Chandrasekhar, "Conducting polymers, fundamentals and applications - A Practical Approach", 1st edition, Springer Science &Business Media, New York, 1999.

20EI201	CORE II –BASIC ELECTRONICS AND INSTRUMENTATION ENGINEERING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To contrast the basic operation of PN junction devices and its applications
- To study the construction and working of transistors and special electronic devices
- To acquire knowledge in basic Industrial Instrumentation system
- To study the characteristics of Measurement system
- To explain various types of Measuring Instruments

UNIT I PN JUNCTION DEVICES AND ITS APPLICATIONS 9

PN diode structure, operation and V-I characteristics, diffusion and transition capacitance, Zener diode, Zener diode Reverse characteristics, Rectifiers - Half Wave and Full Wave Rectifiers, Filters- Series Inductor Filter, Shunt capacitor filter, LC filter, Zener diode as regulator.

UNIT II TRANSISTORS AND SPECIAL DEVICES 9

Structure, operation and characteristics: BJT Common Base, Common Emitter, Common Collector. JFET, MOSFET, UJT, Structure and operation-SCR, DIAC, TRIAC

UNIT III BASIC INSTRUMENTATION SYSTEM 9

Classification and Scope of Instrumentation system in industries, Instrumentation and control techniques-Manual control and automatic control, Instrumentation system- Basics, Process variables and parameters.

UNIT IV BASIC MEASUREMENTS 9

Units and standards, Calibration methods-Static calibration, Classification of errors, Limiting error and probable error, Error analysis-Statistical methods, Odds and uncertainty, Static characteristics-Accuracy, precision, resolution, sensitivity, linearity, span and range, Dynamic characteristics.

UNIT V ELECTRICAL AND ELECTRONIC MEASUREMENTS 9

Types of electrical Instruments, Types of operating forces, Construction and operation of PMMC and moving iron instruments, D'Arsonval galvanometer, Electronic voltmeter and advantages, General purpose cathode ray oscilloscope, Dual trace sampling oscilloscope, Dual beam sampling oscilloscope, Analog and digital storage oscilloscope

TOTAL: 45 PERIODS

OUTCOMES:

- Understand the structure and operation of PN junction devices and power supply design
- Differentiate the various transistors and special electronic devices for real time applications

- Illustrate the basic knowledge in Industrial Instrumentation system
- Verify the static and dynamic characteristics of Measurement system
- Categorize the various types of Measuring Instruments for the Industrial applications

TEXT BOOKS:

1. Robert L. Boylestad, "Electronic Devices and Circuit theory", 11th edition, Published byPearson, 2013
2. A.K. Sawhney, "A Course in Electrical & Electronic Measurements and Instrumentation", DhanpatRai and Co, New Delhi, 2010.

REFERENCES:

1. David A. Bell, "Electronic Devices and Circuits", Prentice Hall of India, 2004.
2. Floyd, "Electron Devices" Pearson Asia, 9th Edition, 2012.
3. D. Patranabis, "Sensors and Transducers", 2nd edition, Prentice Hall of India, 2010.
4. D.V.S Murthy, "Transducers and Instrumentation", 2nd Edition, Prentice Hall of India Pvt. Ltd., New Delhi, 2010.
5. S.K.Singh., "Industrial Instrumentation and Control", 3rd Edition, Tata McGraw - Hill Education, 2008.
6. A.D. Helfrick and W.D. Cooper, "Modern Electronic Instrumentation and MeasurementTechniques", Prentice Hall India Pvt Ltd., New Delhi, 2010.
7. H.S. Kalsi, "Electronic Instrumentation", Tata McGraw-Hill, New Delhi, 2010.
8. NPTL website link :https://nptel.ac.in/courses/117/106/117106091/, https://nptel.ac.in/courses/103/105/103105064/, https://nptel.ac.in/courses/108/105/108105153/
9. Website link: https://new.siemens.com/global/en/products/automation/process-instrumentation.html

20EE202 CORE III - ELECTRIC CIRCUIT ANALYSIS L T P C

3 1 0 4

OBJECTIVES:

- To develop the basic concepts of network analysis, which is the pre-requisite for all the electrical engineering subjects.
- To solve different complex circuits using various network reduction techniques such as Source transformation, Network theorems etc.
- To analyze the series and parallel resonant circuit and to synthesise coupled circuits
- To comprehend three phase systems with balanced and unbalanced loads and power measurements.
- To evaluate AC and DC transients for complex electrical systems.

UNIT I BASIC CIRCUITS ANALYSIS AND NETWORK REDUCTION 6+6

Resistive elements – Ohm's Law -Resistors in series and parallel circuits – Kirchoffs laws - Voltage and current division rule, source transformation -star delta conversion-network reduction techniques– Mesh current and node voltage-methods of analysis for AC and DC circuits-dependent and independent sources

UNIT II THEOREMS FOR DC AND AC CIRCUITS 6+6

A.C. circuits – Average and RMS value – Phasor Diagram – Power, Power Factor and Energy. Thevenins and Norton Theorems – Superposition Theorem – Maximum power transfer theorem – Reciprocity Theorem – Millman's theorem.

UNIT III RESONANCE AND COUPLED CIRCUITS 6+6

Series and parallel resonance – their frequency response – Quality factor and Bandwidth – Self and mutual inductance – Coefficient of coupling -Auto Transformer as a coupled circuit– Tuned circuits – Single tuned circuits.

UNIT IV THREE PHASE CIRCUITS 6+6

Analysis of three phase 3-wire and 4-wire circuits with star and delta connected loads, balanced & unbalanced – phasor diagram of voltages and currents – power measurement in three phase circuits.

UNIT V TRANSIENT RESPONSE ANALYSIS 6+6

L and C elements -Transient response of RL, RC and RLC Circuits using Laplace transform for with step input and sinusoidal input

TOTAL :60 PERIODS

OUTCOMES:

- Apply the knowledge of basic circuital law and simplify the network using reduction techniques and analyse the circuit using Kirchhoff's law.
- Understand network theorems to simplify the complex networks.

- Design resonant circuits which are used in wireless transmission and communication networks.
- Develop the coupled circuit and tuned circuits for communication networks
- Understand 3-phase ac circuits for designing and analysis of power system networks.
- Solve and analyse AC and DC transients using Laplace transform techniques

TEXT BOOKS:

1. William H. Hayt Jr, Jack E. Kemmerly and Steven M. Durbin, "Engineering Circuits Analysis", McGraw Hill publishers, edition, New Delhi, 2013.
2. Charles K. Alexander, Mathew N.O. Sadiku, "Fundamentals of Electric Circuits", Second Edition, McGraw Hill, 2013.
3. Allan H. Robbins, Wilhelm C. Miller, "Circuit Analysis Theory and Practice", Cengage Learning India, 2013.

REFERENCES :

1. Chakrabarti A, "Circuits Theory (Analysis and synthesis), Dhanpath Rai & Sons, New Delhi, 1999.
2. Jegatheesan, R., "Analysis of Electric Circuits," McGraw Hill, 2015.
3. Joseph A. Edminister, Mahmood Nahri, "Electric circuits", Schaum's series, McGraw-Hill, New Delhi, 2010.
4. M E Van Valkenburg, "Network Analysis",Prentice-Hall of India Pvt Ltd, New Delhi, 2015.
5. Mahadevan, K., Chitra, C., "Electric Circuits Analysis," Prentice-Hall of India Pvt Ltd., New Delhi, 2015.
6. Richard C. Dorf and James A. Svoboda, "Introduction to Electric Circuits", 7th Edition, John Wiley & Sons, Inc. 2015.
7. Sudhakar A and Shyam Mohan SP, "Circuits and Network Analysis and Synthesis", McGraw Hill, 2015.

20PC111	PHYSICS & CHEMISTRY LABORATORY	L	T	P	C
		0	0	4	2

OBJECTIVES:

- To introduce different experiments to test basic understanding of physics concepts applied in optics, thermal physics, and properties of matter, semiconductors and liquids.
- To make the students acquire practical skills through volumetric and instrumental analysis.

PHYSICS LABORATORY

LIST OF EXPERIMENTS (Any five experiments to be conducted**)**

1. Determination of wavelength and velocity of ultrasonic waves by Ultrasonic Interferometer.
2. Determination of thermal conductivity of a poor conductor by LEE'S Disc method.
3. Determination of wavelength and divergence angle of semiconductor laser source using diffraction grating.
   Determination of particle size by using diffraction of semiconductor laser beam.
   Analysis of Numerical aperture and acceptance angle of an optical fibre.
4. Determination of Young's Modulus of a beam by non-uniform bending method.
5. Determination of the moment of inertia of the disc and rigidity modulus of wire by Torsional pendulum.
6. Spectrometer - Determination of wavelength of Mercury Spectrum using diffraction grating.
7. Determination of thickness of wire by air wedge method.
8. Determination of Young's Modulus of a beam by Uniform bending method.
9. Determination of band gap of a semiconductor.

CHEMISTRY LABORATORY

10. Determination of total, temporary and permanent hardness of water by EDTA method.
11. Conductometric titration of strong acid vs. strong base.
12. Determination of strength of acids in a mixture using a conductivity meter.
13. Determination of strength of given hydrochloric acid using a pH meter.
14. Estimation of the iron content of the given solution using a potentiometer.
15. Estimation of the iron content of the water sample using a spectrophotometer (thiocyanate method).

16. Estimation of sodium present in water using aflame photometer.
17. Determination of the molecular weight of polyvinyl alcohol using Ostwald viscometer.
18. Determination of corrosion rate by weight loss method.
19. Determination of flash and fire point of a lubricating oil (Pensky Martens apparatus).
20. Determination of concentration of a given solution by constructing a galvanic cell.

TOTAL: 60 PERIODS

OUTCOMES:

- Determine the wavelength of mercury spectrum and also determine the wavelength of a laser source, particle size, divergence angle of semiconductor laser source using diffraction grating and to analyze the numerical aperture and acceptance angle of an optical fibre.
- examine the Young's modulus of a beam by uniform and non-uniform bending and to estimate the moment of inertia of the disc and rigidity modulus of wire by torsional pendulum.
- determine the band gap of a semiconductor
- Analyse the given hard water sample, change in conductivity of an acid(s) when added with base .
- Examine the change in pH when an acid is added with a base, Understand the redox reactions and its impact on emf values.
- Assess the corrosion rate of a given metal, Construct an electrochemical cell to determine the concentration of the given solution.

REFERENCES:

1. Physics laboratory manual, Department of Physics, R.M.K.Engineering college, 2019.
2. Wilson J.D. and Hernandez C.A., - Physics Laboratory Experiments, Houghton Mifflin Company, New York, 2005.
3. J. Mendham, R. C. Denney, J. D. Barnes, M. J. K. Thomas and B. Sivasankar, "Vogel's Quantitative Chemical Analysis", 6th edition, Pearson Education Pvt. Ltd., 2009.

20CS212	ADVANCED C PROGRAMMING LAB	L	T	P	C
		0	0	4	2

OBJECTIVES:

- To develop programs using Arrays and Strings
- To develop programs using pointers and dynamic memory allocation
- To develop programs using files
- To apply C programming for solving Engineering Problems

LIST OF EXPERIMENTS

1. Array Manipulation
2. String Manipulation
3. Pointers
4. Solving polynomial equations
5. Dynamic Memory Allocation
6. File Manipulation
7. Domain specific problems

INDICATIVE LIST OF EXERCISES

1. **Arrays:**
   a) Find the prime factors of a number.
   b) Find maximum repeating number.
   c) Find k^{th} smallest element in an unsorted array.
   d) Matrix manipulation – Addition, Subtraction, Multiplication.
   e) Job Sequencing: Given an array of jobs where every job has a deadline and a profit. Profit can be earned only if the job is finished before the deadline. It is also given that every job takes a single unit of time, so the minimum possible deadline for any job is 1. How to maximize total profit if only one job can be scheduled at a time. Print the sequence of jobID order to maximize total profit.
2. **String Manipulation:**
   a) Find the frequency of all the characters in a string.
   b) Given two strings S1 and S2. Remove all the occurrences of S2 in S1 and print the remaining.
   c) Reversing a set of words.
   d) Find the number of patterns of form 1[0]1 where [0] represents any number of zeroes (minimum requirement is one 0) there should not be any other character except 0 in the [0] sequence in a given binary string.
3. **Pointers:**
   a) Manipulating two dimensional arrays using pointers.
   b) Print the odd positioned characters and then even positioned characters using

pointers.

c) Programs using double pointers in C.

d) Print all permutations of a given string using pointers.

4. **Numerical Solutions of Polynomials**

a) Solve a polynomial equation.

b) Find the value of the derivative of the polynomial equation given by the user who provides the value of the unknown variable x.

5. **Dynamic Memory Allocation:**

a) Find Largest Number Using Dynamic Memory Allocation.

b) Print the list of elements in reverse order.

6. **File Manipulation:**

a) Merge the content of two files.

b) Merge two lists given.

c) Print the odd positioned characters from a file content.

7. **Solve domain specific problems in C:**

Civil

1) Find the area of the irregular land using Trapeziodal rule.
2) Find the area of the irregular land using simpson rule.

EEE & EIE

1) Find the current through a resistor, for voltage varying from 5V to 20V in steps of 5V, using Ohm's Law.
2) Find equivalent resistance when resistors are connected in series, equivalent capacitance when capacitors are connected in parallel.

Mechanical

1) Compute the volume of solids (prism, pyramids, cylinder and cone) from Engineering Graphics problems.
2) Draw a projectile from Engineering mechanics problems.

TOTAL: 60 PERIODS

OUTCOMES:

- Apply array and string concepts to solve problems.
- Employ pointers to solve various problems.
- Implement dynamic memory allocation.
- Understand file manipulations.
- Design and develop real-world applications utilizing the concepts of arrays, strings, pointers, dynamic memory allocation and files.

20EM211 BASIC ENGINEERING AND CIRCUITS LABORATORY L T P C

0 0 4 2

OBJECTIVES:

- To gain hands on experience in plumbing, welding and Foundry
- To gain hands on experience in basic house wiring
- To gain Practical knowledge in measurement and analysis of electrical quantities incomplicated electric circuits using various methods of analysis
- To learn how to analyze an electrical circuit using simulation software
- To wiring, and electric circuits.

LIST OF EXPERIMENTS

GROUP A

1. Hand-on-exercise
Basic pipe connections -Mixed pipe connection- pipe connection with different joining points.

2. Study Of pipeline joints-its location -valves-function-tabs-unions-reducers-elbows in household fittings.

3. Welding - preparation of butt joints and T joints by metal arc welding.

4. Foundry operation like mould preparation for gear and step cone pulley

GROUP B

5. Prelab session on
a) Various safety devices and Safety Measures in Electrical System
b) Analog and Digital Oscilloscopes for measuring various Electrical Quantities
c) Various Power tools and troubleshooting of Electric Iron and fan

6. Draw and demonstrate the layout for a residential house wiring using energy meter, switches, fuse, indicator, LED lamp, fluorescent lamp with one of the lamps to be controlled by 2 different switches

7. Design and develop PCB board for a rectifier circuit and troubleshoot the same

8. Measurement of electrical Quantities Voltage, current, power and p.f in RLC circuits.

9. Measurement of energy using energy meter.

10. Simulation and experimental verification of electrical circuit problems using Kirchhoff's voltage and current laws.

11. Simulation and experimental verification of electrical circuit problems using Superposition theorem.

12. Simulation and experimental verification of electrical circuit problems using Thevenin's theorem and Norton's theorem.

13. Simulation and experimental verification of Maximum Power transfer Theorem.

14. Design and Simulation of series and parallel resonance circuit.

15. Simulation and experimental verification of three phase balanced and unbalanced star and delta networks circuits.

16. Simulation and Experimental validation of RL and RC electric circuit transients.

TOTAL: 60 PERIODS

OUTCOMES

- Identify and rectify faults in plumbing, understand the working of and application of welding machine and foundry
- Identify and rectify or propose remedial measures faults in in simple circuits
- Apply the appropriate methods for simplifying complicated circuits and calculate power, current and voltage in various parts of the circuits

III SEMESTER

20MA301	TRANSFORMS & PARTIAL DIFFERENTIAL EQUATIONS	L	T	P	C
		3	2	0	4

OBJECTIVES:

- Illustrate the concepts and techniques of Fourier series.
- Discuss the concepts of Fourier transforms and Z-transforms
- Describe the solutions of partial differential equations
- Formulate and solve the boundary value problems.

UNIT I FOURIER SERIES 15

Dirichlet's conditions – General Fourier series – Odd and even functions – Half range expansions – Complex form of Fourier series – Parseval's identity – Harmonic analysis.

UNIT II FOURIER TRANSFORMS 15

Statement of Fourier integral theorem – Fourier transform pair – Fourier sine and cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval's identity.

UNIT III Z – TRANSFORMS AND DIFFERENCE EQUATIONS 15

Z-transforms – Elementary properties – Inverse Z-transforms (method of partial fraction and residues) – Convolution theorem – Formation of difference equations – Solution of difference equations using Z-transform.

UNIT IV PARTIAL DIFFERENTIAL EQUATIONS 15

Formation of partial differential equations – Solutions of standard types of first order partial differential equations – Lagrange's linear equation — homogenous and non-homogeneous linear partial differential equations of second and higher order with constant coefficients.

UNIT V APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS 15

Classification of PDE – Method of separation of variables – Solutions of one dimensional wave equation – One dimensional equation of heat conduction – Steady state solution of two dimensional equation of heat conduction (excluding insulated edges).

TOTAL:75 PERIODS

OUTCOMES:

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

CO1: Employ the Fourier series concept in Engineering Problems.
CO2: Identify the solution of Fourier transform in continuous time signals.
CO3: Elucidate the difference equation using Z-transform.
CO4: Compute the solutions of the partial differential equation.
CO5: Utilize the Fourier series for heat and wave equations.

TEXT BOOKS:

1. Erwin Kreyszig, “Advanced Engineering Mathematics”, 10th Edition, Wiley India, 2011.
2. B.S. Grewal, “Higher Engineering Mathematics”, 44th Edition, Khanna Publishers New Delhi, 2017.

REFERENCES:

1. N.P. Bali, and Manish Goyal, “A Textbook of Engineering Mathematics”, 7th Edition, Laxmi Publications Pvt Ltd, 2007.
2. B.V. Ramana, “Higher Engineering Mathematics”, 6th Edition, Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.
3. Glyn James, “Advanced Modern Engineering Mathematics”, 3rd Edition, Pearson Education, 2007.
4. C. Ray Wylie and L.C. Barrett, “Advanced Engineering Mathematics” 6th Edition, Tata McGraw Hill Education Pvt Ltd, New Delhi, 2012.
5. K.B. Datta, “Mathematical Methods of Science and Engineering”, 1st Edition, Cengage Learning India Pvt Ltd, Delhi, 2013.

20EI301	INSTRUMENT TRANSDUCERS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the classification of transducers and model of the transducer.
- To discuss different types of resistive transducers and their application areas.
- To explain the principles of variable inductive transducer.
- To understand the characteristics of the different capacitive transducers for the measurement of physical quantities
- To discuss on variety of transducers and understand MEMS and Smart transducers.

UNIT I CLASSIFICATION AND MATHEMATICAL MODEL OF TRANSDUCERS **09**

Introduction to sensors and transducers - Classification of transducers – Selection of transducers. Types of test signals, Mathematical model of transducer, Zero, I and II order transducers, Response to impulse, step, ramp and sinusoidal inputs.

UNIT II VARIABLE RESISTANCE TRANSDUCERS **09**

Principles of operation - Construction details -Characteristics of resistance transducers -Resistance potentiometers -Strain gauges- Strain gauge basedload cells, torque sensors, force sensors and pressure sensors - Resistance thermometers -Thermistors - Hot wire anemometer - Piezoresistive sensor and humidity sensor

UNIT III VARIABLE INDUCTANCE TRANSDUCERS **09**

Induction potentiometer -Variable reluctance transducers - Linear Variable Differential Transformer - LVDT Pressure transducer- Rotary Variable Differential Transformer- Synchros– Microsyn

UNIT IV VARIABLE CAPACITIVE TRANSDUCERS **09**

Principle of operation, construction details - Variable air gap type - Variable area type - Variable permittivity type - capacitance proximity pickup - Capacitor microphone – Capacitive tachometer.

UNIT V OTHER TRANSDUCERS **09**

Piezoelectric transducer- Ultrasonic transducer - Magnetostrictive transducer - Fibre optic transducers -Hall effect transducers - Digital transducers – Environmental Monitoring sensors (Water Quality & Air pollution) – Introduction to MEMS – Introduction to Smart transducers.

TOTAL:45 PERIODS

OUTCOMES:

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

CO1: Understand the physical quantities for measurement
CO2: Compare the mathematical model of Zero, First and Second order transducer
CO3: Explain the construction and operation of variable resistance transducer.
CO4: Describe the knowledge of inductance transducer.

CO5: Illustrate the knowledge of capacitance transducers.
CO6: Differentiate the construction and operation of other transducers and sensors.

TEXT BOOKS:

1. A. K.Shawney, A course in Electrical and Electronic Measurements and Instrumentation, Dhanpat Rai and Sons, Jan 2015.
2. S. Renganathan, Transducer Engineering, Allied Publishers, 2003.

REFERENCES:

1. D. Patranabis, Sensors and Transducers, 2ndEdition, Prentice Hall of India, 2010.
2. D.V.S. Murthy, Transducers and Instrumentation, 2nd Edition, Prentice Hall of India Pvt. Ltd., New Delhi,2010.
3. Ian Sinclair, Sensors and Transducers, 3rd Edition, Elsevier,2012.
4. Neubert H.K.P., "Instrument Transducers – An Introduction to their Performance and Design", Oxford University Press, Cambridge,2005.
5. NPTEL video lecture on "Sensors and Actuators" by Dr. Hardik J. Pandya, Department of Electrical Engineering, IISc Bangalore. (https://nptel.ac.in/courses/108/108/108108147/)

20EI302 ELECTRICAL AND ELECTRONIC MEASUREMENTS L T P C
3 2 0 4

OBJECTIVES:

- To understand an overview of current, voltage and power measuring electrical, electronics and digital instruments.
- To explain the design of bridges for the measurement of resistance, capacitance and inductance.
- To summarize an overview of test and measuring instruments.
- To discuss the working knowledge of various waveform generators, analyzers.
- To understand the errors occurring in the instrument and its compensation techniques.

UNIT I MEASUREMENT OF CURRENT, VOLTAGE AND RESISTANCE 12

Classification of electro mechanical instruments, Principles, construction and Errors of dynamometer type instruments, induction type instruments, thermal type instruments, Extension of instrument range: shunt and multipliers. Ammeter-Voltmeter method, Loss of Charge, Megger, Earth Resistance Measurement.

UNIT II MEASUREMENT OF POWER AND ENERGY 12

Electrodynamic wattmeter's, Low Power Factor (LPF) wattmeter, errors, calibration of wattmeter. Single and three phase power measurement, Induction type Energy Meter, Errors and Adjustments in Energy meter. Three phase energy meter – Trivector meter and maximum demand meter.

UNIT III D.C. BRIDGES AND A.C. BRIDGES 12

General equation for bridge balance, D.C. bridges, Wheatstone bridge, Kelvin's double bridge, General form of an A.C. bridge, Maxwell's inductance-capacitance bridge, Hay's bridge, Schering bridge, Wien's bridge, Sources of errors in bridge measurement, Wagner earthing device.

UNIT IV ELECTRONIC MEASURING INSTRUMENTS 12

True RMS meter, Digital voltmeter (DVM) – Ramp ADC, Flash ADC, Successive approximation ADC, Measurement of quality factor (Q), Digital frequency meters. Digital LCR meter, Digital wattmeter and energy meters. Recorders - X-Y recorders, Digital Data Recording.

UNIT V SIGNAL GENERATORS AND WAVEFORM ANALYZERS 12

Signal generators – AF Sine and Square Wave Generator, Function Generator, Waveform analyzers - Frequency Selective Wave Analyzer, Super heterodyne Wave Analyzer, Spectrum analyzers - Super heterodyne spectrum analyzer, Filter Bank spectrum analyzer, Distortion analyzers.

TOTAL: 60 PERIODS

OUTCOMES:

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

CO1: Compare various measuring instruments and extension of range of instruments.
CO2: Construct the wattmeter and energy meter to measure power and energy.
CO3: Design DC and AC bridges for the measurement of R, L, C and Frequencymeasurement.
CO4: Classify the kind of instrument suitable for typical electronic measurements.

CO5: Compare various signal generators and waveform analyzers.
CO6: Minimize the errors occurring in the instrument.

TEXT BOOKS:

1. A. K.Shawney, A course in Electrical and Electronic Measurements and Instrumentation, Dhanpat Rai and Sons, Jan 2015.
2. David A. Bell, Electronic Instrumentation and Measurements, Oxford University Press India; 3rd Edition, 2013.
3. H. S. Kalsi, Electronic Instrumentation, McGraw Hill Education; 3rd Edition, 2017.

REFERENCES:

1. Golding's, Electrical Measurements and Measuring Instruments, 6th Edition, (Revised & Enlarged): With Solved Examples & MCQ's (In M.K.S. Units), Medtech, Jan 2019.
2. PrithwirajPurkait, Budhaditya Biswas, Santanu Das, ChiranjibKoley, Electrical and Electronics Measurements and Instrumentation, by McGraw Hill Education (India) Private Limited, 2013.
3. Albert D. Helfrick, William D. Cooper, Modern Electronic Instrumentation and Measurement Techniques, 1st Edition, Pearson, 2016.
4. Ernest ODoebelin and Dhanesh N Manik, “Measurements systems Application and Design”, McGraw Hill publication, 5th Edition, 2015.
5. NPTEL video lecture on “Electrical Measurements and Electronic Instruments” by Prof. Avishek Chatterjee, Department of Electrical Engineering, IIT Kharagpur. (https://nptel.ac.in/courses/108/105/108105153/)

20EI303	ELECTRICAL MACHINES	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To summarize the operation of DC motor and generator
- To understand the characteristic of Transformer
- To classify the performance of 3 phase induction motor
- To explain the working principle of synchronous motor and generator
- To discuss the starting characteristic of special motors

UNIT I D.C. MACHINES 09

Operation and Construction of Motor and Generator – EMF and Torque Equation – Types and Characteristics of Motor and Generator – Starting, Speed Control of D.C. Motor.

UNIT II TRANSFORMERS 09

Principle, Construction and Types of Transformers – EMF Equation – Tests on Transformers - Equivalent Circuit – Phasor Diagram on Load-Regulation and Efficiency of Transformer- Introduction to Three Phase Connection - Current and Potential Transformer.

UNIT III THREE PHASE INDUCTION MOTORS 09

Construction and Principle of Operation-Types - Torque-Slip Characteristics- Starting Methods and Speed Control of Induction Motors.

UNIT IV SYNCHRONOUS MACHINES 09

Alternators: Principle of Operation, Construction Details - Induced EMF Equation - Voltage Regulation. Synchronous Motor: Principle of Operation, Starting Methods- Torque – V Curves, Inverted V Curves.

UNIT V SPECIAL MACHINES 09

Single Phase Induction Motor – Capacitor Start Capacitor Run Motors – Shaded Pole Motor, Repulsion Motor, Universal Motor, Hysteresis Motor, Permanent Magnet Synchronous Motor, Introduction to Stepper Motors- Switched Reluctance Motor

TOTAL: 45 PERIODS

OUTCOMES:

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

CO1: Identify the starting and control techniques of DC Machine.
CO2: Solve the performance calculation of Transformer
CO3: Compare the starting and control techniques of 3 phase induction motor
CO4: Explain the performance characteristic of Synchronous Machines
CO5: Interpret the performancecharacteristic of Special motors
CO6: Design Electrical Machines for Industrial Drive Applications

TEXT BOOKS:

1. A.E.Fitzgerald, Kingsley C., Stephen D. Umans., “Electric Machinery”, McGraw-Hill, Singapore, 6th Edition, 2005.
2. B.L.Theraja, “A Text book of Electrical Technology”, Vol.II, S.C Chand and Co., New Delhi, 2007.

REFERENCES:

1. Abhijit Chakrabarti, Sudipta Debnath, “Electrical Machines” McGraw-Hill, 2015
2. M.V. Deshpande, “Electrical Machines” PHI Learning Pvt. Ltd., 2011
3. NPTEL video lecture on “Electrical Machines” by Prof. G. BHUVANESWARI, Department of Electrical Engineering, IIT Delhi. (https://nptel.ac.in/courses/108/102/108102146/)

20EC302	ELECTRONIC CIRCUITS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To analyze biasing of BJT and BJT amplifiers
- To analyze biasing of MOSFET and MOSFET amplifiers.
- To compute the frequency response of BJT and MOSFET.
- To acquire knowledge of feedback amplifiers and oscillators.
- To illustrate the operation of power amplifiers.

UNIT I BIASING OF DISCRETE BJT AND BJT AMPLIFIERS 09

Load line, Q-point, Biasing methods for BJT, Analysis of CE, CB and CC amplifiers using hybrid- pi equivalent circuit, BJT Differential amplifier – CMRR, Multistage amplifiers - Cascade amplifier, Darlington amplifier, Cascode amplifier.

UNIT II BIASING OF DISCRETE MOSFET AND MOSFET AMPLIFIERS 09

Load line, Q-point, Biasing methods for MOSFET, Analysis of CS, CD and CG MOSFET amplifiers using hybrid-pi equivalent circuits, MOSFET Differential amplifier – CMRR, Multistage Amplifiers - Cascade amplifier, Cascode amplifier.

UNIT III FREQUENCY RESPONSE OF BJT AND MOSFET 09

Frequency response of BJT– Transistor amplifier with circuit capacitors, Short circuit current gain, Miller effect and Miller capacitance, High frequency analysis of CE amplifier, Frequency response of MOSFET –High frequency MOSFET model, Unit gain bandwidth, Miller effect and Miller capacitance, High frequency analysis of MOSFET CS amplifier.

UNIT IV FEEDBACK AMPLIFIERS AND OSCILLATORS 10

Feedback Concepts – gain with feedback – effect of feedback on gain stability, distortion, bandwidth, input and output impedances; topologies of feedback amplifiers – analysis of series-series, shunt-shunt and shunt-series feedback amplifiers, Barkhausen criterion, Colpitts, Hartley, Clapp oscillator, Phase shift, Wien bridge and crystal oscillators.

UNIT V POWER AMPLIFIERS 08

Classification of large signal amplifiers, Class A, B, AB, C, D, Conversion efficiency, Class C tuned amplifier.

TOTAL: 45 PERIODS

OUTCOMES:

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

CO1: Analyze biasing of BJT and BJT amplifiers
CO2: Analyze biasing of MOSFET and MOSFET amplifiers
CO3: Compute the frequency response of amplifiers
CO4: Acquire the knowledge of feedback amplifiers.
CO5: Acquire the knowledge of oscillators.
CO6: Illustrate the operation of power amplifiers.

TEXT BOOKS:

1. Donald. A. Neamen, Electronic Circuits Analysis and Design, 3rd Edition, McGraw- Hill Education (India) Private Ltd., 2010.
2. Robert L. Boylestad and Louis Nasheresky, Electronic Devices and Circuit Theory, 11th Edition, Pearson Education / PHI, 2015.

REFERENCES:

1. David A. Bell, Electronic Devices and Circuits, 5thEdition, Oxford University Press, 2010.
2. Sedra and Smith, Micro Electronic Circuits, 7th Edition, Oxford University Press, 2015.
3. Millman J, Halkias.C. and Sathyabrada Jit, Electronic Devices and Circuits, 4th Edition, Mc Graw Hill Education (India) Private Ltd., 2015.
4. Jacob Millman and Arvin Grabel, Micro Electronics, 2nd Edition, McGraw-Hill Education (India) Pvt Limited, 2017.
5. Floyd, Electronic Devices, 9th Edition, Pearson Education, 2012.
6. https://nptel.ac.in/courses/108/102/108102097/
7. https://nptel.ac.in/courses/108/102/108102095/

20CS302 OBJECT ORIENTED PROGRAMMING

L	T	P	C
3	0	0	3

OBJECTIVES:

- To explain object oriented programming concepts and fundamentals of Java
- To apply the principles of packages, inheritance, interfaces and exceptions
- To develop a java application with I/O streams, threads and generics classes
- To use the functionalities of Strings and Collections
- To design and build simple Graphical User Interfaces

UNIT I INTRODUCTION TO OOP AND JAVA FUNDAMENTALS 09

An Overview of Java - Data Types, Variables, and Arrays – Operators - Control Statements – Class Fundamentals – Declaring objects – Methods – Constructors – this keyword – Overloading methods - Overloading constructors - Access Control – Static – Final.

UNIT II INHERITANCE, INTERFACES AND EXCEPTION HANDLING 09

Inheritance: Inheritance basics, Using super, Method Overriding, Using Abstract Classes, Using final with Inheritance – Package and Interfaces: Packages, Packages and member access, Importing Packages, Interfaces, Static Methods in an Interface – Exception Handling: Exception - Handling Fundamentals, Exception Types, Uncaught Exceptions, Using try and catch, Multiple catch Clauses, Nested try Statements, throw, throws, finally, Java's Built-in Exceptions.

UNIT III MULTITHREADING, I/O AND GENERIC PROGRAMMING 09

Multithreaded Programming: Creating a Thread, Thread Priorities, Synchronization, Interthread Communication – I/O: I/O Basics, Reading Console Input, Writing Console Output, Reading and Writing Files – Generics: Introduction, Generic class, Bounded Types, Generic Methods, Generic Interfaces, Generic Restrictions

UNIT IV STRING HANDLING AND COLLECTIONS 09

Lambda Expressions - String Handling – Collections: The Collection Interfaces, The Collection Classes – Iterator – Map - Regular Expression Processing.

UNIT V EVENT DRIVEN PROGRAMMING 09

Event Handling - Introducing the AWT: Working with Windows, Graphics, and Text - Using AWT Controls, Layout Managers, and Menus - Introducing Swing - Exploring Swing.

TOTAL: 45 PERIODS

OUTCOMES:

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

CO1: Explain the object oriented programming concepts and fundamentals of Java
CO2: Develop Java programs with the packages, inheritance, interfaces and exceptions
CO3: Develop Java programs with the packages, inheritance, interfaces and exceptions
CO4: Apply strings and collections in applications
CO5: Develop interactive Java applications using swings and event handling mechanism.

TEXT BOOKS:

1. Herbert Schildt, ―Java:The complete reference, 11th Edition, McGraw Hill Education,2019.

REFERENCES:

1. Herbert Schildt, ―Java: The complete reference, 11th Edition, McGraw Hill Education,2019.
2. Cay S. Horstmann, Gary cornell, “Core Java Volume –I Fundamentals”, 11th Edition,Prentice Hall, 2019.
3. Paul Deitel, Harvey Deitel, ―Java SE 8 for programmers, 3rd Edition, Pearson, 2015.
4. Steven Holzner, ―Java 2 Black book, Dreamtech press, 2011.
5. Timothy Budd, ―Understanding Object-oriented programming with Java, Third Edition,Pearson Education, 2008.

20EI311	DEVICES AND MACHINES LAB	L	T	P	C
		0	0	4	2

OBJECTIVES:

- Interpret the study the characteristics of various semiconductor devices.
- Provide practical knowledge on the analysis of regulators, amplifiers and oscillators.
- Derive the no load and load characteristics of D.C machines.
- Sketch the speed characteristics of D.C motor.
- Illustrate the regulation characteristics of Transformer.

LIST OF EXPERIMENTS

1. Experimental Characterisation of Semiconductor diode and Zener diode
2. Experimental Characterisation of a NPN Transistor under common emitter configurations
3. Experimental Characterisation of FET and JFET (Draw the equivalent circuit)
4. Experimental Characterisation of UJT and generation of saw tooth waveforms
5. Experimental Characterisation of RC Phase shift oscillator
6. Experimental Characterisation of Hartley and Colpitts oscillators.
7. Experimental Characterisation of Monostable and Astable Multivibrators using BJT
8. Experimental Single Phase half-wave and full wave rectifiers with inductive and capacitive filters.
9. Characteristics of SCR and application as a controlled rectifier.
10. Open circuit characteristics of D.C. shunt generator
11. Load characteristics of D.C. shunt generator.
12. Load test on D.C. shunt motor
13. Speed control of D.C. shunt motor
14. Open circuit and short circuit tests on single phase transformer (Determination of equivalent circuit parameters).
15. Load test on single phase induction motor.

TOTAL :60 PERIODS

OUTCOMES

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

CO1: Differentiate the usage of various electronic equipment and simulation tools for design and analysis of electronic circuits.

CO2: Demonstrate the hands-on experience in studying the characteristics of semiconductor devices.

CO3: Analyze various electronic circuits such as voltage regulators, transistor amplifiers and oscillators.

CO4: Interpret the various speed control techniques of DC machines.

CO5: Compute the equivalent circuit parameters of single-phase transformer under short circuit test
and No-load test

CO6: Illustrate the characteristics of transformer and Induction motor under load test

20EI312	MINI PROJECT	L	T	P	C
		0	0	2	1

OBJECTIVES:

- To use the fundamental knowledge gained in Electronics and Instrumentation Engineering to do a mini project, which allows the students to come up with a prototype of proposed system.
- To prepare the students to find solutions to societal problems expressing their ideas in a novel way.

STRATEGY:

- To identify a topic of interest in consultation with Faculty/Supervisor. Review the literature and gather information pertaining to the chosen topic. State the objectives and develop a methodology to achieve the objectives. Carry out the circuit connection and upload the program into the hardware after debugging. Demonstrate the novelty of the project through the results and outputs.

TOTAL: 30 PERIODS

COURSE OUTCOMES:

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

CO1: Apply fundamental engineering knowledge to the identified problem.

CO2: Analyse and design the technical aspects of the project with comprehensive and systematic approach using new technology.

CO3: Develop projects with sustainability, understanding the societal and environmental importance.

CO4: Integrate as an individual or as a team in development of technical projects, applying ethical principles.

CO5: Understand and write technical report effectively on the project related activities and findings.

CO6: Explore the challenging practical problems and find solution by formulating proper methodology.

EVALUATION PROCEDURE:

The method of evaluation will be as follows:

1. Internal Marks
   (Decided by conducting 3 reviews by the project committee formulated by the department) : **60 Marks**
2. Viva voce examination : **40 Marks**
   (Evaluated by the internal examiner appointed by the CoE with the approval of the HoD)
   a) Project Report : 20 Marks
      (Every student belonging to the same group gets the same mark)
   b) Presentation/ Demonstration : 20 Marks

Total: 100 Marks

20CS311 OBJECT ORIENTED PROGRAMMINGLABORATORY L T P C
0 0 4 2

OBJECTIVES:

- To build software development skills using java programming for real-world applications.
- To implement the concepts of classes, packages, interfaces, collections, exception handling, regular expressions and file processing.
- To develop applications using event handling

LIST OF EXPERIMENTS

1. Develop a Java application to generate Electricity bill. Create a class with the following members: Consumer no., consumer name, previous month reading, current month reading, type of EB connection (i.e domestic or commercial). Compute the bill amount using the following tariff

   If the type of the EB connection is domestic, calculate the amount to be paid as follows: First 100 units - Rs. 1 per unit
   101-200 units - Rs. 2.50 per unit
   201 -500 units - Rs. 4 per unit
   >501 units - Rs. 6 per unit
   If the type of the EB connection is commercial, calculate the amount to be paid as follows:
   First 100 units - Rs. 2 per unit
   101-200 units - Rs. 4.50 per unit
   201 -500 units - Rs. 6 per unit
   > 501 units - Rs. 7 per unit
2. Arrays Manipulations:
   a) Find kth smallest element in an unsorted array
   b) Find the sub array with given sum
   c) Matrix manipulations – Addition, Subtraction, Multiplication
   d) Remove duplicate elements in an Array
   e) Accept an integer value N and print the Nth digit in the integer sequence 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15 and so on till infinity. Example: The 11th digit in the sequence 12345678910111213…. is 0.
3. Develop a java application to implement currency converter (Dollar to INR, EURO to INR, Yen to INR and vice versa), distance converter (meter to KM, miles to KM and vice versa), time converter (hours to minutes, seconds and vice versa) using packages.
4. Develop a java application with Employee class with Emp_name, Emp_id, Address, Mail_id, Mobile_no as members. Inherit the classes, Programmer, Assistant Professor, Associate Professor and Professor from employee class. Add Basic Pay (BP) as the member of all the inherited classes with 97% of BP as DA, 10 % of BP as HRA, 12% of BP as PF, 0.1% of BP for staff club fund. Generate pay slips for the employees with their gross and net salary.
5. Design a Java interface for ADT Stack. Implement this interface using array. Provide necessary exception handling in both the implementations.

6. Write a Java Program to create an abstract class named Shape that contains two integers and an empty method named print Area(). Provide three classes named Rectangle, Triangle and Circle such that each one of the classes extends the class Shape. Each one of the classes contains the methods print Area () that prints the area of the given shape and Numberofsides() that prints the number of sides of the given shape.
7. Write a Java program to apply built-in and user defined exceptions.
8. String Manipulation:
    a) Reversing a set of words and count the frequency of each letter in the string.
    b) Pattern Recognition - Find the number of patterns of form 1[0]1 where [0] represents any number of zeroes (minimum requirement is one 0) there should not be any other character except 0 in the [0] sequence in a given binary string.
    c) Remove all the occurrences of string S2 in string S1 and print the remaining.
    d) Find the longest repeating sequence in a string
    e) Print the number of unique string values that can be formed by rearranging the letters in the string S.
9. Write a Java program that correctly implements producer consumer problem using the concept of inter thread communication.
10. Write a Java program to read and copy the content of one file to other by handling all file related exceptions.
11. Collections:
    a. Write a program to perform string operations using ArrayList. Write functions for the following
    i. Append - add at end
    ii. Insert – add at particular index
    iii. Search
    iv. List all string starts with given letter
    b. Find the frequency of words in a given text.
12. Write a java program to remove all non-alphanumeric characters from a string using regular expression
13. Design a calculator using event-driven programming paradigm of Java with the following options.
    a. Decimal manipulations
    b. Scientific manipulations
14. Develop a mini project for any application using Java concepts.

TOTAL :60 PERIODS

OUTCOMES

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

CO1: Develop and implement Java programs for simple applications that make use of classes, packages and interfaces.

CO2: Develop and implement Java programs with collections, exception handling, regular expressions and multithreading.

CO3: Design applications using file processing and event handling.

20CS313	APTITUDE AND CODING SKILLS – I	L	T	P	C
	(Common to All Branches)	**0**	**0**	**2**	**1**

OBJECTIVES:

- To develop vocabulary for effective communication and reading skills.
- To build the logical reasoning and quantitative skills.
- To develop error correction and debugging skills in programming.

LIST OF EXERCISES:

1. **English – Phase I**

   Vocabulary: Synonyms, Antonyms, Grammar: Subject-Verb Agreement, Tenses and Articles, Prepositions and Conjunctions, Speech and Voices, Comprehension: Inferential and Literal Comprehension, Contextual Vocabulary, Comprehension ordering.

2. **Logical Reasoning – Phase I**

   Deductive Reasoning: Coding deductive logic, Directional sense, Blood relations, Objective Reasoning, Selection decision tables, Puzzles, Inductive reasoning: Coding pattern and Number series pattern recognition, Analogy and Classification pattern recognition, Abductive Reasoning: Logical word sequence, Data sufficiency.

3. **Quantitative Ability - Phase I**

   Basic Mathematics: Divisibility, HCF and LCM, Numbers, decimal fractions and power, Applied Mathematics: Profit and Loss, Simple and Compound Interest, Time, Speed and Distance, Engineering Mathematics: Logarithms, Permutation and Combinations, Probability.

4. **Automata Fix – Phase I**

   Logical, Compilation and Code reuse

TOTAL: 30 PERIODS

OUTCOMES

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

CO1: Develop vocabulary for effective communication and reading skills.
CO2: Build the logical reasoning and quantitative skills.
CO3: Develop error correction and debugging skills in programming.

IV SEMESTER

20MA403	NUMERICAL METHODS (Common to Civil, EEE and EIE)	L 3	T 2	P 0	C 4

OBJECTIVES:

- Develop the skills of solving algebraic, transcendental and the system of equations using various methods.
- Determine the interpolation in various intervals by numerical techniques.
- Compute the differentiation and integration by numerical techniques.
- Illustrate the various techniques of solving ordinary differential equations and partial differential equations.

UNIT I SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS 15

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 – Eigenvalues of a matrix by Power method.

UNIT II INTERPOLATION AND APPROXIMATION 15

Interpolation with unequal intervals – Lagrange's interpolation – Newton's divided difference interpolation – Cubic Splines – Interpolation with equal intervals – Newton's forward and backward difference formulae.

UNIT III NUMERICAL DIFFERENTIATION AND INTEGRATION 15

Approximation of derivatives using interpolation polynomials – Numerical integration using Trapezoidal, Simpson's 1/3 rule – Romberg's Method – Two point and threepoint Gaussian quadrature formulae – Evaluation of double integrals by Trapezoidal and Simpson's 1/3 rules.

UNIT IV NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS 15

Single step methods – Taylor's series method – Euler's method – Modified Euler's method –Fourth order Runge-Kutta method for solving first order equations – Multi step methods – Milne's and Adam's-Bashforth predictor and corrector methods for solving first order equations – Finite difference methods for solving second order – two-point linear boundary value problems.

UNIT V NUMERICAL SOLUTION OF PARTIAL DIFFERENTIALEQUATIONS 15

Finite difference techniques for the solution of two dimensional Laplace's and Poisson's equations on rectangular domain – One dimensional heat flow equation by explicit and implicit (Crank Nicholson) methods – One dimensional wave equation by explicit method.

TOTAL :75 PERIODS

OUTCOMES:

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

CO1: Compute the solutions of algebraic, transcendental and the system of equations.
CO2: Implement the numerical techniques of interpolation in equal and unequal intervals.
CO3: Apply the numerical techniques of differentiation and integration for engineering problems.
CO4: Employ the various techniques and methods for solving first and second order ordinary differential equations.
CO5: Solve the partial differential equations with initial and boundary conditions by using certain techniques with engineering applications.

TEXT BOOKS:

1. R.L. Burden, and J.D. Faires, "Numerical Analysis", 9th Edition, Cengage Learning, 2016.
2. B.S. Grewal, and J.S. Grewal, "Numerical Methods in Engineering and Science", Khanna Publishers, 10th Edition, New Delhi, 2015.

REFERENCES:

1. Brian Bradie, "A Friendly Introduction to Numerical Analysis", Pearson Education, Asia, New Delhi, 2007.
2. C.F. Gerald and P.O. Wheatley, "Applied Numerical Analysis", Pearson Education, Asia, 6th Edition, New Delhi, 2006.
3. J.H. Mathews, "Numerical Methods for Mathematics, Science and Engineering",2nd Edition, Prentice Hall, 1992.
4. K. Sankara Rao, "Numerical Methods for Scientists and Engineers", Prentice Hall of India Pvt. Ltd, 3rd Edition, New Delhi, 2007.
5. S.S. Sastry, "Introductory Methods of Numerical Analysis", PHI Learning Pvt. Ltd, 5th Edition, 2015.

20EI401 DIGITAL PRINCIPLES AND SYSTEM DESIGN

L	T	P	C
3	0	0	3

OBJECTIVES:

- To design digital circuits using simplified Boolean functions
- To analyze and design combinational circuits
- To analyze and design synchronous and asynchronous sequential circuits
- To understand programmable logic devices
- To write HDL code for combinational and sequential circuits

UNIT I BOOLEAN ALGEBRA AND LOGIC GATES 9

Review of Number Systems - Arithmetic Operations - Binary Codes- Boolean Algebra and rules- Boolean Functions - Canonical and Standard Forms - Simplification of Boolean Functions using Karnaugh Map –Basic Logic Gates – Universal gates-NAND and NOR Implementations- Conversion.

UNIT II COMBINATIONAL LOGIC 9

Combinational Circuits – Analysis and Design Procedures -Circuits for arithmetic operations: Full adder, Carry look-ahead adder, binary adder, adder-subtractor- Binary Multiplier -Comparator – Code Converters- Decoders – Encoders –Multiplexers and De-multiplexers - Introduction to HDL – Verilog HDL Models of Combinational circuits.

UNIT III SYNCHRONOUS SEQUENTIAL LOGIC 9

Sequential Circuits - Flip-Flops: Triggering, Types, Conversions, Excitation tables - Analysis of Clocked Sequential Circuits - State Reduction and Assignment –Shift Registers- Counters –Verilog HDL Models of Sequential Circuits.

UNIT IV ASYNCHRONOUS SEQUENTIAL LOGIC 9

Analysis and Design of Asynchronous Sequential Circuits – Reduction of State and Flow Tables – Race-free State Assignment – Hazards-Types and Reduction.

UNIT V MEMORY AND PROGRAMMABLE LOGIC DEVICES 9

RAM and ROM types – Memory decoding - Error detection and correction – DRAM, Flash Memory, Programmable logic devices: Programmable Array Logic – Programmable Logic Array – Sequential Programmable Devices- CPLD – FPGA.

TOTAL :45 PERIODS

OUTCOMES:

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

CO1: Design Digital Circuits using simplified Boolean functions
CO2: Analyze and Design Combinational Circuits
CO3: Analyze and Design Synchronous Sequential Circuits
CO4: Analyze and Design Asynchronous Sequential Circuits
CO5: Interpret designs using Programmable Logic Devices
CO6: Write HDL code for Combinational and Sequential Circuits

TEXT BOOKS:

1. Thomas L. Floyd, "Digital Fundamentals", 11th Edition, Prentice Hall, 2015
2. Morris Mano, M. and Michael D. Ciletti, "Digital Design with an Introduction to the Verilog HDL", 5thEdition, Prentice Hall, 2017.

REFERENCES:

1. John F. Wakerly, "Digital Design Principles and Practices", Fifth Edition, Pearson Education, 2018.
2. Charles H. Roth Jr, Larry L. Kinney, "Fundamentals of Logic Design", First Edition, CENGAGE Learning, 2020
3. Donald P Leach, Albert Paul Malvino and GoutamSaha, "Digital Principles and Applications", 8th Edition, McGraw-Hill, 2015.
4. NPTEL video lectures on "Digital systems Design",Prof. D. Roychoudhury, IIT Kharagpur
    a. https://nptel.ac.in/courses/117/105/117105080/
5. https://learnabout-electronics.org/
6. http://www.pyroelectro.com/edu/digital/

20EI402 INDUSTRIAL INSTRUMENTATION L T P C
3 0 0 3

OBJECTIVES:

- To summarize the importance of process variable measurements.
- To discuss the various measurement techniques used for the measurement of temperature, flow, pressure, level, humidity, speed, density and viscosity in process industries.
- To explain the selection and maintenance of new technology flow instruments.
- To discuss the selection, installation and troubleshooting of process instruments.
- To understand the applications of various industrial sensors.

UNIT I TEMPERATURE MEASUREMENT 09

Definitions and standards – Primary and secondary fixed points – Different types of filled in system thermometers – Sources of errors in filled in systems and their compensation – Bimetallic thermometers– Thermocouples: Laws of thermocouple and types – Radiation fundamentals – Radiation methods of temperature measurement – Total radiation pyrometers – Optical pyrometers – Two color radiation pyrometers –Fiber optic sensor for temperature measurement – Temperature sensor selection, Installation and Calibration.

UNIT II PRESSURE MEASUREMENT 09

Units of pressure – Manometers: Different types, Elastic type pressure gauges: Bourdon tube, Bellows, Diaphragms and Capsules – Electrical methods: Elastic elements with LVDT and strain gauges – Capacitive type pressure gauge – Piezo resistive pressure sensor-Resonator pressure sensor– Measurement of vacuum: McLeod gauge, Thermal conductivity gauge, Ionization gauges, Cold cathode type and hot cathode type – Pressure gauge selection, installation and calibration using dead weight tester.

UNIT III LEVEL AND HUMIDITY MEASUREMENT 09

Level measurement: Float gauges – Displacer type – Bubbler system– Conductivity sensors – Capacitive sensors – D/P methods – Nucleonic gauge – Ultrasonic gauge, DIP ultrasonic sensors – Boiler drum level measurement: Differential pressure transmitter and Hydra step methods – Solid level measurement. Humidity: Dry and wet bulb psychrometers – Resistive and capacitive type hygrometers, Dew cell.

UNIT IV FLOW MEASUREMENT 09

Introduction, definition and units, classification of flow meters, variable head type flow meters – Orifice Plate, Venturi tube, flow nozzle, Pitot tube, Positive displacement flow meters - Nutating disc, Reciprocating piston and oval gear flow meters, Rotameter, Mass flow meter: Thermal and Coriolis type mass flow meters, Electro Magnetic flow meters, laser Doppler anemometer, ultrasonic, vortex, Guidelines for selection of flow meter.

UNIT V MEASUREMENT OF SPEED, DENSITY AND VISCOSITY 09

Speed measurement: Capacitive tacho, Drag cup type tacho, D.C and A.C tacho generators - Stroboscope. Units of density and specific gravity – Baume scale and API scale – Densitometers: Pressure type densitometers, Float type densitometers, Ultrasonic densitometer and gas densitometer - Viscosity: Saybolt viscometer – Rotameter type and Torque type viscometers.

TOTAL: 45 PERIODS

OUTCOMES:

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

CO1: Differentiate the construction and working of various temperature measurement devices.

CO2: Explain the construction and working of instruments used for the measurement of Pressure.

CO3: Describe the construction and working of instruments used for the measurement of level and humidity.

CO4: Study the different flow measurement techniques used in process industries.

CO5: Describe the construction and working of instruments used for the measurement of speed, density and viscosity.

CO6: Identify a suitable measuring instrument for an application.

TEXT BOOKS:

1. Ernest.O.Doebelin and Dhanesh.N.Manik, Doebelin's Measurement Systems, McGraw Hill Education, 6th Edition, 2017.
2. Patranabis D, Principles of Industrial Instrumentation, Tata McGraw Hill, 3rd Edition, 2010.

REFERENCES:

1. B.G.Liptak, Process Measurement and Analysis, CRC Press, 4th Edition, 2003.
2. Singh,S.K., Industrial Instrumentation and Control, Tata McGrawHill Education Pvt. Ltd., New Delhi, 2009.
3. B.E.Noltingk, Instrumentation Reference Book, Butterworth Heinemann Ltd., 2nd Edition, 1995.
4. Douglas M. Considine, Process / Industrial Instruments & Controls Handbook, McGraw Hill, Singapore, 5th Edition, 1999.
5. Andrew W.G, Applied Instrumentation in Process Industries – A survey, Vol I &Vol II, Gulf Publishing Company, Houston, 2001
6. Spitzer D. W., Industrial Flow measurement, ISA press, 3rd Edition, 2005.
7. Tony.R.Kuphaldt, Lessons in Industrial Instrumentation, Version 2.02, April 2014
8. NPTEL video lecture on "Industrial Instrumentation" by Prof. Alok Barua, Department of Electrical Engineering, IIT Kharagpur (https://nptel.ac.in/courses/108/105/108105064/)

20EI403	CONTROL SYSTEM DESIGN	L	T	P	C
		3	2	0	4

OBJECTIVES:

- To discuss the formulation of linear models like state variable model and Transfer function model.
- To understand time domain specifications and steady error for the different order systems to various inputs
- To analyze the stability of linear systems in time domain and frequency domain.
- To design compensator based on the time and frequency domain specifications.
- To discuss state variable representation of physical systems

UNIT I MODELLING OF LINEAR TIME INVARIANT SYSTEMS 12

Control system: Open loop and Closed loop – Feedback control system characteristics – First principle modeling: Mechanical and Thermal systems – Transfer function representations: Block diagram and Signal flow graph. Transfer function of DC and AC servomotors.

UNIT II TIME DOMAIN AND STABILITY ANALYSIS 12

Standard test inputs –Time domain specifications for second order system –Type and order of the system - Steady state error and error coefficients, Stability analysis: Concept of stability – Routh Hurwitz stability criterion – Root locus: Construction and Interpretation.

UNIT III FREQUENCYDOMAINANALYSIS 12

Bode plot, Polar plot and Nyquist plot: Construction, Interpretation and stability analysis – Frequency domain specifications - Introduction to closed loop Frequency Response.

UNIT IV DESIGN OF FEEDBACKCONTROLSYSTEM 12

Electrical network and frequency response of Lead, Lag and Lag-lead compensators - Design of Lead, Lag and Lag-lead compensators using Bode plot technique.

UNIT V STATE SPACE MODEL OF LTIV ANDLTVSYSTEMS 12

State variable formulation – Non uniqueness of state space model – State transition matrix – Free and forced responses for Time Invariant and Time Varying Systems – Controllability – Observability- State Observer - State Feedback Control.

TOTAL: 60 PERIODS

OUTCOMES:

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

CO1: Develop various representations of system based on the first principles approach.

CO2: Determine steady state error and error coefficients for various input signals.

CO3: Construct and interpret root locus, Bode plot, polar plot and Nyquist plot and infer the time domain and frequency domain specifications from the response.

CO4: Analyze and infer the stability of systems in time and frequency domain.

CO5: Design and implement lag, lead, lag-lead compensators to meet the time and frequency domain specifications.

CO6: Determine the system equations in state variable form.

TEXT BOOKS:

1. Nagarath, I.J. and Gopal, M., "Control Systems Engineering", New Age International Publishers, 2017.
2. Benjamin C. Kuo, "Automatic Control Systems", Wiley, 2014.

REFERENCES:

1. Katsuhiko Ogata, "Modern Control Engineering", Pearson, 2015.
2. Richard C.Dorf and Bishop, R.H., "Modern Control Systems", Pearson Education,2009.
3. John J.D., Azzo Constantine, H. and HoupisSttuart, N Sheldon, "Linear Control System Analysis and Design with MATLAB", CRC Taylor& Francis Reprint 2009.
4. RamesC.Panda and T. Thyagarajan, "An Introduction to Process Modelling Identification and Control of Engineers", Narosa Publishing House, 2017.
5. M.Gopal, "Control System: Principle and Design", McGraw Hill Education, 2012.
6. NPTEL Video Lecture Notes on "Control Engineering" by Prof. S. D. Agashe, IIT Bombay.https://nptel.ac.in/courses/108/101/108101037/

20EE304	LINEAR INTEGRATED CIRCUITS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To expose the students to linear integrated circuits and its fabrication.
- To summarize the concepts of operational amplifier and relate its various applications.
- To compare and contrast DAC and ADC Conversions.
- To acquire the basic knowledge of special function IC, switched capacitor filters, voltage regulators.

UNIT I IC FABRICATION **09**

IC classification, fundamental of monolithic IC technology, epitaxial growth, masking and etching, diffusion of impurities, Realisation of monolithic ICs and packaging, Fabrication of diodes, capacitance, resistance and FETs, PV cell, thick and thin film technology, Recent Technology trends in IC fabrication.

UNIT II CHARACTERISTICS OF OPAMP **09**

Ideal OP-AMP characteristics, DC characteristics, AC characteristics, differential amplifier; frequency response of OP-AMP; Basic applications of op-amp – Inverting and Non-inverting Amplifiers-V/I & I/V converters, summer, differentiator and integrator.

UNIT III APPLICATIONS OF OPAMP **09**

Instrumentation amplifier and its applications for transducer Bridge, Log and Antilog Amplifiers, Analog multiplier & Divider, first and second order active filters, comparators, multivibrators, clippers, clampers, peak detector, S/H circuit, D/A converter (R- 2R ladder and weighted resistor types) using opamps, A/D Converter using opamps.

UNIT IV SPECIAL ICs **09**

Functional block diagram, characteristics of IC - 555 Timer circuit and its PWM application - Schmitt Trigger, IC - 566 Voltage Controlled Oscillator (VCO) circuits, IC 565- Phase Locked Loop (PLL) IC and its applications.

UNIT V APPLICATION ICs **09**

AD623 Instrumentation Amplifier and its application as load cell weight measurement – IC voltage regulators –LM78XX, LM79XX; Fixed voltage regulators its application as Linear power supply - LM317,723 Variability voltage regulators, switching regulator- SMPS – ICL 8038 function generator IC.

TOTAL: 45 PERIODS

OUTCOMES:

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

CO1: Demonstrate the fabrication of IC's.
CO2: Analyze the performance characteristics of Op-Amp.
CO3: Design Op-Amp based circuits for engineering applications.
CO4: Classify and comprehend the working principle of data converters.
CO5: Illustrate the function of application specific IC's such as VCO, PLL and its applications.
CO6: Classify the different voltage regulators using Op-Amp.

TEXT BOOKS:

1. D.Roy Choudhary, SheilB.Jani, 'Linear Integrated Circuits', IV edition, New Age, 2018.
2. David A.Bell, 'Op-amp & Linear ICs', Oxford, 2018.
3. Ramakant A.Gayakward, 'Op-amps and Linear Integrated Circuits', IV edition, Pearson Education, 2003 / PHI. 2018.

REFERENCES:

1. Richard Floyd, Buchla, "Fundamentals of Analog Circuits", Pearson, 2013.
2. Robert F.Coughlin, Fredrick F. Driscoll, "Op-amp and Linear ICs", PHI Learning, 6thedition, 2012.
3. Fiore, "Opamps& Linear Integrated Circuits Concepts & Applications", Cengage, 2010.
4. Jacob Millman, Christos C.Halkias, "Integrated Electronics - Analog and Digital circuits system", Tata McGraw Hill, 2010.

20GE301	UNIVERSALHUMANVALUES II: UNDERSTANDING HARMONY	L	T	P	C
		2	2	0	3

OBJECTIVES:

The objective of the course is fourfold:

- Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
- Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
- Strengthening of self-reflection.
- Development of commitment and courage to act.

COURSE TOPICS:

The course has 28 lectures (2 lecture hours) and 14 practice sessions (2 Tutorial hour) in 5 Units.

UNIT I COURSE INTRODUCTION - NEED, BASIC GUIDELINES, CONTENT AND PROCESS FOR VALUE EDUCATION 4

1. Purpose and motivation for the course, recapitulation from Universal Human Values-I
2. Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration
3. Continuous Happiness and Prosperity- A look at basic Human Aspirations
4. Right understanding, Relationship and Physical Facility- The basic requirements for fulfillment of aspirations of every human being with their correct priority
5. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario
6. Method to fulfil the above human aspirations: Understanding and living in harmony at various levels.

Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking

UNIT II UNDERSTANDINGHARMONYINTHEHUMANBEINGHARMONYINMYSELF! 3

7. Understanding human being as a co-existence of the sentient 'I' and the material 'Body'
8. Understanding the needs of Self ('I') and 'Body' - happiness and physical facility
9. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)
10. Understanding the characteristics and activities of 'I' and harmony in 'I
11. 'Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail

12. Programs to ensure Sanyam and Health.

Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease.

UNIT III UNDERSTANDING HARMONY IN THE FAMILY AND SOCIETY- HARMONY IN HUMAN-HUMAN RELATIONSHIP **3**

13. Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship.
14. Understanding the meaning of Trust; Difference between intention and competence
15. Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship
16. Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals.
17. Visualizing a universal harmonious order in society- Undivided Society, Universal Order-from family to world family.

Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives.

UNIT IV UNDERSTANDING HARMONY IN THE NATURE AND EXISTENCE - WHOLE EXISTENCE AS COEXISTENCE **3**

18. Understanding the harmony in the Nature.
19. Interconnectedness and mutual fulfilment among the four orders of nature-recyclability and self regulation in nature
20. Understanding Existence as Co-existence of mutually interacting units in all-pervasive space
21. Holistic perception of harmony at all levels of existence.

Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.

UNIT V IMPLICATIONS OF THE ABOVE HOLISTIC UNDERSTANDING OF HARMONY ONPROFESSIONAL ETHICS **5**

22. Natural acceptance of human values
23. Definitiveness of Ethical Human Conduct
24. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order
25. Competence in professional ethics:
    a. Ability to utilize the professional competence for augmenting universal human order
    b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems,

c. Ability to identify and develop appropriate technologies and management patterns for above production systems.

26. Case studies of typical holistic technologies, management models and production systems.
27. Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations
28. Sumup.

Include practice Exercises and Case Studies will be taken up in Practice (tutorial)Sessions eg. To discuss the conduct as an engineer or scientist etc.

TOTAL: 18 HOURS

OUTCOMES:

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

CO1: Become more aware of themselves, and their surroundings (family, society, nature);

CO2: Become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.

CO3: Have better critical ability.

CO4: Become sensitive to their commitment towards what they have understood (human values, human relationship and human society).

CO5: Apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction.

TEXT BOOKS:

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria,ExcelBooks,NewDelhi, 2010.

Reference Books

1. A Nagaraj, “Jeevan Vidya: Ek Parichaya”, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. E. F Schumacher, "Small is Beautiful", Vintage classics, London, 1993.
3. A.N. Tripathi, “Human Values”, New Age Intl. Publishers, New Delhi, Third Edition 2020.
4. Maulana Abdul Kalam Azad, "India Wins Freedom", Oriental blackswan private limited, Hyderabad, 2020.
5. Mahatma Gandhi, “Hind Swaraj or Indian Home Rule”, Maheswari Publications, Delhi 2020.
6. Romain Rolland, "The life of Vivekananda and the universal gospel", Publication house of Ramakrishna Math, Kolkata, Thirty second edition 2018.
7. Romain Rolland, "Mahatma Gandhi: The man who become one with the universal being “, Srishti Publishers & Distributors, New Delhi, Sixth Edition 2013.
8. Heaton, Dennis P. "The story of stuff." (2010): 553-556.
9. Gandhi, Mohandas Karamchand, “The story of my experiments with truth: An autobiography”, Om Books International, 2018.
10. Andrews, Cecile, “Slow is beautiful: new visions of community, leisure, and joie de vivre”, New society publishers, 2006.
11. Kumarappa, Joseph Cornelius, “The economy of permanence. CP”, All India Village Industries Assn., 1946.

Outcomes:

By the end of the course, students

- would become more aware of themselves, and their surroundings (family, society, nature).
- would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.
- would have better critical ability.
- Would become sensitive to their commitment towards what they have understood (human values, human relationship, and human society).
- would be able to apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction.

20EI411 LINEAR AND DIGITAL INTEGRATED CIRCUITS LAB

L	T	P	C
0	0	4	2

OBJECTIVES:

- To develop the fundamental knowledge on designing of Digital ICs.
- To summarize and develop an adequate knowledge on Coders and Counters.
- To facilitate the students to design various application of OPAMP
- To design, test and study the characteristics of circuits behaviour with Analog ICs.
- To facilitate the students to design voltage to frequency converters.

LIST OF EXPERIMENTS

1. Implementation of Boolean Functions, Adder and Subtractor circuits.
2. Code converters: Excess-3 to BCD and Binary to Gray code converter and vice-versa
3. Parity generator and parity checking
4. Encoders and Decoders
5. Counters: Design and implementation
6. Shift Registers: Design and implementation of 4-bit shift registers in SISO, SIPO, PISO, PIPO modes using suitability IC's.
7. Study of multiplexer and de multiplexer
8. Timer IC application: Study of NE/SE 555 timer in Astability, Monostability operation.
9. Application of Op-Amp: inverting and non-inverting amplifier, Adder, comparator, Integrator and Differentiator.
10. Voltage to frequency characteristics of NE/SE 566 IC.
11. Variability Voltage Regulator using IC LM317.
12. Design of Combinational circuits using Verilog.
13. Design of Sequential circuits using Verilog.

TOTAL: 60 PERIODS

OUTCOMES:

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

CO1: Implement Boolean Functions.
CO2: Interpret the importance of code conversion.
CO3: Execute 4-bit shift registers.
CO4: Design and implement counters using specific counter IC.
CO5: Acquire knowledge on Application of OPAMP and Regulators.
CO6: Construct Voltage frequency converters and Regulators.

20EI412 MEASUREMENTS AND TRANSDUCERS LABORATORY

L	T	P	C
0	0	4	2

OBJECTIVES:

- To understand the basic concepts of measurement and operation of different types of transducers.
- To evaluate the static and dynamic characteristics of different types of transducers.
- To analyse step response of RTD, Thermocouple
- To design the circuit for measure resistance, inductance and capacitance.
- To apply calibration method for the electrical instruments

LIST OF EXPERIMENTS

1. To study the characteristics of potentiometric transducer.
2. Determination of Characteristic study of load cell
3. Determination of Characteristics of linear displacement transducers (LVDT)
4. To study the characteristics of photoelectric tachometer
5. To study the voltage – intensity characteristics of a photo – transistor, LDR
6. To study step response of RTD and thermocouple
7. Determination of Static and Dynamic characteristics of Thermocouple
8. Determination of Static and Dynamic characteristics of RTD and Thermistor.
9. Measurement of an unknown medium resistance using Wheatstone bridge.
10. Measurement of an unknown low resistance using Kelvin's double bridge
11. Measurement of an unknown inductance using Anderson Bridge.
12. Measurement of Capacitance using Schering Bridge
13. Determination of Characteristics of angular displacement transducers
14. Calibration of Ammeter and Voltmeter using Potentiometer.
15. Calibration of Single-phase Energy meter and wattmeter.
16. Real time temperature measurement using LabVIEW.
17. Measurement of Resistance using DAQ VI card.

TOTAL: 60 PERIODS

OUTCOMES:

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

CO1: Apply different types of transducers for measurement applications.
CO2: Evaluate the static and dynamic characteristics of measuring instruments.
CO3: Design signal conditioning circuit for various transducers
CO4: Construct the measurement systems using different types of resistance, capacitance and inductance transducers.
CO5: Interpret the results of analysis in oral form as well as in written form and draw meaningful
conclusions.
CO6: Develop and test the real time application using LabVIEW.

20EC312 FOUNDATION LAB ON INTERNET OF THINGS (IoT)

L	T	P	C
0	0	2	1

OBJECTIVES:

- To impart necessary and practical knowledge of components of Internet of Things and develop skills required to build real-life IoT based projects.
- To interpret the results of analysis and depict the significant conclusions.
- To design and test the various application circuits by using appropriate hardware.
- To understand and present the results in written and oral forms.
- To integrate as a member in a group.

LIST OF EXPERIMENTS

1. Familiarization with Arduino/Raspberry Pi and perform necessary software installation.
2. To interface LED/Buzzer with Arduino/Raspberry Pi and write a program to turn ON LED for 1 sec after every 2 seconds.
3. To interface Push button/Digital sensor (IR/LDR) with Arduino/Raspberry Pi and write a program to turn ON LED when push button is pressed or at sensor detection.
4. To interface DHT11 sensor with Arduino/Raspberry Pi and write a program to print temperature and humidity readings.
5. To interface motor using relay with Arduino/Raspberry Pi and write a program to turn ON motor when push button is pressed.
6. To interface OLED with Arduino/Raspberry Pi and write a program to print temperature and humidity readings on it.
7. To interface Bluetooth with Arduino/Raspberry Pi and write a program to send sensor data to smartphone using Bluetooth.
8. To interface Bluetooth with Arduino/Raspberry Pi and write a program to turn LED ON/OFF when ‘1’/’0’ is received from smartphone using Bluetooth.
9. Write a program on Arduino/Raspberry Pi to upload temperature and humidity data to ThingSpeak cloud.
10. Write a program on Arduino/Raspberry Pi to retrieve temperature and humidity data from ThingSpeak cloud.
11. To install MySQL database on Raspberry Pi and perform basic SQL queries.
12. Write a program on Arduino/Raspberry Pi to publish temperature data to MQTT broker.
13. Write a program on Arduino/Raspberry Pi to subscribe to MQTT broker for temperature data and print it.
14. Write a program to create TCP server on Arduino/Raspberry Pi and respond with humidity data to TCP client when requested.
15. Write a program to create UDP server on Arduino/Raspberry Pi and respond with humidity data to UDP client when requested.

TOTAL: 30PERIODS

OUTCOMES:

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

CO1: Acquire knowledge on Internet of Things and its hardware and software components.
CO2: Demonstrate to interface I/O devices, sensors & communication modules.
CO3: Analyze by connecting and exchanging data with other devices and systems over the Internet.
CO4: Analyze to remotely monitor data and control devices.
CO5: Develop real life IoT based projects.
CO6: Integrate as a member in a group.

REFERENCES:

1. Vijay Madisetti, ArshdeepBahga, Internet of Things, A Hands-on Approach, University Press,2014.
2. Dr. SRN Reddy, RachitThukral and Manasi Mishra, Introduction to Internet of Things: A practical Approach, ETI Labs.
3. Pethuru Raj and Anupama C. Raman, The Internet of Things: Enabling Technologies, Platforms, and Use Cases, CRC Press,1st Edition, Auerbach Publications,2017.
4. Jeeva Jose, Internet of Things, Khanna Publishing House, Delhi, 1st Edition, Khanna Publishing House,2018.
5. Adrian McEwen, Designing the Internet of Things, 1st Edition, Wiley,2013.

20CS414	APTITUDE AND CODING SKILLS – II	L	T	P	C
	(Common to All Branches)	**0**	**0**	**2**	**1**

OBJECTIVES:

- To develop advanced vocabulary for effective communication and reading skills.
- To build an enhanced level of logical reasoning and quantitative skills.
- To develop error correction and debugging skills in programming.
- To apply data structures and algorithms in problem solving.

LIST OF EXERCISES:

1. **English – Phase II**

   Vocabulary: Synonyms, Antonyms, Grammar: Subject-Verb Agreement, Tenses and Articles, Prepositions and Conjunctions, Speech and Voices, Comprehension: Inferential and Literal Comprehension, Contextual Vocabulary, Comprehension ordering.

2. **Logical Reasoning – Phase II**

   Deductive Reasoning: Coding deductive logic, Directional sense, Blood relations, Objective Reasoning, Selection decision tables, Puzzles, Inductive reasoning: Coding pattern and Number series pattern recognition, Analogy and Classification pattern recognition, Abductive Reasoning: Logical word sequence, Data sufficiency.

3. **Quantitative Ability - Phase II**

   Basic Mathematics: Divisibility, HCF and LCM, Numbers, decimal fractions and power, Applied Mathematics: Profit and Loss, Simple and Compound Interest, Time, Speed and Distance, Engineering Mathematics: Logarithms, Permutation and Combinations, Probability.

4. **Automata Fix – Phase I**

   Logical, Compilation and Code reuse

5. **Automata Fix – Phase I**

   Data Structure Concepts: Array and Matrices, Linked list, String processing and manipulation, Stack/Queue, Sorting and Searching

   Advanced Design and Analysis Techniques: Greedy Algorithms, Minimum Spanning Trees, String Matching, Divide and Conquer, Computational Geometry

TOTAL: 30 PERIODS

OUTCOMES

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

CO1: Develop advanced vocabulary for effective communication and reading skills.
CO2: Build an enhanced level of logical reasoning and quantitative skills.
CO3: Develop error correction and debugging skills in programming.
CO4: Apply data structures and algorithms in problem solving