ANNA UNIVERSITY, CHENNAI

UNIVERSITY DEPARTMENTS

B.E. ELECTRONICS AND COMMUNICATION ENGINEERING

REGULATIONS – 2015

VISION

To be recognized as a benchmark and trend setter in Electronics and Communication Engineering domain keeping in phase with rapidly changing technologies through effective partnership with reputed academic institutions, research organizations, industries and community.

MISSION

- Create highly motivated, technologically competent human resource by imparting high quality technical education through flexible student centric updated curricula suited to students with diverse backgrounds.
- Adopt best teaching and learning practices and establish state-of-the-art facilities to provide quality academic ambience for innovativeness, research and developmental activities.
- Enhance collaborative activities with academic institutions and industries for evolving indigenous technological solutions to meet societal needs and nurture leadership and entrepreneurship qualities with ethical means.
- Facilitate adequate exposure to the students, faculty and staff through training in the state-of-the art technologies, efficient administration, global outreach and benchmarking against referential institutions.

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The Programme defines Programme Educational Objectives, Programme Outcomes and Programme Specific Outcomes as follows:

1. PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

PEO1 The graduated Students will demonstrate sufficient theoretical, analytical and initiative skills in Basic Sciences and Engineering necessary, to assimilate, analyze, synthesize and innovative solutions to meet societal needs.

PEO2 The graduated students will have inculcated a thirst for lifelong learning and sustained research interest.

PEO3 The graduated students will practice values and exhibit leadership qualities and team spirit to promote entrepreneurship and indigenization.

After the course duration of four years, B.E. graduates of Electronics and Communication Engineering will exhibit the following outcomes:

2. PROGRAMME OUTCOMES (POs):

PO1: Ability to apply technical knowledge in mathematics, Science and Engineering leading to the realization and evaluation of complex systems, through research problems in the context of evolving societal needs

PO2: Imaginative critical thinking with an ability to think critically, analyze and solve engineering problems

PO3: Ability to design a system, component, or process to meet desired needs within realistic constraints.

PO4: Ability to, gather user needs and requirements, design, develop, integrate, and test complex systems by employing systems engineering thinking and processes, within required operational and acquisition system environments.

PO5: Personal and intellectual autonomy to independently and with an openness to reflect upon and use modern engineering tools necessary to engineering practices

PO6: Educational practices necessary to understand the impact of engineering solutions in a global, economical, environmental and societal context.

PO7: An active and committed global citizen with an awareness of contemporary issues and their Impact on economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability.

PO8: An understanding of professional, ethical, legal issues and responsibilities

PO9: A creative, enterprising team player and engaged participative leader able to effect change.

PO10: A confident, resilient and adaptable individual with good communication skills

PO11: Exercise their responsibilities in the management of cost-effective systems product development by leading and participating in interdisciplinary teams

PO12: Active exploration of new ideas through lifelong learning.

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3. PROGRAMME SPECIFIC OUTCOMES (PSOs):

After the completion of B.E. Electronics and Communication Engineering programme, the student will process the follow program Specific Outcomes:

PSO1 The curriculum of ECE includes mathematics and Engineering topics necessary to analyse and design complex Electronic Systems containing Hardware and Software components.

PSO2 The curriculum of ECE includes mathematics and Engineering topics necessary to analyse and design complex Communication Systems containing Hardware and Software components.

MAPPING OF PROGRAMME EDUCATIONAL OBJECTIVES WITH PROGRAMME OUTCOMES:

PROGRAMME EDUCATIONAL OBJECTIVES	PROGRAMME OUTCOMES											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
PEO1	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓
PEO2	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓
PEO3					✓	✓	✓	✓	✓	✓	✓	✓

A broad relation between the programme educational objective and the Programme outcomes is given in the following table

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MAPPING OF COURSE OUTCOMES WITH PROGRAMME OUTCOMES:

A broad relation between the Course Outcomes and Programme Outcomes is given in the following table

COURSE OUTCOMES		PROGRAMME OUTCOMES											
Sem	**Course Name**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**	**l**
I	Foundational English	√			√	√		√	√	√	√	√	
	Mathematics - I	√	√	√	√							√	√
	Engineering Physics	√	√	√	√							√	√
	Engineering Chemistry	√	√	√	√							√	√
	Computing Techniques	√	√	√	√	√						√	√
	Basic Sciences Laboratory	√	√	√	√	√						√	√
	Computer Practices Laboratory	√	√	√	√	√						√	√
II	Technical English	√			√	√		√	√	√	√	√	√
	Mathematics - II	√	√	√	√							√	√
	Physics for Electronics and Information Science	√	√	√	√							√	√
	Circuit Theory	√	√	√	√		√					√	√
	Electronic Devices	√	√	√	√		√					√	√
	Engineering Graphics												
	Electron Devices and Circuits Laboratory	√	√	√	√	√						√	√
	Engineering Practices Laboratory	√	√	√	√	√						√	√
III	Transform Techniques and Partial Differential Equations	√	√	√	√							√	√
	Signals and Systems	√	√	√	√		√					√	√
	Data Structures and Object Oriented Programming In C++	√	√	√	√	√	√					√	√
	Electronic Circuits – I	√	√	√	√		√					√	√
	Digital Electronics and System Design	√	√	√	√		√					√	√
	Basics of Electrical Engineering	√	√	√	√		√					√	√
	Digital and Electronic Circuits Laboratory.	√	√	√	√	√	√					√	√
	Electrical Engineering Laboratory	√	√	√	√	√						√	√
IV	Linear Algebra and Numerical Methods	√	√	√	√							√	√
	Communication Theory	√	√	√	√		√					√	√
	Electromagnetic Fields and Waves	√	√	√	√		√					√	√
	Electronic Circuits-II	√	√	√	√		√					√	√
	Operational Amplifiers and Analog Integrated Circuits	√	√	√	√		√					√	√
	Microprocessor and Microcontrollers	√	√	√	√		√					√	√
	Electronic Circuits II Laboratory	√	√	√	√	√						√	√
	Microcontroller and Interfacing Laboratory	√	√	√	√	√						√	√
V	Digital Communication Techniques	√	√	√	√		√					√	√
	Control systems Engineering	√	√	√	√		√					√	√
	Transmission Lines and Wave Guides	√	√	√	√		√					√	√
	Discrete Time Signal Processing	√	√	√	√		√					√	√
	Computer Architecture and Organization	√	√	√	√		√					√	√
	Professional Elective - I												
	Communication Systems Laboratory	√	√	√	√	√						√	√
	Discrete Time Signal Processing Laboratory	√	√	√	√	√						√	√
	Seminar	√	√	√	√	√	√					√	√

VI	Principles of Management		√	√	√			√	√	√	√	√	√
	Antennas and Wave Propagation	√	√	√	√		√					√	√
	Communication Networks	√	√	√	√		√					√	√
	VLSI Design	√	√	√	√		√					√	√
	RF and Microwave Communication	√	√	√	√		√					√	√
	Open Elective - I*												
	VLSI Laboratory	√	√	√	√	√						√	√
	RF and Microwave Laboratory	√	√	√	√	√						√	√
	Comprehension	√	√	√	√							√	√
VII	Wireless Communication	√	√	√	√		√					√	√
	Optical Communication	√	√	√	√		√					√	√
	Environmental Science and Engineering	√	√	√	√		√					√	√
	Principles of Digital Image Processing	√	√	√	√		√					√	√
	Professional Elective - II												
	Open Elective - II *****												
	Optical Communication Laboratory	√	√	√	√	√						√	√
	Wireless Communication and Networking Laboratory	√	√	√	√	√						√	√
	Mini Project / Industrial Training (6 weeks)	√	√	√	√	√				√	√	√	√
VIII	Professional Elective - III												
	Professional Elective - IV												
	Professional Elective - V												
	Project Work	√	√	√	√	√				√	√	√	√

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CHOICE BASED CREDIT SYSTEM
CURRICULA AND SYLLABI FOR I TO VIII SEMESTERS

SEMESTER I

S.NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	HS7151	Foundational English	HS	4	4	0	0	4
2.	MA7151	Mathematics - I	BS	4	4	0	0	4
3.	PH7151	Engineering Physics	BS	3	3	0	0	3
4.	CY7151	Engineering Chemistry	BS	3	3	0	0	3
5.	GE7151	Computing Techniques	ES	3	3	0	0	3
PRACTICALS								
6.	BS7161	Basic Sciences Laboratory	BS	4	0	0	4	2
7.	GE7161	Computer Practices Laboratory	ES	4	0	0	4	2
			TOTAL	**25**	**17**	**0**	**8**	**21**

SEMESTER II

S.NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	HS7251	Technical English	HS	4	4	0	0	4
2.	MA7251	Mathematics - II	BS	4	4	0	0	4
3.	PH7255	Physics for Electronics and Information Science	BS	3	3	0	0	3
4.	EC7251	Circuit Theory	ES	4	2	2	0	3
5.	EC7201	Electronic Devices	ES	3	3	0	0	3
6.	GE7152	Engineering Graphics	ES	5	3	2	0	4
PRACTICALS								
7.	EC7211	Electron Devices and Circuits Laboratory	ES	4	0	0	4	2
8.	GE7162	Engineering Practices Laboratory	ES	4	0	0	4	2
			TOTAL	**31**	**19**	**4**	**8**	**25**

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SEMESTER III

SL. NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	EC7301	Electronic Circuits – I	PC	4	2	2	0	3
2.	EC7352	Data Structures and Object Oriented Programming In C++	ES	5	3	2	0	4
3.	EC7353	Digital Electronics and System Design	PC	3	3	0	0	3
4.	EC7355	Signals and Systems	ES	4	2	2	0	3
5.	EE7252	Basics of Electrical Engineering	ES	3	3	0	0	3
6.	MA7358	Transform Techniques and Partial Differential Equations	BS	4	4	0	0	4
PRACTICALS								
7.	EC7311	Digital and Electronic Circuit Laboratory.	PC	4	0	0	4	2
8.	EE7361	Electrical Engineering Laboratory	ES	4	0	0	4	2
			TOTAL	**31**	**17**	**6**	**8**	**24**

SEMESTER IV

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	EC7351	Communication Theory	PC	3	3	0	0	3
2.	EC7401	Electromagnetic Fields and Waves	ES	3	3	0	0	3
3.	EC7402	Electronic Circuits-II	PC	4	2	2	0	3
4.	EC7451	Microprocessors and Microcontrollers	PC	3	3	0	0	3
5.	EC7452	Operational Amplifiers and Analog Integrated Circuits	PC	3	3	0	0	3
6.	MA7353	Linear Algebra and Numerical Methods	BS	4	4	0	0	4
PRACTICALS								
7.	EC7411	Electronic Circuits II Laboratory	PC	4	0	0	4	2
8.	EC7412	Microcontroller and Interfacing Laboratory	PC	4	0	0	4	2
			TOTAL	**28**	**18**	**2**	**8**	**23**

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SEMESTER V

SL. NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	EC7501	Control Systems Engineering	ES	3	3	0	0	3
2.	EC7502	Digital Communication Techniques	PC	3	3	0	0	3
3.	EC7503	Transmission lines and Wave Guides	PC	3	3	0	0	3
4.	EC7551	Computer Architecture and Organization	PC	3	3	0	0	3
5.	EC7552	Discrete Time Signal Processing	PC	3	3	0	0	3
6.		Professional Elective - I	PE	3	3	0	0	3
PRACTICALS								
7.	EC7511	Communication Systems Laboratory	PC	4	0	0	4	2
8.	EC7512	Seminar #	EEC	2	0	0	2	1
9.	EC7561	Discrete Time Signal Processing Laboratory	PC	4	0	0	4	2
			TOTAL	**28**	**18**	**0**	**10**	**23**

SEMESTER VI

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	EC7601	Antennas and Wave Propagation	PC	3	3	0	0	3
2.	EC7602	Communication Networks	PC	3	3	0	0	3
3.	EC7603	RF and Microwave Communication	PC	3	3	0	0	3
4.	EC7651	VLSI Design	PC	3	3	0	0	3
5.	MG7451	Principles of Management	HS	3	3	0	0	3
6.		Open Elective - I*	OE	3	3	0	0	3
PRACTICALS								
7.	EC7611	RF and Microwave Laboratory	PC	4	0	0	4	2
8.	EC7612	VLSI Laboratory	PC	4	0	0	4	2
9.	EC7613	Comprehension #	EEC	2	0	0	2	1
			TOTAL	**28**	**18**	**0**	**10**	**23**

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SEMESTER VII

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	EC7701	Optical Communication	PC	3	3	0	0	3
2.	EC7702	Wireless Communication	PC	3	3	0	0	3
3.	EC7751	Principles of Digital Image Processing	PC	3	3	0	0	3
4.	GE7251	Environmental Science and Engineering	HS	3	3	0	0	3
5.		Professional Elective - II	PE	3	3	0	0	3
6.		Open Elective - II *	OE	3	3	0	0	3
PRACTICALS								
7.	EC7711	Optical Communication Laboratory	PC	4	0	0	4	2
8.	EC7712	Wireless Communication and Networking Laboratory	PC	4	0	0	4	2
9.	EC7713	Mini Project / Industrial Training (6 weeks) #	EEC	4	0	0	4	2
			TOTAL	**30**	**18**	**0**	**12**	**24**

SEMESTER VIII

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.		Professional Elective - III	PE	3	3	0	0	3
2.		Professional Elective - IV	PE	3	3	0	0	3
3.		Professional Elective - V	PE	3	3	0	0	3
PRACTICALS								
4.	EC7811	Project Work	EEC	20	0	0	20	10
			TOTAL	**29**	**9**	**0**	**20**	**19**

TOTAL NO. OF CREDITS:182

*** Course from the curriculum of other UG programmes**

 # The Contact periods will not appear in the slot time table

HUMANITIES AND SOCIAL SCIENCES (HS)

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	HS7151	Foundational English	HS	4	4	0	0	4
2.	HS7251	Technical English	HS	4	4	0	0	4
3.	MG7451	Principles of Management	HS	3	3	0	0	3
4.	GE7251	Environmental Science and Engineering	HS	3	3	0	0	3

BASIC SCIENCES (BS)

SL. NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	MA7151	Mathematics I	BS	4	4	0	0	4
2.	PH7151	Engineering Physics	BS	3	3	0	0	3
3.	CY7151	Engineering Chemistry	BS	3	3	0	0	3
4.	BS7161	Basic Sciences Laboratory	BS	4	0	0	4	2
5.	MA7251	Mathematics - II	BS	4	4	0	0	4
6.	PH7255	Physics for Electronics Engineering and Information Science	BS	3	3	0	0	3
7.	MA7358	Transform Techniques and Partial Differential Equations	BS	4	4	0	0	4
8.	MA7353	Linear Algebra and Numerical Methods	BS	4	4	0	0	4

ENGINEERING SCIENCES (ES)

SL. NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	GE7151	Computing Techniques	ES	3	3	0	0	3
2.	GE7161	Computer Practice Laboratory	ES	4	0	0	4	2
3.	EC7251	Circuit Theory	ES	4	2	2	0	3
4.	EC7201	Electronic Devices	ES	3	3	0	0	3
5.	GE7152	Engineering Graphics	ES	5	3	2	0	4
6.	EC7211	Electron Devices and Circuits Laboratory	ES	4	0	0	4	2
7.	GE7162	Engineering Practices Laboratory	ES	4	0	0	4	2
8.	EC7352	Data Structures and Object Oriented Programming in C++	ES	5	3	2	0	4
9.	EC7401	Electromagnetic Fields and Waves	ES	3	3	0	0	3
10.	EE7252	Basics of Electrical Engineering	ES	3	3	0	0	3
11.	EE7361	Electrical Engineering Laboratory	ES	3	3	0	0	3
12.	EC7501	Control Systems Engineering	ES	3	3	0	0	3
13.	EC7355	Signals and Systems	ES	4	2	2	0	3

PROFESSIONAL CORE (PC)

SL. NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	EC7301	Electronic Circuits – I	PC	4	2	2	0	3
2.	EC7351	Communication Theory	PC	3	3	0	0	3
3.	EC7311	Digital and Electronics Circuit Lab	PC	4	0	0	4	2
4.	EC7353	Digital Electronics and System Design	PC	3	3	0	0	3
5.	EC7402	Electronic Circuits-II	PC	4	2	2	0	3
6.	EC7551	Computer Architecture and Organisation	PC	3	3	0	0	3
7.	EC7452	Operational Amplifiers and Analog Integrated Circuits	PC	3	3	0	0	3

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8.	EC7411	Electronic Circuits II Laboratory	PC	4	0	0	4	2
9.	EC7502	Digital Communication Techniques	PC	3	3	0	0	3
10.	EC7451	Micro processor and Microcontrollers	PC	3	3	0	0	3
11.	EC7503	Transmission lines and wave Guides	PC	3	3	0	0	3
12.	EC7552	Discrete Time Signal Processing	PC	3	3	0	0	3
13.	EC7412	Microcontroller and Interfacing Laboratory	PC	4	0	0	4	2
14.	EC7511	Communication Systems Laboratory	PC	4	0	0	4	2
15.	EC7702	Wireless Communication	PC	3	3	0	0	3
16.	EC7601	Antennas and Wave Propagation	PC	3	3	0	0	3
17.	EC7602	Communication Networks	PC	3	3	0	0	3
18.	EC7651	VLSI Design	PC	3	3	0	0	3
19.	EC7603	RF and Microwave Communication	PC	3	3	0	0	3
20.	EC7712	Wireless Communication and Networking Laboratory	PC	4	0	0	4	2
21.	EC7561	Discrete Time Signal Processing Laboratory	PC	4	0	0	4	2
22.	EC7701	Optical Communication	PC	3	3	0	0	3
23.	EC7751	Principles of Digital Image Processing	PC	3	3	0	0	3
24.	EC7611	RF and Microwave Laboratory	PC	4	0	0	4	2
25.	EC7711	Optical Communication Laboratory	PC	4	0	0	4	2
26.	EC7612	VLSI Laboratory	PC	4	0	0	4	2

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PROFESSIONAL ELECTIVES (PE)

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	CS7452	Operating Systems	PE	3	3	0	0	3
2.	EC7001	Adhoc and Wireless Sensor Networks	PE	3	3	0	0	3
3.	EC7002	Advanced Digital Signal Processing	PE	3	3	0	0	3
4.	EC7003	Advanced Wireless Communication	PE	3	3	0	0	3
5.	EC7004	CAD for VLSI	PE	3	3	0	0	3
6.	EC7005	CMOS Analog IC Design	PE	3	3	0	0	3
7.	EC7006	Cognitive Radio Communication	PE	3	3	0	0	3
8.	EC7007	Digital Control Engineering	PE	3	3	0	0	3
9.	EC7008	Digital Switching and Transmission	PE	3	3	0	0	3
10.	EC7009	Information Theory	PE	3	3	0	0	3
11.	EC7010	Introduction to Embedded Controllers	PE	3	3	0	0	3
12.	EC7011	Introduction to Web Technology	PE	3	3	0	0	3
13.	EC7012	Measurements and Instrumentation	PE	3	3	0	0	3
14.	EC7013	Medical Electronics	PE	3	3	0	0	3
15.	EC7014	MEMS and Microsystems	PE	3	3	0	0	3
16.	EC7015	Mixed Signal IC Design	PE	3	3	0	0	3
17.	EC7016	Optical Networks	PE	3	3	0	0	3
18.	EC7017	Parallel and Distributed Processing	PE	3	3	0	0	3
19.	EC7018	RF Microelectronics	PE	3	3	0	0	3
20.	EC7019	Satellite Communication	PE	3	3	0	0	3
21.	EC7020	VLSI Signal Processing	PE	3	3	0	0	3
22.	EC7021	Wireless Communication Networks	PE	3	3	0	0	3
23.	EC7071	Advanced Microcontrollers	PE	3	3	0	0	3
24.	EC7072	Cryptography and Network Security	PE	3	3	0	0	3
25.	EC7073	Electro Magnetic Interference and Compatibility	PE	3	3	0	0	3
26.	EC7074	Foundations for Nano Electronics	PE	3	3	0	0	3
27.	EC7075	Multimedia Compression and Networks	PE	3	3	0	0	3

28.	EC7076	Real Time and Embedded systems	PE	3	3	0	0	3
29.	EC7077	Robotics	PE	3	3	0	0	3
30.	EC7078	Soft Computing and Applications	PE	3	3	0	0	3
31.	EC7079	Speech Processing	PE	3	3	0	0	3
32.	GE7071	Disaster Management	PE	3	3	0	0	3
33.	GE7072	Foundation Skills In Integrated Product Development	PE	3	3	0	0	3
34.	GE7074	Human Rights	PE	3	3	0	0	3
35.	GE7351	Engineering Ethics and Human Values	PE	3	3	0	0	3
36.	GE7652	Total Quality Management	PE	3	3	0	0	3

EMPLOYABILITY ENHANCEMENT COURSES (EEC)

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	EC7512	Seminar	EEC	2	0	0	2	1
2.	EC7613	Comprehension	EEC	2	0	0	2	1
3.	EC7713	Mini Project / Industrial Training (6 weeks)	EEC	4	0	0	4	2
4.	EC7811	Project Work	EEC	20	0	0	20	10

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SUMMARY

SL. NO.	SUBJECT AREA	CREDITS AS PER SEMESTER								CREDITS TOTAL
		I	II	III	IV	V	VI	VII	VIII	
1.	**HS**	4	4	-	-	-	3	3	-	**14**
2.	**BS**	12	7	4	4	-	-	-	-	**27**
3.	**ES**	5	14	8	3	3	-	-	-	**33**
4.	**PC**	-	-	8	16	16	16	13	-	**69**
5.	**PE**	-	-	-	-	3	-	3	9	**15**
6.	**OE**	-	-	-	-	-	3	3	-	**6**
7.	**EEC**			4		1	1	2	10	**18**
	Total	**21**	**25**	**24**	**23**	**23**	**23**	**24**	**19**	**182**
8.	**Non Credit / Mandatory**									

Attested

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Centre for Academic Courses
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HS7151 **FOUNDATIONAL ENGLISH** **L T P C**
4 0 0 4

COURSE DESCRIPTION:

This course aims at developing the language skills necessary for the first year students of Engineering and Technology.

OBJECTIVES:

- To develop the four language skills – Listening, Speaking, Reading and Writing.
- To improve the students' communicative competence in English.
- To teach students the various aspects of English language usage.

CONTENTS

UNIT I GREETING AND INTRODUCING ONESELF 12

Listening- Types of listening – Listening to short talks, conversations; **Speaking** – Speaking about one's place, important festivals etc. – Introducing oneself, one's family/ friend; **Reading** – Skimming a passage– Scanning for specific information;**Writing**- Guided writing - Free writing on any given topic (My favourite place/ Hobbies/ School life, writing about one's leisure time activities, hometown, etc.); **Grammar** – Tenses (present and present continuous) -Question types - Regular and irregular verbs; **Vocabulary** – Synonyms and Antonyms.

UNIT II GIVING INSTRUCTIONS AND DIRECTIONS 12

Listening – Listening and responding to instructions; **Speaking** – Telephone etiquette - Giving oral instructions/ Describing a process – Asking and answering questions; **Reading** – Reading and finding key information in a given text - Critical reading - **Writing –**Process description(non-technical)- **Grammar** – Tense (simple past& past continuous) - Use of imperatives – Subject – verb agreement – Active and passive voice; - **Vocabulary** – Compound words – Word formation – Word expansion (root words).

UNIT III READING AND UNDERSTANDING VISUAL MATERIAL 12

Listening- Listening to lectures/ talks and completing a task; **Speaking** –Role play/ Simulation – Group interaction; **Reading** – Reading and interpreting visual material; **Writing**- Jumbled sentences – Discourse markers and Cohesive devices – Essay writing (cause & effect/ narrative);**Grammar** – Tenses (perfect), Conditional clauses –Modal verbs; **Vocabulary** –Cause and effect words; Phrasal verbs in context.

UNIT IV CRITICAL READING AND WRITING 12

Listening- Watching videos/ documentaries and responding to questions based on them; **Speaking** Informal and formal conversation; **Reading** –Critical reading (prediction & inference);**Writing**–Essay writing (compare & contrast/ analytical) – Interpretation of visual materials; **Grammar** – Tenses (future time reference);**Vocabulary** – One word substitutes (with meanings) – Use of abbreviations & acronyms – Idioms in sentences.

UNIT V LETTER WRITING AND SENDING E-MAILS 12

Listening- Listening to programmes/broadcast/ telecast/ podcast;**Speaking** – Giving impromptu talks, Making presentations on given topics- Discussion on the presentation;**Reading** –Extensive reading;**Writing**- Poster making – Letter writing (Formal and E-mail) ;**Grammar** – Direct and Indirect speech – Combining sentences using connectives;**Vocabulary** –Collocation;

TEACHING METHODS:

Interactive sessions for the speaking module.
Use of audio – visual aids for the various listening activities.

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Contextual Grammar Tea21ching.

EVALUATION PATTERN:
Internals – 50%
End Semester – 50%

TOTAL: 60 PERIODS

LEARNING OUTCOMES:

- Students will improve their reading and writing skills
- Students will become fluent and proficient in communicative English
- Students will be able to improve their interpersonal communication

TEXTBOOK:

1. Richards, Jack.C with Jonathan Hull and Susan Proctor **New Interchange: English for International Communication. (level 2, Student's Book)** Cambridge University Press, New Delhi: 2010.

REFERENCES:

1. Bailey, Stephen. **Academic Writing: A practical guide for students**. New York: Rutledge, 2011.
2. Morgan, David and Nicholas Regan. **Take-Off: Technical English for Engineering**. London: Garnet Publishing Limited, 2008.
3. Redston, Chris & Gillies Cunningham **Face2Face** (Pre-intermediate Student's Book & Workbook) Cambridge University Press, New Delhi: 2005.
4. Comfort, Jeremy, et al. **Speaking Effectively: Developing Speaking Skills for Business English.** Cambridge University Press, Cambridge: Reprint 2011.

MA7151	MATHEMATICS – I (Common to all branches of B.E. / B.Tech. Programmes in I Semester)	L	T	P	C
		4	0	0	4

OBJECTIVES:

- The goal of this course is for students to gain proficiency in calculus computations. In calculus, we use three main tools for analyzing and describing the behavior of functions: limits, derivatives, and integrals. Students will use these tools to solve application problems in a variety of settings ranging from physics and biology to business and economics.
- To make the student acquire sound knowledge of techniques in solving ordinary differential equations that model engineering problems.
- To familiarize the student with functions of several variables. This is needed in many branches of engineering.
- To acquaint the student with mathematical tools needed in evaluating multiple integrals and their usage.

UNIT I DIFFERENTIAL CALCULUS 12

Representation of functions - New functions from old functions - Limit of a function - Limits at infinity - Continuity - Derivatives - Differentiation rules - Polar coordinate system - Differentiation in polar coordinates - Maxima and Minima of functions of one variable.

UNIT II FUNCTIONS OF SEVERAL VARIABLES 12

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

Attested

UNIT III INTEGRAL CALCULUS 12

Definite and Indefinite integrals - Substitution rule - Techniques of Integration - Integration by parts, Trigonometric integrals, Trigonometric substitutions, Integration of rational functions by partial fraction, Integration of irrational functions - Improper integrals.

UNIT IV MULTIPLE INTEGRALS 12

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

UNIT V DIFFERENTIAL EQUATIONS 12

Method of variation of parameters – Method of undetermined coefficients – Homogenous equation of Euler's and Legendre's type – System of simultaneous linear differential equations with constant coefficients.

TOTAL: 60 PERIODS

OUTCOMES:

- Understanding of the ideas of limits and continuity and an ability to calculate with them and apply them.
- Improved facility in algebraic manipulation.
- Fluency in differentiation.
- Fluency in integration using standard methods, including the ability to find an appropriate method for a given integral.
- Understanding the ideas of differential equations and facility in solving simple standard examples.

TEXT BOOKS:

1. James Stewart, "Calculus with Early Transcendental Functions", Cengage Learning, New Delhi, 2008.
2. Narayanan S. and Manicavachagom Pillai T. K., "Calculus" Volume I and II, S. Viswanathan Publishers Pvt. Ltd., Chennai, 2007.
3. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley and Sons, 9th Edition, New Delhi, 2014.
4. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 43rd Edition, 2014.

REFERENCES:

1. Ramana B.V., "Higher Engineering Mathematics", Tata McGraw Hill Co. Ltd., New Delhi, 11th Reprint, 2010.
2. Jain R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics", Narosa Publications, New Delhi, 3rd Edition, 2007.
3. Bali N., Goyal M. and Watkins C., "Advanced Engineering Mathematics", Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.,), New Delhi, 7th Edition, 2009.
4. Greenberg M.D., "Advanced Engineering Mathematics", Pearson Education, New Delhi, 2nd Edition, 5th Reprint, 2009.
5. Peter V.O'Neil, "Advanced Engineering Mathematics", Cengage Learning India Pvt., Ltd, New Delhi, 2007.

PH7151 **ENGINEERING PHYSICS** **L T P C**

(Common to all branches of B.E / B.Tech programmes) **3 0 0 3**

OBJECTIVE:

- To introduce the concept and different ways to determine moduli of elasticity and applications.
- To instill the concept of sound, reverberation, noise cancellation, and ultrasonic generation, detection and applications
- To inculcate an idea of thermal properties of materials, heat flow through materials and quantum physics
- To promote the basic understanding of interferometers, principles and applications of lasers, optical fibers and sensors
- To establish a sound grasp of knowledge on the basics, significance and growth of single crystals

UNIT I PROPERTIES OF MATTER 9

Elasticity – Poisson's ratio and relationship between moduli (qualitative) - stress-strain diagram for ductile and brittle materials, uses - factors affecting elastic modulus and tensile strength - bending of beams - cantilever - bending moment - Young's modulus determination - theory and experiment - uniform and non-uniform bending - I shaped girders - twisting couple - hollow cylinder - shaft - torsion pendulum - determination of rigidity modulus- moment of inertia of a body (regular and irregular).

UNIT II ACOUSTICS AND ULTRASONICS 9

Classification of sound - loudness and intensity - Weber-Fechner Law - standard intensity and intensity level - decibel - reverberation - reverberation time - calculation of reverberation time for different types of buildings – sound absorbing materials - factors affecting acoustics of buildings : focussing, interference, echo, echelon effect, resonance - noise and their remedies. Ultrasonics: production - magnetostriction and piezoelectric methods - detection of ultrasound - acoustic grating – ultrasonic interferometer - industrial applications – Non-destructive testing - ultrasonic method: scan modes and practice.

UNIT III THERMAL AND MODERN PHYSICS 9

Thermal expansion - thermal stress - expansion joints - bimetallic strips - thermal conductivity- heat conductions in solids – flow of heat through compound media - Forbe's and Lee's disc method: theory and experiment- Black body radiation – Planck's theory (derivation) – Compton effect – wave model of radiation and matter – Schrödinger's wave equation – time dependent and independent equations – Physical significance of wave function – particle in a one dimensional box.

UNIT IV APPLIED OPTICS 9

Interference - Michelson interferometer: construction, working, determination of wave length and thickness - anti-reflection coating - air wedge and its applications - Lasers – principle and applications – Einstein's coefficients – CO_2 and Nd:YAG laser - semiconductor lasers: homo junction and hetro junction - construction and working – applications. Optical fibres - classification (index & mode based) - principle and propagation of light in optical fibres - acceptance angle and numerical aperture - fibre optic communication system - active and passive sensors.

UNIT V CRYSTAL PHYSICS 9

Single crystalline, polycrystalline and amorphous materials – Single crystals: unit cell, crystal systems, Bravais lattices, ditections and planes in a crystal, Miller indices - interplanar distance for a cubic crystal - coordination number and packing factor for SC, BCC, FCC, HCP and diamond structures - structure and significance of NaCl, CsCl, ZnS and graphite - crystal imperfections: point defects, line defects – Burger vectors, dislocations and stacking faults – Growth of single crystals: Bridgman and Czochralski methods.

TOTAL: 45 PERIODS

OUTCOME:

- The students will understand different moduli of elasticity, their determination and applications.
- The students will gain knowledge on the properties of sound, noise cancellation, and production, detection and applications of ultrasonics
- The students will acquire sound knowledge on thermal expansion and thermal conductivity of materials. Further they will gain an idea of quantum physics.
- The students will gain knowledge on interferometers, lasers and fiber optics
- The students will secure knowledge on the basics of crystal structures and their significance. Further they gain basic ideas of growing single crystals.

TEXT BOOKS:

1. Gaur R.K. and Gupta S.L., "Engineering Physics", Dhanpat Rai Publications 2013.
2. Palanisamy P.K., "Engineering Physics", Scitech Publications (P) Ltd. 2006.
3. Arumugam M., "Engineering Physics", Anuradha Publications 2000.

REFERENCES:

1. Serway R.A. and Jewett, J.W. "Physics for Scientists and Engineers with Modern Physics". Brooks/cole Publishing Co. 2010.
2. Tipler P.A. and Mosca, G.P., "Physics for Scientists and Engineers with Modern Physics". W.H.Freeman, 2007.
3. Markert J.T.,Ohanian, H. and Ohanian, M. "Physics for Engineers and Scientists". W.W.Norton & Co. 2007.

CY7151 ENGINEERING CHEMISTRY L T P C
3 0 0 3

OBJECTIVES:

- To develop an understanding about fundamentals of polymer chemistry.
- Brief elucidation on surface chemistry and catalysis.
- To develop sound knowledge photochemistry and spectroscopy.
- To impart basic knowledge on chemical thermodynamics.
- To understand the basic concepts of nano chemistry.

UNIT I POLYMER CHEMISTRY 9

Introduction: Functionality-degree of polymerization. Classification of polymers- natural and synthetic, thermoplastic and thermosetting. Types and mechanism of polymerization: addition (free radical, cationic, anionic and living); condensation and copolymerization. Properties of polymers: Tg, tacticity, molecular weight-weight average, number average and polydispersity index. Techniques of polymerization: Bulk, emulsion, solution and suspension.

UNIT II SURFACE CHEMISTRYAND CATALYSIS 9

Adsorption-Types of adsorption-adsorption of gases on solids- adsorption from solutions- Types of isotherms – Frendlich adsorption isotherm, Langmuir adsorption isotherm. Industrial applications of adsorption. Catalysis: Characteristics and types of catalysts-homogeneous and heterogeneous, auto catalysis. Enzyme catalysis -factors affecting enzyme catalysis, Michaelis - Menton equation. Industrial applications of catalysts.

UNIT III PHOTOCHEMISTRY AND SPECTROSCOPY 9

Photochemistry: Laws of photochemistry-Grotthuss - Draper law, Stark-Einstein law and Lambert-Beer Law. Photo processes-internal conversion, inter-system crossing, fluorescence, phosphorescence, chemiluminescence and photo-sensitization. Spectroscopy: Electromagnetic spectrum-absorption of radiation-electronic, vibrational and rotational transitions. Width and intensities of spectral lines. Spectrophotometric estimation of iron. UV-Vis and IR spectroscopy-principles, instrumentation (Block diagram) and applications.

UNIT IV CHEMICAL THERMODYNAMICS 9

Second law: Entropy-entropy change for an ideal gas, reversible and irreversible processes; entropy of phase transitions; Free energy and work function: Helmholtzand Gibbs free energy functions; Criteria of spontaneity; Gibbs-Helmholtz equation; Clausius Clapeyron equation; Maxwell relations-Van't Hoff isotherm and isochore. Chemical potential; Gibbs-Duhem equation- variation of chemical potential with temperature and pressure.

UNIT V NANOCHEMISTRY 9

Basics-distinction between molecules, nanoparticles and bulk materials; size-dependent properties. Preparation of nanoparticles – sol-gel and solvothermal.Preparation of carbon nanotube by chemical vapour deposition and laser ablation.Preparation of nanowires by VLS growth, electrochemical deposition and electro spinning. Properties and uses of nanoparticles, nanoclusters, nanorods, nanotubes and nanowires.

TOTAL: 45 PERIODS

OUTCOMES:

- Will be familiar with polymer chemistry, surface chemistry and catalysis.
- Will know the photochemistry, spectroscopy and chemical thermodynamics.
- Will know the fundamentals of nano chemistry.

TEXT BOOKS:

1. Jain P. C. & Monica Jain., "Engineering Chemistry", Dhanpat Rai Publishing Company (P) Ltd, New Delhi, 2014.
2. Kannan P., Ravikrishnan A., "Engineering Chemistry", Sri Krishna Hitech Publishing Company Pvt. Ltd. Chennai, 2014

REFERENCES:

1. Pahari A., Chauhan B., "Engineering Chemistry", Firewall Media, New Delhi, 2012.
2. Sivasankar B., "Engineering Chemistry", Tata McGraw-Hill Publishing Company Ltd, New Delhi, 2012.
3. Ashima Srivastava. Janhavi N N, Concepts of Engineering Chemistry", ACME Learning Private Limited., New Delhi., 2010.
4. Vairam S., Kalyani P., Suba Ramesh., "Engineering Chemistry", Wiley India Pvt Ltd., New Delhi., 2011.

GE7151 COMPUTING TECHNIQUES L T P C

(Common to all branches of Engineering and Technology) 3 0 0 3

OBJECTIVES:

- To learn programming using a structured programming language.
- To provide C programming exposure.
- To introduce foundational concepts of computer programming to students of different branches of Engineering and Technology.

UNIT I INTRODUCTION 9

Introduction to Computers – Computer Software – Computer Networks and Internet - Need for logical thinking – Problem formulation and development of simple programs - Pseudo code - Flow Chart and Algorithms.

UNIT II C PROGRAMMING BASICS 9

Introduction to C programming – Fundamentals – Structure of a C program – Compilation and linking processes - Constants, Variables – Data Types – Expressions - Operators –Decision Making and Branching – Looping statements – Solving Simple Scientific and Statistical

Problems.

UNIT III ARRAYS AND STRINGS 9

Arrays – Initialization – Declaration – One dimensional and two dimensional arrays - Strings- String operations – String Arrays - simple programs- sorting- searching – matrix operations.

UNIT IV POINTERS 9

Macros - Storage classes –Basic concepts of Pointers– Pointer arithmetic - Example Problems - Basic file operations

UNIT V FUNCTIONS AND USER DEFINED DATA TYPES 9

Function – definition of function – Declaration of function – Pass by value – Pass by reference – Recursion –Enumerators – Structures - Unions

TOTAL :45 PERIODS

OUTCOMES

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

- Write C program for simple applications
- Formulate algorithm for simple problems
- Analyze different data types and arrays
- Perform simple search and sort**.**
- Use programming language to solve problems.

TEXT BOOKS:

1. Pradip Dey, Manas Ghosh, “Computer Fundamentals and Programming in C”, Second Edition, Oxford University Press, 2013
2. Ashok N. Kamthane, “Computer programming”, Pearson Education, 2007.
3. Yashavant P. Kanetkar. “Let Us C”, BPB Publications, 2011.

REFERENCES:

1**.** Kernighan,B.W and Ritchie,D.M, “The C Programming language”, Second Edition, Pearson Education, 2006
2**.** Byron S Gottfried, “Programming with C”, Schaums Outlines, Second Edition, Tata Mc Graw-Hill, 2006.
3**.** R.G. Dromey, “How to Solve it by Computer”, Pearson Education, Fourth Reprint, 2007.

BS7161	BASIC SCIENCES LABORATORY (Common to all branches of B.E. / B.Tech Programmes)	L	T	P	C
		0	0	4	2

OBJECTIVE:

- To inculcate experimental skills to test basic understanding of physics of materials including properties of matter, thermal and optical properties.
- To induce the students to familiarize with experimental determination of velocity of ultrasonic waves, band gap determination and viscosity of liquids.

PHYSICS LABORATORY: (Any Seven Experiments)

1. Torsional pendulum - Determination of rigidity modulus of wire and moment of inertia of disc
2. Non-uniform bending - Determination of young’s modulus
3. Uniform bending – Determination of young’s modulus

4. Lee's disc Determination of thermal conductivity of a bad conductor
5. Potentiometer-Determination of thermo e.m.f of a thermocouple

6. Laser- Determination of the wave length of the laser using grating
7. Air wedge - Determination of thickness of a thin sheet/wire
8. a) Optical fibre -Determination of Numerical Aperture and acceptance angle
   b) Compact disc- Determination of width of the groove using laser.
9. Acoustic grating- Determination of velocity of ultrasonic waves in liquids.
10. Ultrasonic interferometer – determination of the velocity of sound and compressibility of liquids
11. Post office box -Determination of Band gap of a semiconductor.
12. Spectrometer- Determination of wavelength using gating.
13. Viscosity of liquids - Determination of co-efficient of viscosity of a liquid by Poiseuille"s flow

TOTAL: 30 PERIODS

OUTCOME:

Upon completion of the course, the students will be able

- To determine various moduli of elasticity and also various thermal and optical properties of materials.
- To determine the velocity of ultrasonic waves, band gap determination and viscosity of liquids.

(CHEMISTRY LABORATORY) (Minimum of 8 experiments to be conducted)

1. Estimation of HCl using Na_2CO_3 as primary standard and Determination of alkalinity in water sample.
2. Determination of total, temporary & permanent hardness of water by EDTA method.
3. Determination of DO content of water sample by Winkler's method.
4. Determination of chloride content of water sample by argentometric method.
5. Estimation of copper content of the given solution by Iodometry.
6. Determination of strength of given hydrochloric acid using pH meter.
7. Determination of strength of acids in a mixture of acids using conductivity meter.
8. Estimation of iron content of the given solution using potentiometer.
9. Estimation of iron content of the water sample using spectrophotometer (1, 10-Phenanthroline/thiocyanate method).
10. Estimation of sodium and potassium present in water using flame photometer.
11. Determination of molecular weight of poly vinyl alcohol using Ostwald viscometer.
12. Pseudo first order kinetics-ester hydrolysis.
13. Corrosion experiment-weight loss method.
14. Determination of CMC.
15. Phase change in a solid.

TOTAL: 30 PERIODS

TEXT BOOKS:

1. Vogel's Textbook of Quantitative Chemical Analysis (8^{TH} edition, 2014)
2. Laboratory Manual- Department of Chemistry, CEGC, Anna University (2014).

GE7161 **COMPUTER PRACTICES LABORATORY** **L T P C**
0 0 4 2

OBJECTIVES:

- To understand the basic programming constructs and articulate how they are used to develop a program with a desired runtime execution flow.
- To articulate where computer programs fit in the provision of computer-based solutions to real world problems.
- To learn to use user defined data structures.

LIST OF EXPERIMENTS

1. Search, generate, manipulate data using MS office/ Open Office
2. Presentation and Visualization – graphs, charts, 2D, 3D
3. Problem formulation, Problem Solving and Flowcharts
4. C Programming using Simple statements and expressions
5. Scientific problem solving using decision making and looping.
6. Simple programming for one dimensional and two dimensional arrays.
7. Solving problems using String functions
8. Programs with user defined functions
9. Program using Recursive Function
10. Program using structures and unions.

TOTAL: 60 PERIODS

OUTCOMES

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

- Write and compile programs using C programs.
- Write program with the concept of Structured Programming
- Identify suitable data structure for solving a problem
- Demonstrate the use of conditional statement.

HS7251 **TECHNICAL ENGLISH** **L T P C**
4 0 0 4

OBJECTIVES:

- To enable students acquire proficiency in technical communication.
- To enhance their reading and writing skills in a technical context.
- To teach various language learning strategies needed in a professional environment.

CONTENTS

UNIT I ANALYTICAL READING **12**

Listening- Listening to informal and formal conversations; **Speaking** – Conversation Skills(opening, turn taking, closing)-explaining how something works-describing technical functions and applications; **Reading** –Analytical reading, Deductive and inductive reasoning; **Writing**- vision statement–structuring paragraphs.

UNIT II SUMMARISING **12**

Listening- Listening to lectures/ talks on Science & Technology; **Speaking** –Summarizing/ Oral Reporting, **Reading** – Reading Scientific and Technical articles; **Writing**- Extended definition –Lab Reports – Summary writing.

Attested

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UNIT III DESCRIBING VISUAL MATERIAL 12

Listening- Listening to a panel discussion; **Speaking** – Speaking at formal situations; **Reading** – Reading journal articles - Speed reading; **Writing**-data commentary-describing visual material-writing problem-process- solution-the structure of problem-solution texts- writing critiques

UNIT IV WRITING/ E-MAILING THE JOB APPLICATION 12

Listening- Listening to/ Viewing model interviews; **Speaking** –Speaking at different types of interviews – Role play practice (mock interview); **Reading** – Reading job advertisements and profile of the company concerned; **Writing**- job application – cover letter –Résumé preparation.

UNIT V REPORT WRITING 12

Listening- Viewing a model group discussion; **Speaking** –Participating in a discussion - Presentation; **Reading** – Case study - analyse -evaluate – arrive at a solution; **Writing**– Recommendations- Types of reports (feasibility report)- designing and reporting surveys- – Report format.- writing discursive essays.

TEACHING METHODS:

Practice writing
Conduct model and mock interview and group discussion.
Use of audio – visual aids to facilitate understanding of various forms of technical communication.
Interactive sessions.

EVALUATION PATTERN:

Internals – 50%
End Semester – 50%

TOTAL:60 PERIODS

LEARNING OUTCOMES

- Students will learn the structure and organization of various forms of technical communication.
- Students will be able to listen and respond to technical content.
- Students will be able to use different forms of communication in their respective fields.

TEXTBOOK:

1. Craig,Thaine**. Cambridge Academic English: An integrated skills course for EAP(Student's Book)Level: Intermediate** Cambridge University Press, New Delhi: 2012

REFERENCES:

1. Laws, Anne. **Presentations.** Hyderabad: Orient Blackswan, 2011.
2. Ibbotson, Mark. **Cambridge English for Engineering**. Cambridge University Press, Cambridge, New Delhi: 2008
3. Naterop, Jean B. and Rod Revell. **Telephoning in English**. Cambridge: Cambridge University Press, 2004.
4. Rutherford, Andrea J. **Basic Communication Skills for Technology**. New Delhi: Pearson Education, 2001.
5. Bailey, Stephen. **Academic Writing A practical Guide for Students**. Routledge, London: 2004
6. Hewings, Martin**. Cambridge Academic English: An integrated skills course for EAP(Student's Book) Level: Intermediate** Cambridge University Press, New Delhi: 2012.

Attested

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MA7251	MATHEMATICS - II (Common to all branches of B.E. / B.Tech. Programmes in II Semester)	L	T	P	C
		4	0	0	4

OBJECTIVES:

- To develop the use of matrix algebra techniques that is needed by engineers for practical applications.
- To acquaint the student with the concepts of vector calculus, needed for problems in all engineering disciplines.
- To develop an understanding of the standard techniques of complex variable theory so as to enable the student to apply them with confidence, in application areas such as heat conduction, elasticity, fluid dynamics and flow of the electric current.
- To make the student appreciate the purpose of using transforms to create a new domain in which it is easier to handle the problem that is being investigated.

UNIT I MATRICES **12**

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

UNIT II VECTOR CALCULUS **12**

Gradient and directional derivative – Divergence and Curl – Irrotational and Solenoidal vector fields – Line integral over a plane curve – Surface integral - Area of a curved surface - Volume integral - Green's, Gauss divergence and Stoke's theorems – Verification and application in evaluating line, surface and volume integrals.

UNIT III ANALYTIC FUNCTION **12**

Analytic functions – Necessary and sufficient conditions for analyticity - Properties – Harmonic conjugates – Construction of analytic function - Conformal mapping – Mapping by functions $W = z + c, az, \frac{1}{z}, z^2$ - Bilinear transformation.

UNIT IV COMPLEX INTEGRATION **12**

Line integral - Cauchy's integral theorem – Cauchy's integral formula – Taylor's and Laurent's series – Singularities – Residues – Residue theorem – Application of residue theorem for evaluation of real integrals – Use of circular contour and semicircular contour with no pole on real axis.

UNIT V LAPLACE TRANSFORMS **12**

Existence conditions – Transforms of elementary functions – Transform of unit step function and unit impulse function – Basic properties – Shifting theorems -Transforms of derivatives and integrals – Initial and final value theorems – Inverse transforms – Convolution theorem — Transform of periodic functions – Application to solution of linear ordinary differential equations with constant coefficients.

TOTAL: 60 PERIODS

OUTCOMES:

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

Evaluate real and complex integrals using the Cauchy integral formula and the residue Theorem

Appreciate how complex methods can be used to prove some important theoretical results.

Evaluate line, surface and volume integrals in simple coordinate systems

Calculate grad, div and curl in Cartesian and other simple coordinate systems, and establish identities connecting these quantities

Use Gauss, Stokes and Greens theorems to simplify calculations of integrals and prove simple results.

TEXTBOOKS:

1. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley and Sons, 9th Edition, New Delhi, 2014.
2. Grewal B.S., “Higher Engineering Mathematics”, Khanna Publishers, New Delhi, 43rd Edition, 2014.

REFERENCES:

1. Ramana, B.V. “Higher Engineering Mathematics”, Tata Mc Graw Hill, New Delhi, 2010.
2. Glyn James, “Advanced Modern Engineering Mathematics”, Pearson Education, New Delhi, 2007.
3. Jain R.K. and Iyengar S.R.K., “Advanced Engineering Mathematics”, Narosa Publications, New Delhi, 3rd Edition, 2007.
4. Bali N., Goyal M. and Watkins C., “Advanced Engineering Mathematics”, Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.,), New Delhi, 7th Edition, 2009.
5. Peter V. O’Neil, “Advanced Engineering Mathematics”, Cengage Learning India Pvt., Ltd, New Delhi, 2007.

PH7255	PHYSICS FOR ELECTRONICS AND INFORMATION SCIENCE	L T P C 3 0 0 3

(Common to ECE & IT Branches**)**

OBJECTIVE:

- To understand the electrical properties of materials including free electron theory and applications of quantum mechanics
- To instill knowledge on physics of semiconductors, determination of charge carriers and device applications
- To promote the knowledge of magnetization of matter, classification of magnetic materials and their applications
- To establish a sound grasp of knowledge on different optical properties of materials, optical displays and applications
- To inculcate an idea of significance of nano structures, quantum confinement and ensuing nano device applications.

UNIT I ELECTRICAL PROPERTIES OF MATERIALS 9

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

UNIT II SEMICONDUCTORS AND TRANSPORT PHYSICS 9

Intrinsic Semiconductors – Energy band diagram – direct and indirect band gap semiconductors – Carrier concentration in intrinsic semiconductors – extrinsic semiconductors - Carrier concentration in N-type & P-type semiconductors – Variation of carrier concentration with temperature – Carrier transport in Semiconductors: Drift, mobility and diffusion – Hall effect and devices – Ohmic contacts – Schottky diode.

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UNIT III MAGNETIC PROPERTIES OF MATERIALS 9

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

UNIT IV OPTICAL PROPERTIES OF MATERIALS 9

Classification of optical materials – Absorption emission and scattering of light in metals, insulators & Semiconductors - LED's – Organic LED's – Plasma light emitting devices – LCD's – Laser diodes – Optical data storage techniques (including DVD, Blue -ray disc, Holographic data storage).

UNIT V NANO DEVICES 9

Electron density in a conductor – Significance between Fermi energy and volume of the material – Quantum confinement – Quantum structures – Density of states in lower dimensions – Band gap of nanomaterials –Tunneling – Single electron phenomena – Single electron Transistor. Conductivity of metallic nanowires – Ballistic transport – Quantum resistance and conductance – Carbon nanotubes: Properties and applications - Transport of spin – Spintronic devices and applications.

TOTAL: 45 PERIODS

OUTCOME:

At the end of the course, the students will

- come to have firm knowledge on the electrical properties of materials and applications
- acquire adequate understanding of semiconductor physics and functioning of semiconductor devices
- gain knowledge on magnetization of matter, classification of magnetic materials and their theoretical understanding, and device applications
- understand the optical properties of materials and working principles of various optical devices
- appreciate the importance of nanotechnology, physics of nanodevices, low-dimensional structures and their applications

TEXT BOOKS:

1. Balasubramaniam R. "Callister's Materials Science and Engineering", Wiley-India 2014.
2. Donald Askeland, "Materials Science and Engineering", Cengage Learning India Pvt Ltd., 2010.
3. Kasap S.O., "Principles of Electronic Materials and Devices", Tata Mc Graw-Hill 2007.
4. Pierret R.F., "Semiconductor Device Fundamentals", Pearson 2006.

REFERENCES:

1. Garcia N. and Damask A., "Physics for Computer Science Students", Springer-Verlag, 2012.
2. Datta S., "Quantum Transport: Atom to Transistor", Cambridge University Press 2013.
3. Hanson G.W., "Fundamentals of Nanoelectronics", Pearson Education 2009.
4. Charles Kittel, "Introduction to Solid State Physics", Wiley Publications 2012.
5. Wilson J. and Hawkes, J.F.B., "Optoelectronics: An introduction", Prentice Hall 1989.
6. Neil Gershenfeld, "The Physics of Information Technology", Cambridge Series on Information & the Natural Sciences, Cambridge University Press 2000.

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EC7251 **CIRCUIT THEORY** **L T P C**

2 2 0 3

OBJECTIVES:

- To introduce the basic concepts of DC and AC circuits behavior
- To study the transient and steady state response of the circuits subjected to step and sinusoidal excitations.
- To introduce different methods of circuit analysis using Network theorems, duality and topology.

UNIT I DC CIRCUIT ANALYSIS **6+6**

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

UNIT II NETWORK THEOREM AND DUALITY **4+4**

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

UNIT III SINUSOIDAL STEADY STATE ANALYSIS **8+8**

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

UNIT IV TRANSIENTS AND RESONANCE IN RLC CIRCUITS **6+6**

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

UNIT V COUPLED CIRCUITS AND TOPOLOGY **6+6**

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

TOTAL : 60 PERIODS

OUTCOMES:

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

- Develop the capacity to analyze electrical circuits, apply the circuit theorems in real time
- Design and understand and evaluate the AC and DC circuits.

TEXT BOOKS:

1. William H.Kayt, Jr.Jack E. Kemmerly, Steven M.Durbin, "Engineering Circuit Analysis", Sixth Edition, Tata Mc Graw-Hill Edition, 2012.
2. David A Bell, "Electric Circuits", PHI,2006

REFERENCES:

1. Charles K. Alexander & Mathew N.O.Sadiku, Fundamentals of Electric Circuits", Second Edition, Mc Graw- Hill 2003.

2. D.R.Cunningham, J.A.Stuller, "Basic Circuit Analysis", Jaico Publishing House, 2005

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EC7201 **ELECTRONIC DEVICES** **L T P C**
3 0 0 3

OBJECTIVES:

- To acquaint the students with the construction, theory and operation of the basic electronic devices such as PN junction diode, Bipolar and Field effect Transistors, Power control devices, LED, LCD and other Opto-electronic devices.

UNIT I PN DIODE and BIPOLAR JUNCTION TRANSISTOR 9

PN junction diode, current equations, V-I characteristics, the bipolar transistor action, minority carrier, distribution, low frequency common base, current gain, non-ideal effects, equivalent circuits, Ebers Moll Model-Gummel Poon-model, Hybrid-pi model, frequency limitations, large signal switching characteristics, SiGe and hetro-junction- bipolar junction transistor.

UNIT II FUNDAMENTALS OF FIELD EFFECT TRANSISTORS 9

Fundamentals of JFETs and their device characteristics, Two terminal MOS structures, threshold voltage and charge distribution, capacitance-voltage characteristics, MOSFET structures, I-V relationships, transconductance and substrate effects, frequency limitations,
non-ideal effects, MOSFET scaling, threshold voltage modification due to short and narrow channel effects, avalanche breakdown, drain induced barrier effects.

UNIT III POWER DEVICES AND DISPLAY DEVICES 9

SCR, Diac, Triac, Power BJT, Power MOSFET, IGBT Heat sinks and junction temperature, LED, LCD, Photo transistor, Opto Coupler, Solar cell, CCD.

UNIT IV SPECIAL SEMICONDUCTOR DEVICES 9

Metal-Semiconductor Junction-MESFET, Schottky barrier diode-Zener diode-Varactor diode – Tunnel diode-Gallium Arsenide device, LASER diode, UJT, LDR.

UNIT V SEMICONDUCTOR PROCESSING 9

Semiconductor materials, Silicon crystal growth and refining, Doping techniques, Ion implantation, Doping impurity diffusion, Gas-phase diffusion, Oxidation, Chemical vapor deposition (CVD), Silicon deposition and epitaxy, Dielectric layer deposition, Photolithography Etching, Metallization, Metal deposition, Metal silicides, CMOS process, bipolar process

TOTAL: 45 PERIODS

OUTCOMES:

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

- Explain the V-I characteristic of diode, UJT and SCR
- Describe the equivalence circuits of transistors
- Operate the basic electronic devices such as PN junction diode, Bipolar and Field effect Transistors, Power control devices, LED, LCD and other Opto-electronic devices

TEXT BOOKS:

1. Donald A Neaman, “Semiconductor Physics and Devices”, Third Edition, Tata Mc Graw Hill Inc. 2007.
2. Streetman and Banerjee, “Semiconductor Physics and Devices”, 6th Edition, Pearson Prentice Hall 2006.

REFERENCES:

1. J. P. Colinge, C. A. Colinge, “Physics of semiconductor devices”, kluwer academic publishers, 2012.
2. Yang, “Fundamentals of Semiconductor devices”, McGraw Hill International Edition, 2007.
3. Robert Boylestad and Louis Nashelsky, “Electron Devices and Circuit Theory” Pearson Prentice Hall, 10thedition, 2008

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GE7152 **ENGINEERING GRAPHICS** **L T P C**
3 2 0 4

OBJECTIVES

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

CONCEPTS AND CONVENTIONS (NOT FOR EXAMINATION) **1**

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

UNIT I PLANE CURVES AND FREE HANDSKETCHING **14**

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. Visualization concepts and Free Hand sketching: Visualization principles –Representation of Three Dimensional objects – Layout of views- Free hand sketching of multiple views from pictorial views of objects

UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACES **14**

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 trapezoidal method and traces Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

UNIT III PROJECTION OF SOLIDS **14**

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

UNIT IV PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES **14**

Sectioning of solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other – obtaining true shape of section.

Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids cylinders and cones. Development of lateral surfaces of solids with cut-outs and holes.

UNIT V ISOMETRIC AND PERSPECTIVE PROJECTIONS **15**

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 and miscellaneous problems.

Perspective projection of simple solids-Prisms, pyramids and cylinders by visual ray method and vanishing point method.

COMPUTER AIDED DRAFTING (DEMONSTRATION ONLY) **3**

Introduction to drafting packages and demonstration of their use.

L=45+T=30, TOTAL: 75 PERIODS

OUTCOMES:

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

- Perform free hand sketching of basic geometrical shapes and multiple views of objects.
- Draw orthographic projections of lines, planes and solids
- Obtain development of surfaces.
- Prepare isometric and perspective views of simple solids.

TEXT BOOK:

1. N.D.Bhatt and V.M.Panchal, “Engineering Drawing”, Charotar Publishing House, 50th Edition,

2010.

REFERENCES:

1. K.R.Gopalakrishna., “Engineering Drawing” (Vol I&II combined) Subhas Stores, Bangalore, 2007
2. Luzzader, Warren.J., and Duff,John M,’’ Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production", Eastern Economy Edition, Prentice Hall of India Pvt Ltd, New Delhi, 2005
3. M.B.Shah and B.C.Rana, “Engineering Drawing”, Pearson, 2nd Edition, 2009.
4. K.Venugopal and V.Prabhu Raja, “Engineering Graphics”, New Age International (P) Limited, 2008.
5. K. V.Natarajan, “A text book of Engineering Graphics”, 28th Edition, Dhanalakshmi Publishers, Chennai, 2015.
6. Basant Agarwal and Agarwal C.M., “Engineering Drawing”, Tata Mc Graw Hill Publishing Company Limited, New Delhi, 2008.
7. N.S Parthasarathy and Vela Murali, “Engineering Drawing”, Oxford University Press, 2015.

Publication of Bureau of Indian Standards:

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

Special points applicable to University Examinations on Engineering Graphics:

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

EC7211 ELECTRONIC DEVICES AND CIRCUITS LABORATORY L T P C
0 0 4 2

OBJECTIVES:

- To learn the characteristics of basic electronic devices such as Diode, BJT,FET, SCR
- To understand the working of RL,RC and RLC circuits
- To gain hand on experience in Thevinin & Norton theorem, KVL & KCL, and Super Position Theorems

1. Characteristics of PN Junction Diode
2. Zener diode Characteristics & Regulator using Zener diode
3. Common Emitter input-output Characteristics
4. Common Base input-output Characteristics
5. FET Characteristics
6. SCR Characteristics
7. Clipper and Clamper & FWR
8. Verifications Of Thevinin & Norton theorem
9. Verifications Of KVL & KCL
10. Verifications Of Super Position Theorem
11. verifications of maximum power transfer & reciprocity theorem

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12. Determination Of Resonance Frequency of Series & Parallel RLC Circuits
13. Transient analysis of RL and RC circuits

TOTAL: 60 PERIODS

OUTCOMES:

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

- Analyze the characteristics of basic electronic devices
- Design RL and RC circuits
- Verify Thevinin & Norton theorem KVL & KCL, and Super Position Theorems

GE7162	ENGINEERING PRACTICES LABORATORY	L	T	P	C
	(Common to all Branches of B.E. / B.Tech. Programmes)	0	0	4	2

OBJECTIVES

- To provide exposure to the students with hands-on experience on various Basic Engineering Practices in Civil, Mechanical, Electrical and Electronics Engineering.

GROUP – A (CIVIL & ELECTRICAL)

1. CIVIL ENGINEERING PRACTICES **15**

PLUMBING

Basic pipe connections involving the fittings like valves, taps, coupling, unions, reducers, elbows and other components used in household fittings. Preparation of plumbing line sketches.

- Laying pipe connection to the suction side of a pump.
- Laying pipe connection to the delivery side of a pump.
- Practice in connecting pipes of different materials: Metal, plastic and flexible pipes used in household appliances.

WOOD WORK

- Sawing, planing and making joints like T-Joint, Mortise and Tenon joint and Dovetail joint.

STUDY

- Study of joints in door panels and wooden furniture
- Study of common industrial trusses using models.

2. ELECTRICAL ENGINEERING PRACTICES **15**

- Basic household wiring using Switches, Fuse, Indicator and Lamp etc.,
- Stair case light wiring
- Tube – light wiring
- Preparation of wiring diagrams for a given situation.
- Study of Iron-Box, Fan Regulator and Emergency Lamp

GROUP – B (MECHANICAL AND ELECTRONICS) **15**

3. MECHANICAL ENGINEERING PRACTICES

WELDING

- Arc welding of Butt Joints, Lap Joints, and Tee Joints
- Gas welding Practice.
- Basic Machining - Simple turning, drilling and tapping operations..
- Study and assembling of the following:
    a. Centrifugal pump
    b. Mixie
    c. Air Conditioner.

DEMONSTRATION ON FOUNDRY OPERATIONS.

4. ELECTRONIC ENGINEERING PRACTICES **15**

- Soldering simple electronic circuits and checking continuity.
- Assembling electronic components on a small PCB and Testing.
- Study of Telephone, FM radio and Low Voltage Power supplies.

TOTAL: 60 PERIODS

OUTCOMES:

- Ability to fabricate carpentry components and to lay pipe connections including plumbing works.
- Ability to use welding equipments to join the structures
- Ability to do wiring for electrical connections and to fabricate electronics circuits.

EC7301 **ELECTRONIC CIRCUITS – I** **L T P C**
2 2 0 3

OBJECTIVES:

- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To learn about biasing of BJT and MOSFET circuits
- To design amplifiers
- To study the effect of source and load
- To design amplifiers with active loads
- To study high frequency response of amplifiers

UNIT I BIASING OF DISCRETE BJT AND MOSFET **6+6**

DC Load line, operating point, Various biasing methods for BJT-Design-Stability-Bias compensation, Thermal stability, DC bias analysis of MOSFET circuits.

UNIT II BJT AMPLIFIERS **6+6**

Small signal Analysis of Common Emitter-AC Loadline, Voltage swing limitations, Common collector and common base amplifiers – Differential amplifiers- CMRR- Darlington Amplifier- Bootstrap technique - Multi stage amplifiers - Cascode Amplifier.

UNIT III MOSFET AMPLIFIERS **6+6**

Small signal Analysis of amplifiers, Common source amplifier, Voltage swing limitations, Small signal analysis of Source follower and Common Gate amplifiers, Cascode amplifiers, Differential amplifiers, BiMOS Cascode amplifier.

UNIT IV FREQUENCY ANALYSIS OF BJT AND MOSFET AMPLIFIERS **6+6**

Low frequency analysis, Miller effect, High frequency analysis of CE and MOSFET CS amplifier, Short circuit current gain, cut off frequency – fα fβ, Unity Gain Bandwidth, Determination of bandwidth e of cascode, differential amplifier and multistage amplifiers.

UNIT V IC MOSFET AMPLIFIERS **6+6**

IC biasing Current steering circuits for IC amplifiers- current mirrors, - current sources- PMOS and NMOS current sources, Cascode current source, Widlar current source and Bias independent current source. Amplifier with resistive load - Depletion load, current source load and active load, Differential amplifiers and Common Mode Feedback circuits.

TOTAL: 30L + 30T: 60 PERIODS

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OUTCOMES:

- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world

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

- Choose appropriate biasing circuit for BJT and MOSFET amplifiers.
- Design and analyze amplifiers.
- Determine the effect of source and load.
- Design amplifiers with active loads meant for ICs.
- Exposed to high frequency response of BJT and MOSFET amplifiers.
- Design biasing circuits for IC amplifiers.

TEXT BOOKS:

1. Donald .A. Neamen, Electronic Circuit Analysis and Design –3rd edition, Tata McGraw Hill, 2010.
2. Adel .S. Sedra, Kenneth C. Smith, Micro Electronic circuits, 7th Edition, Oxford University Press, 2014.

REFERENCES:

1. David A. —Bell Electronic Devices and Circuits, Oxford Higher Education press,5th Edition,2010
2. Behzad Razavi, — Design of Analog CMOS Integrated Circuits‖, Tata Mc Graw Hill, 2007.
3. Paul Gray, Hurst, Lewis, Meyer —Analysis and Design of Analog Integrated Circuits‖, 4th Edition, John Willey & Sons 2005
4. Millman .J. and Halkias C.C, —Integrated Electronics‖, McGraw Hill, 2001.
5. D.Schilling and C.Belove, —Electronic Circuits‖, 3rd edition, McGraw Hill, 1989

EC7352	DATA STRUCTURES AND OBJECT ORIENTED PROGRAMMING IN C++	L T P C 3 2 0 4

OBJECTIVES:

- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- This course comprehends the fundamentals of object oriented programming, particularly in C++, which are then used to implement data structures. This also gives an idea of linear and non-linear data structures and their applications.

UNIT I DATA ABSTRACTION & OVERLOADING 9+6

Overview of C++ – Structures – Class Scope and Accessing Class Members – Reference Variables – Initialization – Constructors – Destructors – Member Functions and Classes – Friend Function – Dynamic Memory Allocation – Static Class Members – Container Classes and Integrators – Proxy Classes – Overloading: Function overloading and Operator Overloading.

UNIT II INHERITANCE & POLYMORPHISM 9+6

Base Classes and Derived Classes – Protected Members – Casting Class pointers and Member Functions – Overriding – Public, Protected and Private Inheritance – Constructors and Destructors in derived Classes – Implicit Derived – Class Object To Base – Class Object Conversion – Composition Vs. Inheritance – Virtual functions – This Pointer – Abstract Base Classes and Concrete Classes – Virtual Destructors – Dynamic Binding.

UNIT III LINEAR DATA STRUCTURES 11+6

Asymptotic Notations: Big-Oh, Omega and Theta – Best, Worst and Average case Analysis: Definition and an example – Arrays and its representations – Stacks and Queues – Linked lists –

Linked list based implementation of Stacks and Queues – Evaluation of Expressions – Linked list based polynomial addition.

UNIT IV NON-LINEAR DATA STRUCTURES 9+6

Trees – Binary Trees – Binary tree representation and traversals – Threaded binary trees – Binary tree representation of trees – Application of trees: Set representation and Union-Find operations – Graph and its representations – Graph Traversals – Connected components.

UNIT V SORTING & SEARCHING 7+6

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

L=45 +T=30, TOTAL: 75 PERIODS

OUTCOMES:

- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
- Select suitable data structure for specific Application.
- Compare Linear and nonlinear data structures for different application.
- Perform different searching and sorting techniques.
- Identify connected components in trees.
- Analyze asymptotic notations

TEXT BOOKS:

1. Deitel and Deitel, " C++, How To Program", Fifth Edition, Pearson Education, 2005.
2. Ellis Horowitz, Sartaj Sahni and Dinesh Mehta, Fundamentals of Data Structures in C++, 2nd edition, Universities Press Pvt Ltd., Hyderabad , 2007.

REFERENCES:

1. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++", Third Edition, Addison-Wesley, 2007.
2. Bhushan Trivedi, "Programming with ANSI C++, A Step-By-Step approach", Oxford University Press, 2010.
3. Goodrich, Michael T., Roberto Tamassia, "David Mount. Data Structures and Algorithms in C++", 7th edition, Wiley. 2004.

EC7353 DIGITAL ELECTRONICS AND SYSTEM DESIGN L T P C
3 0 0 3

OBJECTIVES:

- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To introduce Boolean algebra and its applications in digital systems
- To introduce the design of various combinational digital circuits using logic gates
- To bring out the analysis and design procedures for synchronous and asynchronous Sequential circuits
- To introduce the electronic circuits involved in the making of logic gates
- To introduce semiconductor memories and related technology

UNIT I BASIC CONCEPTS AND COMBINATIONAL CIRCUITS 9

Number Systems – Decimal, Binary, Octal, Hexadecimal, 1's and 2's complements, Codes – Binary, BCD, 84-2-1, 2421, Excess 3, Biquinary, Gray, Alphanumeric codes, Boolean theorems, Logic gates, Universal gates, Sum of products and product of sums, Minterms and Maxterms, Karnaugh map and Tabulation methods.

Attested

UNIT II MSI CIRCUITS 9

Problem formulation and design of combinational circuits - Code-Converters, Half and Full Adders, Binary Parallel Adder – Carry lookahead Adder, BCD Adder, Magnitude Comparator, Decoder, Encoder, Priority Encoder, Mux/Demux, Case study: Digital transreciver / 8 bit Arithmetic and logic unit

UNIT III SYNCRONOUS SEQUENTIAL CIRCUITS 9

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

UNIT III ASYNHRONOUS SEQUENTIAL CIRCUITS 9

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

UNIT V LOGIC FAMILIES AND PROGRAMMABLE LOGIC DEVICES 9

Logic families- TTL, MOS, CMOS, BiCMOS - Comparison of Logic families - Implementation of combinational logic/sequential logic design using standard ICs, ROM, PLA and PAL

TOTAL: 45 PERIODS

OUTCOMES:

- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
- Use Boolean algebra and apply it to digital systems.
- Design various combinational digital circuits using logic gates.
- Bring out the analysis and design procedures for synchronous and asynchronous sequential circuits.
- Use electronic circuits involved in the design of logic gates.
- Ability to use the semiconductor memories and related technology.

TEXT BOOKS:

1. M. Morris Mano and Michael D. Ciletti, “Digital Design”, 5th Edition, Pearson, 2013.
2. Charles H. Roth, Jr, “Fundamentals of Logic Design”, Fourth edition, Jaico Books, 2002.

REFERENCES:

1. William I. Fletcher, “An Engineering Approach to Digital Design”, Prentice- Hall of India, 1980.
2. Floyd T.L., “Digital Fundamentals”, Charles E. Merril publishing company,1982.
3. John. F. Wakerly, “Digital Design principles and practices”, Pearson Education, Fourth Edition, 2007.

EC7355 **SIGNALS AND SYSTEMS** **L T P C**

2 2 0 3

OBJECTIVES:

- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To introduce visualization and mathematical representation of continuous-time and discrete-time signals
- To teach the applications of Laplace and Fourier transforms in the analysis of continuous-time signals
- To teach the applications of Z- and Fourier transforms in the analysis of discrete – time signals

UNIT I CLASSIFICATION OF SIGNALS AND SYSTEMS 6+6

Continuous time signals (CT signals)- Discrete time signals (DT signals) – Step, Ramp, Pulse, Impulse, Exponential - classification of CT and DT signals – periodic and a periodic signals, random signals, Energy & Power signals - CT systems and DT systems, Classification of systems.

UNIT II ANALYSIS OF CONTINUOUS TIME SIGNALS 6+6

Fourier series analysis- Spectrum of Continuous Time (CT) signals- Fourier and Laplace transforms in Signal Analysis.

UNIT III LINEAR TIME INVARIANT –CONTINUOUS TIME SYSTEMS 6+6

Differential Equation-Block diagram representation-impulse response, convolution integrals-Fourier and Laplace transforms in Analysis.

UNIT IV ANALYSIS OF DISCRETE TIME SIGNALS 6+6

Baseband Sampling of CT signals- Aliasing, Reconstruction of CT signal from DT signal DTFT and properties, Z-transform & properties.

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

Difference Equations-Block diagram representation-Impulse response-Convolution sum-DTFT and Z Transform analysis of Recursive & Non-Recursive systems.

TOTAL: 30L + 30T: 60 PERIODS

OUTCOMES:

- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
- To compute the spectrum of any signal
- To identify the requirements and use transforms for processing real-world signals
- To analyse and design continuous-time and discrete-time systems

TEXT BOOKS:

1. Allan V.Oppenheim, S.Wilsky and S.H.Nawab, “Signals and Systems”, Pearson, Indian Reprint, 2007.
2. B. P. Lathi, “Principles of Linear Systems and Signals”, Oxford, Second Edition, 2009.

REFERENCES:

1. H P Hsu, “Signals and Systems”, Schaum’s Outlines, Tata McGraw Hill,2006
2. S. Haykin and B. Van Veen, "Signals and Systems", Second Edition, Wiley, 2003.
3. P.Ramakrishna Rao, “Signals and Systems” , Tata Mc Graw Hill Publications, 2008.
4. Edward W. Kamen, Bonnie S. Heck, “Fundamentals of Signals and Systems Using the Web and MATLAB”, Pearson, Indian Reprint, 2007
5. John Alan Stuller, “An Introduction to Signals and Systems”, Thomson, 2007

6. M.J.Roberts, “Signals & Systems, Analysis using Transform methods & MATLAB”, Tata McGraw Hill (India), 2007.

EE7252 BASICS OF ELECTRICAL ENGINEERING L T P C
3 0 0 3

OBJECTIVES:

- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision
- To introduce Magnetic circuits, principle and application of transformers
- To teach principle of operation of DC motors and AC machines
- To teach principle of special electrical machines

UNIT I MAGNETIC CIRCUITS AND ENERGY CONSERVATION 9

Magnetic effects of electric current- Magnetic circuits- Magnetic materials and B-H relationship Energy and co-energy- Electromagnetic induction and force- Hysteresis and eddy current losses.

UNIT II TRANSFORMER 9

Introduction – Single phase transformer construction and principle of operation – EMF equation of transformer-Transformer no–load phasor diagram –– Transformer on–load phasor diagram –– Equivalent circuit of transformer – Regulation of transformer –Transformer losses and efficiency-All day efficiency –auto transformers.

UNIT III DC MACHINES 9

Construction of DC machines – Theory of operation of DC generators – EMF and torque equations-Characteristics of DC generators- Applications, Operating principle of DC motors – Types of DC motors and their characteristics – Speed control of DC motors- Applications

UNIT IV INDUCTION MACHINES AND SYNCHRONOUS MACHINES 9

Principle of operation of three-phase induction motors – Construction –Types – Equivalent circuit – Construction of single-phase induction motors – Double -revolving field theory – starting methods - Principles of alternator – Construction details – Types – Equation of induced EMF – Voltage regulation. Methods of starting of synchronous motors – Torque equation – V curves – Synchronous motors.

UNIT V SPECIAL ELECTRICAL MACHINES 9

Switched reluctance motor, stepper motor, servo motor, BL DC motor- working principles, speed-torque characteristics and applications.

TOTAL: 45 PERIODS

OUTCOMES:

- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world

  At the end of the course the students will be able to
- Describe magnetic circuits, principles of operation of transformers, DC machines.
- Explain the working of AC machines and special electrical machines

TEXT BOOKS:

1. I.J Nagarath and Kothari DP “Electrical Machines “Tata McGraw Hill ,2010.
2. P.C. Sen, “Principles of Electric machines and Power electronics”, John- Wiley& sons 2nd edition ,2007.

REFERENCES:

1. A. E. Fitzgerald, Charles Kingsley, Stephen D. Umans, "Electrical Machinery" 6th Edition, Mc Graw Hill, 2013.
2. Stephen J. Chapman, "Electrical Machinery Fundamentals", 4th Edition, Mc Graw Hill, 2003.
3. Edward Hughes, Revised by John Keith Brown and Ian McKenzie Smith, "Hughes Electrical and Electronic Technology", Pearson Education Limited, 10th Edition, 2016.

MA7358	TRANSFORM TECHNIQUES AND PARTIAL DIFFERENTIAL EQUATIONS	L	T	P	C
		4	0	0	4

OBJECTIVES:

- To introduce the effective mathematical tools for the solutions of partial differential equations that model physical processes;
- To introduce Fourier series analysis which is central to many applications in engineering apart from its use in solving boundary value problems;
- To acquaint the student with Fourier transform techniques used in wide variety of situations in which the functions used are not periodic;
- To develop Z- transform techniques which will perform the same task for discrete time systems as Laplace Transform, a valuable aid in analysis of continuous time systems.

UNIT I PARTIAL DIFFERENTIAL EQUATIONS 12

Formation – Solutions of first order equations – Standard types and Equations reducible to standard types – Singular solutions – Lagrange's Linear equation – Integral surface passing through a given curve – Classification of partial differential equations - Solution of linear equations of higher order with constant coefficients – Linear non-homogeneous partial differential equations.

UNIT II FOURIER SERIES 12

Dirichlet's conditions – General Fourier series – Odd and even functions – Half-range Sine and cosine series – Complex form of Fourier series – Parseval's identity – Harmonic Analysis.

UNIT III APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATION 12

Method of separation of variables – Solutions of one dimensional wave equation and one-dimensional heat equation – Steady state solution of two-dimensional heat equation – Fourier series solutions in cartesian coordinates.

UNIT IV FOURIER TRANSFORM 12

Fourier integral theorem – Fourier transform pair - Sine and cosine transforms – Properties – Transform of elementary functions – Convolution theorem – Parseval's identity.

UNIT V Z – TRANSFORM AND DIFFERENCE EQUATIONS 12

Z-transform – Elementary properties – Inverse Z-transform – Convolution theorem – Initial and final value theorems – Formation of difference equation – Solution of difference equation using Z - transform.

TOTAL: 60 PERIODS

OUTCOME:

- The students can able to solve the partial differential equations, find the Fourier series analysis and solve the problems by using Fourier transform and Z transform techniques.

TEXT BOOKS:

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 43rd Edition, 2014.

2. Erwin kreyszig, “Advanced Engineering Mathematics”, John Wiley & Sons, 9th Edition, New Delhi, 2014

REFERENCES:

1. Glyn James, “Advanced Modern Engineering Mathematics”, Pearson Education, New Delhi, 2007.
2. Ramana, B.V. “Higher Engineering Mathematics”, Tata McGraw Hill, New Delhi, 11th Reprint , 2010.
3. Bali N., Goyal M. and Watkins C., “Advanced Engineering Mathematics”, Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.,), New Delhi, 7th Edition, 2009.
4. Peter V.O’Neil, “Advanced Engineering Mathematics”, Cengage Learning India Pvt., Ltd, New Delhi, 2007.

EC7311 DIGITAL AND ELECTRONIC CIRCUIT LABORATORY L T P C
0 0 4 2

OBJECTIVES:

- To learn hardware implementation and testing of analog and digital circuits
- To design amplifier circuits to meet desired specifications
- To understand the functionality of combinational and sequential circuits
- To simulate basic combinational and sequential circuits using Hardware Description Language HDL

1. Implementation of Boolean expression using universal gates, BCD adder and 2-bit Magnitude comparator
2. Implementation of Boolean expression using MUX and truth table verification of RS, JK, T, and D Flip Flops
3. BCD counter and counters with seven segment display
4. Data transfer using shift registers
5. Realization of Digital circuits using HDL – Combinational circuits
6. Realization of Digital circuits using HDL – Sequential circuits
7. Frequency Response of CE, CB amplifiers and its Spice simulation
8. Design of CC Amplifier for a specific output impedance and its Spice Simulation
9. Spice simulation of CS, CG, and CD configuration of MOSFET amplifiers with various active load configurations.
10. Design of Differential Amplifiers and its CMRR measurement
11. Frequency response of cascode amplifier
12. Frequency response of cascade amplifier

TOTAL: 60 PERIODS

OUTCOMES:

- Ability to design, build and test any digital logic and analog circuits for handling real life projects.
- Exposed to circuit simulations using present meter technology MOSFETs.
- Exposed to digital IC circuit simulators using HDL.

EE7361 ELECTRICAL ENGINEERING LABORATORY L T P C
0 0 4 2

OBJECTIVES:

- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues

- To provide hands on experience with generators and motors.
- To Understand the working of DC/AC motors and generators
- To study the characteristics of transducers
- To learn the use of transformer
- To understand the behavior of linear system through simulation
- To gain knowledge of controllers

1. Study of DC & AC motor starters
2. Open Circuit and Short Circuit test on single phase transformer to draw its equivalent circuit
3. Regulation of three phase alternator
4. Study of three phase circuits
5. Speed Control of DC shunt motor
6. Load Test on DC shunt motor
7. OCC & Load Characteristics of DC shunt generator
8. Load test on single-phase transformer
9. Load test on three-phase Induction motor
10. Load test on single-Phase Induction motor

TOTAL: 60 PERIODS

OUTCOMES:

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

- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
- Perform experiments to study the load characteristics of DC motors / generators.
- Design bridge network circuit to measure the values of passive component.
- Analyse the stability of linear system through simulation software.
- Obtain transfer function of DC generators.

EC7351 COMMUNICATION THEORY L T P C
3 0 0 3

OBJECTIVES:

- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To introduce the concepts of various modulations and their spectral analysis
- To introduce random processes and their characteristics
- To understand noise impact on modulations and
- To introduce some of the essential baseband signal processing techniques

UNIT I AMPLITUDE MODULATION 9

Review of Fourier and Hilbert Transforms-Amplitude Modulation – AM, DSBSC, SSBSC, VSB– Spectral analysis of modulated signals–Demodulation – Square law, envelope detectors Superheterodyne receivers

UNIT II ANGLE MODULATION 9

Angle modulation – PM and FM – Narrow band, Wideband FM - Spectral analysis of modulated signal – FM Modulators and FM Demodulators – Discriminator, PLL, Stereo FM

UNIT III RANDOM PROCESS 9

Random variables, Central limit Theorem, Random Process, Stationary Processes, Mean, Correlation & Covariance functions, Power Spectral Density, Ergodic Processes, Gaussian

Process, Transmission of a Random signal Through a LTI filter.

UNIT IV NOISE PERFORMANCE 9

Noise sources and types – Noise figure and noise temperature – Noise in cascaded systems – Narrow band noise – PSD of in-phase and quadrature noise – Noise performance in AM systems – Noise performance in FM systems – Pre-emphasis and de-emphasis – Capture effect, threshold effect.

UNIT V BASEBAND TECHNIQUES 9

Quantization – Uniform and non-uniform quantization – Quantization noise – Companding laws of speech signals – PCM, DPCM, ADPCM, DM, ADM, and Subband Coding. Multiplexing– TDM (E and T lines), FDM

TOTAL: 45 PERIODS

OUTCOMES:

- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
- Students will have acquired the knowledge on different modulation techniques
- Students will get information about signals broadcasted with different modulation techniques
- Students will understand the role of random process in communication systems.

TEXT BOOKS:

1. S.Haykin, "Communication Systems" 4th edition, John Wiley 2007
2. D.Roody, J.Coolen, "Electronic Communications", 4th edition PHI 2006

REFERENCES:

1. J.G.Proakis, M.Salehi, "Fundamentals of Communication Systems" – Pearson Education 2006.
2. H P Hsu, Schaum Outline Series- "Analog and Digital Communications" TMH 2006
3. B.P.Lathi, "Modern Digital and Analog Communication Systems", 3rd Edition, Oxford University Press, 2007.
4. B.Sklar, "Digital Communications Fundamentals and Applications" 2nd Edition Pearson Education 2007

EC7401 ELECTROMAGNETIC FIELDS AND WAVES L T P C
3 0 0 3

OBJECTIVES:

- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To impart knowledge on the basics of static electric and magnetic field and the associated laws.
- To give insight into the propagation of EM waves and also to introduce the methods in computational electromagnetics.

UNIT I STATIC ELECTRIC FIELD 9

Introduction to co-ordinate systems , Gradient , Divergence , Curl , Divergence theorem, Stokes theorem , Coulombs law , Electric field intensity , Principle of superposition , Electric scalar potential, Electric flux density. Gauss's law and its application, Permittivity, Polarization, Boundary relation, Capacitance, Dielectric strength ,Energy and Energy density, Poisson and Laplace equation and their application, Numerical examples

UNIT II STATIC MAGNETIC FIELD 9

Magnetic field of a current carrying element ,Amperes law , The Biot – Savart law , Magnetic flux Density and Field intensity , Gauss law for magnetic fields , Torque, Magnetic moment ,Magneto

motive force , Permeability , Vector potential , Field computation. Inductance, Energy in an Inductor and Energy density, Boundary relation, Hysterisis, Reluctance and Permeance. Numerical examples

UNIT III TIME VARYING ELECTRIC AND MAGNETIC FIELDS 9

Faradays law , Transformer and Mutual induction , Maxwell's equation , Self and Mutual inductance ,Displacement current , Amperes law and its inconsistency for time varying fields , Boundary relation , Poynting vector , Numerical examples.

UNIT IV PLANE EM WAVES IN ISOTROPIC MEDIA 9

Wave equation from Maxwell's Equation, Uniform plane waves in perfect dielectric, conductors, free space. Polarization, Reflection and Refraction of plane waves at different boundaries, Surface impedance, Numerical examples

UNIT V APPLICATION OF STATIC FIELDS AND COMPUTATIONAL METHODS 9

Deflection of a charged particle, CRO, Ink Jet Printer, Electro static generator, Magnetic Separator, Cyclotron, Velocity selector and Mass Spectrometer, Electromagnetic pump, Introduction to field computation methods-FDM, FEM, MOM, Numerical examples.

TOTAL: 45 PERIODS

OUTCOMES:

- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
- At the end of the course the students will be able to
- Have knowledge on the basics of static electric and magnetic field and the associated laws.
- Understand the propagation of EM waves and also get introduced to the methods in computational electromagnetics.

TEXT BOOKS:

1. W.H.Hayt and A.Buck,‖Engineering Electro Magnetics‖ , 8th Edition, Mc Graw Hill, 2011
2. David .K.Cheng, —Field and wave Electromagnetics ‖, 2nd revised edition, Pearson education, 2013.

REFERENCES:

1. Nannapaneni Narayana Rao,‖ Elements of Engineering Electro Magnetics, 6th edition, Prentice Hall of India, 2007.
2. Mathew.N.O.Sadiku,‖Elements of Electromagnetics‖, Sixth edition ,Oxford University Press, 2015.
3. Karl E.Longman and Sava V.Savov, Fundamentals of Electro-Magnetics, 2nd edition, Prentice Hall of India, 2010.
4. Kraus, Fleisch, —Electromagnetics with Applications, 5th edition, McGraw-Hill, 2010.
5. Guru & Hiziroglu, Electromagnetic Field Theory Fundamentals`` Second edition Cambridge University press, 2009.
6. Ashutosh Pramanik, Electro Magnetism‖ ,Prentice Hall of India,2nd edition, 2008.

EC7402 ELECTRONIC CIRCUITS - II L T P C
2 2 0 3

OBJECTIVES:

- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To study about feedback amplifiers and oscillator principles
- To design Op Amps

- To design oscillators
- To study about tuned amplifiers
- To know the principles of DC-DC convertors

UNIT I FEEDBACK AMPLIFIERS AND STABILITY 6+6

Basic feedback concepts – Properties of Negative feedback – Four feedback topologies– Analysis of series–shunt, series-series, shunt-shunt and shunt-series feedback amplifiers – stability problem – Gain and Phase-margins- Frequency compensation.

UNIT II OPERATIONAL AMPLIFIER 6+6

Design of two stage operational amplifier, Compensation of Op Amps, Cascode Op Amps, Folded Cascode Op Amps, Telescopic Opamp.

UNIT III OSCILLATORS 6+6

Barkhausen criteria for oscillator – Analysis of RC oscillators – Phase shift and Wein bridge oscillators – LC oscillators – Colpitts, Hartley, Clapp, and Ring Oscillators

UNIT IV TUNED AMPLIFIERS 6+6

Basic principles – Inductor losses – Use of transformers – Single tuned amplifier frequency analysis - Amplifier with multiple tuned circuits – Cascade – Synchronous tuning – Stagger tuning – Stability of tuned amplifiers using Neutralization techniques

UNIT V POWER AMPLIFIERS AND DC CONVERTERS 6+6

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

TOTAL: 30L + 30T: 60 PERIODS

OUTCOMES:

- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world

  At the end of the course the students will
- Acquire knowledge about feedback amplifiers and oscillator principles.
- Design and Construct oscillators, tuned amplifiers, Multivibrators and DC-DC convertors.

TEXT BOOKS:

1. Adel .S. Sedra, Kenneth C. Smith, Micro Electronic circuits, 7th Edition, Oxford University Press, 2014.
2. Behzad Razavi, — Design of Analog CMOS Integrated Circuits, Tata McGraw Hill, 2007.

REFERENCES

1. Donald .A. Neamen, Electronic Circuit Analysis and Design –3rd edition, Tata McGraw Hill, 2010
2. **NPTEL Course**: http://www.nptel.ac.in/course.php
3. F. Bogart Jr. Electronic Devices and Circuits 6th Edition, Pearson Education, 2007.
4. Muhammad H.Rashid power electronics Pearson Education / PHI , 2004.

EC7451 MICROPROCESSORS AND MICROCONTROLLERS L T P C
3 0 0 3

OBJECTIVES:

- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To study the architecture of 8085, 8086 and 8051
- To study the addressing modes and instruction set of 8085, 8086 and 8051

- To introduce the need and use of interrupt structure in 8085 and 8051.
- To develop skill in simple program writing for 8085 and 8051 applications.
- To introduce commonly used peripheral / interfacing ICs.

UNIT I 8- BIT MICROPROCESSOR. 9

8085 Architecture, Pin configuration, Instruction set, Addressing modes, Interrupts, Timing diagrams Memory and I/O interfacing.

UNIT II 16- BIT MICROPROCESSOR. 9

8086 Architecture, Instruction set, Addressing modes, Minimum and Maximum mode configuration, Assembler Directives, Assembly Language Programming, Interrupts. Features of 80186, 80286, 80386, and 80486.

UNIT III PERIPHERALS AND INTERFACING 9

Programmable Peripheral Interface (8255), Keyboard display controller (8279), ADC0808 and DAC0808 Interface, Programmable Timer Controller (8254), Programmable interrupt controller (8259), Serial Communication Interface (8251).

UNIT IV MICROCONTROLLER 9

8051 – Architecture, Special Function Registers (SFRs), Instruction set, Addressing modes, Assembly language programming, I/O Ports, Timers / counters, Interrupts and serial communication.

UNIT V MICROCONTROLLER BASED SYSTEM DESIGN. 9

Interfacing to: matrix display, (16x2) LCD, high power devices, optical motorshaft encoder, Stepper Motor, DC Motor speed Control using PWM, RTC and EEPROM interface using I2C protocol.

TOTAL: 45 PERIODS

OUTCOMES:

- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
- Ability to design and develop microprocessor architecture.
- Ability to develop microprocessor and microcontroller systems for entertainment, communication and medical applications.
- Ability to troubleshoot microprocessor and microcontroller systems.

TEXT BOOKS:

1. Ramesh S. Gaonkar, "Microprocessor Architecture, Programming and Applications with 8085". Sixth edition, Penram International Publishing 2012.
2. Douglas V. Hall, "Microprocessor and Interfacing, Programming and Hardware". Revised second Edition 2006, eleventh reprint 2010.Tata McGraw Hill.

REFERENCES:

1. Muhammad Ali Mazidi, Janice Gillispie Mazidi and Rolin D. McKinley, "The 8051 Microcontroller and Embedded Systems", Second Edition, Pearson Education 2008. Fifth impression 2011
2. Krishna Kant, “Microprocessor and Microcontroller Architecture, programming and system design using 8085, 8086, 8051 and 8096, PHI, 2007, Seventh Reprint, 2011.
3. Kenneth J. Ayala., “The 8051 Microcontroller, 3rd Edition, Thompson Delmar Learning, 2012.
4. A.K. Ray, K.M. Bhurchandi, “Advanced Microprocessor and Peripherals”, Second edition, Tata McGraw-Hill, 2010.
5. Barry B. Brey, “The Intel Microprocessors Architecture, Programming and Interfacing”, Pearson Education, 2007. Second impression 2010.

Attested

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EC7452 OPERATIONAL AMPLIFIERS AND ANALOG INTEGRATED CIRCUITS L T P C
3 0 0 3

OBJECTIVES:

- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To study the circuit configuration of linear integrated circuits.
- To introduce practical applications of linear integrated circuits.
- To introduce the concept of analog multiplier and Phase Locked Loop with applications.
- To study the application of ADC and DAC in real time systems.
- To introduce special function ICs and its construction.

UNIT I CIRCUIT CONFIGURATION FOR LINEAR ICS 9

Current sources, Analysis of difference amplifiers with active loads, supply and temperature independent biasing, Band gap references, Monolithic IC operational amplifiers, specifications, frequency compensation, slew rate and methods of improving slew rate. interpretation of TL082 datasheet.

UNIT II APPLICATION OF OPERATIONAL AMPLIFIERS 9

Linear and Nonlinear Circuits using operational amplifiers and their analysis, Inverting and Noninverting Amplifiers, Differentiator, Integrator, Voltage to Currency converter, Instrumentation amplifier, Sine wave Oscillators, Low pass and band pass filters, Comparator, Multivibrator and Schmitt trigger, Triangle wave generator, Precision rectifier, Log and Antilog amplifiers, Non-linear function generator.

UNIT III ANALOG MULTIPLIER AND PLL 9

Analysis of four quadrants and variable Transconductance multipliers, Analog multiplier MPY634 features, Voltage controlled oscillator, Closed loop analysis of PLL, AM, PM and FSK modulators and demodulators, AVC using op-AMP, Frequency synthesizers, Compander ICs.

UNIT IV ANALOG TO DIGITAL AND DIGITAL TO ANALOG CONVERTORS 9

Analog switches, High speed sample and hold circuit and IC's, Types of D/A converter, Current driven DAC, Switches for DAC, A/D converter - Flash, Single slope, Dual slope, Successive approximation, DM and ADM, Voltage to Time and Voltage to Frequency converters.

UNIT V SPECIAL FUNCTION ICS 9

Timers, Voltage regulators - linear and switched mode types, Switched capacitor filter, SMPS,features of TPS40200, TPS40210 buck and boost controller, Frequency to Voltage converters, Tuned amplifiers, Power amplifiers and Isolation Amplifiers, Video amplifiers, Fiber optics ICs and Opto couplers, Sources for Noises, Op Amp noise analysis and Low noise OP-Amps.

TOTAL: 45 PERIODS

OUTCOMES:

- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
- Ability to design new analog linear circuits
- Ability to analyze and develope linear IC based Systems.
- Ability do select appropriate Ics and circuit for analog system design.

TEXT BOOK:

1. Sergio Franco, "Design with operational amplifiers and analog integrated circuits", Mc Graw Hill Education, 2014.

REFERENCES:

1. Gray and Meyer, “Analysis and Design of Analog Integrated Circuits “, Wiley International, 2009.
2. Michael Jacob J., “Applications and Design with Analog Integrated Circuits “, Prentice Hall of Inida,1996.
3. Ramakant A. Gayakwad, “OP - AMP and Linear IC’s “, Prentice Hall, 2012.
4. Botkar K.R., “Integrated Circuits “, Khanna Publishers, 1996.
5. Taub and Schilling, “Digital Integrated Electronics “, Mc Graw Hill, 1977.
6. Coughlin and Driscoll, “Operational amplifiers and Linear Integrated Circuits “, Prentice Hall, 1989.
7. Millman J. and Halkias C., “Integrated Electronics “, Mc Graw Hill, 2001.

MA7353 LINEAR ALGEBRA AND NUMERICAL METHODS L T P C
4 0 0 4

OBJECTIVES:

The basic concepts and tools of the subject covered are:

- Solving systems of linear equations, Matrix operations.
- Vector spaces and subspaces; linear independence and span of a set of vectors, basis and dimension; the standard bases for common vector spaces.
- Inner product spaces: Cauchy-Schwarz inequality, orthonormal bases, the Gramm-Schmidt procedure, orthogonal complement of a subspace, orthogonal projection.
- Linear Transformations: kernel and range of a linear transformation, the Rank- Nullity Theorem, linear transformations and matrices, change of basis, similarity of matrices.
- Eigenvalues and eigenvectors, diagonalizability of a real symmetric matrix, canonical forms.
- Mathematical foundations of numerical techniques for solving linear system, eigen value problems and generalized inverses.

UNIT I VECTOR SPACES 12

Vector spaces – Subspaces – Linear combinations and system of Linear equations – Linear independence and Linear dependence – Bases and Dimensions – Linear Transformation – Matrix representation of Linear Transformation - Null space, Range and dimension theorem.

UNIT II LINEAR TRANSFORMATIONS 12

Linear transformations - Null spaces - Range - Matrix representation of linear transformation - Eigenvalues - Eigenvectors - Diagonalization.

UNIT III INNER PRODUCT SPACES 12

Inner product and norms - Gram Schmidt orthonormalization process - Orthogonal Complement - Least square approximation.

UNIT IV NUMERICAL SOLUTION OF LINEAR SYSTEM OF EQUATIONS 12

Solution of linear system of equations – Direct method: Gauss elimination method – Pivoting – Gauss-Jordan method - LU decomposition method – Cholesky decomposition method - Iterative methods: Gauss-Jacobi and Gauss-Seidel – SOR Method.

UNIT V NUMERICAL SOLUTION OF EIGENVALUE PROBLEMS AND GENERALISED INVERSES 12

Eigen value Problems: Power method – Jacobi’s rotation method – Conjugate gradient method – QR decomposition - Singular value decomposition method.

TOTAL: 60 PERIODS

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OUTCOMES:

- The students can able to solve system of linear equations, to use matrix operations and vector spaces using algebraic methods.
- Demonstrate understanding of common numerical methods and how they are used to obtain approximate solutions.
- Apply numerical methods to obtain approximate solutions to mathematical problems.
- Derive numerical methods for various mathematical operations and tasks, such as interpolation, differentiation, integration, the solution of linear and nonlinear equations, and the solution of differential equations.
- Analyse and evaluate the accuracy of common numerical methods.

TEXT BOOKS:

1. Friedberg, A.H., Insel, A.J. and Spence, L., “Linear Algebra”, Prentice - Hall of India, New Delhi, 2004.
2. Faires, J.D. and Burden, R., “Numerical Methods”, Brooks/Cole (Thomson Publications), New Delhi, 2002.

REFERENCES:

1. Kumaresan, S., “Linear Algebra – A geometric approach”, Prentice – Hall of India, New Delhi, Reprint, 2010.
2. Strang, G., “Linear Algebra and its applications”, Thomson (Brooks/Cole), New Delhi, 2005.
3. Gerald, C.F, and Wheatley, P.O., “Applied Numerical Analysis”, Pearson Education, New Delhi, 2002.
4. Sundarapandian. V, “Numerical Linear Algebra”, Prentice – Hall of India, New Delhi, 2008.
5. Bernard Kolman, David R. Hill, “Introductory Linear Algebra”, Pearson Education, New Delhi, First Reprint, 2009.
6. Richard Branson, "Matrix Operations" , Schaum's outline series, 1989.

EC7411 ELECTRONIC CIRCUITS II LABORATORY L T P C
0 0 4 2

OBJECTIVES:

- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To study circuits using feedback concepts and tuned circuits
- To learn circuits using OPAMP,PLL and Timer ICs
- To know the design of power amplifier circuits to meet desired specifications

1. Design and Analysis of Feedback amplifiers
2. Design and analysis of RC phase shift oscillator
3. Design and analysis of Hartley and Colpitts LC Oscillators
4. Design and analysis of single Tuned amplifier
5. Design and analysis of Wien bridge oscillator using OPAMP
6. Design and analysis of Schmitt trigger using OPAMP
7. Design and analysis of Waveform generators using OPAMP
8. Design and analysis of Active filters using OPAMP
9. Design and analysis of Voltage controlled oscillator using PLL IC
10. Design and analysis of Astable and Monostable Multivibrators using Timer IC
11. Spice simulation of differential amplifiers and operational amplifiers
12. Spice simulation of Class A and Class B Power Amplifiers.

TOTAL: 60 PERIODS

OUTCOMES:

- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
- Ability to design oscillators and multistage amplifiers
- Ability to analyse power amplifier circuits.
- Ability to design circuits using OPAMP,PLL and Timer ICs

EC7412 MICROCONTROLLER AND INTERFACING LABORATORY L T P C
0 0 4 2

OBJECTIVES:

- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To study introduce the programming language of 8085, 8086 and 805.
- To develop skill in program writing for microprocessors and controllers.
- To introduce microprocessor and microcontroller based system design.
- To impart knowledge on embedded S/W development.

8085 based experiments:

1. Assembly Language Programming of 8085.

8086 based experiments:

2. Programs for 16 bit Arithmetic, Sorting, Searching and String operations,
3. Programs for Digital clock, Interfacing ADC and DAC
4. Interfacing and programming 8279, 8259, and 8253.
5. Serial Communication between two microprocessors kits using 8251.
6. Interfacing Stepper Motor, Speed control of DC Motor
7. Parallel communication between two microprocessors kits using Mode 1 and Mode 2 of 8255.
8. Macro assembler Programming for 8086

8051 based experiments using assembly language and C programming:

9. Programming using Arithmetic, Logical and Bit Manipulation instructions of the 8051 microcontroller.
10. Programming and verifying Timer, Interrupts and UART operations in 8051 microcontroller.
11. Interfacing – DAC and ADC and 8051 based temperature measurement
12. Interfacing – LED and LCD
13. Interfacing – Stepper motor and traffic light control system
14. Communication between 8051 Microcontroller kit and PC.

TOTAL: 60 PERIODS

OUTCOMES:

- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
- Ability to design and develop microprocessor based system for real time application.
- Ability to develop microprocessor and microcontroller systems for entertainment, communication and medical applications.
- Ability to troubleshoot microprocessor and microcontroller systems.

Attested

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EC7501 CONTROL SYSTEMS ENGINEERING L T P C
3 0 0 3

OBJECTIVES:

- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues.
- To introduce the elements of control system and their modeling using various Techniques.
- To introduce methods for analyzing the time response, the frequency response and the stability of systems
- To introduce the state variable analysis method.

UNIT I CONTROL SYSTEM MODELING 9

Basic Elements of Control System – Open loop and Closed loop systems - Differential equation - Transfer function, Modeling of Electric systems, Translational and rotational mechanical systems - Block diagram reduction Techniques - Signal flow graph

UNIT II TIME RESPONSE ANALYSIS 9

Time response analysis - First Order Systems - Impulse and Step Response analysis of second order systems - Steady state errors – P, PI, PD and PID Compensation, Analysis using MATLAB

UNIT III FREQUENCY RESPONSE ANALYSIS 9

Frequency Response - Bode Plot, Polar Plot, Nyquist Plot - Frequency Domain specifications from the plots - Constant M and N Circles - Nichol's Chart - Use of Nichol's Chart in Control System Analysis. Series, Parallel, series-parallel Compensators - Lead, Lag, and Lead Lag Compensators, Analysis using MATLAB.

UNIT IV STABILITY ANALYSIS 9

Stability, Routh-Hurwitz Criterion, Root Locus Technique, Construction of Root Locus, Stability, Dominant Poles, Application of Root Locus Diagram - Nyquist Stability Criterion - Relative Stability, Analysis using MATLAB

UNIT V STATE VARIABLE ANALYSIS 9

State space representation of Continuous Time systems – State equations – Transfer function from State Variable Representation – Solutions of the state equations - Concepts of Controllability and Observability – State space representation for Discrete time systems. Sampled Data control systems – Sampling Theorem – Sampler & Hold – Open loop & Closed loop sampled data systems.

TOTAL : 45 PERIODS

OUTCOMES:

- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
- Compute the transfer function of different physical systems. (Level – III (Application))
- Analyze the time domain specifications and calculate the steady state error. (Level – IV (Analysis))
- Illustrate the frequency response characteristics of open loop and closed loop system response. (Level – II (Comprehension))
- Analyze the stability using Routh and root locus techniques. (Level – IV (Analysis))
- Illustrate the state space model of a physical system and discuss the concepts of sampled data control system. (Level – II (Comprehension))

TEXT BOOK:

1. J.Nagrath and M.Gopal," Control System Engineering", New Age International Publishers, 5th Edition, 2007.

REFERENCES:

1. M.Gopal, “Control System – Principles and Design”, McGraw-Hill, 2nd edition 2006.
2. Constantine H. Houpis, Stuart N. Sheldon, “Linear Control System Analysis and Design with MATLAB”, CRC Press, 6th edition 2013.
3. Richard C. Dorf & Robert H. Bishop, “Modern Control Systems”, Prentice Hall, 12th edition (2010)
4. Joseph J. DiStefano, Allen R. Stubberud, Schaum's Outline of “Feedback and Control Systems”, McGraw-Hill Education; 2nd edition 2013.
5. Farid Golnaraghi, Benjamin C. Kuo, “Automatic Control Systems”, Wiley, 9th edition (2009)

EC7502 DIGITAL COMMUNICATION AND TECHNIQUES L T P C
3 0 0 3

OBJECTIVES:

- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To demonstrate the concept of information and types of channels
- To understand the various source coding theorems and the fundamental limit of transmission over the channel.
- To understand the various baseband and bandpass processing techniques.
- To understand spread spectrum.

UNIT I BASEBAND TECHINIQUES 9

Overall picture and the relevance of digital communication techniques, Pulse Modulation-PAM,PPM and PDM, Line codes – RZ,NRZ, Manchester, Binary N-zero substitution codes- PSDs – ISI – Nyquist criterion for distortionless transmission – Pulse shaping – Correlative coding- M-ary schemes – Eye pattern

UNIT II ERROR CONTROL CODING TECHNIQUES 9

Channel coding theorem – Linear block codes – Hamming codes – Cyclic codes – Convolutional codes – Viterbi decoding

UNIT III INTRODUCTION AND INFORMATION THEORY 9

Measure of information – Entropy – Source coding theorem – Discrete memoryless channels– lossless, deterministic, noiseless, BEC, BSC – Mutual information – Channel capacity – Shannon-Hartley law- Transform coding – LPC – Shannon-Fano coding, Huffman Coding, Run length coding, LZW algorithm

UNIT IV BANDPASS SIGNALING 9

Comparison of base band and band pass signaling, Geometric representation of signals – ML detection - Correlator and matched filter detection- generation and detection of BPSK, BFSK, QPSK- BER and Power spectral Density Comparison- Structure of non-coherent receivers-generation and detection of BFSK, DPSK – Principles of QAM – Introduction to Band Pass Sampling theorem.

UNIT V SYNCHRONISATION AND SPREAD SPECTRUM TECHNIQUES 9

Importance of Sync hronisation – Carrier, frame and symbol/Chip synchronisation techniques, Spread Spectrum - PN Sequences, Direct Sequence and Frequency Hopping Spread Spectrum Systems, BER Analysis, Processing gain and Jamming Margin, Spread spectrum in Cellular Systems.

Attested

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Centre for Academic Courses
Anna University, Chennai-600 025

TOTAL: 45 PERIODS

OUTCOMES:

- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
- Capable of configuring Source coding schemes
- To be able to design Channel coding schemes
- To be able to design base band signaling scheme analyze their performance
- To be able to design various Bandpass signaling schemes and compare their performance
- Capable of designing synchronization schemes
- Capable of designing spread spectrum systems

TEXT BOOKS:

1. S. Haykin, "Digital Communications", John Wiley, 2015
2. J.G Proakis, "Digital Communication", 5/e, Tata Mc Graw Hill Company, 2008.

REFERENCES:

1. B. Sklar, "Digital Communication Fundamentals and Applications", 2nd edition, Pearson Education, 2009
2. H P Hsu, Schaum Outline Series- "Analog and Digital Communications", TMH 2006
3. B.P.Lathi, "Modern digital and Analog Communication Systems" 3rd edition, Oxford University Press 2007

EC7503 TRANSMISSION LINES AND WAVE GUIDES L T P C
3 0 0 3

OBJECTIVES:

- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To introduce the various types of transmission lines and to discuss the losses associated.
- To provide thorough understanding about impedance transformation and matching.
- To give insight about the usage of smith chart in problem solving is dealt with.
- To import knowledge on filter theories and waveguide theories are imparted.

UNIT I TRANSMISSION LINE THEORY & PARAMETERS 8

Introduction to different types of transmission lines , Transmission line Equation – Solution – Characteristic impedance-Infinite line concept - Distortion less line – loading – input impedance, Losses in Transmission lines– Reflection loss, Insertion loss, return loss, Introduction to planar transmission lines. Numerical examples

UNIT II IMPEDENCE MATCHING AND TRANSFORMATION 9

Reflection Phenomena – Standing waves – λ/8, λ/4 & λ/2 lines – λ/4 Impedance transformers, Stub Matching – Single and Double Stub – Smith Chart and Applications. Numerical examples

UNIT III NETWORK COMPONENTS 8

Filter fundamentals, Filter design- lumped element and distributed element approach to filter design –Design of Attenuators and Equalizers – Lattice type , Concept of inverse networks– Transients in transmission lines, Lattice diagram. Numerical examples

UNIT IV RECTANGULAR WAVE GUIDES 10

Waves between Parallel Planes – characteristic of TE , TM and TEM waves , Velocities of propagation ,Solution of wave Equation in Rectangular guides ,TE and TM modes , Dominant Mode, Attenuation, Mode Excitation, Dielectric slab wave guides, Numerical examples.

UNIT V CYLINDRICAL WAVE GUIDES 10

Solution of wave equation in circular guides, TE and TM wave in circular guides, Wave impedance, attenuation, mode excitation, formation of cylindrical cavity, Application , cavity resonator and Q for dominant mode, Numerical examples. Practical examples of transmission line and waveguides in communication.

TOTAL: 45 PERIODS

OUTCOMES:

- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world

  At the end of the course the students will be able to
- Analyze the various types of transmission lines and to discuss the losses associated.
- Understand impedance transformation and matching.
- Use smith chart in problem solving
- Apply knowledge on filter theories and waveguide theories are imparted.

TEXT BOOK:

1. John D Ryder —Networks lines and fields‖ Prentice Hall of India, 2005

REFERENCES:

1. E.C.Jordan and K.G. Balmain, —Electromagnetic Waves and Radiating Systems‖ Prentice Hall of India, 2011.
2. Bhag Singh Guru & Hüseyin R. Hiziroglu,"Electromagnetic Field Theory Fundamentals, Second edition Cambridge University press, 2005
3. R. K. Shevgaonkar, " ELECTROMAGNETIC WAVES, Tata Mc Graw Hill Publications, 2006
4. G.S.N Raju "Electromagnetic Field Theory and Transmission Lines‖ Pearson Education India, First edition 2005.

EC7551 COMPUTER ARCHITECTURE AND ORGANIZATION L T P C
3 0 0 3

OBJECTIVES:

- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To study the general purpose architecture for computer system.
- To study the design of data path unit and control unit for ALU operation.
- Understanding the concept of various memories.
- To introduce the concept of interfacing and organization of multiple processors.

UNIT I INTRODUCTION 9

Computing and Computers, Evolution of Computers, VLSI Era, System Design- Register Level, Processor Level, CPU Organization, Data Representation, Fixed – Point Numbers, Floating Point Numbers, Instruction Formats, Instruction Types. Addressing modes.

UNIT II DATA PATH DESIGN 9

Fixed Point Arithmetic, Addition, Subtraction, Multiplication and Division, Combinational and Sequential ALUs, Carry look ahead adder, Robertson algorithm, booth's algorithm, non-restoring division algorithm, Floating Point Arithmetic, Coprocessor, Pipeline Processing, Pipeline Design, Modified booth's Algorithm

UNIT III CONTROL DESIGN 9

Hardwired Control, Microprogrammed Control, Multiplier Control Unit, CPU Control Unit, Pipeline

Control, Instruction Pipelines, Pipeline Performance, Superscalar Processing, Nano Programming.

UNIT IV MEMORY ORGANIZATION 9

Random Access Memories, Serial - Access Memories, RAM Interfaces, Magnetic Surface Recording, Optical Memories, multilevel memories, Cache & Virtual Memory, Memory Allocation, Associative Memory.

UNIT V SYSTEM ORGANIZATION 9

Communication methods, Buses, Bus Control, Bus Interfacing, Bus arbitration, IO and system control, IO interface circuits, Handshaking, DMA and interrupts, vectored interrupts, PCI interrupts, pipeline interrupts, IOP organization, operation systems, multiprocessors, fault tolerance, RISC and CISC processors, Superscalar and vector processor.

TOTAL: 45 PERIODS

OUTCOMES:

- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
- Describe data representation, instruction formats and the operation of a digital computer. (Level – II (Comprehension))
- Illustrate the data path unit and control unit for ALU operation. (Level – II (Comprehension))
- Discuss about implementation schemes of control unit and pipeline performance. (Level – II (Comprehension))
- Explain the concept of various memories, interfacing and organization of multiple processors. (Level – II (Comprehension))
- Discuss about the interrupts, I/Os and other components of the system. (Level – II (Comprehension))

TEXT BOOKS:

1. John P.Hayes, 'Computer architecture and Organisation', Tata McGraw-Hill, Third edition, 1998.
2. V.Carl Hamacher, Zvonko G. Varanesic and Safat G. Zaky, " Computer Organisation", V edition, McGraw-Hill Inc, 1996.

REFERENCES:

1. Morris Mano, "Computer System Architecture", Prentice-Hall of India, 2000.
2. Behrooz Paraami, "Computer Architecture, From Micrprocessor to Supercomputers", , Oxford University Press, Sixth impression 2010.
3. P.Pal Chaudhuri, , "Computer organization and design", 2nd Ed., Prentice Hall of India, 2007.
4. Miles J. Murdocca and Vincent P. Heuring, Principles of Computer Architecture, Printice Hall, 2000
5. William Stallings, "Computer Organisation and Architecture, Designing for Performance, Pearson Education, Eighth Edition 2010.

EC7552 DISCRETE TIME SIGNAL PROCESSING L T P C
3 0 0 3

OBJECTIVES:

- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To understand computation of spectrum and to analyze systems
- To understand filters for spectrum shaping
- To understand implementation issues in a Digital Signal Processor

UNIT I DISCRETE FOURIER TRANSFORM 9

Review of discrete-time signals & systems - DFT and its properties, FFT algorithms & its applications, Overlap-add & overlap-save methods.

UNIT II DESIGN OF INFINITE IMPULSE RESPONSE FILTERS 9

Analog filters – Butterworth filters, Chebyshev Type I filters (upto 3 rd order), Analog Transformation of prototype LPF to BPF /BSF/ HPF. Transformation of analog filters into equivalent digital filters using Impulse invariant method and Bilinear Z transform method - Realization structures for IIR filters – direct, cascade, parallel forms.

UNIT III DESIGN OF FINITE IMPULSE RESPONSE FILTERS 9

Design of linear phase FIR filters windowing and Frequency sampling methods - Realization structures for FIR filters – Transversal and Linear phase structures, Comparison of FIR & IIR.

UNIT IV FINITE WORDLENGTH FFECTS 9

Representation of numbers-ADC Quantization noise-Coefficient Quantization error, Product Quantization error-truncation & rounding errors -Limit cycle due to product round-off error- Round-off noise power

UNIT V INTRODUCTION TO DIGITAL SIGNAL PROCESSORS 9

DSP functionalities - circular buffering – DSP architecture – Fixed and Floating point architecture principles – Programming – Application examples.

TOTAL: 45 PERIODS

OUTCOMES:

- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
- Design systems using spectrum information
- Hardware design and implementation of digital signal processing systems

TEXT BOOKS:

1. John G Proakis and Manolakis, —Digital Signal Processing Principles, Algorithms and Applicationsll, Pearson, Fourth Edition, 2007
2. A.V.Oppenheim, R.W. Schafer and J.R. Buck, Discrete-Time Signal Processing, 8 th Indian Reprint, Pearson, 2004.

REFERENCES:

1. Steven W. Smith, “Digital Signal Processing – A practical guide for Engineers and Scientist”, Newnes publications, 2003
2. I.C.Ifeachor and B.W. Jervis, Digital Signal Processing- A practical approach, Pearson, 2002.
3. D.J. De Fatta, J.G.Lucas and W.S. Hodgkiss, Digital Signal Processing- A system Design Approach, John Wiley & sons, Singapore, 1988.
4. M. H. Hayes, Digital Signal Processing, Schaum‘s outlines, Tata McGraw Hill, 2007.
5. Sanjit K. Mitra, Digital Signal Processing: A Computer-Based Approach, 4th Edition, Copyright© 2011, The McGraw-Hill Companies, Inc

EC7511 COMMUNICATION SYSTEM LABORATORY L T P C

0 0 4 2

OBJECTIVES:

- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- It is intended to demonstrate the architecture of analog and digital communication link components to the students
- Students must understand the role of each module present in the communication links

- They have to study by evaluating the comparing the performance of each techniques used in various modules.

1. AM / FM Modulator and Demodulator
2. Time Division Multiplexing
3. Signal Sampling and reconstruction
4. Pulse Code Modulation and Demodulation
5. Delta Modulation and Demodulation
6. Line coding schemes
7. FSK, PSK and DPSK schemes (Simulation)
8. Error control coding schemes (Simulation)
9. Symbol Timing Synchronization
10. Equalization – Zero Forcing & LMS algorithms
11. Spread spectrum communication (Simulation)
12. Communication link simulation

TOTAL: 60 PERIODS

OUTCOMES:

- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
- Ability to experimentally analyze the performance of various kinds of signaling used in communication systems and their bandwidth requirement.
- They gets hands on experience on system construction and performance evaluation
- Ability to study issues from communication links and channels, and their equalization techniques

EC7561 DISCRETE TIME SIGNAL PROCESSING LABORATORY

L	T	P	C
0	0	4	2

OBJECTIVES:

- To implement Linear and Circular Convolution
- To implement FIR and IIR filters
- To study the architecture of DSP processor
- To demonstrate Finite word length effect

DSP Processor Implementation

1. Study of architecture of Digital Signal Processor
2. MAC operation using various addressing modes
3. Implementation of difference equations
4. Linear Convolution
5. Circular Convolution
6. Waveform generation

MATLAB / Equivalent Software package

7. Generation of sequences
8. Linear and Circular Convolutions
9. DFT
10. FIR filter design
11. IIR filter design
12. Decimation and Interpolation

TOTAL: 60 PERIODS

OUTCOMES:

- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world

- Carry out simulation of DSP systems
- Demonstrate their abilities towards DSP processor based implementation of DSP systems
- Analyze Finite word length effect on DSP systems
- Demonstrate the applications of FFT to DSP
- Implement adaptive filters for various applications of DSP

EC7601 ANTENNAS AND WAVE PROPAGATION L T P C
3 0 0 3

OBJECTIVES:

- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To give insight into the radiation phenomena.
- To give a thorough understanding of the radiation characteristics of different types of antennas
- To create awareness about the the different types of propagation of radio waves at different frequencies

UNIT I FUNDAMENTALS OF RADIATION 9

Definition of antenna parameters – Gain, Directivity, Effective aperture, Radiation Resistance, Band width, Beam width, Input Impedance. Matching – Baluns, Polarization mismatch, Antenna noise temperature, Radiation from oscillating dipole, Half wave dipole. Folded dipole, Yagi array.

UNIT II APERTURE AND SLOT ANTENNAS 9

Radiation from rectangular apertures, Uniform and Tapered aperture, Horn antenna , Reflector antenna , Aperture blockage , Feeding structures , Slot antennas, Microstrip antennas – Radiation mechanism – Application ,Numerical tool for antenna analysis

UNIT III ANTENNA ARRAYS 9

N element linear array, Pattern multiplication, Broadside and End fire array – Concept of Phased arrays, Adaptive array, Basic principle of antenna Synthesis-Binomial array

UNIT IV SPECIAL ANTENNAS 9

Principle of frequency independent antennas –Spiral antenna, Helical antenna, Log periodic. Modern antennas- Reconfigurable antenna, Active antenna, Dielectric antennas, Electronic band gap structure and applications, Antenna Measurements-Test Ranges, Measurement of Gain, Radiation pattern, Polarization, VSWR, Practical antennas for mobile handset and base station applications.

UNIT V PROPAGATION OF RADIO WAVES 9

Modes of propagation , Structure of atmosphere , Ground wave propagation , Tropospheric propagation , Duct propagation, Troposcatter propagation , Flat earth and Curved earth concept ,Sky wave propagation – Virtual height, critical frequency , Maximum usable frequency – Skip distance, Fading , Multi hop propagation

TOTAL : 45 PERIODS

OUTCOMES:

- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
  At the end of the course the students will be able to
- Have insight into the radiation phenomena
- Have a thorough understanding of the radiation characteristics of different types of Antennas.
- Identify the different types of propagation of radio waves at various frequencies.

TEXT BOOKS:

1. John D Kraus,‖ Antennas for all applications‖, 3rd Edition, Mc Graw Hill, 2005
2. R.E.Collin, Antennas and radiowave propagation Mc graw hill 1985

REFERENCES:

1. Constantine.A.Balanis, Antenna Theory Analysis and Design‖ Wiley student edition,3rd edition,2009.
2. Edward C.Jordan and Keith G.Balmain Electromagnetic Waves and Radiating Systems‖ Prentice Hall of India, 2006.
3. Rajeswari Chatterjee: Antenna Theory and Practice ‖Revised Second edition ‖New Age international Publishers, 2011.
4. S.Drabowitch, Modern Antennas‖ Second edition, Springer Publications, 2007.
5. Robert S.Elliott, Antenna theory and Design ‖Wiley student edition, 2010.
6. H.Sizun, Radio Wave Propagation for Telecommunication Applications ‖ First Indian Reprint, Springer Publications, 2007.

EC7602 COMMUNICATION NETWORKS L T P C
3 0 0 3

OBJECTIVES:

- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To introduce the layered communication architectures
- To understand various physical, data link and routing layer protocols
- To understand application layer protocols and security issues.
- To understand various digital switching techniques.

UNIT I NETWORK FUNDAMENTALS AND PHYSICAL LAYER 9

Communication Network Evolution and Recent Trends, definition of layers, services, interface and protocols, OSI reference model - layers and duties. TCP/IP reference model – layers and duties. Physical layer - general description, characteristics, signaling media types, topologies, examples physical layer (RS232C, ISDN, ATM, SONET)

UNIT II DATA LINK LAYER AND NETWORK INTERCONNECTION 9

Logical link control Functions: - Framming, Flow control, Error control: CRC, LLC protocols:-HDLC, P to P. Medium access layer: - Random access, Controlled access, Channelization, IEEE standards: - 802.3, 802.4 and 802.5. Internetworking, Interconnection issues, Interconnection devices: - Repeaters, Hubs, Routers/switches and Gateways.

UNIT III MESSAGE ROUTING TECHNOLOGIES 9

Circuit switching, packet switching, message switching. Internet protocols; IPV4, IPV6, ARP, RARP, ICMP, IGMP, VPN. Network Routing Algorithms:- Distance vector routing, OSPF, Dijikstra's , Bellaman Ford, Congestion control algorithms.

UNIT IV END-END PROTOCOLS AND SECURITY 9

Process-process delivery: - TCP, UDP and SCTP. Application protocols: WWW, HTTP, FTP and TELNET, Network management protocol: SNMP, Network security.

UNIT V DIGITAL SWITCHING 9

Switching functions, Space Division Switch, Time Division Switch, STS switching, TST switching, No 4 ESS Toll switch, digital cross connect systems, Recent advances in Switching Approaches,

Introduction to Software Defined Networking.

TOTAL: 45 PERIODS

OUTCOMES:

- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
- The student would be well versed on the layered communication architectures
- The student would have gained an understanding of the need for different protocols at the different layers and their interworking.
- The student will have an exposure to the various digital switching techniques, wnd would be able to appreciate the evolving trends.

TEXT BOOKS:

1. Behrouz.A. Forouzan, Data Communication and Networking, 4th Edition, Tata McGraw Hill, 2007.
2. John C. Bellamy, Digital Telephony, 3rd Edition, John Wiley 2006.

REFERENCES:

1. Stallings.W., Data And Computer Communication, 4th Edition, Prentice Hall of India, 1996
2. Tanenboum, A.S, Computer Netwotks, 3rd Edition , Prentice Hall Of India, 1996
3. Keshav.S. An Engineering Approach To Computer Networking, Addision – Wesley,1999.
4. J.E.Flood, Telecommunication Switching, Traffic and networks, 1st edition, Pearson Education, 2006

EC7603 RF AND MICROWAVE COMMUNICATION L T P C
3 0 0 3

OBJECTIVES:

- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To inculcate understanding of the basics required for circuit representation of RF networks
- To deal with the issues in the design of microwave amplifier
- To instill knowledge on the properties of various microwave components
- To deal with the microwave generation and microwave measurement techniques

UNIT I TWO PORT RF NETWORKS-CIRCUIT REPRESENTATION 9

Low frequency parameters-impedance, admittance, hybrid and ABCD. High frequency parameters-Formulation of S parameters, properties of S parameters-Reciprocal and lossless networks, transmission matrix, Introduction to component basics, wire, resistor, capacitor and inductor.

UNIT II MICROWAVE TRANSISTOR AMPLIFIER DESIGN AND MATCHING NETWORKS 9

Amplifier power relation, stability considerations, gain considerations, noise figure, impedance matching networks, frequency response, T and Π matching networks, microstripline matching networks.

UNIT III PASSIVE MICROWAVE DEVICES AND CIRCUITS 9

Open, short and matched terminations; coupling probes and loops; power divider; directional coupler; attenuators; phase shifter; circulator; isolator; Impedance matching Devices– Tuning screw, stub and quarter-wave transformers

UNIT IV MICROWAVE GENERATION 9

High frequency effects in Tubes, Two cavity klystron amplifier; Reflex klystron oscillator; TWT amplifier, Backwards wave oscillator; Magnetron oscillator – Theory and applications. Solid state devices: Gunn diode oscillator; BARITT, TRAPATT and IMPATT diode oscillator and amplifier, YIG Devices (Yttrium-Iron Garnet).

UNIT V MICROWAVE MEASUREMENTS 9

Measuring Instruments – VSWR meter, Power meter, Spectrum Analyser, Network Analyser – principles; Measurement of Impedance, frequency, power, VSWR, Q factor, dielectric constant, S-Parameter. Hazards of microwaves, permitted power levels for practical applications.

TOTAL: 45 PERIODS

OUTCOMES:

- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
- Upon completion of the course, students will be able to:
- Explain the active & passive microwave devices & components used in Microwave communication systems.
- Analyze the multi- port RF networks and RF transistor amplifiers.
- Generate Microwave signals and design microwave amplifiers.
- Measure and analyze Microwave signal and parameters.

TEXT BOOKS:

1. Robert E.Colin, ―Foundations for Microwave Engineering‖, 2 edition, Wiley India, 2009.
2. Reinhold Ludwig and Gene Bogadanov, RF Circuit Design, Theory and applications, Pearson Education, Inc., 2012.

REFERENCES:

1. Thomas H.Lee, ―Planar Microwave Engineering, Cambridge University Press, 2004
2. M.M.Radmanesh,―RF and Microwave Electronics‖, Pearson Education, Inc., first edition 2005
3. S.Y.Liao, - Microwave Devices and Circuits‖, Pearson Education Limited, third edition2006. D.M.Pozar, - Microwave Engineering, John Wiley & sons, Inc., 4th edition, 2012.
4. Guillermo Gonzalez, Microwave Transistor Amplifiers: Analysis and design -Second edition, prentice hall, 1997.
5. Annapurna Das and Sisir K Das, ―Microwave Engineering, Tata McGraw Hill Inc., 2nd edition, 2009.

EC7651 VLSI DESIGN L T P C
3 0 0 3

OBJECTIVES:

- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To learn the fundamentals of VLSI design
- To understand the IC Manufacturing Process
- To familiarize with VLSI combinational logic circuits design
- To familiarize with VLSI sequential logic circuits design
- To learn the various arithmetic circuits and testing methodologies
- To familiarize with the different FPGA architectures

UNIT I MOS TRANSISTOR PRINCIPLES 9

MOS Technology and VLSI, Pass transistors, NMOS, CMOS Fabrication process and Electrical properties of CMOS circuits and Device modelling. Characteristics of CMOS inverter, Scaling principles and fundamental limits. Propagation Delays, CMOS inverter scaling, Stick diagram, Layout diagrams, Elmore's constant, Logical Effort. Case study: Study of technology development in MOS

UNIT II COMBINATIONAL LOGIC CIRCUITS 9

Static CMOS logic Design, Design techniques to improve the speed, power dissipation of CMOS logic, low power circuit techniques, Ratioed logic .Pass transistor Logic, Transmission CPL, DCVSL, Dynamic CMOS logic, Domino logic, Dual Rail logic, NP CMOS logic and NOR array logic.

UNIT III SEQUENTIAL LOGIC CIRCUITS 9

Static and Dynamic Latches and Registers, Timing Issues, Pipelines, Clocking strategies, Memory Architectures, and Memory control circuits.

UNIT IV DESIGNING ARITHMETIC BUILDING BLOCKS & TESTING 9

Data path circuits, Architectures for Adders, Accumulators, Multipliers, Barrel Shifters, Need for testing- Manufacturing test principles- Design for testability. Case study: Analysis of area, power and delay for 16 bit adder and 8 bit multilpier

UNIT V IMPLEMENTATION STRATEGIES 9

Full Custom and Semicustom Design, Standard Cell design and cell libraries, FPGA building block architectures, FPGA interconnect routing procedures. Demo: Complete ASIC flow using Backend tool and fabrication flow Overall case study: Development of IC in commercial aspects (design, testing and fab cost)

TOTAL: 45 PERIODS

OUTCOMES:

- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
- At the end of the course students will be in a position to understand the basics of VLSI design, testing and different FPGA architectures.

TEXT BOOK:

1. Jan Rabaey, Anantha Chandrakasan, B.Nikolic, "Digital Integrated circuits: A design perspective". Second Edition, Prentice Hall of India, 2003.

REFERENCES

1. N.Weste, K.Eshraghian, "Principles of CMOS VLSI DESIGN", A system Perspective, second edition, Addision Wesley 2004
2. A.Pucknell, Kamran Eshraghian, "BASIC VLSI DESIGN", Third edition, Prentice Hall of India, 2007.
3. M.J. Smith, "Application specific integrated circuits", Addisson Wesley, 1997
4. R.Jacob Baker, Harry W.LI., David E.Boyee, "CMOS Circuit Design, Layout and Simulation", 2005 Prentice Hall of India

MG7451 **PRINCIPLES OF MANAGEMENT** **L T P C**
3 0 0 3

OBJECTIVES:

- To study the Evolution of Management
- To study the functions and principles of management
- To learn the application of the principles in an organization

UNIT I INTRODUCTION TO MANAGEMENT AND ORGANIZATIONS 9

Definition of Management –Science or Art – Manager Vs Entrepreneur- types of managers-managerial roles and skills – Evolution of Management –Scientific, human relations , system and contingency approaches– Types of Business organization- Sole proprietorship, partnership, company-public and private sector enterprises- Organization culture and Environment – Current trends and issues in Management.

UNIT II PLANNING 9

Nature and purpose of planning – planning process – types of planning – objectives – setting objectives – policies – Planning premises – Strategic Management – Planning Tools and Techniques – Decision making steps and process.

UNIT III ORGANISING 9

Nature and purpose – Formal and informal organization – organization chart–organization structure – types – Line and staff authority – departmentalization – delegation of authority – centralization and decentralization –Job Design - Human Resource Management –HR Planning, Recruitment, selection, Training and Development, Performance Management , Career planning and management.

UNIT IV DIRECTING 9

Foundations of individual and group behaviour– motivation – motivation theories – motivational techniques – job satisfaction – job enrichment – leadership – types and theories of leadership – communication – process of communication – barrier in communication – effective communication –communication and IT.

UNIT V CONTROLLING 9

System and process of controlling –budgetary and non-budgetary control techniques – use of computers and IT in Management control – Productivity problems and management – control and performance – direct and preventive control – reporting.

TOTAL: 45 PERIODS

OUTCOMES:

- The student would have gained the ability to learn the different principles and techniques of management in planning, organizing, directing and controlling.

TEXT BOOKS:

1. Stephen P. Robbins & Mary Coulter, " Management", Prentice Hall (India)Pvt. Ltd., 10th Edition, 2009.
2. JAF Stoner, Freeman R.E and Daniel R Gilbert "Management", Pearson Education, 6th Edition, 2004.

REFERENCES:

1. Stephen A. Robbins & David A. Decenzo & Mary Coulter, "Fundamentals of Management" Pearson Education, 7th Edition, 2011.
2. Robert Kreitner & Mamata Mohapatra, " Management", Biztantra, 2008.
3. Harold Koontz & Heinz Weihrich "Essentials of management" Tata McGraw Hill,1998.
4. Tripathy PC & Reddy PN, "Principles of Management", Tata Mcgraw Hill, 1999

Attested

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EC7611 **RF AND MICROWAVE LABORATORY** **L T P C**
0 0 4 2

OBJECTIVES:

- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To enable the student to verify the basic principles and design aspects involved in high frequency band pass communication system components design and the performance parameters for the components and the overall system.
- To enable the student to gain insight into the practical aspects of radiation phenomena and thoroughly understand the radiation characteristics of different types of antennas.
- To enable the student to appreciate the practical aspects of bandpass system design and understand the associated link power and rise time budgeting challenges and enable them to design and conduct experiments, as well as to analyze and interpret data to produce meaningful conclusions and match with theoretical concepts.

1. Determination of Mode Characteristics of a Reflex Klystron Oscillator
2. VSWR and Impedance Measurement and Impedance Matching
3. Dielectric Constant Measurement
4. Characterization of Directional Couplers
5. Characterization of Multiport junctions
6. Gunn Diode Characteristics
7. Microwave IC – Filter Characteristics
8. Circulator characteristics
9. Isolator characteristics
10. Radiation pattern measurement of dipole and yagi antenna
11. Radiation pattern measurement of horn antenna.
12. Impedance matching with tuners.

TOTAL: 60 PERIODS

OUTCOMES:

- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
- The student would be able to design and conduct experiments to demonstrate the trade-offs involved in the design of high frequency bandpass communication links and the associated components.
- The student would be able to comprehensively record and report the measured data, and would be capable of analyzing and interpreting the experimental measurement data and produce meaningful conclusions.

EC7612 **VLSI LABORATORY** **L T P C**
0 0 4 2

OBJECTIVES:

- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To learn the Hardware Description Language (Verilog/VHDL)
- To learn the fundamental principles of VLSI circuit design in digital and analog domain
- To familiarize fusing of logical modules on FPGAs
- To provide hands on design experience with hardware/software based embedded system.

I FPGA BASED EXPERIMENTS:

1. Design and simulation of Full adder and full subtractor
2. Design and simulation of multiplexer, Decoder and 4 bit comparator

3. Design and simulation of 8 bit adder
4. HDL based design entry and simulation of Ripple counter, synchronous counter and BCD counter
5. Design and simulation of simple state machines
6. 4 bit multiplier design and simulation using HDL
7. Synthesis, P&R and post P&R simulation of the components simulated in (1-6) above. Critical paths and static timing analysis results to be identified. Identify and verify possible conditions under which the blocks will fail to work correctly.
8. Hardware fusing and testing of each of the blocks simulated in (1-6). Use of either chipscope feature (Xilinx) or the signal tap feature (Altera) is a must. Invoke the PLL and demonstrate the use of the PLL module for clock generation in FPGAs.

II IC Design Experiments (Based on Cadence/MAGMA/Tanner)

9. Design and simulation of a simple five transistor differential amplifier – Measure gain, ICMR and CMRR
10. Layout generation, parasitic extraction and resimulation of the five transistor differential amplifier
11. Synthesis and standard cell based design of circuits simulated in 9 above. Identification of critical paths, power consumption
12. For experiment 11 above, P & R, Power and clock routing and post P & R simulation
13. Analysis of results of static timing analysis

TOTAL: 60 PERIODS

OUTCOMES:

- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world

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

- Write HDL code for basic as well as advanced digital integrated circuits.
- Import the logic modules into FPGA Boards.
- Synthesis, Place and Route the digital IPs.
- Design, simulate and extract the layout of Analog IC Blocks using EDA tools.

EC7701 OPTICAL COMMUNICATION L T P C
3 0 0 3

OBJECTIVES:

- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To introduce the principle of light propagation through optical fibers
- To understand signal distortion mechanisms in the fiber
- To introduce optical transmitters and receivers for fiber /free space links
- To introduce optical network concepts and components involved.

UNIT I OPTICAL FIBERS 9

Relevance of optical communication in backhaul/backbone networks and interconnects, fiber optics and free space optics, optical fiber structure and parameters, ray and mode theory of light propagation in optical fibers, fiber materials, fiber fabrication techniques, passive optical components - Optical couplers, filters, isolators.

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UNIT II TRANSMISSION CHARACTERISTICS 9

Optical signal attenuation mechanisms in guided and unguided optical signal transmissions, Optical signal distortion – Group delay, material dispersion, waveguide dispersion, polarization mode dispersion, intermodal dispersion, profile dispersion, fiber types, Standard Singlemode Fibers, Dispersion Shifted Fibers, Dispersion Flattened Fibers, Polarization Maintaining Fibers, Photonic Crystal Fibers, Dispersion compensation, Principles of fiber nonlinearities.

UNIT III OPTICAL TRANSMITTERS 9

Materials for optical sources, light-emitting diodes, semiconductor laser diodes, longitudinal modes, gain and index-guiding, power-current characteristics, spectral behaviour, longitudinal mode control and tunability, noise, direct and external modulation, Laser sources and transmitters for free space communication.

UNIT IV OPTICAL RECEIVERS 9

Principles of optical detection, spectral responsivity, PIN, APD, preamplifier types, receiver noises, Signal to Noise Ratio (SNR) and Bit Error Rate (BER), Principles of coherent detection, link power and rise time budget, **relevance of power and rise time budget in practical link/network planning.**

UNIT V OPTICAL NETWORKING PRINCIPLES 9

Optical amplifiers: erbium doped fiber amplifiers, semiconductor optical amplifiers, Optical switches, Optical MEMS components, Networking Concepts: SONET/SDH/FDDI optical networks, WDM optical networks, layered optical network architecture.

TOTAL: 45 PERIODS

OUTCOMES:

- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
- Insight about the fibers types characteristics and light propagation.
- Thorough knowledge about fiber optic link transmitter and receiver types and design
- Optical networking concepts with components are explored and compared with conventional ideas.

TEXT BOOKS:

1. Gerd Kaiser, “Optical Fiber Communications”, 5th edition, Tata McGraw Hill, New Delhi, 2013.
2. John M. Senior, ‖Optical Fiber Communications- Principles and Practice‖, Third Edition, 3rd impression, Pearson Education, 2012.

REFERENCES:

1. Gerd Keiser, — Optical communications Essentials‖, Special Indian Edition, Tata Mc Graw Hill, New Delhi,2008.
2. Govind P. Agrawal, — Fiber-Optic Communication Systems‖, Third Edition, John Wiley & Sons, reprint 2012.
3. Rajiv Ramasamy & Kumar N. Sivarajan, —Optical Networks – A Practical Perspective‖, 3rd Edition, Morgan Kauffman 2009.

EC7702 **WIRELESS COMMUNICATION** **L T P C**
3 0 0 3

OBJECTIVES:

- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To illustrate the behavior of the wireless channel and its impact on system design
- To understand the design aspects of a cellular system
- To study the various digital signaling techniques and multipath mitigation techniques
- To understand the relevance of multiple antenna techniques.

UNIT I WIRELESS CHANNELS **9**

Large scale path loss – Path loss models: Free Space and Two-Ray models- Link Budget design – Small scale fading - Parameters of mobile multipath channels – Time dispersion parameters- Coherence bandwidth – Doppler spread & Coherence time, Fading due to Multipath time delay spread – flat fading – frequency selective fading – Fading due to Doppler spread – fast fading – slow fading, Practical illustration of Wireless Channel behavior,

UNIT II CELLULAR ARCHITECTURE **9**

Introduction to RF Spectrum and its commercial aspects, Multiple Access techniques- FDMA, TDMA, CDMA – Capacity calculations–Cellular concept-Frequency reuse- channel assignment - hand off - interference & system capacity - trunking & grade of service – Coverage and capacity improvement, Relevance to today's communication demands.

UNIT III DIGITAL SIGNALING FOR FADING CHANNELS **9**

Structure of a wireless communication link, Principles of Offset-QPSK, p/4-DQPSK, Minimum Shift Keying, Gaussian Minimum Shift Keying, Error performance in fading channels, OFDM principle – Cyclic prefix, Windowing, PAPR, Technology Examples

UNIT IV MULTIPATH MITIGATION TECHNIQUES **9**

Equalisation – Adaptive equalization, Linear and Non-Linear equalization, Zero forcing and LMS Algorithms, Diversity – Micro and Macrodiversity, Diversity combining techniques, Error probability in fading channels with diversity reception, Rake receiver.

UNIT V MULTIPLE ANTENNA TECHNIQUES **9**

MIMO systems – spatial multiplexing- System model- Pre-coding- Beam forming - transmitter diversity, receiver diversity - Channel state information-capacity in fading and non-fading channels, Relevance to upcoming wireless communication technologies

TOTAL : 45 PERIODS

OUTCOMES:

- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
- The student would be capable of characterizing a wireless channel and evolve the system design specifications
- The student would be capable of designing a cellular system based on resource availability and traffic demands
- The student would be able to identify suitable signaling and multipath mitigation techniques for the wireless channel and system under consideration
- The student would be capable of exploiting multiple antenna techniques for capacity/ performance gains

Attested

TEXT BOOK:

1. Rappaport,T.S., "Wireless communications", Pearson Education, Second Edition, 2010.

REFERENCES:

1. David Tse and Pramod Viswanath, "Fundamentals of Wireless Communication", Cambridge University Press, 2005.
2. Andreas.F. Molisch, "Wireless Communications", John Wiley – India, 2006.
3. Upena Dalal, "Wireless Communication", Oxford University Press, 2009.
4. Van Nee, R. and Ramji Prasad, "OFDM for wireless multimedia communications", Artech House, 2000.
5. Simon Haykins & Michael Moher, "Modern Wireless Communications", Pearson Education, 2007.
6. Vijay. K. Garg, "Wireless Communication and Networking", Morgan Kaufmann Publishers, 2007.

EC7751 PRINCIPLES OF DIGITAL IMAGE PROCESSING L T P C
3 0 0 3

OBJECTIVES:

- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To study the formation of an image and its acquisition
- To introduce the use and application of transforms in image processing
- To study techniques for improving quality of information in spoilt images
- To introduce schemes for compressing images to save storage space

UNIT I DIGITAL IMAGE FUNDAMENTALS 9

Elements of digital image processing systems, Vidicon and Digital Camera working principles, - Elements of visual perception, brightness, contrast, hue, saturation, mach band effect, Color image fundamentals - RGB, HSI models, Image sampling, Quantization, dither, Two-dimensional mathematical preliminaries, 2D transforms - DFT, DCT, KLT, SVD.

UNIT II IMAGE ENHANCEMENT 9

Point processing, Histograms, Histogram equalization and specification techniques, Noise distributions, Spatial averaging, Directional Smoothing, Median, Geometric mean, Harmonic mean, Contraharmonic mean filters, Homomorphic filtering, Color image enhancement.

UNIT III IMAGE RESTORATION 9

Image Restoration - degradation model, Unconstrained and Constrained restoration, Inverse filtering, Wiener filtering, Geometric transformations-spatial transformations.

UNIT IV IMAGE SEGMENTATION 9

Edge detection, Edge linking via Hough transform – Thresholding - Region based segmentation– Region growing – Region splitting and Merging – Segmentation by morphological watersheds – Hybrid methods

UNIT V IMAGE COMPRESSION 9

Need for data compression, Huffman, Run Length Encoding, Shift codes, Arithmetic coding,

Vector Quantization, Transform coding, JPEG standard, MPEG.

TOTAL: 45 PERIODS

OUTCOMES:

- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
- To utilize appropriate preprocessing techniques for manipulation of images
- To design automated techniques for image based applications

TEXT BOOKS:

1. Rafael C. Gonzalez, Richard E. Woods, , Digital Image Processing', Pearson, Education, Inc., Second Edition, 2004.
2. Anil K. Jain, Fundamentals of Digital Image Processing', Pearson Education, Inc., 2002.

REFERENCES:

1. Kenneth R. Castleman, "Digital Image Processing", Pearson, 2006.
2. Rafael C. Gonzalez, Richard E. Woods, Steven Eddins, "Digital Image Processing using MATLAB", Pearson Education, Inc., 2004.
3. D,E. Dudgeon and RM. Mersereau, "Multidimensional Digital Signal Processing", Prentice Hall Professional Technical Reference, 1990.
4. William K. Pratt, "Digital Image Processing", John Wiley, New York, 2002.
5. Milan Sonka et al, "Image Processing, Analysis and Machine vision", Brookes/Cole, Vikas Publishing House, 2nd edition, 1999.
6. Alan C. Bovik, "Handbook of image and video processing" Elsevier Academic press, 2005.
7. S.Sridhar, " Digital Image processing" Oxford University press, Edition 2011.

GE7251 ENVIRONMENTAL SCIENCE AND ENGINEERING L T P C
3 0 0 3

OBJECTIVES:

- To the study of nature and the facts about environment.
- To find and implement scientific, technological, economic and political solutions to environmental problems.
- To study the interrelationship between living organism and environment.
- To appreciate the importance of environment by assessing its impact on the human world; envision the surrounding environment, its functions and its value.
- To study the dynamic processes and understand the features of the earth's interior and surface.
- To study the integrated themes and biodiversity, natural resources, pollution control and waste management.

UNIT I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY 14

Definition, Scope and Importance of Environment – Need for Public Awareness - Concept of an Ecosystem – Structure and Function of an Ecosystem – Producers, Consumers and Decomposers – Energy Flow in the Ecosystem – Ecological Succession – Food Chains, Food Webs and Ecological Pyramids – Introduction, Types, Characteristic Features, Structure and Function of the (A) Forest Ecosystem (B) Grassland Ecosystem (C) Desert Ecosystem (D) Aquatic Ecosystems (Ponds, Streams, Lakes, Rivers, Oceans, Estuaries) – Introduction to Biodiversity Definition: Genetic, Species and Ecosystem Diversity – Bio geographical Classification of India – Value of Biodiversity: Consumptive Use, Productive Use, Social, Ethical, Aesthetic and Option Values – Biodiversity at Global, National and Local Levels – India as a Mega-Diversity Nation – Hot-Spots of Biodiversity – Threats to Biodiversity: Habitat Loss, Poaching of Wildlife, Man-Wildlife Conflicts – Endangered and Endemic Species of India – Conservation of Biodiversity: In-Situ and Ex-Situ Conservation of Biodiversity.

Field Study of Common Plants, Insects, Birds
Field Study of Simple Ecosystems – Pond, River, Hill Slopes, etc.

UNIT II ENVIRONMENTAL POLLUTION 8

Definition – Causes, Effects and Control Measures of: (A) Air Pollution (B) Water Pollution (C)Soil Pollution (D) Marine Pollution (E) Noise Pollution (F) Thermal Pollution (G) Nuclear Hazards – Soil Waste Management: Causes, Effects and Control Measures of Municipal Solid Wastes – Role of an Individual in Prevention of Pollution – Pollution Case Studies – Disaster Management: Floods, Earthquake, Cyclone and Landslides.
Field Study of Local Polluted Site – Urban / Rural / Industrial / Agricultural.

UNIT III NATURAL RESOURCES 10

Forest Resources: Use and Over-Exploitation, Deforestation, Case Studies - Timber Extraction, Mining, Dams and Their Effects on Forests and Tribal People – Water Resources: Use and Over-Utilization of Surface and Ground Water, Floods, Drought, Conflicts Over Water, Dams-Benefits and Problems – Mineral Resources: Use and Exploitation, Environmental Effects of Extracting and Using Mineral Resources, Case Studies – Food Resources: World Food Problems, Changes Caused by Agriculture and Overgrazing, Effects of Modern Agriculture, Fertilizer-Pesticide Problems, Water Logging, Salinity, Case Studies – Energy Resources: Growing Energy Needs, Renewable and Non Renewable Energy Sources, Use of Alternate Energy Sources. Case Studies – Land Resources: Land as a Resource, Land Degradation, Man Induced Landslides, Soil Erosion and Desertification – Role of an Individual in Conservation of Natural Resources – Equitable Use of Resources for Sustainable Lifestyles.

Field Study of Local Area to Document Environmental Assets – River / Forest / Grassland / Hill / Mountain.

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT 7

From Unsustainable to Sustainable Development – Urban Problems Related to Energy – Water Conservation, Rain Water Harvesting, Watershed Management – Resettlement and Rehabilitation of People; its Problems and Concerns, Case Studies – Role of Non-Governmental Organization- Environmental Ethics: Issues and Possible Solutions – Climate Change, Global Warming, Acid Rain, Ozone Layer Depletion, Nuclear Accidents and Holocaust, Case Studies. – Wasteland Reclamation – Consumerism and Waste Products – Environment Production Act– Air (Prevention And Control Of Pollution) Act – Water (Prevention And Control Of Pollution) Act – Wildlife Protection Act – Forest Conservation Act – Enforcement Machinery Involved in Environmental Legislation- Central and State Pollution Control Boards- Public Awareness.

UNIT V HUMAN POPULATION AND THE ENVIRONMENT 6

Population Growth, Variation Among Nations – Population Explosion – Family Welfare Programme – Environment and Human Health – Human Rights – Value Education – HIV / AIDS – Women and Child Welfare – Role of Information Technology in Environment and Human Health – Case Studies.

TOTAL: 45 PERIODS

OUTCOMES:

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

Environmental Pollution or problems cannot be solved by mere laws. Public participation is an important aspect which serves the environmental Protection. One will obtain knowledge on the following after completing the course.

- Public awareness of environment at infant stage.
- Ignorance and incomplete knowledge has lead to misconceptions.
- Development and improvement in standard of living has lead to serious environmental disasters.

TEXT BOOKS:

Attested

1. Gilbert M. Masters, “Introduction to Environmental Engineering and Science”, Second

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Edition, Pearson Education 2004.
2. Benny Joseph, “Environmental Science and Engineering”, Tata McGraw-Hill, 2006.

REFERENCES:

1. R.K. Trivedi, “Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards”, Vol. I and II, Enviro Media.
2. Cunningham, W.P. Cooper, T. H. Gorhani, ‘Environmental Encyclopedia’, Jaico Publishing, 2001.
3. Dharmendra S. Sengar, “Environmental law”, Prentice Hall, 2007.
4. Rajagopalan.R, “Environmental Studies-From Crisis to Cure”, Oxford University Press 2005.

EC7711 OPTICAL COMMUNICATION LABORATORY L T P C
0 0 4 2

OBJECTIVES:

- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To enable the students to get practical knowledge about transmission and reception of signals in the fiber optic link
- Through experiments the characteristics of fiber is studied and analysed.
- To study the characteristics of optical components and to analyse the characteristics of link design.

1. Characterization of Glass and Plastic Optical Fibers – Measurement of Numerical Aperture, Attenuation and Mode characteristics.
2. DC Characteristics of LED and PIN Photodiode. – Determination of External Power Efficiency of LED and Responsivity and Dark current of the PIN photo diode.
3. Laser diode Characteristics - Threshold Current Determination and Study of Temperature Effects. Comparison of LED and LASER diode.
4. APD Characteristics – Determination of Threshold Voltage and Average gain estimation. Comparison of APD and PIN photo diode
5. Analog Transmission Characteristics of a Fiber Optic Link – Determination of Operating Range of LED and System Bandwidth Determination for Glass and Plastic fiber links and determination of device capacitance of photo diode.
6. Determination of Capacity of a Digital Fiber Optic Link – Maximum Bit Rate estimation for Glass and Plastic fiber links
7. Characterization of optical amplifiers
8. Fiber Optic Link design - power and rise-time budget .
9. Loss Characterization of optical components using OTDR principle.
10. Study of WDM Link Components – WDM Mux / Demux, Isolator, Circulator, Fiber Bragg Grating Filters, etc.
11. Free space optical communication- attenuation and beamwidth measurements.
12. Modeling of optical communication link and devices using simulation tools- VPI/Simulink/OPTSIM/OPTwave/Equivelent

TOTAL: 60 PERIODS

OUTCOMES:

- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
  The students gets knowledge about
- the fiber optical link design
- transmitter and receiver characteristics

- the WDM link
- the free space optics and the simulation of the fiber optic link design

EC7712 WIRELESS COMMUNICATION AND NETWORKING LABORATORY L T P C
0 0 4 2

OBJECTIVES:

- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To understand various protocols of physical, MAC and routing layers.
- To understand and implement various modulation techniques.
- To understand the security issues in the wireless and network and implement the security algorithms.

1. Characterization of Wireless Channels (Simulation/Experiment)
2. Equalization Techniques for Wireless Channels
3. Simulation / Implementation of Multicarrier Modulation
4. Simulation / Implementation of Space Time Block Codes
5. Performance Studies of Adaptive Modulation and Coding
6. Performance Studies of Random MAC Protocols
7. Performance Studies of LLC Protocols
8. Wireless Routing Protocols
9. IOS development of applications using prototype router boards, switches.
10. Wired & Wireless Packet Analysis using Open Source Tools.
11. Network Security Protocols
12. QoS Analysis on Wireless Networks

TOTAL: 60 PERIODS

OUTCOMES:

- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
- Students will be able to modify the characteristics of wireless channels and develop a new channel model.
- Students will get the exposure to the implementation of modulation techniques and the protocol concerned to different layers.
- Experimentally understand the QoS parameters of the network for different application.

CS7452 OPERATING SYSTEMS L T P C
3 0 0 3

OBJECTIVE

- To learn the concepts of operating systems.
- To learn about the various issues in operating systems.
- To familiarize with the important mechanisms in operating systems.
  To appreciate the emerging trends in operating systems

UNIT I OPERATING SYSTEMS OVERVIEW 9

Introduction to operating systems – Computer system organization, architecture – Operating system structure, operations – Process, memory, storage management – Protection and security – Distributed systems – Computing Environments – Open-source operating systems – OS services – User operating-system interface – System calls – Types – System programs – OS structure – OS generation – System Boot – Process concept, scheduling – Operations on processes – Cooperating processes – Inter-process communication – Examples – Multithreading models – Thread Libraries – Threading issues – OS examples

UNIT II PROCESS MANAGEMENT 9

Basic concepts – Scheduling criteria – Scheduling algorithms – Thread scheduling – Multiple-processor scheduling – Operating system examples – Algorithm Evaluation – The critical-section problem – Peterson's solution – Synchronization hardware – Semaphores – Classic problems of synchronization – Critical regions – Monitors – Synchronization examples – Deadlocks – System model – Deadlock characterization – Methods for handling deadlocks – Deadlock Prevention – Deadlock Avoidance – Deadlock detection – Recovery from deadlock

UNIT III STORAGE MANAGEMENT 9

Memory Management – Swapping – Contiguous memory allocation – Paging –Segmentation – Example: The Intel Pentium - Virtual Memory: Background – Demand paging – Copy on write – Page replacement – Allocation of frames – Thrashing**.**

UNIT IV I/O SYSTEMS 9

File concept – Access methods – Directory structure – File-system mounting –Protection – Directory implementation – Allocation methods – Free-space management – Disk scheduling – Disk management – Swap-space management – Protection

UNIT V CASE STUDY 9

The Linux System – History – Design Principles – Kernel Modules – Process Management – Scheduling – Memory management – File systems – Input and Output – Inter-process Communication – Network Structure – Security – Windows 7 – History – Design Principles – System Components – Terminal Services and Fast User – File system – Networking.

TOTAL: 45 PERIODS

OUTCOMES:

On Completion of the course, the students should be able to:

- Articulate the main concepts, key ideas, strengths and limitations of operating systems
- Explain the core issues of operating systems
- Know the usage and strengths of various algorithms of operating systems

TEXT BOOK:

1. Abraham Silberschatz, Peter B. Galvin, Greg Gagne, "Operating System Concepts Essentials", John Wiley & Sons Inc., 2010.

REFERENCES:

1. Andrew S. Tanenbaum, "Modern Operating Systems", Second Edition, Addison Wesley, 2001.
2. Charles Crowley, "Operating Systems: A Design-Oriented Approach", Tata McGraw Hill Education", 1996.
3. M Dhamdhere, " Operating Systems: A Concept-based Approach", Second Edition, Tata Mc Graw-Hill Education, 2007.
4. William Stallings, "Operating Systems: Internals and Design Principles", Seventh Edition, Prentice Hall, 2011.

EC7001 ADHOC AND WIRELESS SENSOR NETWORKS L T P C
3 0 0 3

OBJECTIVES:

- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To equip the students with knowledge of 4G networks and its applications
- To teach the students about various MAC and Routing protocols of Ad hoc and WSN.
- To educate the students on introduction and application of 6lowpan.

UNIT I INTRODUCTION AND APPLICATIONS 9

Introduction to Ad hoc Networks, Characteristic features, Need for Ubiquitous Computing network, Applications of Ad hoc ,Mobility Models : - Brownian Model, Column model, Random Walk Model, Random Waypoint model, Random Gauss Markov Model, Reference point Group Mobility Model,

UNIT II ROUTING PROTOCOLS 9

Need for Different routing Protocols, Proactive Vs Reactive Routing. Unicasting: Dynamic Source Routing, Ad Hoc On-Demand Distance Vector Routing, Temporally Ordered Routing Algorithm, Signal Stability Based Routing, Location Aided Routing, Associativity Based Routing, Zone Routing Protocol. Multicasting: Tree Based Algorithm: CAMP, Mesh based Algorithm: On-Demand Multicast Routing Protocol.

UNIT III OVERVIEW OF WIRELESS SENSOR NETWORKS 9

Challenges for Wireless Sensor Networks-Characteristics requirements-required mechanisms, Difference between mobile ad-hoc and sensor networks, Applications of sensor networks-.Single-Node Architecture- Hardware Components, Energy Consumption of Sensor Nodes

UNIT IV NETWORKING OF SENSORS 9

Physical Layer and Transceiver Design Considerations, MAC Protocols for Wireless Sensor Networks, Low Duty Cycle Protocols And Wakeup Concepts- S-MAC , The Mediation Device Protocol, Wakeup Radio Concepts, Address and Name Management, Assignment of MAC Addresses, Routing Protocols - Energy-Efficient Routing, Geographic Routing.

UNIT V INTRODUCTION AND APPLICATION OF 6LOWPAN 9

Introduction - Architecture, Protocol stack - Link layers – Addressing - Header format – Bootstrapping - Mesh topologies - Internet integration, Functions of an Adaptation Layer, Routing - Mesh-Under -Route-Over –ROLL, Common Protocols –WSP, MQTTS, CAP, Operating system – Contiki - µIPv6, case study - Industrial automation - Health care.

TOTAL : 45 PERIODS

OUTCOMES:

- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
- The student would have gained the knowledge on ad hoc and sensor networks
- The student would have the ability to design new MAC and Routing protocols for Ad hoc and sensor network.
- The students have attained the capability to learn new operating systems used for WSN.

REFERENCES:

1. Charles E. Perkins “ Ad hoc Networking”, Addison-Wesley, 2000
2. Tracy Camp, Jeff Boleng, Vanessa Davies, “ A survey on Mobility Models for Ad hoc Network Research.” Wireless Communications and Mobile Computing: Special Issue on Mobile Ad hoc Networking: Research, Trends and Applications, Vol.2. No. 5. pp 483-502,2002.
3. Hongmei Deng, Wei Li and Dharma P. Agrawal “ Routing security in wireless ad hoc networks”., IEEE Communication magazine, Oct. 2002.
4. Holger Karl & Andreas Willig, " Protocols And Architectures for Wireless Sensor Networks", John Wiley, 2005.

5. Feng Zhao & Leonidas J. Guibas, “Wireless Sensor Networks - An Information Processing Approach", Elsevier, 2007.
6. Kazem Sohraby, Daniel Minoli, & Taieb Znati, “Wireless Sensor Networks-Technology, Protocols, And Applications”, John Wiley, 2015.
7. Zach Shelby, Carsten Bormann, “6LoWPAN: The Wireless Embedded Internet” John Wiley & Sons, November 2009, ISBN: 978-0-470-74799-5.

EC7002 ADVANCED DIGITAL SIGNAL PROCESSING L T P C
3 0 0 3

OBJECTIVES:

- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To bring out the concepts related to stationary and non-stationary random signals
- To emphasize the importance of true estimation of power spectral density
- To introduce the design of linear and adaptive systems for filtering and linear prediction
- To introduce the concept of wavelet transforms in the context of image processing

UNIT I DISCRETE-TIME RANDOM SIGNALS 9

Discrete random process – Ensemble averages, Stationary and ergodic processes, Autocorrelation and Autocovariance properties and matrices, White noise, Power Spectral Density, Spectral Factorization, Innovations Representation and Process, Filtering random processes, ARMA, AR and MA processes.

UNIT II SPECTRUM ESTIMATION 9

Bias and Consistency, Periodogram, Modified periodogram, Blackman-Tukey method, Welch method, Parametric methods of spectral estimation, Levinson-Durbin recursion.

UNIT III LINEAR ESTIMATION AND PREDICTION 9

Forward and Backward linear prediction, Filtering - FIR Wiener filter- Filtering and linear prediction, non-causal and causal IIR Wiener filters,.

UNIT IV ADAPTIVE FILTERS 9

Principles of adaptive filter – FIR adaptive filter – Newton’s Steepest descent algorithm – LMS algorithm – Adaptive noise cancellation, Adaptive equalizer, Adaptive echo cancellers.

UNIT V WAVELET TRANSFORM 9

Short Time Fourier Transform, Multiresolution analysis, Continuous and discrete wavelet transform, Application of wavelet transform.

TOTAL: 45 PERIODS

OUTCOMES:

- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
- To identify appropriate spectrum estimation method based on type of random signal
- To design filters for processing random signal
- To implement multi resolution approach for signals

TEXT BOOKS:

1. Monson H, Hayes, Statistical Digital Signal Processing and Modeling, John Wiley and Sons Inc., New York, Indian Reprint, 2007.
2. John G.Proakis, Dimitris G. Manolakis, Digital Signal Processing, Pearson, Fourth 2007.
3. Dwight F. Mix, Random Signal Processing, Prentice Hall, 1995.

Attested

DIRECTOR
Centre for Academic Courses
Anna University, Chennai-600 025

REFERENCE:

1. Sophocles J. Orfanidis, Optimum Signal Processing, An Introduction, McGraw Hill, 1990.
2. Ramachandran K. I., Soman K. P. , Resmi N. G. **,** Insight into Wavelets from Theory to practice, Eastern Economy Edition , 2010

EC7003 ADVANCED WIRELESS COMMUNICATION L T P C
3 0 0 3

OBJECTIVES:

- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To teach the importance of improving capacity of wireless channel using MIMO
- To teach the characteristic of wireless channel
- To teach techniques for channel improvements using space-time block and Trellis codes
- To teach advanced MIMO system like layered space time codes, MU-MIMO System and MIMO-OFDM systems

UNIT I INTRODUCTION 9

The crowded spectrum, need for high data rate, MIMO systems – Array Gain, Diversity Gain, Data Pipes, Spatial MUX, MIMO System Model. MIMO System Capacity – channel known at the TX, Channel unknown to the TX – capacity of deterministic channels, Random channels and frequency selective channels.

UNIT II RADIO WAVE PROPAGATION 9

Radio wave propagation – Macroscopic fading- free space and out door, small scale fading Fading measurements – Direct pulse measurements, spread spectrum correlation channel sounding frequency domain channel sounding, Antenna Diversity – Diversity combining methods.

UNIT III SPACE TIME BLOCK CODES 9

Delay Diversity scheme, Alamoti space time code – Maximum likelihood decoding maximum ratio combining. Transmit diversity space time block codes for real signal constellation and complex signal constellation - decoding of STBC.

UNIT IV SPACE TIME TRELLIS CODES 9

Space time coded systems, space time code word design criteria, design of space time T C on slow fading channels, design of STTC on Fast Fading channels, performance analysis in slow and fast fading channels, effect of imperfect channel estimation and Antenna correlation on performance, comparison of STBC & STTC.

UNIT V LAYERED SPACE TIME CODES 9

LST transmitter – Horizontal and Vertical LST receiver – ML Rx, Zero forcing Rx; MMSE Rx, SIC Rx, ZF V-blast Rx- MMSE V-blast Rx, Iterative Rx - capacity of MIMO – OFDM systems – capacity of MIMO multi user systems.

TOTAL : 45 PERIODS

OUTCOMES:

- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
- The student has gained the knowledge about the importance of MIMO in today's communication
- The student had understood and appreciate the various methods for improving the data rate of wireless communication system.

TEXT BOOKS:

1. Mohinder Jankiraman, Space-time codes and MIMO systems, Artech House, Boston, London . www.artech house.com, ISBN 1-58053-865-7-2004
2. Paulraj Rohit Nabar, Dhananjay Gore, Introduction of space time wireless communication systems, Cambridge University Press, 2003.

REFERENCES:

1. David Tse and Pramod Viswanath, "Fundamentals of Wireless Communication", Cambridge University Press, 2005.
2. Sergio Verdu " Multi User Detection" Cambridge University Press, 1998
3. Andre Viterbi " Principles of Spread Spectrum Techniques" Addison Wesley 1995
4. Volker Kuhn, "Wireless communication over MIMO channels" John Wiley and Sons Ltd.2006.

EC7004 CAD FOR VLSI L T P C
3 0 0 3

OBJECTIVES:

- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To understand the suite of tools available for support and design of VLSI circuits
- To introduce rules and planning methodologies for synthesizing VLSI circuits
- To introduce different modeling schemes for synthesizing VLSI circuits

UNIT I VLSI DESIGN METHODOLOGIES 9

Introduction to VLSI Design methodologies - Review of Data structures and algorithms – Review of VLSI Design automation tools - Algorithmic Graph Theory and Computational Complexity - Tractable and Intractable problems - general purpose methods for combinatorial optimization.

UNIT II DESIGN RULES 9

Layout Compaction - Design rules - problem formulation - algorithms for constraint graph compaction - placement and partitioning - Circuit representation - Placement algorithms – partitioning.

UNIT III FLOOR PLANNING 9

Floor planning concepts - shape functions and floorplan sizing - Types of local routing problems - Area routing - channel routing - global routing - algorithms for global routing.

UNIT IV SIMULATION 9

Simulation - Gate-level modeling and simulation - Switch-level modeling and simulation - Combinational Logic Synthesis - Binary Decision Diagrams - Two Level Logic Synthesis.

UNIT V MODELLING AND SYNTHESIS 9

High level Synthesis - Hardware models - Internal representation - Allocation -assignment and scheduling - Simple scheduling algorithm - Assignment problem - High level transformations.

TOTAL: 45 PERIODS

OUTCOMES:

- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
- Apply VLSI design methodologies and design rules for digital circuits.

- Use floor planning concepts for digital circuits.
- Apply Gate level and Switch level modeling and Simulate digital circuits

TEXT BOOK:

1. S.H. Gerez, “Algorithms for VLSI Design Automation”, John Wiley & Sons,2002.

REFERENCE:

1. N.A.Sherwani, “Algorithms for VLSI Physical Design Automation”, Kluwar Academic Publishers, 2002.

EC7005 CMOS ANALOG IC DESIGN L T P C
3 0 0 3

OBJECTIVES:

- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To study the DC biasing conditions of various MOS amplifier configurations
- To understand the small signal model of various MOS circuits
- To study the noise modeling and analysis procedure associated with various MOS circuits
- To study OPAMP circuits and its stability conditions
- To study in general negative feedback concept in MOS circuits

UNIT I BASIC BUILDING BLOCKS 9

NMOS and PMOS device operation in saturation and sub-threshold regions, device transconductance, output impedance and equivalent circuit. Introduction to Device models for simulation. CG, CG, and source follower circuits. gm/Id design methodology

UNIT II MULTIPLE TRANSISTOR STAGES 9

Cascode circuits. folded cascode circuits, , Differential amplifier circuits, quantitative analysis of differential pair, CMRR, Differential pair with MOS loads, Gilbert Cell, Current Mirrors.

UNIT III FREQUENCY RESPONSE, NOISE 9

Frequency response of CS and CG stages. Miller effect and association of poles with nodes. Characteristics of noise – thermal and flicker noise. Noise in CS, CG, Cascode and source follower stages.

UNIT IV OPERATIONAL AMPLIFIERS 9

Two stage op-amps, gain boosting, common mode feedback, input range limitation, slew rate, power supply rejection, noise in op-amps.

UNIT V FEEDBACK AND STABILITY 9

Properties of feedback circuits, topologies, effect of loading and noise in feedback circuits. Stability in multipole systems, phase margin, frequency compensation in two stage op-amps, other compensation techniques.

TOTAL: 45 PERIODS

OUTCOMES:

Students who complete this course would be in a position

- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
- To carry out design of the various building blocks used in CMOS analog ICs. These include current mirror, cascades, common source amplifiers, differential amplifiers, two stage OTAs, source followers.
- To carry out the paper design based on hand calculations for the above important building blocks. This is normally the first mandatory step in the complete design and fabrication of

CMOS Analog ICs, and enables the student to carry out circuit simulations and layout design. In conjunction with other similar courses in this area,

- Equip the students with the skills required to pursue design and/or research carriers in the broad field of electronics and communication.

TEXT BOOK:

1. B.Razavi, **"**Design of CMOS Analog Integrated Circuits", Tata McGraw Hill 2002.
2. P.R.Gray, Hurst and Meyer "Analysis and Design of Analog Integrated Circuits", Fifth Edition, John Wiley, 2009
   NPTEL Course: http://nptel.ac.in/courses/117106030/#

REFERENCE:

1. Willy Sansen , **"** Analog Design Essentials:" Springer 2006

EC7006 COGNITIVE RADIO COMMUNICATION L T P C
3 0 0 3

OBJECTIVES:

- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To introduce the concept of software defined radios and their architectures
- To introduce the concept of cognitive radio communication and the components involved
- To introduce the cognitive radio architecture and the functions and issues involved in communication system design.

UNIT I INTRODUCTION TO SOFTWARE DEFINED RADIO 9

Definitions and potential benefits, software radio architecture evolution – foundations, technology tradeoffs and architecture implications.

UNIT II SDR ARCHITECTURE 9

Essential functions of the software radio, architecture goals, quantifying degrees of programmability, top level component topology, computational properties of functional components, interface topologies among plug and play modules, architecture partitions.

UNIT III INTRODUCTION TO COGNITIVE RADIOS 9

Marking radio self-aware, the cognition cycle, organization of cognition tasks, structuring knowledge for cognition tasks, Enabling location and environment awareness in cognitive radios – concepts, architecture, design considerations.

UNIT IV COGNITIVE RADIO ARCHITECTURE 9

Primary Cognitive Radio functions, Behaviors, Components, A–Priori Knowledge taxonomy, observe – phase data structures, Radio procedure knowledge encapsulation, components of orient, plan, decide phases, act phase knowledge representation, design rules.

UNIT V NEXT GENERATION WIRELESS NETWORKS 9

The XG Network architecture, spectrum sensing, spectrum management, spectrum mobility, spectrum sharing, upper layer issues, cross – layer design.

TOTAL: 45 PERIODS

OUTCOMES:

- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
- The students will be able to understand and compare different SDR architectures.

- The students will be able to identify the role of SDR and Cognitive radio communication in XG networks.

TEXT BOOK:

1. Qusay. H. Mahmoud, “Cognitive Networks : Towards Self Aware Network”, John Wiley & Sons Ltd. 2007.

REFERENCES:

1. Markus Dillinger, Kambiz Madani, Nancy Alonistioti, “Software Defined Radio”, John Wiley, 2003.
2. Huseyin Arslan, “Cognitive Radio, SDR and Adaptive System”, Springer, 2007.
3. Joseph Mitola, “Cognitive Radio Architecture”, John Wiley & Sons, 2006.
4. Alexander M. Wyglinski, Maziarnekovee, Y. Thomas Hu, “Cognitive Radio Communication and Networks”, Elsevier, 2010.
5. J. Mitola, “ Cognitive Radio: An Integrated Agent Architecture for software defined radio”, Doctor of Technology thesis, Royal Inst. Technology, Sweden 2000.
6. Simon Haykin, “Cognitive Radio: Brain –empowered wireless communications”, IEEE Journal on selected areas in communications, Feb 2005.
7. Hasari Celebi, Huseyin Arslan , “ Enabling location and environment awareness in cognitive radios”, Elsevier Computer Communications , Jan 2008.

EC7007 DIGITAL CONTROL ENGINEERING L T P C
3 0 0 3

OBJECTIVES:

- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- This course is extended to deliver the concepts of continuous-time control systems to digital domain where the design and stability aspects are introduced.

UNIT I CONTINUOUS TIME SYSTEMS 6

Review of frequency and time response analysis and specifications of control systems, need for controllers, continuous time compensations, continuous time PI, PD, PID controllers.

UNIT II SIGNAL PROCESSING IN DIGITAL CONTROL 12

Sampling, time and frequency domain descriptions, aliasing, hold operations, mathematical model of sample and hold, zero and first order hold, factors limiting the choice of sample rate, reconstruction, Difference equation description, Z-transform method of description, pulse transfer function, time and frequency response of discrete time control systems.

UNIT III DESIGN OF DIGITAL CONTROL ALGORITHMS 9

Review of principle of compensator design, Z-plane specifications, digital compensator design using frequency response plots, discrete integrator, discrete differentiator, development of digital PID controller, transfer function, design in Z-plane.

UNIT IV STATE VARIABLE TECHNIQUES 9

Discrete State Variable concepts, Characteristic equation, Eigen values and Eigenvectors, Jordan canonical models, Phase Variable companion forms.

UNIT V CONTROLLABILITY, OBSERVABILITY AND STABILITY 9

Definitions and Theorems of Controllability and Observability, Relationships between Controllability, Observability and Transfer Functions, Jury, Routh, Lyapunov stability analysis,

Principles of state and output feedback.

TOTAL : 45 PERIODS

OUTCOMES:

- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
- Acquire working knowledge of discrete system science related mathematics.
- Design a discrete system, component or process to meet desired needs.
- Identify, formulate and solve discrete control engineering problems.
- Use the techniques, tools and skills related to discrete signals, computer science and modern discrete control engineering in modern engineering practice.
- Communicate system related concepts effectively.

TEXT BOOK:

1. Benjamin C.Kuo, Digital Control Systems, OXFORD University Press, II Edition, 2007

REFERENCES:

1. M.Gopal, Digital Control and State Variable Methods, Tata McGraw Hill, II Edition, 2007.
2. K.Ogata, Discrete-Time Control Systems, PHI, II Edition,2007.
3. Gene. F.Franklin, J.D.Powell, M.Workman, Digital Control of Dynamic Systems, Addison-Wesley, III Edition, 2000.

EC7008 DIGITAL SWITCHING AND TRANSMISSION L T P C
3 0 0 3

OBJECTIVES:

- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To introduce different types of signaling in digital telephony
- To introduce various transmission schemes for telephony and broadband
- To introduce modeling and analysis techniques for data transmission

UNIT I INTRODUCTION 9

Overview of existing Voice, Data and Multimedia Networks and Services; Review of Basic Communication principles; Synchronous and Asynchronous transmission, Line Codes

UNIT II TRUNK TRANSMISSION 9

Multiplexing & Framing - types and standards; Trunk signaling; Optical Transmission-line codes and Muxing: SONET/SDH; ATM; Microwave and Satellite Systems.

UNIT III LOCAL LOOP TRANSMISSION 9

The Analog Local Loop; ISDN local loop; DSL and ADSL; Wireless Local Loop; Fiber in the loop; Mobile and Satellite Phone local loop.

UNIT IV SWITCHING 9

Evolution; Space switching, Time switching and Combination Switching; Blocking and Delay characteristics; Message ,Packet and ATM switching; Advances in switching techniques – shared memory fast packet switches, shared medium fast packet switches and space division fast packet switches, Photonic switching - Optical TDM, WDM.

UNIT V TELETRAFFIC ENGINEERING 9

Telecom Network Modeling; Arrival Process; Network Blocking performance; Delay Networks-Queuing system analysis and delay performance.

Attested

TOTAL : 45 PERIODS

OUTCOMES:

- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
- The student have gained the ability to understand the different type of signaling, transmission schemes and switching techniques used in digital telephony.
- They have gained the ability to model and analyze the different techniques for data transmission**.**

TEXT BOOKS:

1. J. Bellamy, "Digital Telephony", John Wiley, 2003, 3rd Edition.
2. JE Flood, "Telecommunications Switching, Traffic and Networks", Pearson, 2005.

REFERENCES:

1. R.A.Thompson, "Telephone switching Systems", Artech House Publishers, 2000.
2. W. Stalling, " Data and Computer Communications", Prentice Hall, 1993.
3. T.N.Saadawi, M.H.Ammar, A.E.Hakeem, "Fundamentals of Telecommunication Networks", Wiley Interscience, 1994.
4. W.D. Reeve, "Subscriber Loop Signalling and Transmission Hand book", IEEE Press (Telecomm Handbook Series), 1995.
5. Tarmo Anttalaien, "Introduction to Telecommunication Network Engineering", 2nd edition, Artech House, 2003.
6. T. Viswanathan, "Telecommunication Switching Systems", Prentice-Hall, 1992.

EC7009 INFORMATION THEORY L T P C
3 0 0 3

OBJECTIVES:

- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To teach different types of entropy
- To teach entropy in the context of data compression
- To teach channel capacities over different channels

UNIT I QUANTITATIVE STUDY OF INFORMATION 8

Basic inequalities, Entropy, Kullback-Leibler distance, Mutual information, Bounds on entropy, Fisher information, Cramer Rao inequality, Second law of thermodynamics , Sufficient statistic, Entropy rates of a Stochastic process .

UNIT II CAPACITY OF NOISELESS CHANNEL 8

Fundamental theorem for a noiseless channel, Data compression, Kraft inequality, Shannon-Fano codes, Huffman codes, Asymptotic equipartition, Rate distortion theory.

UNIT III CHANNEL CAPACITY 9

Properties of channel capacity, Jointly typical sequences, Channel Coding Theorem, converse to channel coding theorem, Joint source channel coding theorem

UNIT IV DIFFERENTIAL ENTROPY AND GAUSSIAN CHANNEL 9

AEP for continuous random variables, relationship between continuous and discrete entropy, properties of differential entropy, Gaussian channel definitions, converse to coding theorem for Gaussian channel, channels with colored noise, Gaussian channels with feedback

UNIT V NETWORK INFORMATION THEORY 11

Gaussian multiple user channels, Multiple access channel, Encoding of correlated sources, Broadcast channel, Relay channel, Source coding and rate distortion with side information,

General multi-terminal networks.

TOTAL : 45 PERIODS

OUTCOMES:

- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
- This course helps to understand insight of source coding
- Students will understand the limitations of the channel
- It helps to understand the data rate that can be offered by the channel in the presence of AWGN

TEXT BOOK:

1. Thomas Cover, Joy Thomas ,"Elements of Information theory ", Wiley, 2005.

REFERENCE:

1. David Mackay , "Information theory, interference & learning algorithms", Cambridge University Press, I edition, 2002

EC7010 INTRODUCTION TO EMBEDDED CONTROLLERS L T P C
3 0 0 3

OBJECTIVES:

- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To learn about the designing of an embedded system for commercial applications
- To learn the features, architecture and programming of PIC microcontrollers
- Interfacing Input/Output devices with the PIC microcontroller
- To learn about the communication protocols in a microcomputer system
- To learn about the fundamentals of real-time operating system in an embedded system environment

UNIT I 8-BIT CONTROLLER 9

Microprocessors and microcontrollers, introducing PIC 16F877- architecture, memory technologies, timing circuits, power-up and reset, parallel ports, ADC, interrupt, serial peripheral buses (UART, I2C, SPI), PWM, counters and timers, instruction set and assembly language programming.

UNIT II 16-BIT CONTROLLER 9

DsPIC30F microcontroller- architecture, DSP engine, memory, parallel ports, system and power management, ADC, interrupt, PWM.

UNIT III PIC DEVELOPMENT TOOLS AND PROGRAMMING 9

Software development tools- editor, assembler, compiler, cross-compiler and simulator, Hardware development tools- development board, device programmer, in-circuit emulator and debuggers. Embedded C Programming, data types and variables, data type modifiers, storage Class modifiers, C statements, structures and operations, pointers, libraries, in-line assembly programming, optimizing and testing embedded C programs.

UNIT IV MULTITASKING AND THE REAL-TIME OPERATING SYSTEM 9

The challenge of multitasking and real time, multitasking with sequential programming, State machines, Real time operating system, RTOS services, synchronization and messaging tools, CCS PIC C Compiler RTOS. Design example: Voltmeter with RS232 serial output.

UNIT V PERIPHERAL INTERFACING WITH PIC MICROCONTROLLER 9

Human and physical interfaces- switches to keyboard, LED display, liquid crystal display, Actuators and sensors, PWM, serial communication protocols (UART, I2C, SPI), programming interrupt, timers and counter.

TOTAL: 45 PERIODS

OUTCOMES:

- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
- Ability to design and develop embedded systems for a given problem.
- Ability to develop embedded system for entertainment, communication and medical applications.
- Ability to implement distributed embedded computing platform and proper scheduling of the process.
- Ability build and trouble shoot embedded systems.

TEXT BOOKS:

1. D. E. Simon, “An Embedded Software Primer”, Addison-Wesley, 1999.
2. Kirk Zurell, "C programming for Embedded Systems", CRC Press, 2000.
3. Dogan Ibrahim, "Advanced PIC microcontroller projects in C", Newnes publication, 2012.
4. Tim Wilmshurst, "Designing Embedded Systems with PIC microcontrollers-Principles and Applications", Newnes Publications, 2007.

REFERENCES:

1. Douglas V.Hall, "Microprocessor and Interfacing, Programming and Hardware", Revised second Edition 2006, Eleventh Reprint 2011. Tata Mc Graw Hill.
2. Muhammad Ali Mazidi, Rolin McKinlay, Danny Causey, "PIC Microcontroller and Embedded Systems: Using Assembly and C for PIC18", Prentice hall publications, 2007.
3. Julio Sanchez Maria P.Canton, “Microcontroller Programming: The microchip PIC”, CRC Press, Taylor & Francis Group,2007.
4. Martin Bates, "Interfacing PIC microcontrollers-Embedded Design by Interactive Simulation", Newnes Publication, 2006.

EC7011 INTRODUCTION TO WEB TECHNOLOGY L T P C

3 0 0 3

OBJECTIVES:

- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To introduce the features of object oriented programming languages using Java
- To design and create user interfaces using Java frames and applets
- To have a basic idea about network programming using Java
- To create simple Web pages and provide client side validation
- To create dynamic web pages using server side scripting

UNIT I JAVA FUNDAMENTALS 9

Java Data types – Class – Object – I / O Streams – File Handling concepts – Threads – Applets – Swing Framework – Reflection

UNIT II JAVA NETWORKING FUNDAMENTALS 9

Overview of Java Networking - TCP - UDP - InetAddress and Ports - Socket Programming - Working with URLs - Internet Protocols simulation - HTTP - SMTP - POP - FTP - Remote Method Invocation - Multithreading Concepts

UNIT III CLIENT SIDE TECHNOLOGIES 9

XML - Document Type Definition - XML Schema - Document Object Model - Presenting XML - Using XML Parsers: DOM and SAX – JavaScript Fundamentals - Evolution of AJAX - AJAX Framework - Web applications with AJAX - AJAX with PHP - AJAX with Databases

UNIT IV SERVER SIDE TECHNOLOGIES 9

Servlet Overview - Life cycle of a Servlet - Handling HTTP request and response - Using Cookies - Session tracking - Java Server Pages - Anatomy of JSP - Implicit JSP Objects – JDBC - Java Beans - Advantages - Enterprise Java Beans - EJB Architecture - Types of Beans - EJB Transactions

UNIT V APPLICATION DEVELOPMENT ENVIRONMENT 9

Overview of MVC architecture - Java Server Faces: Features - Components - Tags - **Struts:** Working principle of Struts - Building model components - View components - Controller components - Forms with Struts - Presentation tags - Developing Web applications -

Hibernate: Configuration Settings - Mapping persistent classes - Working with persistent objects - Concurrency - Transactions - Caching - Queries for retrieval of objects - **Spring:** Framework - Controllers - Developing simple applications

TOTAL: 45 PERIODS

OUT COMES:

- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
- The students gained the knowledge about Java and basic Web concepts and enable the student to create simple Web based applications.

TEXT BOOK:

1. Deitel, Deitel, Goldberg, “Internet & World Wide Web How To Program”, Third Edition, Pearson Education, 2006.

REFERENCES:

1. Marty Hall and Larry Brown, “Core Servlets And Javaserver Pages”, Second Edition
2. Bryan Basham, Kathy Siegra, Bert Bates, “Head First Servlets and JSP”, Second Edition
3. Uttam K Roy, “Web Technologies”, Oxford University Press, 2011.

EC7012 MEASUREMENTS AND INSTRUMENTATION L T P C
3 0 0 3

OBJECTIVES:

- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To introduce principles of various measurement techniques using analog and digital equipments
- To teach Importance of signal generators and analyzers in measurements
- To emphasize the need for data acquisition systems and optical domain measurement techniques

UNIT I SCIENCE OF MEASUREMENT 9

Measurement System – Instrumentation – Characteristics of measurement systems – Static and Dynamic – Errors in Measurements – Calibration and Standards.

UNIT II TRANSDUCERS 9

Classification of Transducers – Variable Resistive transducers – Strain gauges , Thermistor, RTD-

Variable Inductive transducers- LVDT, RVDT,- Variable Capacitive Transducers – Capacitor microphone- Photo electric transducers – Piezo electric transducers – Thermocouple – IC sensors - Fibre optic sensors – Smart/intelligent sensors.

UNIT III SIGNAL CONDITIONING AND SIGNAL ANALYZERS 9

DC and AC bridges – Wheatstone, Kelvin, Maxwell, Hay and Schering. Pre- amplifier – Isolation amplifier – Filters – Data acquisition systems. Spectrum Analyzers – Wave analyzers – Logic analyzers.

UNIT IV DIGITAL INSTRUMENTS 9

Digital Voltmeters – Millimeters – automation in Voltmeter – Accuracy and Resolution in DVM - Guarding techniques – Frequency counter- Data Loggers – Introduction to IEEE 488/GPIB Buses.

UNIT V DATA DISPLAY AND RECORDING SYSTEMS 9

Dual trace CRO – Digital storage and Analog storage oscilloscope. Analog and Digital Recorders and printers. Virtual Instrumentation - Block diagram and architecture – Applications in various fields. Measurement systems applied to Micro and Nanotechnology.

TOTAL : 45 PERIODS

OUTCOMES:

- Discuss about the principles of various measurement techniques.
- Analyze the transducers and its impact.
- Explain about the signal conditioning system and signal analyzers.
- Illustrate the digital measurement equipments.
- Emphasize the need for data acquisition, recording and display systems.

TEXT BOOKS:

1. Albert D.Helfrick and William D. Cooper, “Modern Electronic Instrumentation and Measurement Techniques”, Prentice Hall of India, 2007.
2. Ernest o Doebelin and dhanesh N manik, “Measurement systems” ,5th edition ,McGraw-Hill, 2007.

REFERENCE:

1. Albert D.Helfrick and William D. Cooper, “Modern Electronic Instrumentation and Measurement Techniques”, Prentice Hall of India, 2nd Edition, 2008.

EC7013 MEDICAL ELECTRONICS L T P C
3 0 0 3

OBJECTIVES:

- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To gain knowledge about the various physiological parameters both electrical and non electrical and the methods of recording and also the method of transmitting these parameters.
- To study about the various assist devices used in the hospitals.
- To gain knowledge about equipment used for physical medicine and the various recently developed diagnostic and therapeutic techniques.

UNIT I ELECTRO-PHYSIOLOGY AND BIO-POTENTIAL RECORDING 9

The origin of Bio-potentials; biopotential electrodes, biological amplifiers, ECG, EEG, EMG,PCG, lead systems and recording methods, typical waveforms and signal characteristics.

UNIT II BIO-CHEMICAL AND NON ELECTRICAL PARAMETER MEASUREMENT **9**

pH, PO_2, PCO_2, colorimeter, Auto analyzer, Blood flow meter, cardiac output, respiratory measurement, Blood pressure, temperature, pulse, Blood cell counters.

UNIT III ASSIST DEVICES **9**

Cardiac pacemakers, DC Defibrillator, Dialyser, Heart lung machine

UNIT IV PHYSICAL MEDICINE AND BIOTELEMETRY **9**

Diathermies- Shortwave, ultrasonic and microwave type and their applications, Surgical Diathermy Telemetry principles, frequency selection, biotelemetry, radiopill, electrical safety

UNIT V RECENT TRENDS IN MEDICAL INSTRUMENTATION **9**

Thermograph, endoscopy unit, Laser in medicine, cryogenic application, Introduction to telemedicine

TOTAL: 45 PERIODS

OUTCOMES:

- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world

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

- Discuss the application of electronics in diagnostic and therapeutic area.
- Measure biochemical and various physiological information.
- Describe the working of units which will help to restore normal functioning

TEXT BOOKS:

1. Leslie Cromwell, "Biomedical instrumentation and measurement", Prentice Hall of India, New Delhi, 2007.
2. John G.Webster," Medical Instrumentation Application and Design", 3rd Edition, Wiley India Edition, 2007

REFERENCES:

1. Khandpur, R.S., "Handbook of Biomedical Instrumentation", TATA McGraw-Hill, New Delhi, 2003.
2. Joseph J.Carr and John M.Brown, "Introduction to Biomedical equipment Technology", John Wiley and Sons, New York, 2004.

EC7014 MEMS AND MICRO SYSTEMS **L T P C**
3 0 0 3

OBJECTIVES:

- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To enable the student to understand the basic principles of sensors and actuators, materials and fabrication aspects of MEMS and Microsystems.
- To make the student familiar with the mechanical and the electrostatic design and the associated system issues.
- To introduce the student to the different MEMS applications , the design basics, the design tools and the performance issues.

UNIT I INTRODUCTION TO MEMS **9**

MEMS and Microsystems, Miniaturization, Typical products, Micro sensors, Micro actuation, MEMS with micro actuators, Microaccelorometers and Micro fluidics, MEMS materials, Micro fabrication

UNIT II MECHANICS FOR MEMS DESIGN 9

Elasticity, Stress, strain and material properties, Bending of thin plates, Spring configurations, torsional deflection, Mechanical vibration, Resonance, Thermo mechanics – actuators, force and response time, Fracture and thin film mechanics.

UNIT III ELECTRO STATIC DESIGN AND SYSTEM ISSUES 9

Electrostatics: basic theory, electro static instability. Surface tension, gap and finger pull up, Electro static actuators, Comb generators, gap closers, rotary motors, inch worms, Electromagnetic actuators. bistable actuators. Electronic Interfaces, Feed back systems, Noise, Circuit and system issues.

UNIT IV MEMS APLLICATION 9

Case studies – Capacitive accelerometer, Peizo electric pressure sensor, Microfluidics application, Modeling of MEMS systems, CAD for MEMS.

UNIT V INTRODUCTION TO OPTICAL AND RF MEMS 9

Optical MEMS, - System design basics – Gaussian optics, matrix operations, resolution. Case studies- MEMS scanners and retinal scanning display, Digital Micro mirror devices. RF Mems – design basics, case study – Capacitive RF MEMS switch, performance issues.

TOTAL: 45 PERIODS

OUTCOMES:

- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
- The student would be able to demonstrate an understanding of the different aspects of microsystem design.
- Given the user requirements and the functionality the student would be in a position to apply his knowledge for identifying a suitable MEMS structure, material and fabrication procedure.
- The student would be capable of applying his knowledge and design tools and will be well practiced in design skills.

TEXT BOOKS:

1. Stephen Santeria," Microsystems Design", Springer, 2014.
2. N.P.Mahalik, "MEMS", Tata McGraw hill, 2008.

REFERENCES:

1. Nadim Maluf," An introduction to Micro electro mechanical system Engineering", Artech House, 2004.
2. Ai Qun Liu," Photonic MEMS devices", CRC press Bocaraton, 2009.
3. Tai Ran Hsu," MEMS & Micro systems Design , Manufacture and Nanoscale Engineering", John Wiley, New Jersy, 2008.
4. Chang Liu, "Foundations of MEMS", Pearson education, 2012.

EC7015 MIXED SIGNAL IC DESIGN L T P C
3 0 0 3

OBJECTIVES:

- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To design MOS circuits applied for various data conversion stages namely, sample and hold, comparators, switched capacitor amplifiers

- To, study the various CMOS design considerations of ADC architectures used in practice including SAR, Pipeline, Flash ADCs
- To study the general design principles design sigma delta converters

UNIT INTRODUCTION 9

Quantization noise, anti aliasing filters, gain and offset errors, definitions of INL and DNL, SNR, SFDR, ENOB of ADC/DACs, finite duration pulse aperture effects, transistor matching, Bandgap reference design

UNIT II D/A CONVERTER DESIGN, SAMPLE AND HOLD CIRCUITS 9

Current Steering DACs, current cell design issues. Properties of MOS Switches, charge injection, bootstrapping, sampling jitter, thermal noise, Quantization noise and nonlinearity effects.

UNIT III COMPARATOR DESIGN 9

Comparator architectures, metastibility and yield, Clock feed through effects, switched capacitor amplifiers and offset cancellation.

UNIT IV ADC/DAC ARCHITECTURES: 9

SAR, Flash, Pipeline and time interleaved ADC topologies and their CMOS realizations issues. Error correction procedures for ADCs,

UNIT V OVER SAMPLING CONVERTERS. 9

Delta sigma modulators, alternative modulator architectures, quantization and noise shaping, decimation filtering, implementation of Delta sigma modulators, delta sigma DACs,

TOTAL: 45 PERIODS

OUTCOMES:

Students who complete this course would be in a position

- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
- To carry out the design of the various building blocks used in mixed signal (A/D and D/A converters) CMOS IC Design. These include sample and hold circuits, comparators and switched capacitor amplifiers, and simple designs of flash ADCs, pipeline ADCs, Current Steering DACs and sigma delta converters.

- The student who takes this course will be able to carry out the paper design based on hand calculations for the above important functional blocks and enables the student to carry out circuit simulations and layout design.
- Equip the students with the skills required to pursue design and/or research carriers in the broad field of electronics and communication.

TEXT BOOKS:

1. Marcel Pelgrom, “Analog to Digital Conversion” Springer Verlag, Second Edition 2013

REFERENCES:

1. Schreier, Temes, “Understanding Delta-Sigma Data Converters, Wiley-IEEE Press, 2004
2. Franco Malobreti “ Data Converters” Springer Verlag, 2007

NPTEL Course: http://nptel.ac.in/courses/117106034/

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EC7016 **OPTICAL NETWORKS** **L T P C**
3 0 0 3

OBJECTIVES:

- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To enable the student to understand the importance of the backbone infrastructure for our present and future communication needs and familiarize them with the architectures and the protocol stack in use.
- To enable the student to understand the differences in the design of data plane and the control plane and the
- routing, switching and the resource allocation methods and the network management and protection methods in vogue.
- To expose the student to the advances in networking and switching domains and the future trends.

UNIT I OPTICAL SYSTEM COMPONENTS **9**

Light Propagation in optical fibers – Loss & bandwidth, System limitations, NonLinear effects; Solitons; Optical Network Components – Couplers, Isolators & Circulators, Multiplexers & Filters, Optical Amplifiers, Switches, Wavelength Converters.

UNIT II OPTICAL NETWORK ARCHITECTURES **9**

Introduction to Optical Networks; SONET / SDH, Metropoliton - Area Networks, Layered Architecture ; Broadcast and Select Networks – Topologies for Broadcast Networks, Media-Access Control Protocols, Testbeds for Broadcast & Select WDM; Wavelength Routing Architecture.

UNIT III WAVELENGTH ROUTING NETWORKS **9**

The optical layer, Node Designs, Optical layer cost tradeoff, Routing and wavelength assignment, Virtual topology design, Wavelength Routing Testbeds, Architectural variations.

UNIT IV PACKET SWITCHING AND ACCESS NETWORKS **9**

Photonic Packet Switching – OTDM, Multiplexing and Demultiplexing, Synchronisation, Broadcast OTDM networks, Switch-based networks; Access Networks – Network Architecture overview, Future Access Networks, Optical Access Network Architectures; and OTDM networks.

UNIT V NETWORK DESIGN AND MANAGEMENT **9**

Transmission System Engineering – System model, Power penalty - transmitter, receiver, Optical amplifiers, crosstalk, dispersion; Wavelength stabilization ; Overall design considerations; Control and Management – Network management functions, Configuration management, Performance management, Fault management, Optical safety, Service interface.

TOTAL: 45 PERIODS

OUTCOMES:

- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
- At the end of the course, the student should be able to ,Use the backbone infrastructure for our present and future communication needs
- Discuss the architectures and the protocol stack in use.
- Compare the differences in the design of data plane, control plane ,routing, switching, resource allocation methods,
- Network management and protection methods in vogue.
- Describe the advances and recent trends in the networking and switching approaches.

TEXT BOOK:

1. Rajiv Ramaswami and Kumar N. Sivarajan, “Optical Networks: A Practical Perspective”, Harcourt Asia Ptv Ltd., Second Edition, 2004.

REFERENCES:

1. C. Siva Ram Moorthy and Mohan Gurusamy, “WDM Optical Networks: Concept, Design and Algorithms”, Prentice Hall of India, I[st] Edition, 2002. 54
2. P.E. Green, Jr., “Fiber Optic Networks”, Prentice Hall, NJ, 1993.
3. Biswanath Mukherjee, “Optical WDM Networks”, Springer Series, 2006.

EC7017 PARALLEL AND DISTRIBUTED PROCESSING L T P C
3 0 0 3

OBJECTIVES:

- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To study the principles of parallel processing
- To understand the concept of shared memory architecture in multiprocessing
- To study the parallel programming models.

UNIT I PARALLEL ARCHITECTURE 9

Parallel Computer Models, Program and Network properties, Principles of scalable performance

UNIT II PROCESSORS AND MEMORY HIERARCHY, BUS 9

Advanced processor Technology, Super scalar and vector processor, Memory hierarchy technology, Virtual Memory Technology, Backplane Bus systems.

UNIT III PIPELINING AND SUPER SCALAR TECHNIQUES 9

Linear Pipeline, Nonlinear pipeline, Instruction pipeline, Arithmetic pipeline, Superscalar and super pipeline design, Parallel and scalable architectures- Multiprocessor and Multicomputers.

UNIT IV SOFTWARE FOR PARALLEL PROGRAMMING 9

Parallel programming models, languages, compliers- Parallel Program Development and Environments.

UNIT V DISTRIBUTED SYSTEMS 9

Models, Hardware concepts, communication, synchronization mechanism, case study: MPI and PVM, Distributed file systems.

TOTAL: 45 PERIODS

OUTCOMES:

- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
- Use different Processor and memory hierarchy technology.
- Apply various types of Pipelining methodologies.
- Identify models, Languages and compilers for Parallel Programming
- Design distributed systems

TEXT BOOKS:

1. Hwang. K, “Advanced computer Architecture”, Parallelism, scalability, Programmability, Tata McGraw Hill, 1993.
2. Tanenbaum A.S, “Distributed Operating Systems”, Pearson Education Asia, 2002.
3. Dezso Sima, Terence Fountain, Peter Kacsuk, “Advanced Computer Architectures”, Pearson Education, 2007.

REFERENCES:

1. V.Rajaraman and C.Siva Ram Murthy, “Parallel Computers Architecture and Programming”,

PHI, 2000.
2. Quinn, M.J., “Designing Efficient Algorithms for Parallel Computers”, McGraw - Hill, 2003.
3. Culler, D.E., “Parallel Computer Architecture”, A Hardware – Software approach, Harcourt Asia Pte. Ltd., 1999.

EC7018 RF MICROELECTRONICS L T P C
3 0 0 3

OBJECTIVES:
- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To introduce radio transceiver architectures • To understand the design issues in CMOS LNAs , Mixers, Oscillators, PLLs, Synthesizers and Power Amplifiers.

UNIT I TRANSCEIVER ARCHITECTURES 9

Heterodyne and Homodyne architectures, Discrete and CMOS realization passive components for RF, Impedance Matching, Distortion, IIP3 and Blocking Effects, Noise Figure, Noise matching conditions. Friis Formula for cascaded blocks. .

UNIT II CMOS LNAS AND MIXERS 9

Noise Figure of and impedance matching issues CS, CG and differential LNAs, Passive mixers and conversion loss, Active mixers, Gilbert cells, linearity and Noise Figure of mixers.

UNIT III OSCILLATORS 9

Negative transconductance, nonlinearity and Differential LC tuned oscillators, Ring oscillators and Colpitts oscillator, Quadrature oscillators–Phase noise.

UNIT IV PLLS AND SYNTHESIZERS 9

Phase Detectors, charge pumps and their transfer functions, Synthesizers based on first, second and third order PLLs and stability issues, Introduction to integer and fractional N synthesizers.

UNIT V POWER AMPLIFIERS 9

Class A, B, C, D, E, F and AB power amplifiers, Linearization and impedance matching issues of power amplifiers.

TOTAL : 45 PERIODS

OUTCOMES:
- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world

Upon completion of the course, students will be able to
- Understand radio transceiver architectures
- Design and Analyze CMOS LNAs , Mixers, Oscillators, PLLs,
- Synthesizers and Power Amplifiers.

TEXT BOOKS:
1. B. Razavi, —RF Microelectronics‖, Pearson Education, 2nd edition,2012.
2. Thomas Lee, —The Design of CMOS Radio Frequency Integrated Circuits, Cambridge University Press, Second Edition, 2004

EC7019 **SATELLITE COMMUNICATION** **L T P C**
3 0 0 3

OBJECTIVES:

- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To enable the student to understand the necessity for satellite based communication, the essential elements involved and the transmission methodologies.
- To enable the student to understand the different interferences and attenuation mechanisms affecting the satellite link design
- .To expose the student to the advances in satellite based navigation, GPS and the different application scenarios.

UNIT I SATELLITE ORBITS AND TRAJECTORIES 8

Orbital Mechanics—Orbit Equations, Kepler's Laws, Orbital Period, Orbits and their types, look angle calculation; Satellite Launch.

UNIT II SATELLITE SUBSYSTEM 10

Satellite Subsystems—AOCS, TTC&M, Power, Transponders, Antennas; earth control-Effects of earth-Perturbation, suntransit, moontransit, satellite power design, MTBF. Basic Equations; System Noise and G/T ratio; Uplink, Downlink and Design for a specified C/N ratio, with GEO and LEO examples; Atmospheric and Rain effects on link performance.

UNIT III LINK DESIGN, MODULATION AND ERROR CONTROL 10

Single link design-double link design aspects, PAM, baseband processing, Digital Modulation for satellite links- BPSK,QPSK and QAM; TDM standards for satellite systems; Error control requirements for satellite link—ARQ, Concatenated Codes,Interleaving, Turbo codes.

UNIT IV MULTIPLE ACCESS FOR SATELLITE COMMUNICATIONS 9

FDM-FM-FDMA - TDMA-structure and system design; Onboard Processing systems; DAMA and PAMA; CDMA-system design and capacity.

UNIT V SOME APPLICATIONS 8

Remote sensing, navigation, scientific and military application, VSAT—Network Architecture, Access Control protocols and techniques, VSAT Earth stations; Satellite Mobile Telephony—Global star, DBS/DTH Television, GPS, Weather satellites.

TOTAL: 45 PERIODS

OUTCOMES:

- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
- The student would be able to demonstrate an understanding of the basic principles of satellite orbits, placement and control, satellite link design and the communication system components.
- The student would be able to demonstrate an understanding of the different communication, sensing and navigational applications of satellite and their implementation.

TEXT BOOKS:

1. T.Pratt, C. Bostian and J.Allnutt; "Satellite Communications", John Wiley and Sons, Second Edition., 2014.
2. D.Rody, "Satellite Communications", 4th Edition, McGraw Hill, 2006.

REFERENCES:

1. W.L.Pritchard, H G Suyderhoud and R A Nelson, "Satellite Communication System Engineering", Second edition, Prentice Hall, 1993.
2. Tri. T. Ha, "Digital Satellite Communications", McGraw Hill, Second Edition, 1990.
3. B.N.Agarwal, "Design of Geosynchronous Space craft", Prentice Hall, 1986.

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4. M. Richharia, “Satellite Systems for Personal Applications”, John Wiley, 2010.

EC7020 VLSI SIGNAL PROCESSING L T P C
3 0 0 3

OBJECTIVES:

- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To design DSP architectures that are suitable for VLSI implementation for a given algorithm
- To learn high-level algorithms that reduce the number of multipliers, area of implementation and power consumption.
- To address issues related to high performance VLSI architectures such as pipelining styles.

UNIT I PIPELINING AND PARALLEL PROCESSING 9

Introduction to DSP Systems, Typical DSP algorithms, Data flow graph representations, Loop bound and Iteration bound, Longest Path Matrix algorithm; Pipelining and Parallel processing of FIR digital filters, Pipelining and Parallel processing for low power.

UNIT II RETIMING AND ALGORITHMIC STRENGTH REDUCTION 9

Retiming - definitions and properties; Unfolding – an algorithm for Unfolding, properties of unfolding, sample period reduction and parallel processing application; Algorithmic strength reduction in filters and transforms – 2-parallel FIR filter, 2-parallel fast FIR filter, DCT algorithm architecture transformation, Odd-Even Merge-Sort architecture, Parallel Rank-Order filters.

UNIT III FAST CONVOLUTION AND COMBINED PIPELINING AND PARALLEL PROCESSING OF IIR FILTERS 9

Fast convolution – Cook-Toom algorithm, Modified Cook-Took algorithm; Pipelined and parallel recursive adaptive filters, Look- Ahead pipelining in first- order IIR filters, Look- Ahead pipelining with power-of-two decomposition, Clustered Look-Ahead pipelining, parallel processing of IIR filters, combined pipelining and parallel processing of IIR filters, pipelined adaptive digital filters, relaxed look-ahead, pipelined LMS adaptive filter.

UNIT IV BIT-LEVEL ARITHMETIC ARCHITECTURES 9

Bit-Level Arithmetic Architectures- parallel multipliers with sign extension, parallel carry-ripple array multipliers, parallel carry-save multiplier, 4x 4 bit Baugh-Wooley carry-save multiplication tabular form and implementation, Bit-serial FIR filter, CSD representation, CSD multiplication using Horner’s rule for precision improvement, Distributed Arithmetic

UNITV NUMERICAL STRENGTH REDUCTION AND WAVE PIPELINING 9

Numerical Strength Reduction – subexpression elimination, Multiple Constant Multiplications, Synchronous pipelining and Clocking styles, Clock skew in edge-triggered single-phase clocking, Wave pipelining.

TOTAL : 45 PERIODS

OUTCOMES:

- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
- To develop efficient DSP algorithms suitable for VLSI implementations
- To effectively modify and develop DSP architectures for VLSI implementations

TEXT BOOK:

1. Keshab K.Parhi, “VLSI Digital Signal Processing systems, Design and implementation “, Wiley, Inter Science, 1999.

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REFERENCES:

1. Mohammed Ismail and Terri Fiez, "Analog VLSI Signal and Information Processing", McGraw-Hill, 1994.
2. S.Y. Kung, H.J. White House, T. Kailath, "VLSI and Modern Signal Processing", Prentice Hall, 1985.
3. Jose E. France, YannisTsividis, "Design of Analog - Digital VLSI Circuits for Telecommunication and Signal Processing ", Prentice Hall, 1994.

EC7021 WIRELESS COMMUNICATION NETWORKS L T P C
3 0 0 3

OBJECTIVES:

- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To understand the working of WI-fi, 3G systems such as UMTS, CDMA 2000
- To learn 4G networks
- To know about ad hoc and sensor network
- To learn about WLAN, WWAN, Wimax and LTE

UNIT I WIRELESS LOCAL AREA NETWORKS 9

Introduction to wireless LANs - IEEE 802.11 WLANs - Physical Layer- MAC sublayer- MAC Management Sublayer- Wireless ATM - HIPERLAN- HIPERLAN-2

UNIT II 3G OVERVIEW & 2.5G EVOLUTION 9

Migration path to UMTS, UMTS Basics, Air Interface, 3GPP Network Architecture,CDMA2000 overview- Radio and Network components, Network structure, Radio network, TD-CDMA, TD-SCDMA.

UNIT III ADHOC & SENSOR NETWORKS 9

Characteristics of MANETs, Table-driven and Source-initiated On Demand routing protocols, Hybrid protocols, Wireless Sensor networks- Classification, MAC and Routing protocols.

UNIT IV INTERNETWORKING BETWEEN WLANS AND 3G WWANS 9

Internetworking objectives and requirements, Schemes to connect WLANs and 3G Networks, Session Mobility, Internetworking Architectures for WLAN and GPRS, System Description, Local Multipoint Distribution Service, Multichannel Multipoint Distribution system.

UNIT V 4G & BEYOND 9

4G features and challenges, Technology path, IMS Architecture, WiMAX, LTE, Convergent Devices, 4G technologies, Advanced Broadband Wireless Access and Services, Multimedia, MVNO.

TOTAL : 45 PERIODS

OUTCOMES:

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

- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
- Analyze different routing techniques in ad hoc and sensor network
- Demonstrate internetworking between different wireless networks
- Describe 4G features and challenges

TEXT BOOKS:

1. Clint Smith. P.E., and Daniel Collins, —3G Wireless Networksǁ, 2nd Edition, Tata McGraw Hill, 2007.

2. Vijay. K. Garg, —Wireless Communication and Networking‖, Morgan Kaufmann Publishers, http://books.elsevier.com/9780123735805:, 2007.

REFERENCES:

1. Kaveth Pahlavan, K. Prashanth Krishnamurthy, "Principles of Wireless Networks", Prentice Hall of India, 2006.
2. William Stallings, "Wireless Communications and networks" Pearson / Prentice Hall of India, 2nd Ed., 2007.
3. Andrew Richardson, —WCDMA design Handbook‖ Cambridge University Press,2007
4. Dharma Prakash Agrawal & Qing-An Zeng, —Introduction to Wireless and Mobile Systems‖,
5. Thomson India Edition, 2nd Ed., 2007.
6. Gary. S. Rogers & John Edwards, —An Introduction to Wireless Technology‖, Pearson Education, 2007.
7. Sumit Kasera and Nishit Narang, — 3G Networks – Architecture, Protocols and Procedures‖, Tata McGraw Hill, 2007.
8. Jochen Schiller, " Mobile Communication", 2nd Edition, Pearson Education Limited 2003
9. C.Siva Ram M Murthy, B.S. Mano, "Ad Hoc Wireless Networks: Architectures and Protocols", Prentice Hall PTR, Pearson Education 2004.

EC7071 ADVANCED MICROCONTROLLERS L T P C
3 0 0 3

OBJECTIVES:

- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To introduce the concept of microcontroller based system development.
- To introduce the concept of RISC and CISC microcontrollers.
- To study the architecture of PIC, R8C and MSP430 family microcontrollers

UNIT I RISC PROCESSORS 9

RISC Vs CISC, RISC properties and evolution, Advanced RISC microcontrollers, PIC18xx microcontroller family, Architecture, Instruction set, ROM, RAM, Timer programming, Serial port programming, Interrupt programming, ADC and DAC interfacing, CCP module and programming.

UNIT II CISC PROCESSORS 9

RL78 16 BIT Microcontroller architecture, addressing modes, on-Chip memory, ADC, interrupts, MAC unit, Barrel shifter, internal and external clock generation, memory CRC, on chip debug function and self programming.

UNIT III MSP430 16 - BIT MICROCONTROLLER 9

The MSP430 Architecture, CPU Registers, Instruction Set, addressing modes, the MSP430 family viz. MSP430x2x, MSP430x4x, MSP430x5x. Low power aspects of MSP430 : low power modes, active Vs standby current consumption, FRAM Vs Flash for low power and reliability.

UNIT IV PROGRAMMING AND PERIPHERAL INTERFACE USING MSP430 FAMILIES 9

Memory mapped peripherals, I/O pin multiplexing, Timers, RTC, watchdog timer, PWM control, Analog interfacing and data acquisition, DMA, programming with above internal peripherals using optimal power consumption. Case study: Remote control of air conditioner and home appliances.

UNIT V COMMUNICATION INTERFACE USING MSP 430 MICROCONTROLLER 9

Serial and parallel communication, synchronous and asynchronous interfaces , Implementing and programming of : UART, I2C and SPI protocol. wireless connectivity : NFC, Zigbee, bluetooth and

WiFi. MSP430 development tools. Case study: Implementing WiFi connectivity in smart electric meter.

TOTAL: 45 PERIODS

OUTCOMES:

- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world

  The students will be able to
- Define, formulate and analyze microcontroller based system.
- Ability to work with PIC, R8C and MSP 430 microcontroller for a specific realworld application.
- Ability to describe the architecture and programming of PIC, R8C and MSP 430 microcontroller
- Manage a project from start to finish

TEXT BOOK:

1. Alaxander G, James M. Conard, " Creating fast, Responsive and energy efficient Embedded systems using the Renesas RL78 microcontroller", micrium press, USA, reprinted by S.P Printers, haryana ISBN No.978-1-935772-98-9. © 2011

REFERENCES:

1. Muhammad Ali Mazidi, Rolind D. Mckinlay and Danny Causey. "PIC Microcontroller and Embedded Systems" Pearson Education, 2008.
2. John H. Davies, “MSP 430 Micro controller basics” Elsevier, 2008.

EC7072 CRYPTOGRAPHY AND NETWORK SECURITY L T P C
3 0 0 3

OBJECTIVES:

- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To teach the importance of security for networks
- To teach the basics of number theory and Galois field concepts
- To teach symmetric and asymmetric key in crypto systems
- To teach authentication and key management techniques
- To teach security specific to network layer

UNIT I NUMBER THEORETIC AND ALGEBRAIC ALGORITHMS 9

Significance of network and data security in todays communication scenario – Overall Classification - Integer Arithmetic Modular Arithmetic – matrices – Linear congruence- Substitution ciphers – Transposition ciphers – Stream cipher- Block ciphers – Algebraic structures – GF(2^n) fields.

UNIT II MODERN SYMMETRIC KEY CIPHERS 9

Modern block ciphers – Modern stream ciphers – DES – AES – uses of modern block ciphers and stream cipher, Application Examples

UNIT III ASYMMETRIC KEY ENCIPHERMENT 9

Mathematics of cryptography – Primality Testing – Factorization – Chinese Remainder Theorem – Quadratic – Exponentiation & Logarithm – RSA, Rabin – Elliptic curve, Application Examples

UNIT IV INTEGRITY AUTHENTICATION AND KEY MANAGEMENT 9

Message integrity – random oracle model – message authentication – SHA-512 – WHIRL POOL- Digital signature schemes Entity anthentication– password – challenge response – zero knowledge – Biometrics – Kerberos – symmetric key management – public key distribution – steganography, Application Examples.

Attested

UNIT V NETWORK SECURITY 9

Security at the Application Layer: E-mail – PGP – S/MIME – Security at the transport layer: SSL and TLS – Security at the network layer: IPsec, Two Security Protocol – Security Association – Internet Key Exchange – ISAKMP, Application Examples.

TOTAL : 45 PERIODS

OUTCOMES:

- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
- The student have gained the knowledge about the importance of security for networks, use of number theory and Galois field concepts.
- The student would have ability to design new symmetric and Asymmetric key crpto system
- The student would have ability to develop new authentication and key management techniques.

TEXT BOOKS:

1. Behrouz A. Ferouzan, “Cryptography & Network Security”, Tata McGraw Hill, 2007.
2. W.Stallings, “Cryptography & Network Security: Principles and Practice”, Prentice Hall, Third Edition, 2003.

REFERENCES:

1. Douglas R.Stlinson, “Cryptography Theory and Practice”, CRC Press series on Discrete Mathematics and its application 1995.
2. Charlie Kaufman, Radia Perlman, Mike Speciner, “Network Security Private Communication in a Public World”, Pearson Education, Second Edition, 2003.

EC7073 ELECTRO MAGNETIC INTERFERENCE AND COMPATIBILITY L T P C 3 0 0 3

OBJECTIVES:

- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To tutor the basics of EMI,EMC
- To instill knowledge on the EMI coupling mechanism and its mitigation techniques
- To impart comprehensive insight about the current EMC standards and about various measurement techniques

UNIT I BASIC CONCEPTS 7

Definition of EMI and EMC; Intra and Inter system EMI; Sources and victims of EMI, Conducted and Radiated EMI emission and susceptibility; Transient & ESD; Case Histories; Radiation Hazards to humans.

UNIT II COUPLING MECHANISM 9

Common made coupling; Differential mode coupling; Common impedance coupling; Ground loop coupling; Field to cable coupling; Cable to cable coupling; Power mains and Power supply coupling.

UNIT III EMI MITIGATION TECHNIQUES 10

Shielding – principle, choice of materials for H, E and free space fields, and thickness; EMI gaskets; Bonding; Grounding – circuits, system and cable grounding; Filtering; Transient EMI control devices and applications; PCB Zoning, Component selection, mounting, trace routing.

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UNIT IV STANDARDS AND REGULATION 7

Units of EMI; National and International EMI Standardizing Organizations – IEC, ANSI, FCC, CISPR, BIS, CENELEC; FCC standards; EN Emission and Susceptibility standards and specifications; MIL461E Standards.

UNIT V TEST METHODS AND INSTRUMENTATION 12

EMI test sites - Open area site; TEM cell; Shielded chamber; Shielded Anechoic chamber; EMI test receivers; Spectrum Analyzer; Transient EMI Test wave Simulators; EMI coupling Networks - Line impedance Stabilization Networks; Feed through capacitors; Antennas and factors; Current probes and calibration factor; MIL-STD test methods; Civilian STD Test methods, Government policies.

TOTAL: 45 PERIODS

OUTCOMES:

- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world

  Upon Completion of the course, the students will be able to
- To design a EMI free system
- To reduce system level crosstalk
- To design high speed Printed Circuit board with minimum interference
- To make our world free from unwanted electromagnetic environment

TEXT BOOKS:

1. V.P. Kodali, ―Engineering EMC Principles, Measurements and Technologies‖, IEEE Press, New york, 2010 (2nd Edition)
2. Henry W.Ott., ―Noise Reduction Techniques in Electronic Systems‖, A Wiley Inter Science Publications, John Wiley and Sons, Newyork, 2009

REFERENCES:

1. Don R.J.White Consultant Incorporate, ―Handbook of EMI/EMC‖, Vol I-V, 1988 2. Bemhard Keiser, ―Principles of Electromagnetic Compatibility‖, 3rd Ed, Artech house, Norwood, 1987
2. C.R. Paul, ―Introduction to Electromagnetic Compatibility‖, John wiley & sons Inc. 2006

EC7074 FOUNDATIONS FOR NANO ELECTRONICS L T P C

3 0 0 3

OBJECTIVES:

- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- The objectives of the course is to introduce quantum mechanics concepts, approximations and statistical mechanics for understanding nano systems

UNIT I INTRODUCTION TO QUANTUM MECHANICS 9

Particles, waves, probability amplitudes, schrodinger equation, wave packets solutions, operators, expectation values, eigen funtions, piecewise constant potentials.

UNIT II SIMPLE HARMONIC OSCILLATORS AND APPROXIMATIONS 9

SHM Operators, SHM wavepacket solutions, Quantum LC circuit, WKB approximations, variational methods.

UNIT III SYSTEMS WITH TWO AND MANY DEGREES OF FREEDOM 9

Two level systems with static and dynamic coupling, problems in more than one dimensions,

electromagnetic field quantization, density of states.

UNIT IV STATISTICAL MECHANICS 9

Basic concepts, microscopic, quantum systems in equilibrium, statistical models applied to metals and semiconductors

UNIT V APPLICATIONS 9

Hydrogen and Helium atoms, electronic states, Atomic force microscope, Nuclear Magnetic Resonance, carbon nanotube properties and applications

TOTAL : 45 PERIODS

OUTCOMES:

- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
- The student would have gained the knowledge on quantum mechanics concepts, approximations and statistical mechanics for understanding nano systems

TEXT BOOKS:

1. Hagelstein, Peter L., Stephen D. Senturia, and Terry P. Orlando, "**Introduction to Applied Quantum and Statistical Physics**.", New York, NY: Wiley, 2004.
2. Rainer Waser, "Nanoelectronics and Information Technology", Wiley 2005
3. Michael A. Nielsen and Isaac L. Chuang, "Quantum Computation and Quantum Information", Cambridge University Press, 2000.

REFERENCES:

1. Neil Gershenfeld "The Physics of Information Technology", Cambridge University Press, 2000.
2. Adrian Ionesu and Kaustav Banerjee eds. " Emerging Nanoelectronics: Life with and after CMOS" , Vol I, II, and III, Kluwer Academic, 2005.

EC7075 MULTIMEDIA COMPRESSION AND NETWORKS L T P C
3 0 0 3

OBJECTIVES:

- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To introduce probability related study of the characteristics of text, voice, image and video data
- To introduce various compression schemes for text, voice, image and video
- To analyse the compression schemes
- To introduce communication protocols for voice over internet and multimedia networking

UNIT I MULTIMEDIA COMPONENTS 9

Introduction- Multimedia skills- Multimedia components and their characteristics- Text, sound, images, graphics, animation, video, hardware.

UNIT II AUDIO AND VIDEO COMPRESSION 9

Audio compression–DPCM-Adaptive DPCM –adaptive predictive coding-linear Predictive coding-code excited LPC-perpetual coding – Video compression principles-H.261, H.263, MPEG 1, 2, 4.

UNIT III TEXT AND IMAGE COMPRESSION 9

Compression principles-source encoders and destination encoders-lossless and lossy compression-entropy encoding –source encoding- text compression –static Huffman coding

dynamic Huffman coding –arithmetic coding –Lempel Ziv-Welsh Compression-image compression

UNIT IV VoIP TECHNOLOGY 9

Basics of IP transport, VoIP challenges, H.323/ SIP –Network Architecture, Protocols, Call establishment and release, VoIP and SS7, Quality of Service – CODEC Methods-VOIP applicability.

UNIT V MULTIMEDIA NETWORKING 9

Multimedia networking- Applications-streamed stored and audio-making – Best Effort service-protocols for real time interactive Applications-distributing multimedia-beyond best effort service-secluding and policing Mechanisms-integrated services-differentiated Services-RSVP.

TOTAL : 45 PERIODS

OUTCOMES:

- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
- Various components of multimedia have been studied
- Compressions and decompressions of multimedia components are explored
- The adaptation of compression techniques in various state-of-the-art technologies were observed

TEXT BOOKS:

1. Fred Halshall, "Multimedia communication- Applications, Networks, Protocols and Standards", Pearson education, 2007.
2. Tay Vaughan, "Multideai: Making It Work", 7/e, TMH, 2007.

REFERENCES:

1. Kurose and W. Ross, "Computer Networking "A Top Down Approach, Pearson education, 3rd ed, 2005. Marcus Goncalves "Voice over IP Networks", McGraw Hill,
2. KR. Rao,Z S Bojkovic, D A Milovanovic, "Multimedia Communication Systems: Techniques, Standards, and Networks", Pearson Education 2007
3. R. Steimnetz, K. Nahrstedt, "Multimedia Computing, Communications and Applications", Pearson Education, First ed, 1995.
4. Ranjan Parekh, "Principles of Multimedia", TMH, 2006.

EC7076 REAL TIME AND EMBEDDED SYSTEMS L T P C
3 0 0 3

OBJECTIVES:

- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To study the architecture and programming of ARM processors.
- To introduce the basic concepts of hard real time multiprocessing.
- To introduce the analytical concepts for effective programming.
- To study about the basics of the buses used for embedded system networking.

UNIT I INTRODUCTION TO EMBEDDED COMPUTING AND ARM PROCESSORS 9

Complex systems and microprocessors – Embedded system design process – Formalism for system design– Design example: Model train controller- ARM Processor Fundamentals-Instruction Set and Programming using ARM Processor.

Attested

UNIT II COMPUTING PLATFORM 9

CPU: Programming input and output – Supervisor mode, exception and traps – Coprocessor – Memory system mechanism – CPU performance – CPU power consumption- CPU buses – Memory devices – I/O devices – Component interfacing- System Level Performance Analysis- Parallelism. Design Example: Data Compressor.

UNIT III PROGRAM DESIGN AND ANALYSIS 9

Program design – Model of programs – Assembly and Linking – Basic compilation techniques – Program Optimization- Analysis and optimization of execution time, power, energy, program size – Program validation and testing- Example: Software Modem.

UNIT IV PROCESS AND OPERATING SYSTEMS 9

Multiple tasks and Multi processes – Processes – Context Switching – Operating Systems – Priority based Scheduling- RMS and EDF - Inter Process Communication mechanisms – Evaluating operating system performance – Power optimization strategies for processes.

UNIT V HARDWARE ACCELERATORS & NETWORKS 9

Multiprocessors- CPUs and Accelerators – Performance Analysis- Distributed Embedded Architecture – Networks for Embedded Systems: - I2C, CAN Bus, Ethernet, Myrinet – Network based design – Internet enabled systems. Design Example: Elevator Controller.

TOTAL : 45 PERIODS

OUTCOMES:

- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
- Ability to design and develop ARM processor based systems.
- Ability to develop embedded system for entertainment, communication and medical applications.
- Ability to implement distributed embedded computing platform and proper scheduling of the process.

TEXT BOOKS:

1. Wayne Wolf, “Computers as Components - Principles of Embedded Computing System Design”, Morgan Kaufmann Publisher (An imprint of Elsevier), Second Edition, 2008.
2. Andrew N Sloss, Dominic Symes, Chris Wright, “ARM System Developer’s Guide- Designing and Optimizing System Software”, Elsevier/Morgan Kaufmann Publisher, 2008.

REFERENCES:

1. David E-Simon, “An Embedded Software Primer”, Pearson Education, 2010.
2. K.V.K.K.Prasad, “Embedded Real-Time Systems: Concepts, Design & Programming”, Dreamtech press, 2005.
3. Jane. W. S. Liu, “Real-Time systems”, Pearson Education Asia.2011
4. Sriram V Iyer, Pankaj Gupta, “Embedded Real Time Systems Programming”, Tata Mc-Graw Hill, 2004.
5. Tammy Noergaard, “Embedded Systems Architecture”, Elsevier, 2006.

EC7077 ROBOTICS L T P C
3 0 0 3

OBJECTIVES:

- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To introduce the electronics and software aspects in the design of robots

- To bring out the different languages for programming robot
- To specify robot requirements in the industry
- To introduce latest state of the art robots

UNIT I SCOPE OF ROBOTS 4

The scope of industrial Robots - Definition of an industrial robot - Need for industrial robots – Economic and Social Issues- applications.

UNIT II ROBOT COMPONENTS 9

Fundamentals of Robot Technology - Automation and Robotics - Robot anatomy - Work volume - Precision of movement - End effectors - Sensors.

UNIT III ROBOT PROGRAMMING 9

Robot Programming - Methods - interlocks textual languages. Characteristics of Robot level languages, characteristic of task level languages.

UNIT IV ROBOT WORK CELL 9

Robot Cell Design and Control - Remote Center compliance - Safety in Robotics.

UNIT V FUTURE TRENDS 14

Telepresence robot, Autonomous mobile robots, Walker Robots, Solar-ball Robot, Underwater bots, Aerobots, Advanced robotics in Space - Specific features of space robotics systems - long-term technical developments, Next generation robots.

TOTAL: 45 PERIODS

OUTCOMES:

- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
- Ability to design and develop robotic based systems.
- Ability to develop system for industrial automation and medical applications.
- Ability to provide automatic solution for replacing humans in life threatening area.

TEXT BOOKS:

1. Barry Leatham - Jones, “Elements of industrial Robotics” Pitman Publishing, 1987.
2. J. M. Selig, "Introductory Robotics", Prentice Hall, 1992.
3. John Iovine, "Robots, Android and Animatronics", Second Edition, McGraw-Hill, 2012.
4. John M. Holland, "Designing Autonomous Mobile Robots-Inside the mind of an Intelligent Machine", Newnes Publication, 2004.
5. Robert J. Schilling, "Fundamentals of Robotics- Analysis and Control", Pearson Education, 2006.

REFERENCES:

1. Mikell P.Groover, Mitchell Weiss, Roger N.Nagel Nicholas G.Odrey, “Industrial Robotics Technology, Programming and Applications “, McGraw Hill Book Company 1986.
2. Fu K.S. Gonzaleaz R.C. and Lee C.S.G., “Robotics Control Sensing, Vision and Intelligence“, McGraw Hill, International Editions, 1987.
3. Bernard Hodges and Paul Hallam, “Industrial Robotics”, British Library Cataloging in Publication 1990.
4. Deb, S.R. Robotics Technology and flexible automation, Tata McGraw Hill, 1994.

Attested

EC7078 SOFT COMPUTING AND APPLICATIONS L T P C
3 0 0 3

OBJECTIVES:

- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- This course gives an idea and principles of various soft computing techniques, which are applicable to core areas such as networks , pattern recognition, image processing
- To introduce fuzzy set theory
- To teach different optimization techniques
- To introduce neural networks and neuro-fuzzy modeling
- To teach various applications of computational intelligence

UNIT I FUZZY SET THEORY 10

Introduction to Neuro – Fuzzy and Soft Computing – Fuzzy Sets – Basic Definition and Terminology – Set-theoretic Operations – Member Function Formulation and Parameterization – Fuzzy Rules and Fuzzy Reasoning – Extension Principle and Fuzzy Relations – Fuzzy If-Then Rules – Fuzzy Reasoning – Fuzzy Inference Systems – Mamdani Fuzzy Models – Sugeno Fuzzy Models – Tsukamoto Fuzzy Models – Input Space Partitioning and Fuzzy Modeling.

UNIT II OPTIMIZATION 8

Derivative-based Optimization – Descent Methods – The Method of Steepest Descent – Classical Newton's Method – Step Size Determination – Derivative-free Optimization – Genetic Algorithms – Simulated Annealing – Random Search – Downhill Simplex Search.

UNIT III NEURAL NETWORKS 10

Supervised Learning Neural Networks – Perceptrons - Adaline – Backpropagation Mutilayer Perceptrons – Radial Basis Function Networks – Unsupervised Learning Neural Networks – Competitive Learning Networks – Kohonen Self-Organizing Networks – Learning Vector Quantization – Hebbian Learning.

UNIT IV NEURO FUZZY MODELING 9

Adaptive Neuro-Fuzzy Inference Systems – Architecture – Hybrid Learning Algorithm – Learning Methods that Cross-fertilize ANFIS and RBFN – Coactive Neuro Fuzzy Modeling– Framework Neuron Functions for Adaptive Networks – Neuro Fuzzy Spectrum.

UNIT V APPLICATIONS OF COMPUTATIONAL INTELLIGENCE 8

Printed Character Recognition – Inverse Kinematics Problems – Automobile Fuel Efficiency Prediction – Soft Computing for Color Recipe Prediction**.**

TOTAL : 45 PERIODS

OUTCOMES:

- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
- Upon completion of the course, the student should be able to:
- Apply various soft computing frame works.
- Design of various neural networks.
- Use fuzzy logic.
- Discuss hybrid soft computing

TEXT BOOKS:

1. J.S.R.Jang, C.T.Sun and E.Mizutani, "Neuro-Fuzzy and Soft Computing", PHI, 2004, Pearson Education 2004.
2. N.P.Padhy, "Artificial Intelligence and Intelligent Systems", Oxford University Press, 2006.

REFERENCES:

1. Timothy J.Ross, “Fuzzy Logic with Engineering Applications”, McGraw-Hill, 1997.
2. Davis E.Goldberg, “Genetic Algorithms: Search, Optimization and Machine Learning”, Addison Wesley, N.Y., 1989.
3. S. Rajasekaran and G.A.V.Pai, “Neural Networks, Fuzzy Logic and Genetic Algorithms”, PHI, 2003.
4. R.Eberhart, P.Simpson and R.Dobbins, “Computational Intelligence - PC Tools”, AP Professional, Boston, 1996.
5. Dr.S.N.Sivanandam and S.N.Deepa, “Principles of Soft Computing”, Wiley India, 2007.
6. Amit Konar, “Artificial Intelligence and Soft Computing Behaviour and Cognitive model of the human brain”, CRC Press, 2008.

EC7079 SPEECH PROCESSING L T P C

3 0 0 3

OBJECTIVES:

- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To introduce speech production and related parameters of speech
- To show the computation and use of techniques such as short time Fourier transform, linear predictive coefficients and other coefficients in the analysis of speech
- To understand different speech modeling procedures such as Markov and their implementation issues
- To introduce speech recognition and synthesis techniques

UNIT I BASIC CONCEPTS 10

Speech Fundamentals: Articulatory Phonetics – Production and Classification of Speech Sounds; Acoustic Phonetics – Acoustics of speech production; Review of Digital Signal Processing concepts; Short-Time Fourier Transform, Filter-Bank and LPC Methods.

UNIT II SPEECH ANALYSIS 10

Features, Feature Extraction and Pattern Comparison Techniques: Speech distortion measures – mathematical and perceptual – Log–Spectral Distance, Cepstral Distances, Weighted Cepstral Distances and Filtering, Likelihood Distortions, Spectral Distortion using a Warped Frequency Scale, LPC, PLP and MFCC Coefficients, Time Alignment and Normalization –Dynamic Time Warping, Multiple Time – Alignment Paths.

UNIT III SPEECH MODELING 8

Hidden Markov Models: Markov Processes, HMMs – Evaluation, Optimal State Sequence – Viterbi Search, Baum-Welch Parameter Re-estimation, Implementation issues.

UNIT IV SPEECH RECOGNITION 8

Large Vocabulary Continuous Speech Recognition: Architecture of a large vocabulary continuous speech recognition system – acoustics and language models – n-grams, context dependent sub-word units; Applications and present status.

UNIT V SPEECH SYNTHESIS 9

Text-to-Speech Synthesis: Concatenative and waveform synthesis methods, sub-word units for TTS, intelligibility and naturalness – role of prosody, Applications and present status.

TOTAL: 45 PERIODS

OUTCOMES:

- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
- To design fundamental algorithms for speech synthesis, coding and recognition
- To design systems for realizing multimedia applications with basic speech signal processing techniques

TEXT BOOKS:

1. Lawrence Rabinerand Biing-Hwang Juang, “Fundamentals of Speech Recognition”, Pearson Education, 2003.
2. Daniel Jurafsky and James H Martin, “Speech and Language Processing – An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition”, Pearson Education, 2002.

REFERENCES:

1. Frederick Jelinek, “Statistical Methods of Speech Recognition”, MIT Press, 1997.
2. Steven W. Smith, “The Scientist and Engineer’s Guide to Digital Signal Processing”, California Technical Publishing, 1997.
3. Thomas F Quatieri, “Discrete-Time Speech Signal Processing – Principles and Practice”, Pearson Education, 2004.
4. Claudio Becchetti and LucioPrinaRicotti, “Speech Recognition”, John Wiley and Sons, 1999.
5. Ben Gold and Nelson Morgan, “Speech and audio signal processing, Processing and Perception of Speech and Music”, Wiley- India Edition, 2006 Edition.

GE7071 DISASTER MANAGEMENT L T P C
3 0 0 3

OBJECTIVES:

- To provide students an exposure to disasters, their significance and types.
- To ensure that students begin to understand the relationship between vulnerability, disasters, disaster prevention and risk reduction
- To gain a preliminary understanding of approaches of Disaster Risk Reduction (DRR)
- To enhance awareness of institutional processes in the country and
- To develop rudimentary ability to respond to their surroundings with potential disaster response in areas where they live, with due sensitivity

UNIT I INTRODUCTION TO DISASTERS 9

Definition: Disaster, Hazard, Vulnerability, Resilience, Risks – Disasters: Types of disasters – Earthquake, Landslide, Flood, Drought, Fire etc - Classification, Causes, Impacts including social, economic, political, environmental, health, psychosocial, etc.- Differential impacts- in terms of caste, class, gender, age, location, disability - Global trends in disasters: urban disasters, pandemics, complex emergencies, Climate change- Dos and Don’ts during various types of Disasters.

UNIT II APPROACHES TO DISASTER RISK REDUCTION (DRR) 9

Disaster cycle - Phases, Culture of safety, prevention, mitigation and preparedness community based DRR, Structural- nonstructural measures, Roles and responsibilities of- community, Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs), States, Centre, and other stake-holders- Institutional Processes and Framework at State and Central Level- State Disaster Management Authority(SDMA) – Early Warning System – Advisories from Appropriate Agencies.

Attested

DIRECTOR
Centre for Academic Courses
Anna University, Chennai-600 025

UNIT III INTER-RELATIONSHIP BETWEEN DISASTERS AND DEVELOPMENT 9

Factors affecting Vulnerabilities, differential impacts, impact of Development projects such as dams, embankments, changes in Land-use etc.- Climate Change Adaptation- IPCC Scenario and Scenarios in the context of India - Relevance of indigenous knowledge, appropriate technology and local resources.

UNIT IV DISASTER RISK MANAGEMENT IN INDIA 9

Hazard and Vulnerability profile of India, Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management, Institutional arrangements (Mitigation, Response and Preparedness, Disaster Management Act and Policy - Other related policies, plans, programmes and legislation – Role of GIS and Information Technology Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessment.

UNIT V DISASTER MANAGEMENT: APPLICATIONS AND CASE STUDIES AND FIELD WORKS 9

Landslide Hazard Zonation: Case Studies, Earthquake Vulnerability Assessment of Buildings and Infrastructure: Case Studies, Drought Assessment: Case Studies, Coastal Flooding: Storm Surge Assessment, Floods: Fluvial and Pluvial Flooding: Case Studies; Forest Fire: Case Studies, Man Made disasters: Case Studies, Space Based Inputs for Disaster Mitigation and Management and field works related to disaster management.

TOTAL: 45 PERIODS

OUTCOMES:

The students will be able to

- Differentiate the types of disasters, causes and their impact on environment and society
- Assess vulnerability and various methods of risk reduction measures as well as mitigation.
- Draw the hazard and vulnerability profile of India, Scenarious in the Indian context, Disaster damage assessment and management

TEXT BOOKS:

1. Singhal J.P. “Disaster Management”, Laxmi Publications, 2010. ISBN-10: 9380386427 ISBN-13: 978-9380386423
2. Tushar Bhattacharya, “Disaster Science and Management”, McGraw Hill India Education Pvt. Ltd., 2012. **ISBN-10:** 1259007367, **ISBN-13:** 978-1259007361]
3. Gupta Anil K, Sreeja S. Nair. Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi, 2011
4. Kapur Anu Vulnerable India: A Geographical Study of Disasters, IIAS and Sage Publishers, New Delhi, 2010.

REFERENCES:

1. Govt. of India: Disaster Management Act , Government of India, New Delhi, 2005
2. Government of India, National Disaster Management Policy,2009.

GE7072 FOUNDATION SKILLS IN INTEGRATED PRODUCT DEVELOPMENT L T P C 3 0 0 3

OBJECTIVES:

- To understand the global trends and development methodologies of various types of products and services
- To conceptualize, prototype and develop product management plan for a new product based on the type of the new product and development methodology integrating the hardware, software, controls, electronics and mechanical systems

- To understand requirement engineering and know how to collect, analyze and arrive at requirements for new product development and convert them in to design specification
- To understand system modeling for system, sub-system and their interfaces and arrive at the optimum system specification and characteristics
- To develop documentation, test specifications and coordinate with various teams to validate and sustain up to the EoL (End of Life) support activities for engineering customer

UNIT I FUNDAMENTALS OF PRODUCT DEVELOPMENT 9

Global Trends Analysis and Product decision - Social Trends - Technical Trends- Economical Trends - Environmental Trends - Political/Policy Trends - Introduction to **Product Development Methodologies and Management** - Overview of Products and Services - Types of Product Development - Overview of Product Development methodologies - Product Life Cycle - Product Development Planning and Management

UNIT II REQUIREMENTS AND SYSTEM DESIGN 9

Requirement Engineering - Types of Requirements - Requirement Engineering - Traceability Matrix and Analysis - Requirement Management - **System Design & Modeling** - Introduction to System Modeling - System Optimization - System Specification - Subsystem Design - Interface Design

UNIT III DESIGN AND TESTING 9

Conceptualization - Industrial Design and User Interface Design - Introduction to Concept generation Techniques **– Challenges in Integration of Engineering Disciplines** - Concept Screening & Evaluation - **Detailed Design** - Component Design and Verification – **Mechanical, Electronics and Software Subsystems** - High Level Design/Low Level Design of S/W Program - Types of Prototypes, S/W Testing- Hardware Schematic, Component design, Layout and Hardware Testing – **Prototyping** - Introduction to Rapid Prototyping and Rapid Manufacturing - System Integration, Testing, Certification and Documentation

UNIT IV SUSTENANCE ENGINEERING AND END-OF-LIFE (EOL) SUPPORT 9

Introduction to Product verification processes and stages - Introduction to Product validation processes and stages - Product Testing standards and Certification - Product Documentation - **Sustenance** - Maintenance and Repair – Enhancements - **Product EoL** - Obsolescence Management - Configuration Management - EoL Disposal

UNIT V BUSINESS DYNAMICS ENGINEERING SERVICES INDUSTRY 9

The Industry - Engineering Services Industry - Product development in Industry versus Academia - **The IPD Essentials** - Introduction to vertical specific product development processes - Manufacturing/Purchase and Assembly of Systems - Integration of Mechanical, Embedded and S/W systems – Product development Trade-offs - Intellectual Property Rights and Confidentiality - Security and configuration management.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Define, formulate and analyze a problem
- Solve specific problems independently or as part of a team
- Gain knowledge of the Innovation & Product Development process in the Business Context
- Work independently as well as in teams
- Manage a project from start to finish

TEXT BOOKS:

1. Book specially prepared by NASSCOM as per the MoU

2. Karl T Ulrich and Stephen D Eppinger, "Product Design and Development", Tata McGraw Hill, Fifth Edition, New Delhi, 2011
3. John W New Storm and Keith Davis, "Organizational Behavior", Tata Mc Graw Hill, Eleventh Edition, New Delhi, 2005.

REFERENCES:

1. Hiriyappa B, —Corporate Strategy – Managing the Business‖, Authorhouse, USA, 2013
2. Peter F Drucker, —People and Performance‖, Butterworth – Heinemann [Elsevier], Oxford, UK, 2004.
3. Vinod Kumar Garg and Venkitakrishnan N, K, —Enterprise Resource Planning – Concepts and Practice‖, Prentice Hall India, New Delhi, 2003
4. Mark S Sanders and Ernest J McCormick, "Human Factors in Engineering and Design", McGraw Hill Education, Seventh Edition, New Delhi, 2013.

GE7074 HUMAN RIGHTS L T P C
3 0 0 3

OBJECTIVES:

- To sensitize the Engineering students to various aspects of Human Rights.

UNIT I **9**

Human Rights – Meaning, origin and Development. Notion and classification of Rights – Natural, Moral and Legal Rights. Civil and Political Rights, Economic, Social and Cultural Rights; collective / Solidarity Rights.

UNIT II **9**

Evolution of the concept of Human Rights Magana carta – Geneva convention of 1864. Universal Declaration of Human Rights, 1948. Theories of Human Rights.

UNIT III **9**

Theories and perspectives of UN Laws – UN Agencies to monitor and compliance.

UNIT IV **9**

Human Rights in India – Constitutional Provisions / Guarantees.

UNIT V **9**

Human Rights of Disadvantaged People – Women, Children, Displaced persons and Disabled persons, including Aged and HIV Infected People. Implementation of Human Rights – National and State Human Rights Commission – Judiciary – Role of NGO‘s, Media, Educational Institutions, Social Movements.

TOTAL: 45 PERIODS

OUTCOMES:

- Engineering students will acquire the basic knowledge of human rights

REFERENCES:

1. Kapoor S.K., —Human Rights under International law and Indian Laws, Central Law Agency, Allahabad, 2014.
2. Chandra U., —Human Rights‖, Allahabad Law Agency, Allahabad, 2014.
3. Upendra Baxi, The Future of Human Rights, Oxford University Press, New Delhi.

GE7351 ENGINEERING ETHICS AND HUMAN VALUES L T P C
(Common to all branches) **3 0 0 3**

OBJECTIVES
- To emphasize into awareness on Engineering Ethics and Human Values.
- To understand social responsibility of an engineer.
- To appreciate ethical dilemma while discharging duties in professional life.

UNIT I HUMAN VALUES 3
Morals, Values and Ethics – Integrity – Work Ethic – Honesty – Courage –Empathy – Self-Confidence – Discrimination- Character.

UNIT II ENGINEERING ETHICS 9
Senses of 'Engineering Ethics' - variety of moral issues - types of inquiry - moral dilemmas - moral autonomy - Kohlberg's theory - Gilligan's theory - consensus and controversy – Models of Professional Roles - theories about right action - Self-interest –Professional Ideals and Virtues - uses of ethical theories. Valuing Time – Co-operation – Commitment

UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION 9
Engineering as experimentation - engineers as responsible experimenters - codes of ethics – Importance of Industrial Standards - a balanced outlook on law – anticorruption- occupational crime -the challenger case study.

UNIT IV ENGINEER'S RIGHTS AND RESPONSIBILITIESON 12
Collegiality and loyalty – Respect for authority – Collective Bargaining – Confidentiality- Conflict of interest – Occupational Crime – Professional Rights – IPR- Safety and risk - assessment of safety and risk - risk benefit analysis and reducing risk - the Three Mile Island, Bhopal Gas plant and Chernobyl as case studies.

UNIT V GLOBAL ISSUES 12
Multinational corporations - Environmental ethics - computer ethics - weapons development - engineers as managers-consulting engineers-engineers as expert witnesses and advisors -moral leadership-Sample code of conduct.

TOTAL : 45 PERIODS

OUTCOMES:
- Students will have the ability to perform with professionalism , understand their rights, legal, ethical issues and their responsibilities as it pertains to engineering profession with engaging in life-long learning with knowledge of contemporary issues.

TEXT BOOKS
1. Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw-Hill, New York 2005.
2. Charles E Harris, Michael S. Protchard and Michael J Rabins, "Engineering Ethics – Concepts and Cases", Wadsworth Thompson Leatning, United States, 2000 (Indian
3. Govindarajan M, Natarajan S, Senthil Kumar V. S, "Engineering Ethics", Prentice Hall of India, New Delhi, 2004.

REFERENCES:
1. Charles D. Fleddermann, "Engineering Ethics", Pearson Education / Prentice Hall, New Jersey, 2004
2. Charles E Harris, Michael S. Protchard and Michael J Rabins, "Engineering Ethics – Concepts and Cases", Wadsworth Thompson Leatning, United States, 2000
3. John R Boatright, "Ethics and the Conduct of Business", Pearson Education, New Delhi, 2003.
4. Edmund G Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientists and

Engineers", Oxford Press , 2000
5. R.Subramanian , "Professional Ethics ",Oxford University Press ,Reprint ,2015.

GE7652 TOTAL QUALITY MANAGEMENT L T P C
3 0 0 3

AIM:
To provide comprehensive knowledge about the principles, practices, tools and techniques of Total quality management.

OBJECTIVES:
- To understand the need for quality, its evolution, basic concepts, contribution of quality gurus, TQM framework, Barriers and Benefits of TQM.
- To understand the TQM Principles.
- To learn and apply the various tools and techniques of TQM.
- To understand and apply QMS and EMS in any organization.

UNIT I INTRODUCTION 9
Introduction - Need for quality - Evolution of quality - Definition of quality - Dimensions of product and service quality –Definition of TQM-- Basic concepts of TQM –-Gurus of TQM (Brief introduction) -- TQM Framework- Barriers to TQM –Benefits of TQM.

UNIT II TQM PRINCIPLES 9
Leadership--The Deming Philosophy, Quality council, Quality statements and Strategic planning--Customer Satisfaction –Customer Perception of Quality, Feedback, Customer complaints, Service Quality, Kano Model and Customer retention – Employee involvement – Motivation, Empowerment, Team and Teamwork, Recognition & Reward and Performance Appraisal--Continuous process improvement – Juran Trilogy, PDSA cycle, 5s and Kaizen - Supplier partnership – Partnering, Supplier selection, Supplier Rating and Relationship development.

UNIT III TQM TOOLS & TECHNIQUES I 9
The seven traditional tools of quality – New management tools – Six-sigma Process Capability–Bench marking – Reasons to bench mark, Bench marking process, What to Bench Mark, Understanding Current Performance, Planning, Studying Others, Learning from the data, Using the findings, Pitfalls and Criticisms of Bench Marking – FMEA – Intent of FMEA, FMEA Documentation, Stages, Design FMEA and Process FMEA.

UNIT IV TQM TOOLS & TECHNIQUES II 9
Quality circles – Quality Function Deployment (QFD) – Taguchi quality loss function – TPM – Concepts, improvement needs – Performance measures-- Cost of Quality - BPR.

UNIT V QUALITY MANAGEMENT SYSTEM 9
Introduction—Benefits of ISO Registration—ISO 9000 Series of Standards—Sector-Specific Standards—AS 9100, TS16949 and TL 9000-- ISO 9001 Requirements—Implementation—Documentation—Internal Audits—Registration--**ENVIRONMENTAL MANAGEMENT SYSTEM:** Introduction—ISO 14000 Series Standards—Concepts of ISO 14001—Requirements of ISO 14001—Benefits of EMS.

TOTAL: 45 PERIODS

OUTCOMES:
- Ability to apply TQM concepts in a selected enterprise.
- Ability to apply TQM principles in a selected enterprise.
- Ability to apply the various tools and techniques of TQM.
- Ability to apply QMS and EMS in any organization.

TEXT BOOK:

1. Dale H.Besterfiled, Carol B.Michna,Glen H. Besterfield, Mary B.Sacre,Hemant Urdhwareshe and Rashmi Urdhwareshe, “Total Quality Management”, Pearson Education Asia, Revised Third Edition, Indian Reprint, Sixth Impression,2013.

REFERENCES:

1. James R. Evans and William M. Lindsay, “The Management and Control of Quality”, (6th Edition), South-Western (Thomson Learning), 2005.
2. Oakland, J.S. “TQM – Text with Cases”, Butterworth – Heinemann Ltd., Oxford, Third Edition, 2003.
3. Suganthi,L and Anand Samuel, “Total Quality Management”, Prentice Hall (India) Pvt. Ltd., 2006 .
4. Janakiraman,B and Gopal, R.K, “Total Quality Management – Text and Cases”,Prentice Hall (India) Pvt. Ltd., 2006.