SCHEME & SYLLABUS

for

B.TECH. COURSE

in

Electronics and Communication Engineering

(w.e.f. Session 2017)

DEPARTMENT OF ELECTRONICS ENGINEERING

YMCA UNIVERSITY OF SCIENCE AND TECHNOLOGY FARIDABAD

VISION

YMCA University of Science and Technology aspires to be a nationally and internationally acclaimed leader in technical and higher education in all spheres which transforms the life of students through integration of teaching, research and character building.

MISSION

- To contribute to the development of science and technology by synthesizing teaching, research and creative activities.
- To provide an enviable research environment and state-of-the-art technological exposure to its scholars.
- To develop human potential to its fullest extent and make them emerge as world class leaders in their professions and enthuse them towards their social responsibilities.

Department of Electronics Engineering

VISION

To be a Centre of Excellence for producing high quality engineers and scientists capable of providing sustainable solutions to complex problems and promoting cost effective indigenous technology in the area of Electronics, Communication & Control Engineering for Industry, Research Organizations, Academia and all sections of society.

MISSION

- To frame a well-balanced curriculum with an emphasis on basic theoretical knowledge as well the requirements of the industry.
- To motivate students to develop innovative solutions to the existing problems for betterment of the society.
- Collaboration with the industry, research establishments and other academic institutions to bolster the research and development activities.
- To provide infrastructure and financial support for culmination of novel ideas into useful prototypes.
- To promote research in emerging and interdisciplinary areas and act as a facilitator for knowledge generation and dissemination through Research, Institute - Industry and Institute-Institute interaction.

About Electronics Engineering Department

YMCA University of Science & Technology, Faridabad established in 2009, formerly known as YMCA Institute of Engineering, Faridabad, established in year 1969 as a Joint Venture of Govt. of Haryana and National Council of YMCA of India with active assistance from overseas agencies of West Germany to produce highly practical oriented personnel in specialized field of engineering to meet specific technical manpower requirement of industries. Electronics Engineering Department started in 1969 and has been conducting B.Tech. Courses in Electronics Instrumentation and Control and Electronics and Communication Engineering of 4-Years duration since 1997. Students are admitted through centralized counseling nominated by state govt. in 1st Year and 2nd year through lateral entry entrance test. Besides under graduate degree courses, it is also running M.Tech. Courses in VLSI, Instrumentation and Electronics & Communication. Department of Electronics Engineering is also running Ph.D. Programme. All courses are duly approved by AICTE/ UGC. The Electronics Engineering Department has been well known for its track record of employment of the pass out students since its inception.

The Department has good infrastructure consisting of 11 laboratories, 10 Lecture Halls and 1 Conference Room beside 6 workshops. It has excellent faculty with 2 Professors, 4 Associate Professors and 23 Assistant Professors. At present, 8 faculty members are PhD in various specializations. The various syllabi of UG/PG courses have been prepared with active participation from Industry. The Department is organizing number of expert lectures from industry experts for students in every semester. Seven month training is mandatory for every B.Tech. Students. Emphasis has been given on project work and workshop for skill enhancement of students. Choice based credit system allows students to study the subjects of his/her choice from a number of elective courses /audit courses.

PROGRAM EDUCATIONAL OBJECTIVES (PEOS)

1. To prepare students to excel in undergraduate programmes and succeed in industry/ technical profession through global, rigorous education.

2. To provide students with a solid foundation in mathematical, scientific and engineering fundamentals required to solve engineering problems and also to pursue higher studies.

3. To train students with good scientific and engineering breadth so as to comprehend, analyze, design, and create novel products and solutions for the real life problems.

4. To provide students with foundation in skill development required to design, develop and fabricate engineering products

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5. To inculcate in students professional and ethical attitude, effective communication skills, teamwork skills, multidisciplinary approach, and an ability to relate engineering issues to broader social context, additional courses with regard to physical, psychological and career growth.

6. To provide student with an academic environment aware of excellence, outstanding leadership, written ethical codes and guidelines with moral values, and the life-long learning needed for successful professional career.

PROGRAMME OUTCOMES (POs)

Engineering Graduates will be able to:

1) Engineering knowledge: Apply knowledge of mathematics, science, engineering fundamentals, and Electronics Engineering to the solution of engineering problems.

2) Problem analysis: Identify, formulate, review literature and analyze Electronics Engineering problems to design, conduct experiments, analyze data and interpret data.

3) Design /development of solutions: Design solution for Electronics Engineering problems and design system component of processes that meet the desired needs with appropriate consideration for the public health and safety, and the cultural, societal and the environmental considerations.

4) Conduct investigations of complex problems: Use research based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions in Electronics Engineering.

5) Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to Electronics Engineering activities with an understanding of the limitations.

6) The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to mechanical engineering practice.

7) Environment and sustainability: Understand the impact of the Electronics Engineering solutions in societal and environmental contexts, and demonstrate the knowledge and need for sustainable development.

8) Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the Electronics Engineering practice.

9) Individual and team work: Function affectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings in Electronics Engineering.

10) Communication: Communicate effectively on complex engineering activities with the engineering committee and with society at large, such as, being able to comprehend and write affective reports and design documentation, make effective presentations in Electronics Engineering.

11) Project Management and finance: Demonstrate knowledge & understanding of the mechanical engineering principles and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments in Electronics Engineering.

12) Life - long learning: Recognize the need for, and the preparation and ability to engage in independent research and lifelong learning in the broadest contest of technological changes in Electronics Engineering.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

1. To apply the fundamental and design knowledge in the areas of analog & digital circuits, Electronics and Communication Systems.
2. To pursue higher studies or get placed in Industries and Organizations.

GRADING SCHEME

Marks %	Grade	Grade points	Category
90-100	O	10	Outstanding
80<marks<90	A+	9	Excellent
70<marks< 80	A	8	Very good
60<marks< 70	B+	7	Good
50<marks< 60	B	6	Above average
45<marks< 50	C	5	Average
40<marks< 45	P	4	Pass
<40	F	0	Fail
	Ab	0	Absent

Percentage calculation= CGPA * 9.5

MINIMUM CREDITS TO BE EARNED FOR DIFFERENT COURSE FOR QUALIFYING FOR THE B.TECH IN ELECTRONICS & COMMUNICATION ENGINEERING

S.N.	Category of Courses	Abbreviation	Credits Offered		Minimum Credits to be Earned
1.	Programme Core Course	PCC	(≥ 80)	87	87
2.	Ability Enhancement Compulsory Course	AECC	(≥ 06)	07	07
3.	Skill Enhancement Course	SEC	(≥ 32)	35	35
4.	Discipline Specific Electives	DSE	(≥ 15)	18	12
5.	General Elective Course	GEC	(≥ 06)	06	03
6.	Basic Science Course	BSC	(≥ 20)	25	25
7.	Basic Engineering Course	BEC	(≥ 15)	17	17
8.	Mandatory Audit Course	MAC	0	0	0
9.	Massive Open Online Courses	MOOCS	4	4	4
	TOTAL		**≥178**	**199**	**190**

GENERAL ELECTIVE COURSES- I and II (Semester- V and VIII respectively)

Students have to select two different General Elective Courses-I and II from the given list:

Courses offered by Computer Engineering Department

S.No.	Code	Name of Course	No. of Contact Hours	Credits
1.	GC-101C	Intelligent Systems	3	3
2.	GC-102C	Cyber laws and Security	3	3
3.	GC-103C	Soft Computing	3	3
4.	GC-104C	Web Technology and Information Retrieval	3	3
5.	GC-105C	Intellectual Property and Rights	3	3

Courses offered by Electrical Engineering Department

S.No.	Code	Name of Course	No. of Contact Hours	Credits
1.	GL-201C	Installation Testing & Maintenance of Electrical Equipments	3	3
2.	GL-202C	Utilization of Electrical Power & Traction	3	3

Courses offered by Mechanical Engineering Department :

S.No.	Code	Name of Course	No. of Contact Hours	Credits
1.	GM-301C	Industrial Engineering	3	3
2.	GM-302C	Quality Management	3	3
3.	GM-303C	Automobile Engineering	3	3
4.	GM-304C	CAM and Automation	3	3
5.	GM-305C	Manufacturing Processes	3	3
6.	GM-306C	Power Plant Engineering	3	3

Courses offered by Electronics Engineering Department

(Not for Electronics Engineering students):

S.No.	Code	Name of Course	No. of Contact Hours	Credits
1.	GE-401C	Microprocessor and Interfacing	3	3
2.	GE-402C	Digital Signal Processing	3	3
3.	GE-403C	Instrumentation and Control	3	3
4.	GE-404C	Data Communication and Networking	3	3

Courses offered by HAS Department

S.No.		Name of Course	No. of Contact Hours	Credits
1.	GA-501C	Soft Skills for Engineers	3	3
2.	GA-502C	Maths –III	3	3

Courses offered by MBA Department

S.No.		Name of Course	No. of Contact Hours	Credits
1.	GB-601C	Human Resource Management	3	3
2.	GB-602C	Financial Management	3	3
3.	GB-603B	Marketing Management	3	3
4.	GB-604B	Entrepreneur Development	3	3
5.	GB-605B	Principles of Management and Economics	3	3

MANDARORY AUDIT COURSES (MAC-I and MAC-II) (Semester- III and IV respectively)

S.No.	Code	Name of Course	No. of Contact Hours	Credits
1.	AC-101C	German- I	2	0
2.	AC-102C	German –II (With German – I as prerequisite)	2	0
3.	AC-103C	French – I	2	0
4.	AC-104C	French –II (With French – I as prerequisite)	2	0
5.	AC-105C	Sanskrit – I	2	0
6.	AC-106C	Sanskrit – II (With Sanskrit– I as prerequisite)	2	0
7.	AC-107C	Personality Development	2	0
8.	AC-108C	Interview and Group Discussion Skills	2	0
9.	AC-109C	Yoga and Meditation	2	0
10.	AC-110C	Art of Living/ Living Skills	2	0
11.	AC-111C	Contribution of NSS towards Nation/Role of NSS	2	0
12.	AC-112C	Physical Education	2	0

Note: Students will have to select any two out of the list.

YMCA UNIVERSITY OF SCIENCE AND TECHNOLOGY, FARIDABAD
PROPOSED SCHEME OF STUDIES & EXAMINATIONS
B.TECH 1st YEAR (SEMESTER -I) ECE ENGINEERING (2017-2018)

Course No.	Course Title	Teaching Schedule			Marks for Sessionals	Marks for End Term Examination		Total Marks	Credits	Course Type
		L	P	TOTAL		Theory	Practical			
HAS-101C	Physics-I	4	-	4	25	75	-	100	4	BSC
HAS-103C	Mathematics-I	4	-	4	25	75	-	100	4	BSC
HAS-109C	Interactive English	3	-	3	25	75	-	100	3	AECC
EE-101C	Basic Electrical Engineering	3	-	3	25	75	-	100	3	BEC
CE-101C	Fundamentals of Computer & Programming with C	3	-	3	25	75	-	100	3	BEC
HAS-151C	Physics Lab-I	-	2	2	25	75	-	100	1	BSC
EE-151C	Basic Electrical Engineering Lab	-	2	2	15	35	-	50	1	BEC
CE-151C	Fundamentals of Computer & Programming with C Lab	-	2	2	15	35	-	50	1	BEC
HAS-159C	Language lab	-	2	2	15	35	-	50	1	AECC
ME-152C	Engineering Drawing	-	4	4	30	70	-	100	2	BEC
WS-161C	Workshop-I	-	6	6	30	70	-	100	3	SEC
	Total	**17**	**18**	**35**	**255**	**695**	**-**	**950**	**26**	

Note: Exams duration will be as under

(a) Theory exams will be of 3 hours duration.

(b) Practical exams will be of 2 hours duration

(c) Workshop exam will be of 3 hours duration

YMCA UNIVERSITY OF SCIENCE AND TECHNOLOGY, FARIDABAD
PROPOSED SCHEME OF STUDIES & EXAMINATIONS
B.TECH 1st YEAR (SEMESTER -II) ECE/ EIC/ EL ENGINEERING (2017-2018)

Course No.	Course Title	Teaching Schedule			Marks for Sessionals	Marks for End Term Examination		Total Marks	Credits	Course Type
		L	P	Total		Theory	Practical			
HAS-102C	Physics-II	4	-	4	25	75	-	100	4	BSC
HAS-104C	Mathematics-II	4	-	4	25	75	-	100	4	BSC
HAS-105C	Chemistry	3	-	3	25	75	-	100	3	BSC
HAS-107C	Environmental Studies	3	-	3	25	75	-	100	3	AECC
EC-101C	Elements of Electronics Engg.	3	-	3	25	75	-	100	3	BEC
ME-101C	Basics of Mechanical Engineering	3	-	3	25	75	-	100	3	BEC
HAS-152C	Physics Lab-II	-	2	2	15	35		50	1	BSC
HAS-155C	Chemistry Lab	-	2	2	15	35	-	50	1	BSC
ME-151C	Basics of Mechanical Engineering Lab	-	2	2	15	35	-	50	1	BEC
WS-162C	Workshop- II	-	6	6	30	70	-	100	3	SEC
	Total	**20**	**12**	**32**	**225**	**625**	**-**	**850**	**26**	

Note: Exams duration will be as under

(a) Theory exams will be of 3 hours duration.
(b) Practical exams will be of 2 hours duration
(c) Workshop exam will be of 3 hours duration

Scheme of Studies & Examination
B.Tech IInd Year (Semester – III)
Electronics & Communication Engineering
w.e.f. Session 2017

Course No.	Course Title	Teaching Schedule				Marks for Sessional	Marks for End Term Examination		Total Marks	Credits	Category Code
		L	T	P	Total		Theory	Practical			
HAS-201C	Mathematics III	3	-	-	3	25	75	-	100	3	BSC
EC-203C	Electrical Engineering Materials & Semiconductor Devices	3	-	-	3	25	75	-	100	3	PCC
EC-205C	Networks Analysis & Synthesis	3	1	-	4	25	75	-	100	4	PCC
EI-207C	Electromechanical Energy Conversion	3	-	-	3	25	75	-	100	3	PCC
EI-209C	Electrical Measurement & Instrumentation	3	-	-	3	25	75	-	100	3	PCC
EC-211C	Analog Electronics	3	1	-	4	25	75	-	100	4	PCC
	MOOC*	4	-	-	4	25	75	-	100	4	MOOC
EC-255C	Network Analysis & Synthesis Lab	-	-	2	2	15	-	35	50	1	PCC
EI-257C	Electromechanical Energy Conversion Lab	-	-	2	2	15	-	35	50	1	PCC
EI-259C	Electrical Measurement & Measuring Instruments Lab	-	-	2	2	15	-	35	50	1	PCC
EC-261C	Analog Electronics Lab	-	-	2	2	15	-	35	50	1	PCC
EC-263C	Workshop-III	-	-	6	6	60	-	140	200	3	SEC
	Mandatory Audit Course-1	2	-	2	-					0	MAC
	Total	24	-	16	38	295	525	280	1100	31	

***Passing in MOOCs course is compulsory.**

Note: Exams Duration will be as under

(a) Theory exams will be of 3 hours duration.
(b) Practical exams will be of 08 hours duration
(c) Workshop exam will be of 8 hours duration

Scheme of Studies & Examination
B.Tech IInd Year (Semester – IV)
Electronics & Communication Engineering
w.e.f. Session 2017

Course No.	Course Title	Teaching Schedule				Marks for Sessional	Marks for End Term Examination		Total Marks	Credits	Category Code
		L	T	P	Total		Theory	Practical			
EI-204C	Signals and Systems	3	1	-	4	25	75	-	100	04	PCC
HAS-206C	Computational Techniques	3	-	-	3	25	75	-	100	03	PCC
EC-208C	Digital Electronics	3	-	-	3	25	75	-	100	03	PCC
EC-210C	Communication Systems	3	-	-	3	25	75	-	100	03	PCC
EC-212C	Electromagnetic Field Theory	3	1	-	4	25	75	-	100	04	PCC
HAS-256C	Computational Techniques Lab	-	-	2	2	15	-	35	50	01	PCC
EC-258C	Digital Electronics Lab	-	-	2	2	15	-	35	50	01	PCC
EC-260C	Communication Systems Lab	-	-	2	2	15	-	35	50	01	PCC
EC-262C	Workshop-IV	-	-	6	6	60	-	140	200	03	SEC
	Mandatory Audit Course-II	2	-	-	2					0	MAC
	Total	**17**	**-**	**12**	**31**	**230**	**375**	**245**	**850**	**26**	

The student will have to select one subject each from list of Mandatory Audit Course-II

Note: Exams Duration will be as under

(a) Theory exams will be of 3 hours duration.
(b) Practical exams will be of 08 hours duration
(c) Workshop exam will be of 8 hours duration

Scheme of Studies & Examination
B.Tech IIIrd Year (Semester Vth)
Electronics & Communication Engineering
w.e.f. Session 2017

Course No.	Course Title	Teaching Schedule				Marks for Sessional	Marks for End Term Examination		Total Marks	Credits	Category Code
		L	T	P	Total		Theory	Practical			
EC-301C	Digital Communication System	3	1	-	4	25	75	-	100	4	PCC
EC-303C	Analog Integrated Circuits	3	1	-	4	25	75	-	100	4	PCC
EC-305C	Antenna & Wave Propagation	3	-	-	3	25	75	-	100	3	PCC
EI-307C	Microprocessors &Interfacing	3	-	-	3	25	75	-	100	3	PCC
	Discipline Specific Elective-I	3	-	-	3	25	75	-	100	3	DSE
	Discipline Specific Elective-II	3	-	-	3	25	75	-	100	3	DSE
	General Elective Course-I*	3	-	-	3	25	75	-	100	3	GEC
	Discipline Specific Elective-II Lab	-	-	2	2	15	-	35	50	1	PCC
EC-351C	Analog Integrated Circuits Lab	-	-	2	2	15	-	35	50	1	PCC
EI-353C	Microprocessors &Interfacing Lab	-	-	2	2	15	-	35	50	1	PCC
EC-359C	Electronics Circuits Simulation Lab	-	-	2	2	15	-	35	50	1	PCC
EC-361C	Workshop-V	-	-	6	6	60	-	140	200	3	SEC
	Total	21	-	15	36	295	525	280	1100	30	

Discipline Specific Elective Course-I

A. Television Engineering (EC-309C)
B. Mechatronics (EI-311C)
C. Switching Theory (EC-313C)

Discipline Specific Elective –II

A. Power Electronics (EI-315C)
B. Software Define Radio (EC-317C)

Discipline Specific Elective -II Lab (to be chosen as per DSE-II)

A. Power Electronics Lab (EI-355C) B. Software Defined radio Lab (EC-357C)

General Elective course –I: The student will have to select one subject each from list of Electives given on page 8.

Note: Exams Duration will be as under

(a) Theory exams will be of 3 hours duration.
(b) Practical exams will be of 08 hours duration
(c) Workshop exam will be of 8 hours duration

Scheme of Studies & Examination
B.Tech III[rd] Year (Semester – VI)
Electronics & Communication Engineering
w.e.f. Session 2017

Course No.	Course Title	Teaching Schedule				Marks for Sessional	Marks for End Term Examination		Total Marks	Credits	Category Code
		L	T	P	Total		Theory	Practical			
EC-302C	Digital Systems Design	3	-	-	3	25	75	-	100	3	PCC
EC-304C	Control Systems Engineering	3	1	-	4	25	75	-	100	4	PCC
EC-306C	MOSIC Technology	3	1	-	4	25	75	-	100	4	PCC
EC-308C	Microwave and Radar Engineering	3	-	-	3	25	75	-	100	3	PCC
	Discipline Specific Elective-III	3	-	-	3	25	75	-	100	3	DSE
	Discipline Specific Elective-IV	3	-	-	3	25	75	-	100	3	DSE
EC-352C	Digital Systems Design Lab	-	-	2	2	15	-	35	50	1	PCC
EC-354C	Control Systems Engineering Lab	-	-	2	2	15	-	35	50	1	PCC
EC-356C	MOSIC Technology Lab	-	-	2	2	15	-	35	50	1	PCC
EC-358C	Microwave Engineering Lab	-	-	2	2	15	-	35	50	1	PCC
EC-362C	Workshop-VI	-	-	6	6	60	-	140	200	3	SEC
	Total	18	-	14	33	270	450	280	1000	27	

Discipline Elective Course-III

A. Data Structure (EC-310C)
B. Real Time Operating Systems (EC-312C)
C. Nano Technology (EC-314C)

Discipline Elective Course-IV

A. Wireless Communication (EC-316C)
B. Cellular and Mobile Communications (EC-318C)

The student will have to select one subject each from list of Electives course.

Note: Exams Duration will be as under

(a) Theory exams will be of 3 hours duration.

(b) Practical exams will be of 08 hours duration

(c) Workshop exam will be of 08 hours duration

Scheme of Studies & Examination
B.Tech IVth Year (Semester VII)
Electronics & Communication Engineering
w.e.f. Session 2017

Course No.	Course Title	Teaching Schedule				Examination		Total Marks	Credits	Category Code
		L	T	P	Total	Internal	External			
EC-401C	Industrial Training	8 hrs per day				150	350	500	10	SEC

A) Procedure for Annual Examination & Marks

1. Training Evaluation	50Marks
2. Training Seminar	50Marks
3. Training Viva	100 Marks
Total (a)	200 Marks

B) Continuous Assessment Marks

1. Assessment by Institute Faculty	100 Marks
2. Assessment by Industrial Guide	100 Marks
3. Conduct Marks	100 Marks
Total (b)	300 Marks
Total (a+b)	500 Marks

Scheme of Studies & Examination
B.Tech IVth Year (Semester VIII)
Electronics & Communication Engineering
w.e.f. Session 2017

Course No.	Course Title	Teaching Schedule				Marks for Sessional	Marks for End Term Examination		Total Marks	Credits	Category Code
		L	T	P	Total		Theory	Practical			
EI-402C	Digital Signal Processing	3	1	-	4	25	75	-	100	4	PCC
EI-404C	Embedded Systems Design	3	-	-	3	25	75	-	100	3	PCC
EC-406C	Computer Networks	3	-	-	3	25	75	-	100	3	PCC
	Discipline Specific Elective-V	3	-	-	3	25	75	-	100	3	DSE
	Discipline Specific Elective-VI	3	-	-	3	25	75	-	100	3	DSE
	General Elective Course-II*	3	-	-	3	25	75	-	100	3	GEC
EI-452C	Digital Signal Processing Lab	-	-	2	2	15	-	35	50	1	SEC
EC-456C	Network Programming Lab	-	-	2	2	15	-	35	50	1	SEC
EC-458C	Major Project	-	-	4	4	30	-	70	100	2	SEC
EC-462C	Workshop-VIII	-	-	6	6	60	-	140	200	3	SEC
	Total	18	-	14	33	270	450	280	1000	26	

Discipline Specific Elective Course-V

A. Optical Communication Systems (EC-408C)
B. Image Processing (EC-410C)
C. IOT (EC-412C)

Discipline Specific Elective Course-VI

A. Satellite Communication (EC-414C) B. Network Security (EC-416C)
C. MIMO Wireless Communications (EC-418C)

General Elective Course-II

Students have to select the one subject as per the list given in Page 8.

The student will have to select one subject each from list of Electives course.

Note: Exams Duration will be as under

(a) Theory exams will be of 3 hours duration.
(b) Practical exams will be of 08 hours duration
(c) Workshop exam will be of 8 hours duration

HAS-101C PHYSICS I

B. Tech I Semester

No. of Credits: 4		Sessional:	25 Marks
L T P Total		Theory:	75 Marks
4 0 0 4		Total :	100 Marks
		Duration of Exam:	3 Hours

Pre –Requisite: *None*

Successive: Physics II, Engineering Mechanics, Material Science

Course Objective:

The objective of the course is to make the students familiar with topics of general physical optics like interference, diffraction, polarization, fiber optics, lasers. The second part of the syllabus consists of theory of relativity, electrostatics and electrodynamics.

Course Outcomes (COs): At the end of the course, the student shall be able to:

CO 1- Understand the basics of interference and diffraction.

CO 2- Understand the phenomenon of polarization and have elementary knowledge of lasers and fibre optics.

CO 3- Know the fundamentals of Electrostatics and Electrodynamics.

CO 4- Comprehend the basics of special theory of relativity.

Syllabus:

UNIT I **Interference:** Coherent sources, conditions for sustained interference, Analytical treatment of interference, Division of Wave-Front - Fresnel's Biprism, Division of Amplitude- Interference by a plane parallel film, Wedge-shaped film, Newton's Rings, Michelson Interferometer, applications (Resolution of closely spaced spectral lines, determination of wavelengths).

Diffraction: Difference between interference and diffraction Fraunhofer and Fresnel diffraction. Fraunhofer diffraction through a single slit, Plane transmission diffraction grating, absent spectra, dispersive power, resolving power and Rayleigh criterion of resolution.

UNIT II **Polarisation:** Polarised and unpolarised light, Uniaxial crystals, optic axis, double refraction, Nicol prism, quarter and half wave plates, Detection and Production of

different types of polarized light, Polarimetry; Optical and specific rotation, Biquartz and Laurent's half shade polarimeter.

Laser and Fibre Optics: Spontaneous and Stimulated emission, Laser principle, Einstein's coefficients, characteristics of laser beam-concept of coherence, spatial and temporal coherence, He-Ne and semiconductor lasers (simple ideas), applications.

Propagation of light in optical fibres, numerical aperture, V-number, single and multimode fibres, Elementary idea of attenuation and dispersion, applications.

UNIT III **Electrostatics:** Dielectric polarization, dielectric relaxation process, types of polarization, relation between E,P and D, Gauss's law in the presence of a dielectric, Energy stored in a uniform electric field, dielectric losses and variation with frequency.

Electrodynamics: Maxwell's field equations –significance, differential and integral form, Maxwell's equations in different media- free space, dielectric and conductor.

UNIT IV **Special Theory of Relativity:** Inertial and non-inertial frames, Galilean transformations, Michelson's Morley Experiment, Postulates of Special Theory of Relativity, Lorentz transformations, Consequences of LT (length contraction and time dilation), addition of velocities, variation of mass with velocity, mass energy equivalence.

Text Books

1. Perspectives of Modern Physics - Arthur Beiser (TMH)
2. Optics – Ajoy Ghatak (TMH)
3. Modern Physics for Engineers – S.P.Taneja (R. Chand)
4. Engineering Physics – Satya Prakash (Pragati Prakashan)
5. Modern Engineering Physics – A.S.Vasudeva (S. Chand)
6. Engineering Physics (Vol-1)- S.L. Gupta (Dhanpat Rai)

Reference Books:

1. Fundamentals of Physics – Resnick & Halliday (Asian Book)
2. Introduction to Electrodynamics – D.J. Griffith (Prentice Hall)

HAS-103C MATHEMATICS I

B. Tech I Semester

No. of Credits: 4		Sessional:	25 Marks
L T P Total		Theory:	75 Marks
4 0 0 4		Total :	100 Marks
		Duration of Exam:	3 Hours

Pre –Requisite: None

Successive: Mathematics II, Numerical Methods, Operations Research

Course Objective:

To make students able to learn about matrices, rank, Eigen values and Eigen vectors and about the quadratic form of the matrices, Taylor's series, Macluarin's series, Asymptotes, Curvature, partial differentiation, Composite and Implicit functions, Maxima-Minima of functions of two variables, Differentiation under the integral sign, Double Integral, Triple Integral, Beta & Gamma functions, Scalar and Vector-point functions, gradient, divergence and curl of a vector, Green's theorem, Stoke's theorem, Gauss-Divergence theorem and their application.

Course Outcomes (COs): At the end of the course, the student shall be able to:

CO 1- Learn about matrices, rank, eigen values and eigen vectors and about the quadratic form of the matrices.

CO 2- Learn about Taylor's series, Macluarin's series , Asymptotes, Curvature, Students learn about partial differentiation, Composite and Implicit functions, Maxima- Minima of functions of two variables, Differentiation under the integral sign.

CO 3- Learn about Double integral, Triple integral, Beta & Gamma functions and their applications.

CO 4- Acquire knowledge about scalar and vector point function, gradient, divergence and curl ,Green's ,Divergence and Stoke's theorem and their applications.

Syllabus:

UNIT I **Matrices and its Applications:** Rank of Matrix, Normal form, Inverse using Gauss-Jordon method, Consistency of linear system of equations using Rank method, Linear and Orthogonal transformation, Linear-dependence and Linear- Independence of Vectors, Eigen-Values and its properties, Eigen-Vectors, Cayley- Hamilton theorem & its applications, Diagonalisation of Matrices, Similar Matrices, Quadratic Forms.

UNIT II **Applications of Derivatives:** Taylor's & Maclaurin's Series for one variable, Asymptotes, Curvature, Radius of Curvature for Cartesian, Parametric and Polar-curves, Radius of curvature at the Origin (by using Newton's method, by method of Expansion), Center of curvature.

Partial Differentiation and its Applications: Functions of two or more variables, Partial derivatives of I^{st} and higher order, Total differential and differentiability, Euler's theorem for Homogeneous functions, Derivatives of Composite and Implicit functions, Jacobians, Taylor's series for functions of two variables, Maxima-Minima of functions of two variables, Lagrange's Method of undetermined multipliers, Differentiation under the integral sign (Leibnitz rule).

UNIT III **Double and Triple Integrations:** Double integral, Change of Order of Integration, Double integral in Polar co-ordinates, Applications of double integral to find (i) Area enclosed by plane curves (ii) Volume of solids of revolution, Triple Integral, Change of variables, Volume of solids, Beta & Gamma functions and relation between them.

UNIT IV **Vector Calculus:** Differentiation of vectors, Scalar and Vector-point functions, Gradient of a scalar field and directional derivatives, Divergence and Curl of a vector field and their physical interpretations, Integration of vectors, line integral, Surface integral, Volume integral, Green's theorem, Stoke's theorem, Gauss- Divergence theorem(without proof) with their simple applications.

Text Books/ Reference Books:

1. Advanced Engineering Mathematics, Erwin Kreyzig
2. B.S.Grewal, Higher Engg. Mathematics, Khanna Publications.
3. Advanced Engineering Mathematics, Dr.Babu Ram, Pearsons publications.
4. Engineering Mathematics Seventh Edition by John Bird, Published by Newnes.
5. Advanced Engineering Mathematics, K.A.Stroud, Dexter Booth, Published by Palgrave.

HAS-109C **INTERACTIVE ENGLISH**

B. Tech I Semester

No. of Credits: 3		Sessional:	25 Marks
L T P Total		Theory:	75 Marks
3 0 0 3		Total :	100 Marks
		Duration of Exam:	3 Hours

Pre –Requisite: None

Successive: None

Course Objective:

To read and discuss text of a chosen Shakespearean tragedy and make students familiar with Romantic poetry in English literature so as to help the students enhance their understanding of value of literature in wider socio-historical context by evoking examples from Elizabethan England, the French revolution and Industrial revolution. Thereby to furnish examples from the literary canon to be first emulated and later critiqued in creative and critical writing. At the same time, to hone the skills of students in written communication by working on the vocabulary of students so they can express themselves clearly and persuasively.

Course Outcome (COs): At the end of the course, the student shall be able to:

CO 1- Students are conversant with representative texts of Shakespeare and Romantic poetry. They also understand the historical context of these literary works.

CO 2- Students are able to communicate effectively in corporate environment.

CO 3- Inculcate critical thinking and demonstrate an ability to articulate their thoughts coherently and creatively.

CO 4- Command a better vocabulary and express their thoughts clearly and precisely.

Syllabus:

UNIT I **Literature:** Shakespeare's Macbeth(story adaptation of play); Romantic poetry- 'The Chimney Sweeper' by Blake, 'To Autumn' by John Keats, 'The Rainbow' by William Wordsworth, 'Ozymandias' by PB Shelley, 'The Rime of the Ancient Mariner' (text of 1834) –Part-I and Part-II by Samuel Coleridge, Historical context of Romantic poetry-French Revolution and Industrial revolution.

UNIT II **Functional English:** Report Writing- hypothesis-evidence-thesis, Proposals/Feasibility and Progress Reports/Memo/Letter formats; Essays/paragraphs; applications; description of objects, appliances, instruments, products, processes.

UNIT III **Critical thinking and Creative Writing:** Critical thinking; creative writing exercises; Seven Cs of writing/ Story composition/news reports/ feature writing/verse composition, Paraphrasing poems, comprehending Unseen Passages, writing biographies, art of interviewing, book reviews.

UNIT IV **Semantics and Syntax:** Antonyms, synonyms, homophones, words often confused, one word substitutes, word origins, sentence correction/error correction exercises in basic grammar.

References:

1. Shakespeare Readers. VolumeI. *Macbeth.* Scholastic India, 2016.
2. Michael Neill, David Schalkwyk. *The Oxford Handbook of Shakespearean Tragedy.* Oxford UP. 2016
3. Claire McEachern.*The Cambridge Companion to Shakespearean Tragedy.* Cambridge UP. 2013
4. RC Sharma and Krishna Mohan. 4th edition. *Business Correspondence and Report Writing*. McGraw Hill.
5. Bretag, Crossman, and Bordia. *Communictaion Skills.* TatMcGraw Hill.2012
6. A.C. Bradley and John Bayley. *Shakespearean Tragedy*. Penguin Books.1991

Other background readings:

1. Das, Manoj *Tales Told by Mystics*. Sahitya Akademi. New Delhi 2001
2. Usha Bande. Pointed Vision: An Anthology of Short Stories. Oxford UP. 2002
3. Reference material consisting of poems and material related to Romantic poetry to be circulated by the teacher consisting of introductory notes on French revolution and industrial revolution.

EE-101C **BASIC ELECTRICAL ENGINEERING**

B. Tech I Semester

No. of Credits: 3	Sessional:	25 Marks
L T P Total	Theory:	75 Marks
3 0 0 3	Total :	100 Marks
	Duration of Exam:	3 Hours

Pre –Requisite: None

Successive: Power Plant Engineering

Course Objectives:

The objective of this Course is to provide the students with an introductory and broad treatment of the field of *Electrical Engineering.*

.C**ourse Outcome (COs):** At the end of the course, the student shall be able to:

- **CO 1-** Analyze and solve the problems of DC Circuits and Network theorems
- **CO 2-** Solve problems related to AC circuits and Magnetic circuits
- **CO 3-** Examine the behaviour of poly phase system and power measurement
- **CO 4-** Understand the working principle, construction and applications of AC & DC machines

Syllabus:

UNIT I **DC Circuits:** Ohm's Law and Kirchhoff‟s Laws; Analysis of series, parallel and series-parallel circuits excited by independent voltage sources; Power and energy; *Electromagnetism*:- Faradays Laws, Lenz's Law, Fleming's Rules, Statically and dynamically induced EMF; Concepts of self inductance, mutual inductance and coefficient of coupling; Energy stored in magnetic fields; Hysteresis and Eddy current losses.

UNIT II **Network Theorems:** Superposition, Thevenin's and Norton's, Reciprocity, Compensation, Maximum Power transfer, Tellegan's and Millman's theorems, Application of theorems to dc and ac circuits.

UNIT III **AC Circuits:** *Single Phase A.C. Circuits :-*Generation of sinusoidal voltage-definition of average value, root mean square value, form factor and peak factor of sinusoidal voltage and current and phasor representation of alternating quantities; Analysis with phasor diagrams of R, L, C, RL, RC and RLC circuits; Real power, reactive power, apparent power and power factor, series, parallel and series- parallel circuits, Series and Parallel resonance, selectivity, bandwidth and Q factor, earthing

Three Phase A.C. Circuits:- Necessity and Advantages of three phase systems, Generation of three phase power, definition of Phase sequence, balanced supply and balanced load; Relationship between line and phase values of balanced star and delta connections; Power in balanced three phase circuits, measurement of power by two wattmeter method.

UNIT IV **Electrical Machines:**

Transformers: - Principle of operation and construction of single phase transformers (core and shell types). EMF equation, losses, efficiency and voltage regulation, Principle of operation of an Auto Transformer. Applications.

Synchronous Generators: - Principle of operation and constructional features, Applications

DC Machines:- Principle of Operation and constructional features, Classification and Applications.

Three Phase Induction Motor:- Principle of Rotating Magnetic Field, Principle of Operation of 3-Phase Induction Motor, Starting Methods and Applications of Three Phase Induction Motors.

Text Books:

1. Edward Hughes, Electrical Technology,10th Edition,ELBS 2010
2. Electrical Engg. Fundamentals. By V. Del Toro Prentice Hall
3. Electrical Technology, By H. Cotton, 7th Edition
4. Basic Electrical Engineering by Kothari & Nagrath TMH

CE-101C FUNDAMENTALS OF COMPUTER AND PROGRAMMING WITH C

B.Tech I Semester

No. of Credits: 3	Sessional: 25 Marks
L T P Total	Theory: 75 Marks
3 0 0 3	Total: 100 Marks
	Duration of Exam: 3 Hours

Pre-Requisite: None

Successive: Kinematics of Machines and Operations Research

NOTE: Question paper has two parts. Part-1 has 10 questions each of 2 marks. It covers the entire syllabus. Attempt any four questions out of six from Part-2.

Course Objectives:

1. To understand the major components of computer system, programming languages and networking concepts.
2. To understand the basic building blocks of C language like variables, data types, managing I/O etc.
3. To understand the different statements like sequential, decision making, iterative such as if-else, loops and derived data types like arrays, structures etc.
4. To learn about the concept of Pointers and understand functions and file handling.

Course Outcomes (COs): After the successful completion of the course, student is able to:

CO 1- Learn the major components of computer system, programming language and Networking.

CO 2- Understand the building blocks of C language like variables, data types, managing I/O etc.

CO 3- Understand the different statements like sequential, decision making, iterative such as if-else, loops and derived data types like arrays and structures.

CO 4- Learn about the concept of Pointers and understand functions and file handling.

Syllabus:

UNIT I **An Overview of Computer System and Operating Systems:** Fundamentals: Hardware organization of a computer, CPU, Input/ Output Devices, Memories, Registers, Ports.

Different Number Systems:- Decimal Number System, Binary Number System, Octal Number System, Hexadecimal Number System, and their inter-conversions.

Operating System Basics: Introduction to Operating system, Functions of an Operating Systems, Classification of Operating Systems.

UNIT II **Basic Introduction to Programming Languages:** Machine Language, Assembly Languages, High level Languages, Types of high level languages, Complier, Interpreter, Assembler, Loader, Linker, Relationship between Compiler, Loader and Linker. Flowcharts.

UNIT III **Basic Introduction to Computer Networks:** LAN, MAN, WAN, OSI Reference model, Introduction to Internet and protocols: TCP/IP ref. model, Network connecting devices. Hypertext documents, HTTP, DNS, Network Security.

UNIT IV **An Overview of C:** Basic and Derived Data Types: Constants, Variables and Data types, operators and Expressions, managing I/O operations, Decision Making, branching and looping, Derived Data Types like Arrays, Strings.

Structure and Union in C: Defining structure, declaring variables, Accessing structure members, structure initialization, copying and comparing structures variables, operations on individual members, Array of structure, structure with structure, unions.

UNIT V **Pointers in C:** Introduction, Understanding Pointers, Accessing the address of a variable, Declaring Pointer Variables, Initialization of Pointer Variables, Pointer Expressions, Pointer Increments and Scale Factors, pointers and Arrays, Pointer and Character Strings, Pointers as Function Arguments, Pointers to Functions.

UNIT VI **File Management in C:** Defining and opening file, closing file, I/O operation on files, error handling during I/O operations.

Text Books:

1. Fundamental of Information Technology by A.Leon & M.Leon.
2. Let Us C by Yashwant Kanetkar.
3. Computer Fundamentals and Programming in C by A. K. Sharma, Universities Press.

Reference Books:

1. Programming in C by Schaum Series.
2. Computer Networks (4th Edition) by Andrew S. Tanenbaum
3. Digital Principles and Application by Donald Peach, Albert Paul Malvino
4. Operating System Concepts, (6th Edition) by Abraham Silberschatz, Peter Baer Galvin, Greg Gagne.

HAS-151C PHYSICS LAB - I

B. Tech I Semester

No. of Credits: 1		Sessional:	15 Marks
L T P Total		Practical:	35 Marks
0 0 2 2		Total :	50 Marks
		Duration of Exam:	2 Hours

Pre –Requisite: Physics - I

Successive: None

Course Objectives:

A physics lab reinforces the theory class with required physics lab experiments to stress the fundamental concepts of physics. Optical experiments, which will establish the fundamental interference, diffraction phenomena which will be clearly visualized with the experiment mentioned in the syllabus.

Course Outcomes (COs): After studying this course the students will be able to:

CO 1- The students are able to determine the wavelength of different colour using different instruments.

CO 2- The students are able to find the frequency using different apparatus and handle other fundamental apparatus.

CO 3- The students are able to understand optical experiments, which will establish the fundamentals of interference and diffraction phenomena.

List of Experiments:

1. To find the wavelength of sodium light by Newton's rings experiment.
2. To find the wavelength of sodium light by Fresnel's biprism experiment.
3. To find the wavelength of various colours of white light with the help of a plane transmission diffraction grating.
4. To find the refractive index and cauchy's constants of a prism by using spectrometer.
5. To find the wavelength of sodium light by Michelson interferometer.
6. To find the resolving power of a telescope.
7. To find the pitch of a screw using He-Ne laser.
8. To find the specific rotation of sugar solution by using a polarimeter.

9. To compare the capacitances of two capacitors by De'sauty bridge and hence to find the dielectric constant of a medium.

10. To find the flashing and quenching potentials of Argon and also to find the capacitance of unknown capacitor.

11. To study the photoconducting cell and hence to verify the inverse square law.

12. To find the temperature co-efficient of resistance by using platinum resistance thermometer and Callender and Griffith bridge.

13. To find the frequency of A.C. mains by using sonometer.

14. To find the velocity of ultrasonic waves in non-conducting medium by piezo-electric method.

Note :

(i) The experiments in Ist semester will be based mainly upon Optics, Electrostatics.

(ii) Students will be required to perform at least 10 experiments out of the list.

Reference Books:

1. Advanced Practical Physics – B.L. Worshnop and H.T. Flint (KPH)
2. Practical Physics – S.L.Gupta & V.Kumar (Pragati Prakashan).
3. Advanced Practical Physics Vol.I & II – Chauhan & Singh (Pragati Prakashan).

EE-151C BASIC ELECTRICAL ENGINEERING LAB

B. Tech I Semester

No. of Credits: 1		Sessional:	15 Marks
L T P Total		Practical:	35 Marks
0 0 2 2		Total :	50 Marks
		Duration of Exam:	2 Hours

Pre –Requisite: Basic Electrical Engineering

Successive: *Nil*

List of Experiments:

1. To verify KCL and KVL.
2. To verify Thevenin's & Norton's theorems.
3. To verify maximum power transfer theorem.
4. To verify Superposition theorems.
5. To study frequency response of a series R-L-C circuit and determine resonant frequency & Q- factor for various Values of R, L, C.
6. To study frequency response of a parallel R-L-C circuit and determine resonant frequency & Q -Factor for various values of R, L, C.
7. To find inductance of coil without core and with iron core.
8. To perform polarity test on single phase transformer.
9. To perform O.C. and S.C. test on single phase transformer.
10. To study various type of electrical instruments
11. To measurement of power and power factor in a three phase system by two wattmeter method.

CE-151C FUNDAMENTALS OF COMPUTER AND PROGRAMMING WITH C LAB

B. Tech I Semester

No. of Credits: 1		Sessional:	15 Marks
L T P Total		Practical:	35 Marks
0 0 2 2		Total :	50 Marks
		Duration of Exam:	2 Hours

Pre –Requisite: FOCP

Successive: KOM, OR

Course Objectives:

1. To understand the basic building blocks of C language like variables, data types, managing I/O etc.
2. To understand the different statements like sequential, decision making, iterative such as if-else, loops and derived data types like arrays, structures etc.
3. To learn about the concept of Pointers and understand functions and file handling.

Course Outcomes (COs): After studying this course the students will be able to:

CO 1- Implement the different statements like sequential, decision making, iterative such as if-else, loops and derived data types like arrays and structures.

CO 2- Implement the concept of Pointers and understand functions, file handling.

List of Experiments:

1. Write a Program to calculate sum of two numbers
2. Write a Program to calculate Simple Interest.
3. Write a Program to find larger among two numbers
4. Write a Program to find largest among three numbers
5. Write a Program to calculate roots of a quadratic equation
6. Write a Program to print 1 to 10 using loop
7. Write a Program to print even numbers from 2 to 100
8. Write a Program to print sum of digits of a number
9. Write a Program to print the reverse of a number entered by user

10. Write a Program to print table of a number
11. Write a Program to print the Fibonacci series
12. Write a Program to calculate factorial of a number
13. Write a Program to find a^b
14. Write a Program to check if number is Prime
15. Write a Print first n terms of Fibonacci Series
16. Write a Program to find largest and smallest element in an array
17. Write a Program to find sum of two 2-D arrays
18. Write a Program to multiply two 2-D arrays
19. Write a Program to use inbuilt string functions.
20. Write a Program to check whether entered string is palindrome
21. Write a Program to calculate factorial of a number using functions
22. Write a Program to find factorial using recursion
23. Write a Program to find length of a string using pointers
24. Write a Program to calculate marks using array of structures.
25. Write a Program to copy the contents of one file to another file

Reference Books:

1. Let Us C by Yashwant Kanetkar
2. Fundamentals of Computers and Programming with C by A. K. Sharma Dhanpat Rai publications
3. Test your C Skills by Yashwant Kanetkar

HAS-159C LANGUAGE LAB

B. Tech I Semester

No. of Credits: 1		Sessional:	15 Marks
L T P Total		Practical:	35 Marks
0 0 2 2		Total :	50 Marks
		Duration of Exam:	2 Hours

Pre –Requisite: Interactive English

Successive: None

Course Objectives:

To guide the students to improve their conversational and linguistic skills including better command over spoken English. Introduce students to various scenarios to help them opt for appropriate responses on interpersonal level.

Course Outcomes (COs): The students will be trained to respond better to new scenarios that demand good communication skills.

1. The students will be able to resolve potential conflicts by avoiding communication gaps and overcoming barriers.

2. Students will learn to use skills effectively for enhancing performance and even improving upon their power to persuade.

Corporate Interaction & Communication

1. Presentations
2. Listening Skills & Language Lab (Practical) Interviews of Isaac Asimov, Richard Feynman, Steve Jobs and other scientists and technocrats. Other inspiring speeches on social issues as well as related to the corporate world and industry; Audio/Video Lessons and Observation
3. Group Discussions, Corporate Dialogue: Conflict-Resolution exercises; Role Play; Mock-interviews.
4. Internal Assessment: based on participation, short presentation & performance in interactive exercises: competence gauged through participation in various events organized in the classroom and at university level throughout the semester.

***Recommended*:**

1. Language Lab Software

ME-152C ENGINEERING DRAWING

B. Tech I Semester

No. of Credits: 2

L	T	P	Total
0	0	4	4

Sessional: 30 Marks

Practical: 70 Marks

Total : 100 Marks

Duration of Exam: 3 Hours

Pre-Requisite: None

Successive: Machine Drawing, Computer Aided Design

Course Objectives:

To understand the basic principles of engineering drawing and graphics and to apply the same to draw different types of projections.

Course Outcomes (COs): At the end of the course, the student shall be able to:

CO 1- Understand the basic principles of projections of points and lines.

CO 2- Understand the different orientations and projections of planes.

CO 3 - Understand projections and sectioning of solids in different orientations.

CO 4- Grasp the concepts of development of surfaces.

CO 5- Understand and draw orthographic and isometric view of an object.

Syllabus:

UNIT I **Introduction and Projections of Points:** Importance and scope of Engineering Drawing, Instruments, Lettering, Types of lines, Dimensioning, Different methods of projections, B.I.S Specifications, Introduction to AutoCAD.

Introduction to plane of projection, reference & auxiliary planes, projection of points in different quadrants.

UNIT II **Projection of Lines:** Projection of lines parallel to reference planes, perpendicular to reference planes, inclined to one reference plane and parallel to the other, inclined to both the reference planes, traces, true inclinations & true lengths of the lines.

UNIT III **Projection of Planes:** Parallel to one reference plane, inclined to one plane but perpendicular to the other, inclined to both reference planes.

UNIT IV **Projections and Sectioning of Solids :** Projection of Polyhedra, solids of revolution-in simple positions with axis perpendicular to a plane, with axis parallel to both planes, with axis parallel to one plane and inclined to the other.

Projection of section of prisms, pyramids, cylinders and cones with axis perpendicular to one reference plane and parallel to the other reference plane.

UNIT V **Development of Surfaces:** Development of simple object with and without sectioning.

UNIT VI **Orthographic and Isometric Projections:** Orthographic projections of simple machines components and Nuts, Bolted Joints, Screw threads.

Introduction to isometric projections, Isometric scale, Isometric projections/ views of plane figures like prisms, pyramids, cylinders and cones.

Text Books:

1. Machine Drawing - N D Bhatt and V M Panchal, Charotar Publishing House.
2. A Text Book of Machine Drawing - P S Gill Pub.: S K Kataria & Sons.
3. Engineering Graphics with Auto CAD 2002 - James D.Bethune, Pearson Education.
4. A Text Book of Machine Drawing by Laxmi Narayana and Mathur, M/s. Jain Brothers, New Delhi.
5. Machine Drawing by N Sidheshwar, Kannaieh, V S Sastry, TMH., New Delhi.
6. Fundamentals of Engineering Drawing by Luzaddder: PHI.
7. Fundamentals of Engineering Drawing by French and Vierk; Mc Graw Hill.

HAS-102C PHYSICS II

B. Tech II Semester

No. of Credits: 4	Sessional: 25 Marks
L T P Total	Theory: 75 Marks
4 0 0 4	Total : 100 Marks
	Duration of Exam: 3 Hours

Pre –Requisite: Physics I

Successive: Engineering Mechanics, Material Science, Micro and Nano Manufacturing

Course Objective:

This course introduces basic principles of crystal structure along with the defects. Emphasis is placed on the shortcoming of classical physics at the turn of the century leading to the discoveries of the modern era. The concepts of quantum mechanics and solid state serve as the foundation stone for the course. Extensions of these topics will include the modern view of the atom, wave particle duality of light, distribution of atoms, magnetism and conductivity. Through this course students will able to understand the basics of Nanotechnology and Superconductivity.

Course Outcome (COs): At the end of the course, the student shall be able to:

CO 1- Understand the basics of crystal structure and defects in solids. They would also be able to comprehend Quantum Physics and its relevance in the modern era.

CO 2- Learn the fundamentals of Free electron theory and have an elementary idea of Nanoscience and Nanotechnology.

CO 3- Understand Band theory of solids and Photoconductivity.

CO 4- Comprehend magnetic properties of solids and superconductivity and their applications in the contemporary world.

.**Syllabus:**

UNIT I **Crystal Structure:** Space lattice, unit cell and translation vector, Miller indices, inter-planar spacing, simple crystal structure (NaCl and Diamond), Bragg's law, Laue method, powder method, Point defects in solids – Schottky and Frenkel defects.

Quantum Physics: Difficulties with Classical physics, Introduction to quantum mechanics-simple concepts. Black Body radiation, Planck's radiation law, de-Broglie hypothesis, phase velocity and group velocity. Schrodinger wave equations-time dependent and time independent, Particle in a one-dimensional

box, Elementary idea of Quantum Statistics (Bose-Einstein and Fermi-Dirac Statistics), distribution function.

UNIT II **Nanomaterials and Applications:** Basic principle of Nanoscience and Nanotechnology, synthesis of nanoparticles, techniques- ball milling, sputtering, plasma synthesis, properties of nanoparticles-mechanical, optical, magnetic and electronic; introduction to carbon nanotubes.

Free Electron Theory : Elements of classical free electron theory and its limitations, Drude's theory of conduction, quantum theory of free electrons. Fermi level, density of states. Fermi-Dirac distribution function, Concept of thermionic emission-Richardson equation.

UNIT III **Band Theory Of Solids:** Origin of energy bands, Kronig-Penny model (qualitative), E-K diagrams, Brillouin Zones, concept of effective mass and holes. Classification of solids into metals, semiconductors and insulators, Fermi energy and its variation with temperature, Hall Effect and its applications.

Photoconductivity & Photovoltaics: Photoconductivity in insulating crystal, variation with illumination, effect of traps, application of photoconductivity, photovoltaic cells, solar cell and its characteristics.

UNIT IV **Magnetic Properties of Solids:** Atomic magnetic moments, orbital diamagnetism, classical theory of paramagnetism, ferromagnetism- molecular fields and domains.

Superconductivity: Introduction (Experimental survey), Meissner effect, London equations, Hard and Soft superconductors, Elements of BCS Theory, Applications of superconductors

Text Books:

1. Perspectives of Modern Physics - Arthur Beiser (TMH)
2. Optics – Ajoy Ghatak (TMH)
3. Modern Physics for Engineers – S.P.Taneja (R. Chand)
4. Engineering Physics – Satya Prakash (Pragati Prakashan)
5. Modern Engineering Physics – A.S.Vasudeva (S. Chand)
6. Engineering Physics (Vol-2)- S.L. Gupta (Dhanpat Rai)

HAS-104C **MATHEMATICS II**

B. Tech II Semester

No. of Credits: 4		Sessional:	25 Marks
L T P Total		Theory:	75 Marks
4 0 0 4		Total :	100 Marks
		Duration of Exam:	3 Hours

Pre –Requisite: Mathematics I

Successive: Numerical Methods, Operations Research

Course Objective:

This course will give detailed view of exact differential equations, concept of obtaining suitable integrating factor, solution of ordinary differential equations with constant coefficients and variable coefficients. Application, Laplace transforms, Inverse Laplace transforms, solution of differential equations using laplace transforms, Partial Differential Equations, Lagrange's method, Charpit's method and Solution of homogeneous partial differential equations and application of partial differential equations to heat and wave equations, about infinite series, tests for checking convergence and divergence of infinite series. Checking the absolute convergence of alternating series.

Course Outcome (COs): At the end of the course, the student shall be able to:

CO 1- Acquire knowledge about many kinds of differential equations, different methods to find the solution of differential equations and applications of differential equations to solve boundary value problems and simultaneous equations.

CO 2- Acquire knowledge about Laplace transform, Inverse Laplace transform and its applications.

CO 3- Acquire knowledge about formation of partial differential equation, method to solve linear and non linear partial differential equation and method of separation of variable to solve heat and wave equation.

CO 4- Infinite series and different tests to check the convergence and divergence of Infinite series.

.**Syllabus:**

UNIT I **Ordinary Differential Equation and its Applications:** Exact differential equation of first order, Equations reducible to exact differential equation, differential equation of second and higher order, Complete solutions of linear differential equations(Complementary Function + Particular Integral), Method of variation of parameter to find Particular Integral, Cauchy's and Legendre's linear Equation,

Simultaneous linear equations with constant co-efficient, Application of linear differential equations to Electric circuits(LC,LCR circuit), Newton's law of cooling, Heat flow, Orthogonal trajectory.

UNIT II **Laplace-Transforms and its Applications:** Laplace-transforms of elementary functions, Elementary properties of Laplace-transforms, Existence conditions, Transforms of derivatives, Transforms of Integrals, Multiplications by t^n, division by t, Evaluation of integrals by Laplace –transforms, Second shifting Theorem , Inverse transforms, Convolution theorem, Applications to linear differential equations to solve boundary value problems with constants coefficients and simultaneous linear differential equations with constant coefficients.

UNIT III **Partial Differential Equation and its Application:** Formation of partial-differential equations. Lagrange's linear partial –differential equations. First order non-linear partial differential equations, Charpit's method. Homogeneous Partial-differential equation of second and higher order, Method of Separation of Variables and its applications to wave equation and one dimensional Heat equation.

UNIT IV **Infinite Series:** Convergence and divergence of Infinite series, Comparison Test, D'Alembert's Ratio Test, Gauss Test, Integral Test, Raabe's Test, Logarithmic Test, Cauchy's Root Test, Alternating Series, Conditional Convergence & Absolute Convergence.

Text/ Reference Books:

1. B.S. Grewal – Engineering Mathematics
2. Advanced Engineering Mathematics, Erwin Kreyzig
3. Advanced Engineering Mathematics, Dr. Babu Ram, Pearsons Publications.
4. Engineering Mathematics Seventh Edition by John Bird ,Published by Newnes.
5. Advanced Engineering Mathematics, K.A. Stroud, Dexter Booth, Published by Palgrave.

HAS-105C **CHEMISTRY**

B. Tech II Semester

No. of Credits: 3		Sessional:	25 Marks
L T P Total		Theory:	75 Marks
3 0 0 3		Total :	100 Marks
		Duration of Exam:	3 Hours

Pre –Requisite: None

Successive: Material Science

Course Objective:

To illustrate the basic understanding of Analytical chemistry and to improve the reasoning ability of the student towards chemistry in everyday life, enhance the basic knowledge for the theoretical aspect of engineering chemistry. To make students aware about the various applications of chemical sciences in engineering.

Course Outcomes (COs): At the end of the program the students acquired knowledge about:

CO 1- Illustrate the basic parameters of water, different water softening processes and effect of hard water in industries.

CO 2- Describe the basic properties and application of various polymers as an engineering material.

CO 3- Demonstrate the mechanism, physical and chemical properties of lubricants and their applications.

CO 4- Apply instrumental techniques of chemical analysis.

Syllabus:

UNIT I **Polymers and Polymerization:** Introduction & Classification of polymers. effect of structure on properties of polymers, Bio degradable polymers, preparation, properties and technical application of thermo–plastics (PVC, PE, Teflon)& thermosets (PF,UF), elastomers (SBR,BUNA-N), Silicones, Introduction to polymeric composites.

Phaserule: Terminology, Derivation of Gibb's phase rule. One component system: water system, two components systems: Simple eutectic system (Pb – Ag), system with congruent melting point (Zn – Mg), Cooling curves.

UNIT II **Water and its Treatment:** Hardness of water and its determination, (EDTA method) units of hardness, alkalinity of water and its determination, Related

numerical problems, Problems associated with boiler feed water: scale and sludge formation, Priming and foaming, Boiler corrosion & Caustic embrittlement. Water softening Techniques: Lime-Soda treatment, Zeolite, Ion – exchange process, Mixed bed demineralization.

UNIT III **Corrosion and its Prevention:** Mechanism of Dry and wet corrosion (rusting of iron), types of corrosion, galvanic corrosion, differential aeration corrosion, stress corrosion. Factors affecting corrosion, preventive measures (proper design, Cathodic and Anodic protection, Protective coatings), Soil corrosion, Microbiological Corrosion.

Lubrication and Lubricants: Introduction, mechanism of lubrication, classification of lubricants. Additives for lubricants. Properties of lubricants (Flash & Fire point, Saponification number, Iodine value, Acid value, Viscosity and Viscosity index Aniline point, Cloud point and pour point).

UNIT IV **Fuels:** Definition and characteristics of a good fuel, Classification of fuels with suitable examples, Definition and determination of calorific value of a fuel with the help of bomb calorimeter, Proximate and Ultimate analysis of a fuel and its importance, Merits and demerits of gaseous fuel over other varieties of fuel, Composition properties and uses of (i) Water gas (ii) Oil gas (iii) Biogas (iv) LPG (v) CNG.

Books recommended

1. Engineering Chemistry , P.C. Jain, Monica Jain (DhanpatRai& Co)
2. Chemistry in Engineering &Tech , Vol. I & II , Kuriacose (TMH)
3. Instrumental methods of Chemical analysis, MERITT & WILLARD(EAST -WEST press)
4. Physical Chemistry , P.W Atkin (ELBS, OXFORD Press)
5. Physical Chemistry W.J.Moore (Orient Longman)

HAS-107C ENVIRONMENTAL STUDIES
B. Tech II Semester

No. of Credits: 3		Sessional:	25 Marks
L T P Total		Theory:	75 Marks
3 0 0 3		Total :	100 Marks
		Duration of Exam:	3 Hours

Pre –Requisite: *None*

Successive: None

Course Objective:

The prime objective of the course is to provide the students a detailed knowledge on the threats and challenges to the environment due to developmental activities. The students will be able to identify the natural resources and suitable methods for their conservation and sustainable development. The focus will be on awareness of the students about the importance of ecosystem and biodiversity for maintaining ecological balance. The students will learn about various attributes of pollution management and waste management practices. The course will also describe the social issues both rural and urban environment and environmental legislation.

Course Outcomes (COs): At the end of the program the students acquired knowledge about:

CO 1- Understand / evaluate / develop technologies on the basis of ecological principles and environmental regulations which in turn help in sustainable development. The students will also be able to introduce the thinking about environmental issues from an interdisciplinary perspective.

CO 2- Identify and relate about the renewable and non-renewable resources, their importance and ways of conservation to sustain human life on earth.

CO 3- Know about the concepts of ecosystem and its function in the environment, the need for protecting the producers and consumers in various ecosystems and their role in the food web.

CO 4- Recognize, relate and become sensitive to the effects of pollution and will be able to contribute his learning's towards their prevention or mitigation. The students will also be able to describe the social issues along with the trends of human population growth and the possible means to combat the challenges.

Syllabus:

UNIT I **The Multidisciplinary Nature of Environmental Studies:** Definition, scope and importance. Need for public awareness.

UNIT II **Natural Resources: Renewable and Non-Renewable Resources:** Natural resources and associated problems:

- 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 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.

UNIT III **Ecosystems:**

- 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 following ecosystem:

  a) Forest ecosystem b) Grassland ecosystem c) Desert ecosystem d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).

UNIT IV ***Biodiversity and its Conservation:***

- Introduction – Definition: genetic, species and ecosystem diversity.
- Biogeographical 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.

UNIT V **Environmental Pollution:** Definition.

- Causes, effects and control measures of: Air pollution b) Water pollution c) Soil pollution d) Marine pollution e) Noise pollution f) Thermal pollution g) Nuclear hazards
- Solid waste Management: Causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution. Pollution case studies. Disaster management: floods, earthquake, cyclone and landslides.

UNIT VI **Social Issues and the Environment:**

- 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.
- 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 Protection Act. Air (Prevention and Control of Pollution) Act. Water (Prevention and Control of Pollution) Act
- Wildlife Protection Act. Forest Conservation Act. Issues involved in enforcement of environmental legislation
- Public awareness.

UNIT VII **Human Population and the Environment:** 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.

UNIT VIII **Field Work:**

- Visit to a local area to document environmental assets-river / forest / grassland / hill / mountain.
- Visit to a local polluted site – Urban / Rural / Industrial / Agricultural.
- Study of common plants, insects, birds.
- Study of simple ecosystems – pond, river, hill slopes, etc.

Text Books:

1. Perspectives in Environmental Studies by A. Kaushik and C. P. Kaushik, New age international publishers.
2. Environmental Studies by Benny Joseph, Tata McGraw Hill Co, New Delhi

Reference Books:

1. Environmental Science: towards a sustainable future by Richard T. Wright. 2008 PHL Learning Private Ltd. New Delhi.
2. Environmental Engineering and science by Gilbert M. Masters and Wendell P. Ela 2008 PHI Learning Pvt Ltd.
3. Environmental Science by Daniel B. Botkin& Edwards A. Keller, Wiley INDIA edition.
4. Fundamentals of Ecology by Odum, E.P., Barrick, M. and Barret, G.W. Thomson Brooks/Cole Publisher, California, 2005.

EC- 101C ELEMENTS OF ELECTRONICS ENGINEERING

B. Tech II Semester

No. of Credits: 3		Sessional:	25 Marks
L T P Total		Theory:	75 Marks
3 0 0 3		Total :	100 Marks
		Duration of Exam:	3 Hours

Pre –Requisite: None

Successive: Material Science, Mechatronics, Industrial Control

Course Objective:

Fundamental knowledge in the field of electronics will be provided in this course by emphasizing on the basic components and circuits like the diodes, BJTs, JFETS, MOSFETS etc. Such different types of circuitry components/circuits and their applications are introduced so as to complete the theoretical and practical basis on analog circuit design.

Course Outcomes (COs): At the end of the program the students acquired knowledge about:

CO 1- Basics of digital electronics, solving problems related to number systems and Boolean algebra, various flip flops.

CO 2- The semiconductors and diodes, transistors, amplifiers and their applications.

CO 3- Display devices like LCDs, LEDs and Optoelectronic devices.

CO 4- Electronic instruments like CRO, function generator and multimeter etc.

CO 5- Basics of Communication system and modulation techniques like AM, FM, PM etc.

Syllabus:

UNIT I **Semiconductor Physics:** Overview of Semiconductors, PN junction diode and Zener diode –Diode circuits: rectifiers (bridge type only), filters, clippers and clampers - BJT construction, operation, characteristics (CB, CE and CC configurations) and uses – JFET and MOSFET construction, operation, characteristics (CS configuration) and uses.

UNIT II **Digital Electronics:** Binary, Decimal, Octal and Hexadecimal number systems and conversions, Boolean Algebra, De Morgan's theorem, logic gates (AND, OR, NOT, NAND, NOR, XOR, XNOR),Combinational and sequential circuits, Introduction to flip-flops (S-R & J-K).

UNIT III **Electronics Instruments**: Role, importance and applications of general-purpose test instruments like Multimeter: Digital & Analog, Cathode Ray Oscilloscope (CRO), Function/Signal Generator.

UNIT IV **Optoelectronic Devices and Displays:** Photoconductive cell - photovoltaic cell - solar cell – photodiodes – phototransistors, Seven segment display: Common anode and Common cathode connections and applications.

LED DISPLAY: Construction, Working, Advantages, Disadvantages and Applications.

LCD DISPLAY: Types of liquid crystals; Types of LCD display:- Dynamic scattering and field effect type; Construction, Working, Advantages, Disadvantages and Applications.

UNIT V **Communication System:** Block diagram of a basic communication system – frequency spectrum - need for modulation - methods of modulation - principles of AM, FM, PM , pulse analog and pulse digital modulation – AM / FM transmitters & receivers (block diagram description only)

Text / Reference Books:

1. Sedra A S and Smith K C, “Microelectronic Circuits” 4th Ed., New York, Oxford University Press, New York (1997).

2. Tocci R J and Widmer N S, “Digital Systems – Principles and Applications”, 8th Ed., Pearson Education India, New Delhi (2001).

3. Cooper and Helfrick, “Modern Electronic Instrumentation and Measuring Techniques”, 4th print Prentice Hall of India, New Delhi (1996)

4. Boylestad and Nashelsky, “Electronic Devices and Circuit Theory”, 8th Ed, Pearson Education India, New Delhi (2002).

5. Millman and Grabel, “Microelectronics”, 2nd Ed. Tata McGraw-Hill (1999).

ME-101C **BASICS OF MECHANICAL ENGINEERING**

B. Tech II Semester

No. of Credits: 3		Sessional:	25 Marks
L T P Total		Theory:	75 Marks
3 0 0 3		Total :	100 Marks
		Duration of Exam:	3 Hours

Pre –Requisite: None

Successive: Thermodynamics, Mechanics of Solids, Manufacturing Process

Course Objective:

The main objective of teaching this course is to provide the basic knowledge of mechanical engineering.

Course Outcome (COs): At the end of the course, the student shall be able to:

CO 1- Understand the basics of thermodynamics and I.C. Engines.

CO 2- Understand the working of various power transmission devices and lifting machines.

CO 3- Understand the concept of stresses and strains.

CO 4- Understand the basics of manufacturing processes, operations of machine tools and measuring tools.

Syllabus:

UNIT I **Basic Concepts of Thermodynamics:** Macroscopic and Microscopic Approaches, Thermodynamic Systems, Surrounding and Boundary, Thermodynamic Properties – Intensive and Extensive, Thermodynamic Equilibrium, State, Path, Process and Cycle, Concept of Thermodynamic Work and Heat, Zeroth Law of Thermodynamics, Energy and First law of Thermodynamics, First law applied to non flow processes, Internal Energy and Enthalpy. Numerical Problems.

UNIT II **I.C. Engines:** Introduction, classification, Constructional details and working of 2 stroke & 4 stroke petrol engine & diesel engine, Otto, diesel and dual cycles, simple problems on Otto & diesel cycles.

UNIT III **Simple Lifting Machines:** Definition of machine, velocity ratio, Mechanical advantage, Efficiency, Laws of machines, Reversibility of machine, Wheel and axle, Differential pulley block, Single, Double and Triple start worm and worm wheel, Simple and compound screw jacks, Problems.

UNIT IV **Basics of Power Transmission:** Transmission of mechanical power: introduction belt drives, gear drives, their advantages and disadvantages. Introduction to brakes and clutches.

UNIT V **Stresses and Strains:** Introduction, Concept & types of Stresses and Strains, Poisons ratio, stresses and Strains in simple and compound bars under axial loading, Stress– Strain diagrams, Hook's law, Elastic constants and Mechanical Properties of metals like mild steel and cast iron.

UNIT VI **Basics of Manufacturing Processes and Measurements:** Brief introduction to classification of different manufacturing processes: Primary shaping processes, metal cutting processes, joining processes, finishing processes and processes bringing change in properties, Working principle, parts and specification of commonly used machine tools in workshop such as Lathe, Shaper and Milling.

Measuring Instruments: introduction to slip gauges, Go and No Go gauges**,** dial gauges, vernier calliper, micrometer, sine bar, vernier height gauges.

Text Books:

1. Basics of Mechanical Engineering- R.K Rajput Laxmi Pub, Delhi.
2. Elements of Mechanical Engineering- D.S Kumar, S.K Kataria and Sons.
3. Engineering Thermodynamics- P.K Nag TMH, New Delhi.
4. Workshop Technology Vol I & II –Hazra & Chaudhary, Asian Book Comp., New Delhi.

Reference Books:

1. Engineering Thermodynamics- C.P Arora, Pub- TMH, New Delhi.
2. Manufacturing Science- Amitabha Ghosh & Ashok Kumar Malik, - East- West Press.
3 Manufacturing Process & Systems- Oswald, Munoz, John Wiley.
4 Workshop Technology Vol I, II & III- Chapman, WAJ, Edward Arnold.
5. Basics of Mechanical Engineering – Vineet Jain, Dhanpat Rai Publications
6. Automobile Engineering by Dr Kirpal Singh, standard Publishers Distributors

HAS-152C **PHYSICS LAB II**

B. Tech II Semester

No. of Credits: 1	Sessional:	15 Marks
L T P Total	Practical:	35 Marks
0 0 2 2	Total :	50 Marks
	Duration of Exam:	2 Hours

Pre –Requisite: Physics I

Successive: None

Course Objectives:

To develop the domain knowledge in the fields of physics and to extend knowledge and processes used by physics have produced new and exciting technologies that are in everyday use.

Course Outcomes (COs): After studying this course the students will be able to:

CO 1- To demonstrate competency and understanding of the basic concepts found in core physics courses mechanics, quantum mechanics, magnetic properties, photoconductivity and modern physics.

CO 2- To utilize the scientific method for formal investigation and to demonstrate competency with experimental methods that are used to discover and verify the concepts related to content knowledge.

List of Experiments:

1. To find the low resistance by carey - Foster's bridge.
2. To find the resistance of a galvanometer by Thomson’s constant diffelction method using a post office box.
3. To find the value of high resistances by Substitution method.
4. To find the value of high resistances by Leakage method.
5. To study the characteristics of a solar cell and to find the fill factor.
6. To find the value of e/m for electrons by Helical method.
7. To find the ionisation potential of Argon/Mercury using a thyratron tube.
8. To study the variation of magnetic field with distance and to find the radius of coil by Stewart and Gee's apparatus.
9. To study the characteristics of (Cu-Fe, Cu-Constantan) thermo couple.
10. To find the value of Planck's constant by using a photo electric cell.
11. To find the value of co-efficient of self-inductance by using a Rayleigh bridge.
12. To find the value of Hall Co-efficient of semi-conductor.

13. To study the V-I characteristics of a p-n diode.
14. To find the band gap of intrinsic semi-conductor using four probe method.
15. To calculate the hysteresis loss by tracing a B-H curve.

Text/ Reference Books:

1. Advanced Practical Physics – B.L. Worshnop and H.T. Flint (KPH)
2. Practical Physics – S.L.Gupta &V. Kumar (Pragati Prakashan)
3. Advanced Practical Physics Vol. I& II – Chauhan & Singh (Pragati Prakashan)

HAS-155C CHEMISTRY LAB

B. Tech II Semester

No. of Credits: 1		Sessional:	15 Marks
L T P Total		Practical:	35 Marks
0 0 2 2		Total :	50 Marks
		Duration of Exam:	2 Hours

Pre –Requisite: Chemistry

Successive: None

Course Objectives:

To apply fundamental knowledge of practical chemistry to engineering and technology.

Course Outcomes (COs): After studying this course the students will be able to:

CO 1- Find out hardness of water quantitatively.

CO 2- Analyse sample of water for many parameters.

CO 3- Analyse sample of lubricating oil for many parameters.

CO 4- Prepare polymeric resins in the laboratory.

List of Experiments:

1. Determination of Ca++ and Mg++ hardness of water using EDTA solution.
2. Determination of alkalinity of water sample.
3. Determination of dissolved oxygen (DO) in the given water sample
4. To find the eutectic point for a two component system by using method of cooling curve.
5. Determination of viscosity of lubricant by Red Wood Viscosity (No. 1 & N0. 2)
6. To determine flash point& fire point of an oil by Pensky Marten’s flash point apparatus.
7. To Prepare Phenol formaldehyde and Urea formaldehyde resin.
8. To find out saponification no. of Oil
9. To determine TDS of Water samples of different sources.
10. Determination of concentration of KMnO4 solution spectrophotomererically
11. Determination of strength of HCl solution by titrating against NaOH solution conductometrically.
12. To determine amount of sodium and potassium in a, given water sample by flame photometer.
13. Estimation of total iron in an iron alloy.

Reference Books:

1. Advanced practical organic chemistry, O P Agarwal, (Krishna publishing).
2. Advanced practical inorganic chemistry, Gurdeep Raj, (Krishna publishing).
3. Advanced practical physical chemistry, J B Yadav, (Krishna publishing).

ME-151C **BASICS OF MECHANICAL ENGINEERING LAB**

B. Tech II Semester

No. of Credits: 1		Sessional:	15 Marks
L T P Total		Practical:	35 Marks
0 0 2 2		Total :	50 Marks
		Duration of Exam:	2 Hours

Pre –Requisite: Basics of Mechanical Engineering

Successive: Thermodynamics, Mechanics of Solids, Manufacturing Process

Course Objectives:

To understand the basics of mechanical engineering and by working models and experiments.

Course Outcomes (COs): After studying this course the students will be able to:

CO 1- Understand the basics of working of boilers, mountings and accessories.

CO 2- Understand the principle and working of two strokes and four strokes internal combustion engines.

CO 3- Understand the mechanisms of simple lifting machines.

CO 4 - Understand the mechanism of gear drive.

CO 5- Understand the use of various measuring devices.

List of Experiments:

1. To study the construction and working of Cochran and Babcock & Wilcox boilers.
2. To study the function and working of various mountings and accessories in a boiler.
3. To study the construction and working of 2 stroke & 4 stroke diesel engine.
4. To study the construction and working of 2 stroke & 4 stroke petrol engine.
5. To calculate the mechanical advantage, velocity ratio and efficiency of worm and worm wheel.
6. To calculate the mechanical advantage, velocity ratio and efficiency winch crab.
7. To study Simple screw jacks and compound screw jacks and determine their efficiency.
8. Measurement of diameter of shaft using (i) vernier caliper (ii) digital caliper (iii) vernier micrometer (iv) digital micrometer.
9. Measurement of angle of taper using sine bar.
10. To study the different types of gears.

WS- 161C/ WS- 162C **WORK SHOP-1/II**

B. Tech I/ II- Semester

No. of Credits: 3	Internal:	30 Marks
L T P Total	External:	70 Marks
0 0 6 6	Total :	100 Marks
	Duration of Exam:	3 Hours

MECHANICAL WORKSHOP (Group –I)

Course Outcomes (COs): After studying this course the students would:

CO 1- Have exposure to mechanical workshop layout and safety aspects.

CO 2- Understand the functions of various machines and cutting tools used in machine shop.

CO 3- Practice real time job preparation using various operations related to machine shop such as filing, drilling, milling & turning.

CO 4 - Practice job preparation in welding shop.

CO 5 - Learn to use different measuring tools like vernier caliper, vernier height gauge and micrometer.

CO 6 - Practice job preparation in sheet metal shop.

List of Exercises:

Fitting, sheet metal and welding workshop:

1. To study layout, safety measures and different engineering materials (mild steel, medium carbon steel, high carbon steel, high speed steel and cast iron etc) used in workshop.
2. To study and use of different types of tools, equipments, devices & machines used in fitting, sheet metal and welding section.
3. To determine the least count of vernier calliper, vernier height gauge, micrometer and take different reading over given metallic pieces using these instruments.
4. To study and demonstrate the parts, specifications & operations performed on lathe machine.
5. To study and demonstrate the parts, specifications & operations performed on milling machine.
6. To study and demonstrate the parts, specifications & operations performed on shaper machine.
7. To prepare a job involving different type of filing practice exercise in specified dimensions.
8. To prepare a job involving multi operational exercise (drilling, counter sinking, tapping, reaming, hack sawing etc.)
9. To prepare a multi operational sheet metal job (self secured single groove joint/ hasp & stay etc.).
10. To practice striking an arc, straight short bead, straight continuous bead and re-start of electrode in flat position by arc welding on given M.S. plate as per size.
11. To practice tack weld of two close plate in flat position by arc welding on given M.S. plate as per size.
12. To practice close butt joint in flat position by arc welding on given M.S. plate as per size.

NOTE: - At least nine exercises should be performed from the above list; remaining three may either be performed from above list or designed by the concerned institution as per the scope of the syllabus and facilities available in institute.

WS- 161C/ WS- 162C **Workshop- I/II**

No. of Credits: 3

L T P **Internal: 30 Marks**
Total 0 **External: 70 Marks**
Total: 100 Marks
Duration of Exam: 3 Hours

(Group –II)
PART-A
Computer Engineering Workshop

Course Outcomes (COs):

After the completion of the course the student will be able to:

CO1- Acquire skills in basic engineering practice.
CO2- Have working knowledge of various equipments used in workshop.
CO3- Have hands on experience about various machines and their components.
CO4- Obtain practical skills of basic operation and working of tools used in the workshop.

1. To study and demonstrate Block diagram of Digital Computer System and brief explanation of each unit.
2. To demonstrate History/ Generation/ classifications and different types of Personnel Computer.
3. To study and demonstrate internal parts of a Computer System (Card level) and other peripheral devices and explanation of POST & BIOS.
4. To study and demonstrate primary memory and secondary memory.
5. To demonstrate CPU Block diagram and other Peripheral chips, Mother Board/ Main Board and its parts, Connectors, Add On Card Slots etc.
6. To study working of various types of monitors: CRT type, LCD type & LED type.
7. To study Keyboard and Mouse: Wired, Wireless, Scroll & Optical with detail working.
8. To study Printers: Dot Matrix Printers, Daisy wheel Printers, Ink-Jet Printers and Laser Jet Printers with detailed working explanation.
9. Assembly / Installation and Maintenance of Personnel Computer Systems: Practical exercise on assembly of Personnel Computer System, Installation of Operating System: Windows & Linux etc, Installation of other Application Softwares and Utility Softwares, Fault finding in Personnel Computers: Software or Hardware wise, Virus: Introduction, its Types & Removal techniques, Data Backup and Restore, Data Recovery Concepts, Typical causes of Data loss.

10. To demonstrate networking concepts: Introduction of Connecting devices: Hub, Switch & Router etc, Networking Cable preparation: Normal & Cross Cables, Data Transferring Techniques from one Computer System to another Computer System, Configuration of Switch/ Routers etc.

PART-B
Electrical Workshop

1. Introduction of Electrical Safety precautions, Electrical Symbols, Electrical Materials, abbreviations commonly used in Electrical Engg. and familiarization with tools used in Electrical Works.
2. To make a Straight Joint & Tee joint on 7/22 PVC wire and Britannia Joint on GI wire.
3. To study fluorescent Tube Light, Sodium Lamp and High Pressure Mercury Vapour Lamp.
4. To study different types of earthing and protection devices e.g. MCBs, ELCBs and fuses.
5. To study different types of domestic and industrial wiring and wire up a circuit used for Stair case and Godown wiring.
6. To make the connection of fan regulator with lamp to study the effect of increasing and decreasing resistance in steps on the lamp.
7. To fabricate half wave and full wave rectifiers with filters on PCB.
8. Maintenance and Repair of Electrical equipment i,e Electric Iron , Electric Toaster , Water heater, Air coolers and Electric Fans etc.
9. To study soldering process with simple soldering exercises.
10. To make the connection of a three core cable to three pin power plug and connect the other cable end by secured eyes connection using 23/0.0076”or 40/0.0076” cable.

PART- C
Electronics Workshop

1. To study and demonstrate basic electronic components, Diode, Transistor, Resistance, Inductor and capacitor.
2. To study and demonstrate resistance color coding, measurement using color code and multimeter and error calculation considering tolerance of resistance.
3. To study and demonstrate Multimeter and CRO- front panel controls, description of block diagram of CRT and block diagram of CRO.

4. To study and demonstrate Vp(peak voltage),Vpp(peak to peak voltage), Time, frequency and phase using CRO.
5. Introduction to function generator. Functions of front panel controls and measurement of different functions on CRO.
6. To study and demonstrate variable DC regulated power supply, function of controls and DC measurement using multimeter and CRO.
7. Soldering practice on wire mesh or a resistance decade board includes fabrication, soldering, lacing, harnessing forming and observation.
8. Testing of components using multimeter and CRO like diode, transistor, resistance capacitor, Zener diode and LED.
9. To study and demonstrate rectification, half wave, Full wave and bridge rectifier. Fabrication, assembly and waveform observation.
10. To design and fabricate a printed circuit board of a Zener regulated/ series regulated power supply and various measurements, testing of power supply.

Note: At least 8 exercises are to be performed from each part by the students.

HAS-201C **Mathematics-III**

L T P CR			
3 0 0 3	**Theory**	**:**	**75**
	Class Work	**:**	**25**
	Total	**:**	**100**
	Duration of Exam	**:**	**3 Hrs.**

Course Objectives:

Course is designed to develop appreciation of the scope, usefulness and elegance of mathematics. Students will learn Fourier series, transforms and use these concepts for solving problems in physics, electronics and computer science.

It will give them knowledge of the basics of operations research, including the students ability to formulate problems and to think creatively and synthesize information. It will develop in them the skills for problem solving when a complex variable is involved

Syllabus

Part-A

Fourier Series and Fourier Transforms: Euler's formulae, conditions for a Fourier expansion, change of interval, Fourier expansion of odd and even functions, , half range sine and cosine series. Fourier expansion of square wave, rectangular wave, saw-toothed wave, half and full rectified wave, Fourier integrals.

Fourier transforms, Shifting theorem (both on time and frequency axes), Fourier transforms of derivatives, Fourier transforms of integrals, Convolution theorem. Applications of Fourier transform for solution of standard equations/boundary value problems.

Part-B

Functions of Complex Variable: Definition, Exponential function, Trigonometric and Hyperbolic functions, Logarithmic functions, Limit and Continuity of a function, Differentiability and Analyticity.

Cauchy-Riemann equations, necessary and sufficient conditions for a function to be analytic, polar form of the Cauchy-Riemann equations. Harmonic functions, Milne Thomson Method to find harmonic conjugate of a function. application to flow problems. Integration of complex functions. Cauchy- Integral theorem and formula.

Power series, radius and circle of convergence, Taylor's, Maclaurin's and Laurent's series.

Zeroes and singularities of complex functions, Residues. Cauchy's residue theorem, Evaluation of real integrals using residues (around unit and semi circle only).

Part-C

Probability Distributions : Conditional probability, Bayes theorem and its applications, expected value of a random variable. Properties and application of Binomial, Poisson and Normal distributions.

Linear Programming: Linear programming problems formulation, solving linear programming problems using (i) Graphical method(corner point, iso cost/iso profit) (ii) Simplex method (iii) BIG M method (iv) Duality concept and Dual simplex method.

Course Outcomes:

On successful complete of this course, the students should be able to:

- Use fourier series, transforms and also use concepts for solving problems in physics , electronics and computer science.
- Solve problem when a complex variable is involved. they will learn about use of complex variables, complex integration, basic theorems and their applications.

- Use power series expansion of various functions, Taylor's series, Laurent's series. Solve problems of probability distributions: Binomial, Poisson and Normal distributions.

- Apply knowledge of the basics of operations research, including the students ability to formulate problems and to think creatively and synthesize results using simplex, Big M method, dual simplex method

TEXT BOOKS:

1. Advanced Engg. Mathematics : F Kreyszig. WielyEstern Ltd.
2. Higher Engg. Mathematics : B.S. Grewal, Khanna Publishers, New Delhi

REFERENCE BOOKS:

1. Advanced Engg. Mathematics: Michael D. Greenberg.
2. Operation Research: H.A. Taha.
3. Probability and statistics for Engineers: Johnson. PHI.

EC-203C **Electrical Engineering Materials and Semiconductor Devices**

L T P CR			
3 0 0 3	**Theory**	**:**	**75**
	Class Work	**:**	**25**
	Total	**:**	**100**
	Duration of Exam	**:**	**3 Hrs.**

Course Objectives:

- To familiarize the students about various types of materials, their properties and applications.
- To study various types of semiconductor materials
- To familiarize the students about concept of drift, diffusion and Continuity equations use in semiconductors
- To familiarize the students about various technologies used for fabrication
- To familiarize the students about the construction and characteristics of Bipolar and MOS Devices
- To familiarize the students about the construction and characteristics of Power devices

Syllabus

UNIT 1 CONDUCTING MATERIALS:

Review of energy bands, description of materials, drift velocity, collision time, Mean free path, mobility, conductivity, relaxation time, factors affecting conductivity of materials, types of thermal conductivity, Wiedmann-Franz law, super conductivity, effect of magnetic field, conducting materials, applications.

UNIT 2 DIELECTRIC MATERIALS:

Behaviour of dielectric materials in static electric field, Dipole moments, Polarization, Dielectric constant, Polarizability, Susceptibility, mechanisms of polarization, behaviour in alternating field, dielectric loss, loss tangent, types of dielectric & insulating materials, electrostriction, Piezo-electricity, Applications.

UNIT 3 MAGNETIC MATERIALS:

Permeability, Magnetic susceptibility, magnetic moment, Magnetization, Dipole moment, types of magnetic materials, Magnetostriction, eddy current & hysteresis losses, applications.

UNIT 4 SEMICONDUCTORS:

Review of Si and Ge as semiconducting materials, Intrinsic and extrinsic semiconductors, Effect of temperature on Intrinsic and extrinsic semiconductors. Continuity Equation, P-N junction, P-N Junction diode: V-I characteristics, static and dynamic resistance, Ideal Diode, Drift & Diffusion current, Diffusion & Transition capacitances of P-N junction, breakdown mechanism : Zener and avalanche breakdown.

UNIT 5 CONSTRUCTION AND CHARACTERISTICS OF DEVICES:

Brief introduction to Planar Technology for device fabrication, Metal -semiconductor junctions (ohmic and non-ohmic), Zener diode, Zener diode as constant voltage regulator, electrical and optical excitation in diodes: LED, solar cells and photo-detectors.

UNIT 6 CONSTRUCTION AND CHARACTERISTICS OF BIPOLAR AND MOS DEVICES:

BJT:CB, CE,CC configuration, current amplification factors and their relationship , comparison of CB, CC,CE, Transistor amplifying action, UJT, UJT as relaxation oscillator, Comparison between: BJT/FET, JFET/MOSFET JFET, JFET parameters, MOSFETS: depletion and enhancement type

UNIT 7 POWER DEVICES: CONSTRUCTION AND CHARACTERISICS

Thyristor, Two transistor analogy of thyristor, Diac, Triac, GTO, IGBT, VMOS

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

- Understand the properties and characteristics of materials.
- Be able to get the basic knowledge about the Electric and Magnetic circuits.
- Gain knowledge about semiconductor materials and devices.
- Understand the concept of fabrication.
- Gain knowledge about various bipolar and MOS devices.

TEXT BOOKS:

1. Electrical Engineering Materials: A.J. Dekker; PHI.
2. Solid State Electronic Devices: Streetman& Banerjee; Pearson.
3. Electronic Devices & Circuits: Millman & Halkias; MGH.

REFERENCE BOOKS:

1. Electrical Engineering Materials: S.P Seth & P.V Gupta; Dhanpat Rai.
2. Power Electronics : P.S Bhimra : Khanna Publications
3 Electronic Devices & Circuit Theory : Boylestad & Nashelsky; Pearson.
4. Semiconductor Devices: Jaspreet Singh; John Wiley.
5. Basic Electronics and Linear circuits: N N Bhargava, Kulshreshtha, TMH

EC-205C **Network Analysis & Synthesis**

L T P CR			
3 1 0 4	**Theory**	**:**	**75**
	Class Work	**:**	**25**
	Total	**:**	**100**
	Duration of Exam	**:**	**3 Hrs.**

Course Objectives:

- To introduce the concept of circuit elements lumped circuits, circuit laws and reduction.
- To give the exposure to the students regarding solution of network by using various theorems.
- To study the concept of coupled circuits.
- To study the transient response of series and parallel A.C. circuits.
- To study the application of Laplace transforms to circuit analysis.
- To study two port model of circuit and circuit elements.
- To introduce the concept of various types of filter circuits
- To introduce the concept of network synthesis.

Syllabus

UNIT-1 -INTRODUCTION

Introduction to lumped element electrical systems, Dual networks, Solution to some typical problems, Thevenin‘s and Norton theorem, equivalent circuits, Analogus system Electrical analogus to mechanical translational and rotational system. f-v analogy, f-I analogy.

UNIT2 TRANSIENTS:

Transient response of simple R - L, R - C and R - L - C series and parallel circuits using classical differential equation approach and Laplace Transform method. Response of RL, RC, RLC circuits for impulse and pulse and non sinusoidal periodic functions, excitations using Laplace Transform method.

UNIT 3 NETWORK FUNCTIONS:

Terminal pairs or Ports, Network functions for one-port and two-port networks, poles and zeros of Network functions, Restrictions on pole and zero Locations for driving point functions and transfer functions, Time domain behaviour from the pole-zero plot.

UNIT 4 CHARACTERISTICS AND PARAMETERS OF TWO PORT NETWORKS:

Relationship of two-port variables, short-circuit Admittance parameters, open circuit impedance, parameters, Transmission parameters, hybrid parameters, relationships between parameter sets, Inter-connection of two port networks.

UNIT 5 TOPOLOGY:

Principles of network topology, graph matrices, network analysis using graph theory.

UNIT 6 TYPES OF FILTERS AND THEIR CHARACTERISTICS:

Filter fundamentals, high-pass, low-pass, band-pass, and band-reject Filters.

UNIT 7 NETWORK SYNTHESIS:

Positive real functions, synthesis of one port and two port networks, elementary ideas of Active networks

Course Outcomes:

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

1. Find analogus systems in mechanical and electrical machines using f-v and f-i analogy
2. Find transient response of electrical networks using classical methods and laplace methods
3. Find the network functions of various networks and characteristics and parameters of two port networks
4. Solve circuits using graph theory
5. Synthesize filters (BPF, LPF, HPF, BSF) and networks

TEXT BOOKS:

1. Network Analysis & Synthesis :Umesh Sinha; SatyaPrakash Pub.

2. Network Analysis & Synthesis :F.F.Kuo; John Wiley & Sons Inc.

3. Network Analysis: Van Valkenburg; PHI

REFERENCE BOOKS:

1. Introduction to modern Network Synthesis : Van Valkenburg; John Wiley
2. Basic Circuit Theory: Dasoer Kuh; McGraw Hill.
3. A Course in Electrical Circuit Analysis by Soni & Gupta; Dhanpat Rai Publication.
4. Circuit Analysis: G.K. Mithal; Khanna Publication.
5. Networks and Systems: D.RoyChoudhury; New Age International.

EI-207C Electromechanical Energy Conversion

L T P CR			
3 0 0 3	**Theory**	**:**	**75**
	Class Work	**:**	**25**
	Total	**:**	**100**
	Duration of Exam	**:**	**3 Hrs.**

Course Objectives:

- To provide the knowledge of the Energy balance equation, Principle of Electromechanical Energy Conversion, force & torque equations of singly excited magnetic system as well as dynamic equations.
- To explain construction, theory, working Principle of transformer, O.C.,S.C. test, regulation & efficiency, auto-transformer, three phase transformer.
- To explain construction, theory, working principle of d.c. motors and generators, load characteristics, starting & speed control of d.c. motors.
- To explain construction, theory, working principle, phasor diagram, equivalent circuit, phasor diagram, load characteristics, introduction to single phase induction motors, stepper, servo, reluctance and universal motors.

Syllabus

UNIT 1 ELECTROMECHANICAL ENERGY CONVERSION:
Principles Of Force and torque in magnetic field system, energy balance, energy and force in singly excited magnetic field system, concept of co-energy, forces and torques in system with permanent magnets, dynamic equation.

UNIT 2 TRANSFORMERS:
Basic theory, construction , operation at no-load and full-load, equivalent circuit, phasor diagram, O.C. and S.C. tests for parameters determination, efficiency and regulation, auto-transformer, introduction to three-phase transformer ; Current and Potential Transformers : Principle, construction, analysis and applications.

UNIT 3 DC MACHINES:
Basic theory of DC generator, brief idea of construction, emf equation, load characteristics, basic theory of DC motor, concept of back emf, torque and power equations, load characteristics, starting and speed control of DC motors, applications.

UNIT 4 INDUCTION MOTOR:
Basic theory, construction, Phasor diagram, Equivalent circuit, Torque equation, Load characteristics, starting and speed control of induction motor, Introduction to single phase Induction motor and its applications, Fractional H.P. Motors, Introduction to stepper, servo reluctance and universal motors.

UNIT 5 SYNCHRONOUS MACHINES:

Construction and basic theory of synchronous generator, emf equation, model of generator, Phasor diagram, Regulation, Basic theory of synchronous motor, v-curves, synchronous condenser, applications.

Course Outcomes: On successful complete of this course, the students should be able to:

- Know basics of various types of electric machines, singly excited magnetic field system, dynamic equations.
- Understand theory, various tests, calculate various parameters of transformers.
- Design d.c machine depending on the performance characteristics & use them in various applications.
- Understand the basic principles of Induction machines, synchronous machines and their characteristics.

TEXT BOOK:

1. Electrical Machines: Nagarath and Kothari; TMH

REFERENCE BOOKS:

1. Electrical Machines :P.S. Bimbhra; Khanna
2. Electrical Machines: Mukherjee and Chakravorti; DhanpatRai& Sons
3. Electrical Technology (Vol-II) : B.L Theraja; S. Chand.

EI-209C **Electrical Measurement and Instrumentation**

L T P CR			
3 0 0 3	**Theory**	**:**	**75**
	Class Work	**:**	**25**
	Total	**:**	**100**
	Duration of Exam	**:**	**3 Hrs.**

Course Objectives:

- To introduce the fundamentals of various types of Instruments
- To introduce the principle, working and applications of various types of measuring instruments
- To introduce the principle, working and applications of various types of Wattmeters and Energy Meters
- To introduce the principle, working and applications of various types of Instrument Transformers
- To introduce the principle, working and applications of various types of AC and DC bridges
- To introduce the various types of transducers and Electronics Instruments

Syllabus

Unit 1: Analog Ammeters and Voltmeters

PMMC and MI Instruments, Construction, Torque Equation, Range Extension, Effect of temperature, Classification, Errors, Advantages and Disadvantages.

Unit 2: Analog Wattmeters and Power Factor Meters

Power and Power Factor, Electrodynamometer type wattmeter, power factor meter, Construction, theory, Shape of scale, torque equation, Advantages and disadvantages, active and reactive power measurement in single phase, Measurement in three phase.

Unit 3: Analog Energy Meter

Single phase induction type energy meters, construction, theory, Operation, lag adjustments, Max Demand meters/indicators, Measurement of VAH and VARh.

Unit 4: DC and AC Bridges

Measurement of resistance, Wheatstone Bridge, Kelvin‘s Bridge, Kelvin‘s Double Bridge, Measurement of inductance, Capacitance, Maxwell‘s Bridge, Desauty Bridge, Anderson Bridge, Schering Bridge, Wien Bridge, Applications and Limitations.

Unit 5: Instrument Transformers

Current Transformer and Potential Transformer - construction, theory, phasor diagram, errors, testing and applications.

Unit 6: Transducers:

Transducers Measurement of Temperature, RTD, Thermistors, LVDT, Strain Gauge, Piezoelectric Transducers, Digital Shaft Encoders, Tachometer, Hall effect sensors.

Unit 7: Electronic Instruments

Electronic Display Device, Digital Voltmeters, CRO, Digital Storage Oscilloscope, measurement of voltage and frequency, Lissajous Patterns, Wave Analyzers, Harmonic Distortion Analyzer.

Course Outcomes: On successful complete of this course, the students should be able to:

- Compare performance of MC, MI and Dynamometer types of measuring instruments, Energy meters and CRO
- Determine the circuit parameters using AC and DC bridges
- Understand the principle and working of various types of Instrument Transformers.
- Select transducers for the measurement of various electrical quantities like temperature, displacement and strain
- Understand operating principles of electronic measuring instruments

TEXT BOOK:

A course in Electrical And Electronic measurement and instrumentation : A.K. Sawhney, Dhanpat Rai Publication.

REFERENCE BOOKS:

1. Electrical Measurements: E.W. Golding, TMH
2. Electrical And Electronic measurement and instrumentation: J.B. Gupta, Kataria and Sons.
3. Electronic instrumentation and measurement technique : W.D. Cooper & A.D. Helfrick
4. Measuring systems: E.O. Doeblin; TMH.

EC-211C	**Analog Electronics**		
L T P CR	**Theory**	**:**	**75**
3 1 0 4	**Class Work**	**:**	**25**
	Total	**:**	**100**
	Duration of Exam	**:**	**3 Hrs.**

Course Objectives:

- To introduce Diode as circuit element, load line concepts, half wave rectifier, filter circuits, clipper circuits and clamper circuits, voltage multiplier circuits.
- To introduce basic concepts of transistor and its operation, characteristics of transistor, Analysis of a transistor amplifier circuits using h parameters, miller's theorem
- To introduce basic concepts of transistor biasing, concept of operating point, different methods of biasing: fixed bias, collector to base bias, emitter bias, voltage divider biasing, compensation techniques.
- To introduce basic concepts Hybrid π model of transistor, CE short circuit gain, gain bandwidth product, emitter follower at high frequencies.
- To introduce basic concepts of JFET, V-I characteristics of FET, small signal model of FET, common source amplifier, source follower, biasing of FET, application of FET as VVR.
- To introduce basic concepts of Regulated power supply, voltage regulation, Series and shunt regulator, IC regulator.

Syllabus

UNIT 1 SEMICONDUCTOR DIODE & DIODE CIRCUITS:

Diode as a circuit element, Load line concepts, half wave & Full wave rectifier, Filter circuits (Capacitor & Inductor Filter), Clipping circuits, clamping circuits, Peak to peak detector, Voltage multiplier circuit.

UNIT 2 TRANSISTOR AT LOW FREQUENCIES:

Bipolar junction transistor operation, Characteristics, Analysis of a transistor amplifier circuits using h-parameters, emitter follower, Miller's theorem.

UNIT3 TRANSISTOR BIASING:

Operating point, Selection of operating point, bias stability, Stability factor, Different methods for transistor biasing: fixed bias, collector to base bias, emitter bias, voltage divider biasing, compensation techniques (thermistor &Sensistor compensation).

UNIT4 TRANSISTOR AT HIGH FREQUENCIES:

Hybrid Pi model, CE short circuit gain, frequency response, alpha cut off frequency, Gain Bandwidth product, Emitter follower at high frequencies .

UNIT5 FET & FET CIRCUITS:
Junction field effect transistor, Pinch off voltage, Volt ampere characteristics, small signal model, common source amplifier, source follower, biasing of FET, application of FET as voltage variable resistance.

UNIT6 REGULATED POWER SUPPLY:
Block Diagram of Power supply, Voltage regulation, Series and Shunt voltage regulator, IC Regulator.

Course Outcomes: On successful complete of this course, the students should be able to:

- Understand diodes as a device, rectifier circuits, filter circuits and application of diode as clipper and clamper circuits.
- Understand the concepts of transistor and their characteristics, analysis of transistor amplifier using h parameters.
- Describe the basic concept of biasing and different biasing techniques and compensation techniques.
- Analyze the hybrid model of transistor at high frequency.
- Understand the concepts of FET, V-I characteristics and small signal model of FET. Also discuss biasing of FET and application of FET as VVR.
- Understand concept of regulated power supply and IC regulator.

TEXT BOOKS:
1. Integrated Electronics: Millman & Halkias ; McGrawHill
2. Electronic circuit analysis and design (Second edition): D.A.Neamen; TMH

REFERENCE BOOKS:
1. Electronics Principles: Malvino ; McGrawHill
2. Electronics Circuits: Donald L. Schilling & Charles Belove ; McGrawHill
3. Electronics Devices & Circuits: Boylestad&Nashelsky ; Pearson.

EC-255C	**Network Analysis and Synthesis Lab**			
L T P CR		**Internal Marks**	**:**	**15**
0 0 2 1		**External Marks**	**:**	**35**
		Total	**:**	**50**
		Duration of Exam	**:**	**3 Hrs.**

List of Experiments

1. Transient response of RC circuit.
2. Transient response of RL circuit.
3. To find the resonance frequency, Band width of RLC series circuit.
4. To calculate and verify ―Z" parameters of a two port network.
5. To calculate and verify "Y" parameters of a two port network.
6. To determine equivalent parameter of parallel connections of two port network.
7. To plot the frequency response of low pass filter and determine half-power frequency.
8. To plot the frequency response of high pass filters and determines the half-power frequency.
9. To plot the frequency response of band-pass filters and determines the band-width.
10. To calculate and verify "ABCD" parameters of a two port network.
11. To synthesize a network of a given network function and verify its response.
12. Introduction of P-Spice

Course Outcomes: On successful complete of this course, the students should be able to:

- Design RC & RL circuits and check their transient response experimentally.
- Design RLC series circuits & find the frequency response.
- Analyse the circuits of two port network and verify ‘ABCD’ ‘Z’ & ‘Y’ parameters of two port network.
- Design & plot the frequency response of low pass filter, high pass filter & band-pass filter experimentally.
- Synthesize a network using Foster & Cauer Forms.
- Write experimental reports and work in a team in professional way.

Software Used: P-spice

EI-257C	**EMEC Lab**		
L T P CR	**Internal Marks**	**:**	**15**
0 0 2 1	**External Marks**	**:**	**35**
	Total	**:**	**50**
	Duration of Exam	**:**	**3 Hrs.**

List of Experiments

1. To perform Open Circuit Test and Short Circuit Test on a Single Phase Transformer.
2. To fine the Turns ratio and Polarity Test of a Single Phase Transformer
3. To perform load test on a sigle phase transformer and determine efficiency and valtage regulation
4. To plot magnetization curve for separately excited DC Generator.
5. To plot external characteristics of DC Shunt Generator.
6. To plot external characteristics of DC series Generator.
7. To study speed control of DC Shunt Motor.
8. To perform load test on DC Shunt Motor.
9. To perform Back to Back test of sigle phase transformer.
10. To study the starting methods of 3-Phase Induction motor.
11. To plot open circuit and short circuit characteristics of a 3-phase Synchronous Generator.
12. To perform No-Load test and Blocked Rotor test on 3-Phase Induction Motor.

EI-259C	**Electrical Measurement and Measuring Instruments Lab**		
L T P CR	**Internal Marks**	**:**	**15**
0 0 2 1	**External Marks**	**:**	**35**
	Total	**:**	**50**
	Duration of Exam	**:**	**3 Hrs.**

List of Experiments

1. Find the value of unknown resistance using Wheatstone Bridge.
2. To measure unknown frequency using CRO by Lissajous pattern
3. To find value of unknown resistance using Kelvin Double Bridge
4. To measure power factor of AC load using voltage current method.
5. Study and analysis of working principle of energy meter.
6. To study potential transformer (PT).
7. To study current transformer (CT).
8. To measure high power using Instrument Transformer.
9. To determine B-H curve of ferromagnetic material.
10. To study AC bridges (Hay's bridge, Maxwell bridge, Schering bridge)

Course Outcomes: On successful complete of this course, the students should be able to:

- Operate and make the various measurements on Wheatstone Bridge, CRO, Kelvin Double Bridge and thermocouple.
- Operate potential transformer and current transformer.
- Measure high power using Instrument Transformer.
- Determine B-H curve of ferromagnetic material

EC-261C	**Analog Electronics Lab**		
L T P CR	**Internal Marks**	**:**	**15**
0 0 2 1	**External Marks**	**:**	**35**
	Total	**:**	**50**
	Duration of Exam	**:**	**3 Hrs.**

List of Experiments

1. Study of Half wave & Full wave rectifiers.
2. Study of Diode as clipper and clamper.
3. Study of Zener diode as a voltage regulator.
4. Study of CE amplifier for voltage, current & Power gains and input, output impedances.
5. Study of CC amplifier as a buffer.
6. To study the frequency response of RC coupled amplifier.
7. Study of 3-terminal IC regulator.
8. Study of FET common source amplifier.
9. Study of FET common Drain amplifier.
10. Study & design of a.d.c. voltage doubler.
11. V-I Characteristics of PN junction diode and zener diode.

Course Outcomes: On successful complete of this course, the students should be able to:

- Understand the operation of half wave & full wave rectifier without & with filter experimentally.
- Understand the application of diode &Zener diode experimentally.
- Obtain input and output characteristics of transistors in CE, CB & CC configurations.
- Obtain FET characteristics.
- Write experimental reports and work in a team in professional way

EC-263C	**Workshop-III**		
L T P CR	**Internal Marks**	**:**	**60**
0 0 6 3	**External Marks**	**:**	**140**
	Total	**:**	**200**
	Duration of Exam	**:**	**8 Hrs.**

List of Job/ Experiments

1. To fabricate & verify half-wave rectifier with & without filter & to find Ripple Factor.
2. To fabricate & verify full wave centre-tap rectifier with & without filter & to find Ripple Factor.
3. To fabricate & verify full wave bridge rectifier with & without filter & to find Ripple Factor.
4. To fabricate fixed IC voltage regulator & to find line & load regulation.
5. To design & fabricate variable voltage regulator & to find line & load regulation
6. To design & fabricate Zener diode as a shunt voltage regulator & to find line & load regulation
7. To Fabricate fixed dual power supply.
8. To design & study 555 timer as astable multivibrator.
9. To design & study 555 timer as VCO.
10. To design & study 555 as square wave generator.
11. To fabricate 555 based mini project.
12. To plot Transistor characteristics of CE configuration.
13. To Design RC coupled Amplifier & to find i/p impedance, o/p impedance, mid band gain, bandwidth.
14. To Design RC phase-shift oscillator.
15. To fabricate OP-AMP based mini project.

EI-204C **Signals and Systems**

L T P CR			
3 1 0 4	**Theory**	**:**	**75**
	Class Work	**:**	**25**
	Total	**:**	**100**
	Duration of Exam	**:**	**3 Hrs.**

Course Objectives:

- To introduce the signals and their classification
- To study various types of LTI systems
- To introduce the signal analysis using Fourier series method
- To introduce the properties of Fourier Transform, Lapalace Transform, DTFT and DFT

Syllabus

UNIT1. SIGNALS AND SYSTEMS:
Continuous Time and Discrete Time signals, Exponential and Sinusoidal Signals, Unit Impulse and Unit Step Functions, Continuous and Discrete Time Systems, basic System Properties.

UNIT2. LINEAR TIME INVARIANT SYSTEMS:
Discrete Time LTI Systems, Continuous Time LTI Systems, properties of LTI Systems, causal LTI Systems Described by Difference equations.

UNIT3. FOURIER SERIES REPRESENTATION OF PERIODIC SIGNALS:
Response of LTI systems to Complex Exponentials, Fourier series Representation of CT periodic Signals, properties of CT Fourier Series, Fourier Series representation of DT periodic Signals, properties of DFS, Fourier series and LTI Systems, Filtering, Examples of CT filters, Examples of DT filters.

UNIT4 CONTINUOUS TIME FOURIER TRANSFORM:
Representation of a periodic Signals by continuous FT, FT of periodic signals, convolution and multiplication property of continuous FT, systems characterized by Linear Constant Coefficient Differential Equations., , Magnitude and phase representation of FT, Magnitude and phase response of LTI systems, Time domain and Frequency domain aspects of ideal and non ideal filters.

UNIT 5: LAPALACE TRANSFORM:
Need of Laplace transform, Properties, initial and final value theorem, ROC, parallel and cascade structure.

UNIT 6 : DISCRETE TIME FOURIER TRANSFORM (DTFT) and DISCRETE FOURIER TRANSFORM (DFT):
Properties of DTFT and DFT, convolution property, multiplication property, Duality, Systems characterized by Linear Constant Coefficient Difference Equations.

Course Outcomes: On successful complete of this course, the students should be able to:

- Classify the signals as Continuous time and Discrete time
- Analyze the spectral characteristics of signals using Fourier analysis.
- Classify systems based on their properties and determine the response of LTI system using convolution.
- Identify system properties based on impulse response and Fourier analysis.
- Apply transform techniques to analyze continuous-time and discrete-time signals and systems.

TEXT BOOK:

1. Alan V. Oppenheim, Alan S. Willsky, S. Hamid Nawab, Signals and Systems Prentice Hall India, 2nd Edition, 2009.

REFERENCE BOOKS:

1. John G. Proakis, Dimitris G. Manolakis, Digital Signal Processing, Principles, Algorithms, and Applications, 4th Edition, PHI, 2007.
2. Robert A. Gable, Richard A. Roberts, Signals & Linear Systems, 3rd Edition, John Wiley, 1995.
3. B.P Lathi, Modern Digital and Analog Communication Systems, 3rd Edition, Oxford Publications.

HAS-206C **Computational Techniques**

L T P CR			
3 0 0 3	**Theory**	**:**	**75**
	Class Work	**:**	**25**
	Total	**:**	**100**
	Duration of Exam	**:**	**3 Hrs.**

Course Objectives:

- To introduce the students about Newton‘s forward and backward interpolation formulae, Central difference interpolation formula, Gauss forward and backward interpolation formulae, Langrages interpolation formula and Newton‘s divided difference formulae.
- To introduce the students about the solution of algebraic equations, transcendental equations and simultaneous algebraic equations.
- To introduce the students about the solution of Trapezoidal rule, Simpson's 1/3rd and 3/8th rules, Boole's rule and Weddle's rule, Romberg's Integration
- To introduce the students about the numerical solution of ODE and PDE

Syllabus

UNIT1 FINITE DIFFERENCES AND INTERPOLATION:

Various difference operators and relation between them .Newton‘s forward and backward interpolation formulae. Central difference interpolation formula. Gauss forward and backward interpolation formulae. Langrages interpolation formula and Newton‘s divided difference formulae.

UNIT2 SOLUTION OF ALGEBRAIC AND TRANSCENDENTAL EQUATIONS:

Bisection method, method of false position,secant method, iteration method, Newton's Raphson method, Generalised Newton-Raphson method

UNIT3 SOLUTIONS OF SIMULTANEOUS ALGEBRIC EQUATIONS:

Jacobi's method, Gauss-Seidal method, Relaxation method.

UNIT4 NUMERICAL DIFFERENTIATION AND INTEGRATION: Formula for derivatives Trapezoidal rule, Simpson's $1/3^{rd}$ and $3/8^{th}$ rules, Boole's rule and Weddle's rule, Romberg's Integration.

UNIT5 NUMERICAL SOLUTION OF O.D.E:

Taylor series, Picard‘s method, Euler , Modified Euler method, Runge-Kutta second and fourth order methods, predictor collector methods (Adams-Bashforth and Milne's method only),

UNIT6 NUMERICAL SOLUTION OF P.D.E:

Finite difference approximations of partial derivatives, solution of Laplace equation (Standard 5-point formula only), one-dimensional heat equation (Schmidt method, Crank-Nicolson method, Dufort and Frankel method) and wave equation.

Course Outcomes:

On successful complete of this course, the students should be able to:

- Understand about Newton‘s forward and backward interpolation formulae, Central difference interpolation formula, Gauss forward and backward interpolation formulae, Langrages interpolation formula and Newton‘s divided difference formulae.

- Understand about the solution of algebraic equations, transcendental equations and simultaneous algebraic equations

- Understand about the solution of Trapezoidal rule, Simpson's 1/3rd and 3/8th rules, Boole's rule and Weddle's rule, Romberg's Integration

- Understand about the numerical solution of ODE and PDE

TEXT BOOKS:

1. Numerical Methods in Engg. & Science: B.S. Grewal;khanna.

2. Numerical Methods for Scientific and Engg. Computations: M.K. Jain, S.R.K. Iyenger and R.K. Jain-Wiley Eastern Ltd

REFERENCE BOOKS:

1 Computer oriented Numerical Methods: U.Ra
2 Introduction to Numerical Analysis C.E.Froberg;AddisonWesly
3 Numerical methods in Engg. & Science: B.S Grewal

EC-208 C **Digital Electronics**

L T P CR			
3 0 0 3	**Theory**	**:**	**75**
	Class Work	**:**	**25**
	Total	**:**	**100**
	Duration of Exam	**:**	**3 Hrs.**

Course Objectives:

- To introduce Digital signals, numbers systems, various types of logic gates and various types of codes
- To introduce Combinational design using gates, K-map and Q-M methods of simplification
- To introduce Multiplexers and Demultiplexers, Decoders, Adders / Subtractors, BCD arithmetic circuits, Encoders, Decoders / Drivers for display devices.
- To introduce Sequential circuits, F/F Conversions, sequence generators, Counters
- To introduce the design of Synchronous and Asynchronous sequential circuits.
- To introduce various types of Digital Logic Families
- To introduce various types of A/D and D/A converters
- To classification of memories and various types of Programmable Logic Devices

Syllabus

UNIT 1 FUNDAMENTALS OF DIGITAL TECHNIQUES:

Digital signal, logic gates: AND, OR, NOT, NAND, NOR, EX-OR, EX-NOR, Boolean algebra. Review of Number systems. Binary codes: BCD, Excess-3, Gray, EBCDIC, ASCII, Error detection and correction codes.

UNIT 2 COMBINATIONAL DESIGN USING GATES:

Design using gates, Karnaugh map and Quine Mcluskey methods of simplification.

UNIT 3 COMBINATIONAL DESIGN USING MSI DEVICES

Multiplexers and Demultiplexers and their use as logic elements, Decoders, Adders / Subtractors, BCD arithmetic circuits, Encoders, Decoders / Drivers for display devices.

UNIT 4 SEQUENTIAL CIRCUITS:

Flip Flops : S-R, J-K, T, D, master-slave, edge triggered, shift registers, F/F Conversions, sequence generators, Counters, Asynchronous and Synchronous Ring counters and Johnson Counter, Design of Synchronous and Asynchronous sequential circuits.

UNIT 5 DIGITAL LOGIC FAMILIES:

Switching mode operation of p-n junction, bipolar and MOS. devices. Bipolar logic families:RTL, DTL, DCTL, HTL, TTL, ECL, MOS, and CMOS logic families. Tristate logic, Interfacing of CMOS and TTL families.

UNIT 6 A/D AND D/A CONVERTERS:

Sample and hold circuit, weighted resistor and R -2 R ladder D/A Converters, specifications for D/A converters. A/D converters : Quantization, parallel -comparator, successive approximation, counting type, dual-slope ADC, specifications of ADCs.

UNIT 7 MEMORIES AND PLD'S

Classification of memories –RAM organization l-Bipolar RAM cell – MOSFET RAM cell – Dynamic RAM cell – ROM- PROM –EPROM –EEPROM –EAPROM –Programmable Logic Devices –Programmable Logic Array (PLA)-Programmable Array Logic (PAL)-Field Programmable Gate Arrays (FPGA).

Course Outcomes:

On successful complete of this course, the students should be able to:

- Represent numerical values in various number systems and perform number conversions between different number systems.
- Analyze and design digital combinational circuits like decoders, encoders, multiplexers, and de-multiplexers including arithmetic circuits (half adder, full adder).
- Analyze and design sequential digital circuits like registers, counters using flip flop.
- Analyze the difference logic families and analog to digital converter.
- Nomenclature and technology in the area of memory devices: ROM, RAM, PROM, PLD, FPGA etc.

TEXT BOOK:

1. Modern Digital Electronics(Edition III) : R. P. Jain; TMH

REFERENCE BOOKS:

1. Digital Integrated Electronics: Taub& Schilling; MGH
2. Digital Principles and Applications: Malvino& Leach; McGraw Hill.
3. Digital Design: Morris Mano; PHI

EC-210C **Communication Systems**

L T P CR			
3 0 0 3	**Theory**	**:**	**75**
	Class Work	**:**	**25**
	Total	**:**	**100**
	Duration of Exam	**:**	**3 Hrs.**

Course Objectives:

- To introduce the basic of communication system, signals and their classification
- To introduce the signal analysis using Fourier Series and Fourier Transform alongwith their properties.
- To introduce the methods used for generation and detection of AM,DSB, SSB, FM and PM
- To introduce Sampling theorem. PAM, PWM and PPM
- To introduce the deneration and detection of PCM,DM and ADM.
- To introduce various Digital modulation techniques such as ASK, BPSK,FSK, alongwith generation and demodulation.
- To introduce basic concepts of noise, Internal and external noise, SNR, noise figure.

Syllabus

UNIT1. INTRODUCTION TO COMMUNICATION SYSTEMS:

The essentials of a Communication system, modes and media‘s of Communication, Classification of signals and systems, Fourier analysis of signals.

UNIT2. AMPLITUDE MODULATION:

Amplitude modulation, Generation of AM waves, Demodulation of AM waves, DSBSC, Generation of DSBSC waves, Coherent detection of DSBSC waves, single side band modulation, generation of SSB waves, demodulation of SSB waves, vestigial sideband modulation (VSB).

UNIT3. ANGLE MODULATION:

Basic definitions: Phase modulation (PM) & frequency modulation (FM), narrow band frequency modulation, wideband frequency modulation, generation of FM waves, Demodulation of FM waves.

UNIT4. PULSE MODULATION:

Sampling theory, pulse amplitude modulation (PAM), pulse time modulation., Elements of pulse code modulation,Quantization, Uniform &nonuniform Quantization, Necessicity of nonuniform quantization, A law of Companding, μ law of companding, Quantization error in PCM, transmission BW of PCM, Differential Pulse Code Modulation, Delta Modulation, Adaptive Delta Modulation, TDM, FDM.

UNIT5. DIGITAL MODULATION TECHNIQUES:

ASK, Generation and detection of ASK, FSK Generation and detection of FSK, BPSK ,

Generation & detection of BPSK, QPSK, generation and detection of QPSK, DPSK, M-ary PSK.

UNIT6. INTRODUCTION TO NOISE:
External noise, internal noise, S/N ratio, noise figure, noise temperature.

Course Outcomes: On successful complete of this course, the students should be able to:

- Understand Fourier Series and Fourier Transform and their applications in communication system.
- Understand Amplitude modulation, frequency modulation and Phase modulation and their mathematical expression, their generation and detection.
- Understand Sampling theorem, basic concept of PAM, PWM, PPM and PCM. Quantization and necessity of quantization.
- Understand Digital modulation techniques: ASK, BPSK, FSK and their generation and detection.
- Understand basic concepts of noise, internal and external noise, signal to noise ratio and noise figure

TEXT BOOKS:

1. Communication systems (4th edn.): Simon Haykins; John wiley& sons.
2. Communication systems: Singh &Sapre; TMH.

REFERENCE BOOKS:

1. Electronic Communication systems: Kennedy; TMH.
2. Communication Electronics: Frenzel; TMH.
3. Communication system: Taub& Schilling; TMH.
4. Communication systems: Bruce Carlson, McGraw Hill.

EC-212C	**Electromagnetic Field Theory**		
L T P CR	**Theory**	**:**	**75**
3 1 0 4	**Class Work**	**:**	**25**
	Total	**:**	**100**
	Duration of Exam	**:**	**3 Hrs.**

Course Objectives:

- To apply vector calculus to static electric-magnetic fields in different engineering situations.
- To analyze Maxwell's equation in different forms (differential and integral) and apply them to diverse engineering problems.
- To examine the phenomena of wave propagation in different media and its interfaces and in applications of microwave engineering.
- To analyze the nature of electromagnetic wave propagation in guided medium which are used in microwave applications.
- To give the exposure to students regarding the concepts of transmission line

Syllabus

UNIT1.STATIC ELECTRIC FIELDS:

Coulomb's Law, Introduction to Del operation, Study of Del operation on scalar and vector and its physical interpretation, Laplacian operator, Stoke's Theorem and Divergence Theorem, Gauss's Law, potential function, field due to a continuous distribution of charge, equi-potential surfaces, Poison's equation, Laplace's equation, method of electrical images, capacitance, electro-static energy, boundary conditions, the electro-static uniqueness theorem for field of a charge distribution, Dirac-Delta representation for a point charge and an infinitesimal dipole.

UNIT2. STEADY MAGNETIC FIELDS:

Faraday Induction law, Ampere's Work law in the differential vector form, Ampere's law for a current element, magnetic field due to volume distribution of current and the Dirac-delta function, Ampere's Force Law, boundary conditions for magnetostatic, magnetic vector potential, scalar vector potential (Alternative derivation).

UNIT3. TIME VARYING FIELDS:

Introduction to conduction current, convection current and displacement current; Equation of continuity for static and time varying fields, inconsistency of Ampere's law, Maxwell's field equations and their interpretation, solution for free space conditions, electromagnetic waves in a homogeneous medium, Discussion on : Group velocity, Phase velocity, Attenuation constant, Phase constant, Refractive index; propagation of uniform plane-wave, relation between E & H in a uniform plane-wave, wave equations for conducting medium, Maxwell's equations using phasor notation, wave propagation in a conducting medium, Loss Tangent, conductors, dielectrics, wave propagation in good conductor and good dielectric, depth of penetration, polarization, linear, circular and elliptical,

UNIT4. REFLECTION AND REFRACTION OF E M WAVES:

Reflection and refraction of plane waves at the surface of a perfect conductor & perfect dielectric (both normal incidence as well as oblique incidence), Brewester's angle and total

internal reflection, reflection at the surfaces of a conductive medium, surface impedance, transmission-line analogy, poynting theorem, interpretation of E x H, power loss in a plane conductor.

UNIT5.TRASMISSION LINE THEORY:

Transmission line as a distributed circuit, Primary and Secondary constant, Transmission less and Loss less transmission line, Open circuit and short circuit transmission line, Reflection coefficient, Standing waves, VSWR, Smith's chart and its applications.

Course Outcomes: On successful complete of this course, the students should be able to:

- Apply vector calculus to engineering situations of static electric fields in different engineering situations.
- Apply vector calculus to steady magnetic fields in different engineering situation.
- To analyse maxwell's equations in different forms(differential and integral) and to examine the behaviour of wave propagation in different media and its apply them to diverse engineering problems.
- Understand reflection and refraction of electromagnetic wave in different medium and amount of power transmitted, power losses and stored in different medium.
- Understand the concept of transmission line, infinite transmission line, standing wave ratio and application of smith chart for calculation of transmission line parameter.

TEXT BOOK:

1. Electro-magnetic Waves and Radiating System: Jordan &Balmain, PHI.

REFERENCE BOOKS:

1. Engineering Electromagnetics : Hayt; TMH
2. Electro-Magnetics : Krauss J.DF; McGraw Hill.

HAS-256C **Computational Techniques Lab**

L T P CR			
0 0 2 1	**Internal Marks**	**:**	**15**
	External Marks	**:**	**35**
	Total	**:**	**50**
	Duration of Exam	**:**	**3 Hrs.**

List of Experiments

Write Down and Execute the Following Programs Using C/C++/MATLAB

1. To find the roots of non-linear equation using Bisection method/muller's Method.
2. To find the roots of non-linear equation using Newton's method/muller's Method.
3. Curve fitting by least - square approximations.
4. To solve the system of linear equations using Gauss- Elimination method.
5. To solve the system of linear equations using Gauss-Seidal iteration method.
6. To solve the system of linear equations using Gauss-Jorden method.
7. To Integrate numerically using Trapezoidal rule.
8. To Integrate numerically using Simpson's rules.
9. To find the largest eigen value of a matrix by power-method.
10. To find numerical solution of ordinary differential equations by Euler's method.
11. To find numerical solution of ordinary differential equations by Runge Kutta method.
12. To find numerical solution of ordinary differential equations by Milne's method.
13. To find the numerical solution of Laplace equation.
14. To solve a given problem using Newtons forword interpolation formula.
15. To solve a given problem using Lagranges forword interpolation formula.

Course Outcomes: On successful complete of this course, the students should be able to:

- Write and execute the program of C/C++/MATLAB for finding the roots of non linear equation using Bisection methods & Newton methods.
- Write & execute the program of C/C++/MATLAB of curve fitting by least square approximation.
- Write & execute the program of C/C++/MATLAB for solving the system of linear equations using Gauss Elimination Method, Gauss Seidal Method & Gauss Jorden Method.
- Write & execute program for integration.

- Write & execute program for solution of ordinary differential equations by using various methods.
- Write & execute the program of numerical solution of Laplace Equation, Wave Equation & Heat Equation.
- Write experimental reports and work in a team in professional way

EC-258 C **Digital Electronics Lab**

L T P CR			
0 0 2 1	**Internal Marks**	**:**	**15**
	External Marks	**:**	**35**
	Total	**:**	**50**
	Duration of Exam	**:**	**3 Hrs.**

List of Experiments

1. Study of TTL gates – AND, OR, NOT, NAND, NOR, EX-OR, EX-NOR.
2. Design & realize a given function using K-maps and verify its performance.
3. To verify the operation of multiplexer & Demultiplexer.
4. To verify the operation of comparator.
5. To verify the truth tables of S-R, J-K, T & D type flip flops.
6. To verify the operation of bi-directional shift register.
7. To design & verify the operation of 3-bit synchronous counter.
8. To design and verify the operation of synchronous UP/DOWN decade counter using J K flip-flops & drive a seven-segment display using the same.
9. To design and verify the operation of asynchronous UP/DOWN decade counter using J K flip-flops & drive a seven-segment display using the same.
10. To design & realize a sequence generator for a given sequence using J-K flip-flops.
11. Study of CMOS NAND & NOR gates and interfacing between TTL and CMOS gates.
12. Design a 4-bit shift-register and verify its operation. Verify the operation of a ring counter and a Johnson counter.
13. To realize the given function using decoder and OR gate.

Course Outcome: On the successful competition of this course, the students should be able to:

- Verify the operation of basic & universal gates.
- Design & verify the standards of combinational circuits.
- Verify the operations of different type of flip flops.
- Design the counters using flip flops for a given sequence.
- Verify the working of shift registers.
- Write experimental reports and work in a team in professional way

EC-260C **Communication Systems Lab**

L T P CR			
0 0 2 1	**Internal Marks**	**:**	**15**
	External Marks	**:**	**35**
	Total	**:**	**50**
	Duration of Exam	**:**	**3 Hrs.**

List of Experiments

1. Study of Amplitude Modulation and determination of Modulation index.
2. Study of Frequency Modulation and determination of Modulation index.
3. Study of Phase Modulation.
4. Study of Pulse Amplitude Modulation.
5. Study of Pulse Width Modulation.
6. Study of Pulse Frequency Modulation.
7. Study of Pulse Code Modulation.
8. Study of frequency Shift Keying.
9. Study of ASK
10. Study of PSK
11. Project related to the scope of the course.
12. Study of Delta modulation

Course Outcomes: On successful complete of this course, the students should be able to:

- Demonstrate about various blocks in communication system.
- Analyze the types of modulations.
- Analyze and design the analog modulator and demodulator circuits.
- Generate the waveforms of AM,FM, PM, PWM,PPM and PAM.
- Calculate Power relations in Amplitude and Frequency modulated waves.
- Write experimental reports and work in a team in professional way

EC-262C	**Workshop-IV**		
L T P CR	**Internal Marks**	**:**	**60**
0 0 6 3	**External Marks**	**:**	**140**
	Total	**:**	**200**
	Duration of Exam	**:**	**8 Hrs.**

List of Job/ Experiments

1. To verify the truth table of OR, AND, NOT, NAND, NOR, Ex-OR, Ex-NOR gates for negative and positive logic using TTL/CMOS ICs.
2. To fabricate NAND, NOR & NOT gate using Diode Transistor Logic.
3. To design & realize combinational circuit using K-Map & verify its performance.
4. To design 4 bit parallel adder / subtractor/ for unsigned/ signed numbers.
5. To fabricate & verify the operation of Multiplexer & to implement any given function with a MUX.
6. To verify the operation of DEMUX & decoder.
7. To design Code converters.
8. To identify common cathode & common anode of seven segment display with its various segments.
9. To fabricate BCD to seven segment decoder.
10. To verify the truth table of SR, JK, D & T Flip-Flop & conversion of one flip-flop to another FF.
11. To design Mod-8 Synchronous Counter using T Flip-Flop.
12. To design UP-DOWN decade counter using JK/T Flip-Flop & derive o/p into SSD.
13. To design minute clock.
14. To verify the function of Universal Shift Register.
15. To design Ring & Johnson counter using Universal Shift Register.
16. To verify the function of RAM.
17. To verify the function of a 4- bit ALU.
18. To study the operation of 8-bit A/D converter.
19. To design 4bit DAC.
20. Mini project based on concepts of digital electronics.

EC-301C	**Digital Communication System**		
L T P CR	**Theory**	**:**	**75**
3 1 0 4	**Class Work**	**:**	**25**
	Total	**:**	**100**
	Duration of Exam	**:**	**3 Hrs.**

Course Objectives:

- To introduce students about communication channels and their characteristics.
- To introduce the students about Digital Modulation Techniques.
- To introduce the students about the various components of information theory.
- To introduce the students for various types of coding techniques.
- To introduce the students about the various error correcting codes.
- To introduce the students about Random Signal Theory

Syllabus

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Unit 1: Communication channels and their characteristics: Model of digital communication system. Geometrical interpretation of signals-numerical examples, Detection of known signals in noise, Union bound on probability of error, Correlation receiver, Matched filter receiver, numerical examples.

Unit 2: Detection of signals with unknown phase in noise: Maximum likelihood estimation, Wiener filter for waveform estimation. Discrete PAM signals, Intersymbol interference, Nyquist's criterion for distortion less baseband binary transmission. Nyquist's criterion for distortion less baseband binary transmission-numerical examples, Correlative coding, Baseband M-ary PAM systems, Eye pattern, Adaptive equalization for data transmission.

Unit 3: Digital modulation formats-coherent binary modulation techniques: Coherent quadrature modulation techniques Coherent quadrature modulation techniques, Noncoherent binary modulation techniques, Comparison of binary and quaternary modulation techniques M-ary modulation techniques- M-ary PSK, M-ary QAM, M-ary FSK.

Unit 4 Information Theory:
Introduction to information and entropy, channel capacity for discrete and continuous channels, Shannon's Theorem, Shannon-Hartley Theorem, Noisy channels, coding theory : Shannon-Fano coding, minimum redundance coding, linear block codes , hamming codes , convolution codes maximization of entropy of a continuous message transmission rate, effect of medium on the information, selection of channels ,effect of noise and its minimization.

Unit 5 Random Signal Theory:
Representation of random signals, concept of probability, probability of joint occurrence, conditional probability, discrete probability theory, continuous random variables, probability distribution function, probability density function, joint probability density functions. Statistical average and moments, Ergodic processes, correlation function, power spectral density, central limit theory, response of linear system to random signals. Error function, regularity, covariance relation among the spectral densities of the two input-output random processes. Cross spectral densities.

Course Outcomes: On successful complete of this course, the students should be able to:

- Understand about communication channels and their characteristics.
- Understand about Digital Modulation Techniques.
- Understand about the various components of information theory and coding techniques.
- Understand about the various error correcting codes and random Signal Theory

TEXT BOOK:

1. Principles of Communication Systems : TaubSchiling; TMH

REFERENCE BOOKS:

1. Communication Systems: Singh and Sapre ; TMH
2. Communication Systems: A Bruce Carlson; TMH

EC-303C **Analog Integrated Circuits**

L T P CR			
3 1 0 4	**Theory**	**:**	**75**
	Class Work	**:**	**25**
	Total	**:**	**100**
	Duration of Exam	**:**	**3 Hrs.**

Course Objectives:

- To introduce the classification of amplifiers and distortion in amplifiers.
- To introduce the basic concepts of feedback amplifier.
- To introduce Barkhausen criteria of oscillation and various types of oscillators.
- To introduce the Class A, Class B and Class C operation of amplifier circuits and configurations
- To introduce Operational amplifier and their characteristics.
- To introduce Linear and non linear application of Operational Amplifier.
- To introduce waveform generators, multivibrators using IC 555 and its applications.

Syllabus

UNIT1. SINGLE AND MULTISTAGE AMPLIFIERS:

Classification of amplifiers, distortion in amplifiers, frequency response of an amplifier, step response of an amplifier, pass-band of cascaded stages, RC-coupled amplifier, low frequency response of RC coupled stage, effect of an emitter bypass capacitor on low Frequency response, multistage CE amplifier.

UNIT2. FEEDBACK AMPLIFIERS:

Feedback concept, transfer gain with feedback, general characteristics of negative feedback amplifiers, input resistance, output resistance, voltage series feedback, current series feedback, current shunt feedback, voltage shunt feedback.

UNIT3. OSCILLATORS:

Sinusoidal oscillators, Barkhausen criteria, R-C phase shift oscillator, generalform of oscillator circuit, wien-bridge oscillator, crystal oscillator.

UNIT4. POWER AMPLIFIERS:

Class A, B, and C operations; Class A large signal amplifiers, higher order harmonic distortion, efficiency, transformer coupled power amplifier, class B amplifier : efficiency & distortion; class A and class B push-pull amplifiers; Cross over distortion, Class C power amplifier.

UNIT5. OPERATIONAL AMPLIFIERS:

Ideal and practical operational amplifiers, inverting and non-inverting amplifier, differential amplifier, emitter coupled differential amplifier, transfer characteristics of a differential amplifier, offset error : voltage and current, common mode rejection ratio (CMRR) .

UNIT6. LINEAR APPLICATIONS OF OPERATIONAL AMPLIFIERS:

Scale changer, phase shifter, adder, voltage to current converter, current to voltage converter, DC voltage follower, Bridge amplifier, AC coupled amplifier, AC voltage follower, Integrator, differentiator.

UNIT7. NON-LINEAR APPLICATIONS OF OPERATIONAL AMPLIFIERS:
Comparators sample & hold circuits, Logarithmic amplifier, anti-log amplifier, logarithmic multiplier, waveform generators, regenerative comparator (Schmitt Trigger), multivibrators , 555 timer IC (monostable & Astable operation) & its application.

Course Outcomes: On successful complete of this course, the students should be able to:

- Understand the concept of single and multistage amplifier, RC coupled amplifier and effect of emitter by pass capacitor and coupling capacitor on low frequency response of RC coupled amplifier.
- Understand basic concept of negative feedback and their effects, also understand different types of negative feedback.
- Understand basic concept of oscillators and circuits of RC phase shift and wein bridge oscillator.
- Understand the difference between power and voltage amplifier, concept of Class A, Class B and Class C power amplifier, concept of push pull amplifiers.
- Understand basics of Operational amplifier and their linear and non linear application, concept of multivibrator using 555 IC and its applications.

TEXT BOOKS:

1. Integrated Electronics: MilmanHalkias, TMH.
2. Operational Amplifiers: Gaikwad, PHI

REFERENCE BOOKS:

1. Electronic Circuit Analysis and Design (Second edition) : D.A.Neamen; TMH
2. Integrated Circuits: K R Botkar.
3. Linear Integrated Circuits : D R Chaudhary (WEL)

EC-305C **Antenna and Wave Propagation**

L T P CR			
3 0 0 3	**Theory**	**:**	**75**
	Class Work	**:**	**25**
	Total	**:**	**100**
	Duration of Exam	**:**	**3 Hrs.**

Course Objectives:

- To introduce basic concepts and parameter of Antenna.
- To introduce Design and Analysis of various types of antennas.
- To introduce various types of practical Antennas viz microwave antenna, horn antenna, helical antenna, log periodic antenna , Loop antenna, broadband antenna.
- To introduce design of broadside and end fire array, pattern multiplication, array tapering techniques, super directive array.
- To introduce various types of wave propagations.

Syllabus

UNIT1. INTRODUCTION:

Physical concept of Radiation in single wire, two wire, and dipole, Current Distribution on a thin wire antenna

UNIT2. ANTENNA PARAMETERS:

Radiation Pattern, Radiation Power Density, Radiation intensity, Directivity, Gain, Antenna efficiency, Beamwidth, Bandwidth ,Polarisation, Antenna Input Impedance, Elementary idea about self and mutual impedance, Radiation efficiency, Effective aperture, Antenna Temperature

UNIT3. ELEMENTAL LINEAR ANTENNA:

Retarded potential, Infinitesimal dipole, Current distribution of short dipole and half wave dipole, Far-field, Radiating near-field and reactive near-field region, Monopole and Half wave dipole

UNIT 4: PRACTICAL ANTENNA:

Microwave Antenna‘s-Antennas with parabolic reflectors, Horn Antenna's, Lens Antenna's, folded dipole - Yagi-uda Antenna, Helical Antenna, Discone antenna, Log-periodic Antenna, Loop antenna, Principle of Broad Band Antenna

UNIT5. ANTENNA ARRAY:

Array of two point sources, Array factor, n-element linear array with uniform amplitude and spacing, Analysis of Broadside array, Ordinary end-fire array, n-element linear array with non-uniform spacing, ,Analysis of Binomial and Dolph-Tschebyscheff array, Scanning Array, Superdirective array

UNIT6. PROPAGATION:

Ground waves, Space waves, effect of Earth, Duct formation, ionosphere, and sky waves.

Course Outcomes: On successful complete of this course, the students should be able to:

- Understand the basics and parameter of antenna radiation
- Understand the design and analyses of linear and practical antenna

- Understand the design and analyses of antenna array
- Understand the wave propagation methods

TEXT BOOKS:

1. Antennas by J.D.Kraus, TMH Publications.
2. Antenna & Wave Propagation by K.D Prasad. Satya Publication

REFERENCES BOOKS :

1. Antenna & Radio wave propagation by CoIlin,TMH Publication
2. Electromagnetic Waves & Radiating Systems by Jordan &Balman, PHI Publications

EI-307C	**Microprocessors and Interfacing**		
L T P CR	**Theory**	**:**	**75**
3 0 0 3	**Class Work**	**:**	**25**
	Total	**:**	**100**
	Duration of Exam	**:**	**3 Hrs.**

Course Objectives:

- To introduce the architecture and Operations of 8085 and 8086 microprocessor
- To study the addressing modes, instruction set and programming of 8085 & 8086.
- To introduce the various types of interrupts of 8085 and 8086 microprocessor
- To introduce various peripheral devices (8255, 8254, 8259 and 8257)
- To introduce various methods of interfacing of Peripherals with 8085/8086 microprocessor.

Syllabus

PART A

UNIT1. ARCHITECTURE OF 8085:

Functional block diagram—Registers, ALU, Bus systems. Pin configuration, Timing and control signals, Machine cycle and timing diagrams.
Interrupts—Types of interrupt, interrupt structure.

UNIT2. PROGRAMMING OF 8085:

Instruction format, Addressing modes, Instruction set. Development of assembly language programs.

PART B

UNIT3. INTERFACING DEVICES:

(a).The 8255 PPI chip: Architecture, pin configuration, control words, modes and Interfacing with 8085.
(b). The 8254 PIC chip: Architecture, pin configuration, control words, modes and Interfacing with 8085.

UNIT4. INTERRUPT AND DMA CONTROLLER:

(a). The 8259 Interrupt controller chip: Architecture, pin configuration, control words, modes
(b). The 8257 DMA controller chip: Architecture, pin configuration, control words, modes

PART C

UNIT5. ARCHITECTURE OF 8086:

Functional block diagram of 8086, details of sub-blocks such as EU, BIU, memory segmentation, physical address computations, pin configuration, program relocation,
Minimum and Maximum modes of 8086— Block diagrams and machine cycles. Interrupts—Types of interrupt, interrupt structure.

UNIT6. PROGRAMMING OF 8086:

Instruction format, Addressing modes, Instruction set. Development of assembly language programs. Assembler directives.

Course Outcomes: On successful complete of this course, the students should be able to:

- Understand the architecture and Operations of 8085 and 8086 microprocessor
- Understand the addressing modes, instruction set and programming of 8085 & 8086.

- Understand the various types of interrupts of 8085 and 8086 microprocessor
- Understand various peripheral devices (8255, 8254, 8259 and 8257)
- Understand various methods of interfacing of Peripherals with 8085/8086 microprocessor

TEXT BOOKS:

1. Microprocessor Architecture, Programming & Applications with 8085: Ramesh S Gaonkar; Wiley Eastern Ltd.

2. Advanced Microprocessors and Peripherals by AK Ray & KM Bhurchandi, TMH Publications

REFERENCE BOOKS:

1. Microprocessors and interfacing: Hall; TMH

2. The 8088 & 8086 Microprocessors-Programming, interfacing, Hardware& Applications :Triebel & Singh; PHI

3. Microcomputer systems: the 8086/8088 Family: architecture, Programming & Design: Yu-Chang Liu & Glenn A Gibson; PHI.

4. Advanced Microprocessors and Interfacing: Badri Ram; TMH

EC-309C **Television Engineering**

L T P CR			
3 0 0 3	**Theory**	**:**	**75**
	Class Work	**:**	**25**
	Total	**:**	**100**
	Duration of Exam	**:**	**3 Hrs.**

Course Objectives:

- To give the exposure to students regarding elements of a television system, signal transmission and bandwidth.
- To give the exposure to students about the analysis and synthesis of TV Pictures, Composite Video Signal, Receiver Picture tubes and Television Camera Tubes.
- To give the exposure to students about the various Color Television systems with a greater emphasis on television standards.
- To study the advanced topics in digital television and High definition television.

Syllabus

UNIT1 ELEMENTS OF A TELEVISION SYSTEM:

Picture transmission, sound transmission, picture reception, sound reception synchronization, receiver controls, color television. Analysis and Synthesis of Television Pictures: Gross structure, image continuity, no. of scanning lines, flicker, fine structure.

UNIT2. COMPOSITE VIDEO SIGNAL:

Video signal dimensions, horizontal sync details, vertical sync details, scanning sequence details, functions of vertical pulse train, and sync details of 525 line system.

UNIT3. SIGNAL TRANSMISSION AND CHANNEL BANDWIDTH:

Amplitude Modulation, channel bandwidth, vestigial side band transmission, Transmission efficiency, complete channel bandwidth, reception of vestigial side band signals, frequency modulation, FM channel bandwidth, channel bandwidth for color transmission, allocation of frequency bands for television signal transmission, television standards.

UNIT4. THE PICTURE TUBE:

Monochrome picture tube, Beam deflection, screen phosphor, face plate, picture tube characteristics, Television Camera Tubes: Basic principal, Image orthicon, Vidicon.

UNIT5. BASIC TELEVISION BROADCASTING:

Television transmitter, positive & negative modulation.

Television Receiver: Receiver sections, vestigial side band correction, choice of intermediate frequencies, picture tube circuitry & controls, sound signal separation, sound section, Sync processing & AFC circuit, vertical Deflection circuit, Horizontal deflection circuit.

UNIT6. ESSENTIALS OF COLOR TELEVISION:

Compatibility, natural light, color perception, three color television camera, the luminance signal, values of Luminance & color difference signals on Colors, color television display tubes (Delta gun, PIL, Trinitron).

UNIT7. COLOR SIGNAL TRANSMISSION AND RECEPTION:
Color signal transmission, bandwidth for color signal transmission.

UNIT8. TELEVISION APPLICATIONS:
Cable television, CCTV, picture phone, television via satellite(DTH), Remote Control (Electronic control system), Introduction to Digital TV Technology and their merits,IPTV.

Course Outcomes: On successful complete of this course, the students should be able to:

- Understand the various principles used in television.
- Gain knowledge about various elements of a Television system and television standards.
- Gain knowledge about the allocation of frequency bands for TV signal transmission.
- Understand the essentials of color Television and its applications.
- Understand the concept of color signal transmission and reception.

TEXT BOOK:
Monochrome and Color Television: R.R.Gulati ; New Age Publications

REFERENCE BOOK:
Television and Video Engineering: M.S.Dhake, Tata McGraw Hill Publications.

EI-311C **Mechatronics**

L T P CR			
3 0 0 3	**Theory**	**:**	**75**
	Class Work	**:**	**25**
	Total	**:**	**100**
	Duration of Exam	**:**	**3 Hrs.**

Course Objectives:

- To give the exposure to students regarding mechatronics and mechatronics elements
- To give the exposure to students about rotational drives and real time interfacing.
- To give the exposure to students about Drives and mechanisms of an automated system
- To give the exposure to students about understanding for the selection of suitable sensors and actuators; designing electro-mechanical systems.

Syllabus

Unit-I: Rotational Drives - Pneumatic Motors: continuous and limited rotation - Hydraulic Motors: continuous and limited rotation - Brushless DC Motors - Motion convertors, Fixed ratio, invariant motion profile, variators, remotely controlled couplings Hydraulic Circuits and Pneumatic Circuits.

Unit-II: Mechanical Systems and Design - Mechatronics approach - Control program control, adaptive control and distributed systems - Design process - Types of Design - Integrated product design - Mechanisms, load conditions, design and flexibility Structures, load conditions, flexibility and environmental isolation – Man machine interface, industrial design and ergonomics, information transfer from machine from machine to man and man to machine, safety.

Unit-III: Real Time Interfacing - Introduction Elements of data acquisition and control Overview of I/O process-Installation of I/O card and software - Installation of application software- Over framing.

Unit-IV: Case studies on Data Acquisition - Transducer calibration system for Automotive applications Strain Gauge weighing system - Solenoid force - Displacement calibration system - Rotary optical encoder - Inverted pendulum control - Controlling temperature of a hot/cold reservoir -Pick and place robot - Carpark barriers.

Unit-V: Case studies on Data Acquisition and Control - Thermal cycle fatigue of a ceramic plate - pH control system - De-Icing Temperature Control System - Skip control of a CD Player - Autofocus Camera, exposure control.

Unit-VI: Case studies on design of Mechatronics products - Motion control using D.C. Motor, A.C. Motor & Solenoids - Car engine management - Barcode reader.

Course Outcomes: On successful complete of this course, the students should be able to:

- Understand about mechatronics and mechatronics elements

- Demonstrate how mechatronics integrates knowledge from different disciplines in order to realize engineering and consumer products that are useful in everyday life.
- Understand selection of suitable sensors and actuators; designing electro-mechanical systems.
- Workwith mechanical systems that include digital and analogue electronics as a data acquisition model.

Texts Books:

1. W. Bolton, Mechatronics - Electronic Control systems in Mechanical and Electrical Engineering-, 2nd Edition, Addison Wesley Longman Ltd., 1999.
2. Devdas Shetty, Richard A. Kolk, Mechatronics System Design, PWS Publishing company, 1997
3. Bradley, D. Dawson, N.C. Burd and A.J. Loader, Mechatronics: Electronics in Products and Processes, Chapman and Hall, London, 1991.
4. Brian Morris, Automated Manufacturing Systems - Actuators, Controls, Sensors and Robotics, Mc Graw Hill International Edition, 1995.
5. Gopal Sensors A comprehensive Survey Vol I & Vol VIII, BCH Publisher

EC-313 C Switching Theory

L T P CR			
3 0 0 3	**Theory**	**:**	**75**
	Class Work	**:**	**25**
	Total	**:**	**100**
	Duration of Exam	**:**	**3 Hrs.**

Course Objectives:

- To give the exposure to students regarding Evolution of Telecommunication and Basics of switching system
- To give the exposure to students about Crossbar switching, electronic space division switching and stored program control.
- To give the exposure to students about Digital Transmission
- To give the exposure to students about Time Division Switching
- To give the exposure to students about Telecommunication Traffic and SONET/SDH

Unit 1: Introduction – Evolution of Telecommunication, Basics of switching system, step-by-step switching, Design considerations.

Unit 2: Principles of Crossbar switching, electronic space division switching, stored program control, software architecture, switching functions.

Unit 3: Digital transmission, Frequency Division multiplexing, Time Division multiplexing, Statistical Division Multiplexing, switching hierarchy, Synchronous digital hierarchy both USA and European standards.

Unit 4: Message switching, circuit switching & packet switching, space division switching, Time division switching. Two dimensional switching, grade of service, non-blocking, digital cross connect, concentrators, expanders and distributors, two stage networks, three stage networks, n-stage networks.

Unit 5: Time Division Switching – Time Division space switching, Time division time switching, time multiplexed space switching. Time multiplexed time switching, space – time combination switching, three stage combination switching, n-stage combination switching, signalling techniques.

Unit 6: Telecommunication Traffic – Units of Traffic, Network traffic load and parameters, Grade of service and Blocking Probability, traffic measurement, Mathematical model, Incoming traffic and service time characteristics, Blocking models and loss estimates, delay systems.
Digital Subscriber access – ISDN, High data rate digital subscriber loops, Digital Loop carrier systems, fibre in the loop, voiceband modems, digital satellite services, Broadband switching systems. Network synchronization control and management, timing, timing inaccuracies, network synchronization, network control and management.

Unit 7: SONET/SDH – SONET multiplexing overview, frame formats, operation, administration and maintenance, frequency justification and payload framing, virtual tributes, DS3 payload mapping, E4 payload mapping, SONET optical standards, SONET rings & networks.

Course Outcomes: On successful complete of this course, the students should be able to:

- Understand about Evolution of Telecommunication and Basics of switching system
- Understand about Crossbar switching, electronic space division switching and stored program control.
- Understand about various Digital Transmission techniques
- Understand about various types of Switching
- Understand about Telecommunication Traffic and SONET/SDH

Text Books:

1. Digital Telephony, John C Bellamy, 3/e, Wiley-India, 1999.
2. Telecommunication Switching Systems and Networks, T Viswanathan, PHI, 1997.
3. Telecommunications Switching, Traffic and Networks, J E Flood, Pearson, 2004.
4. Introduction to Telecommunications, Gokhale, 2/e, Cengage Learning, 2005
5. Telecommunication Transmission Systems, Robert G Winch, 2/e, Tata McGraw Hill, 2004.

EI-315C	**Power Electronics**		
L T P CR	**Theory**	**:**	**75**
3 0 0 3	**Class Work**	**:**	**25**
	Total	**:**	**100**
	Duration of Exam	**:**	**3 Hrs.**

Course Objectives:

- To make student capable of designing and operating of basic power electronic converter circuits with the knowledge of various switching devices.
- To develop the understanding of working of various types of power converter circuit such as DC-DC converter, AC-DC converter, AC-AC converter, DC-AC converters in detail
- To give the knowledge of .various industrial, commercial and residential applications of power converter circuits.

Syllabus

UNIT1 INTRODUCTION:

Introduction to Thyristors, Their static and dynamic characteristics, Turn-on and Turn - off methods and circuits, Ratings and protection of SCR'S, Other members of thyristor family, Series and parallel operation of thyristors, Firing circuits for SCRs.Commutation circuits.

UNIT2 PHASE CONTROLLED CONVERTERS:

Principle of phase control, Single phase half wave circuit with different types of loads, Single phase and three phase semi converter and full converter bridge circuits with line commutation, Continuous and discontinuous conduction effect of source inductance on single phase and three phase full converters, Single phase and three phase dual converters and their operation with circulating and non circulating currents.

UNIT3 DC CHOPPERS:

Principle of chopper operation, Control strategies, Types of choppers, Step upand step down choppers, Types of choppers, Steady state time domain analysis with R, L, and E type loads, Voltage, Current and Load commutated choppers.

UNIT4 INVERTERS:

Single phase VSI, Half bridge and full bridge inverters and their steady state analysis,Introduction of Series and parallel inverters, and Three phase bridge inverters with 180^0 and 120^0 modes. Single-phase PWM inverters. Current source inverters,CSI with R load (qualitative approach).

UNIT5 AC VOLTAGE CONTROLLERS:

Types of single-phase voltage controllers, Single-phase voltage controller with R and RL type of loads. Three phase voltage controller configurations R Load.

UNIT6 CYCLOCONVERTERS:

Principles of operation, Single phase to single phase step up and step down cycloconverters. Three phase to single phase and three-phase to three-phase cycloconverters, Output voltage equation for a cycloconverter.

Course Outcomes: On successful complete of this course, the students should be able to:

- Understand about various power semiconductor devices and their characteristics.

- Analyze the characteristics of different power electronics switches and selection of components for different applications.
- Understand the analysis and design of various single phase and three phase power converter circuits and knowledge of their applications.
- Identify the basic requirements for power electronics based design application.
- Understand the use of power converters in commercial and industrial applications

TEXT BOOKS:

1. Dubey, G.K., Doradla, S.R., Joshi, A. and Sinha, R.M.K., Thyristorised Power Controllers, New Age International (P) Limited, Publishers (2004).
2. Rashid, M., Power Electronics, Prentice−Hall of India (2006) 3rd ed.
3. Bhimbra P.S., Power Electronics,Khanna Publisher

REFERENCE BOOKS:

1. Mohan, N., Underland, T. and Robbins, W. P., Power Electronics: Converter Applications and Design, John Wiley (2007) 3rd ed.

EC-317C	**Software Defined Radio**		
L T P CR	**Theory**	**:**	**75**
3 0 0 3	**Class Work**	**:**	**25**
	Total	**:**	**100**
	Duration of Exam	**:**	**3 Hrs.**

Course Objectives:

- To make student capable of the SDR and implementation details
- To introduce the students about the blocks of SDR for a specific application
- To introduce the students about the challenges in the implementation of SDR
- To introduce the students about transmitter and receiver architectures in SDR

Syllabus

Introduction – Software Defined Radio – A Traditional Hardware Radio Architecture – Signal Processing Hardware History – Software Defined Radio Project Complexity.

A Basic Software Defined Radio Architecture – Introduction – 2G Radio Architectures- Hybrid Radio Architecture- Basic Software Defined Radio Block Diagram- System Level Functioning Partitioning-Digital Frequency Conversion Partitioning.

RF System Design – Introduction- Noise and Channel Capacity- Link Budget- Receiver Requirements- Multicarrier Power Amplifiers- Signal Processing Capacity Tradeoff.

Analog-to-Digital and Digital-to-Analog Conversion- Introduction – Digital Conversion Fundamentals- Sample Rate- Bandpass Sampling- Oversampling- Antialias Filtering – Quantization – ADC Techniques-Successive Approximation- Figure of Merit-DACs- DAC Noise Budget- ADC Noise Budget.

Digital Frequency Up- and Down Converters- Introduction- Frequency Converter Fundamentals- Digital NCO- Digital Mixers- Digital Filters- Halfband Filters- CIC Filters- Decimation, Interpolation, and Multirate Processing-DUCs - Cascading Digital Converters and Digital Frequency Converters.

Signal Processing Hardware Components- Introduction- SDR Requirements for Processing Power- DSPs- DSP Devices- DSP Compilers- Reconfigurable Processors- Adaptive Computing Machine- FPGAs

Software Architecture and Components – Introduction- Major Software Architecture Choices – Hardware – Specific Software Architecture- Software Standards for Software Radio-Software Design Patterns- Component Choices- Real Time Operating Systems- High Level Software Languages- Hardware Languages.

Smart Antennas for Software Radio- Introduction- 3G smart Antenna Requirements- Phased Antenna Array Theory- Applying Software Radio Principles to Antenna Systems- Smart Antenna Architectures- Optimum Combining/ Adaptive Arrays- DOA Arrays- Beam Forming for CDMA- Downlink Beam Forming.

Course Outcomes: On successful complete of this course, the students should be able to:

- Conceptualize the SDR and implementation details
- Identify the blocks of SDR for a specific application

- Recognize the challenges in the implementation of SDR
- Analyze the transmitter and receiver architectures in SDR

Text Books:

1. Paul Burns, Software Defined Radio for 3G, Artech House, 2002.
2. Tony J Rouphael, RF and DSP for SDR, Elsevier Newnes Press, 2008
3. Jouko Vanakka, Digital Synthesizers and Transmitter for Software Radio, Springer, 2005.
4. P Kenington, RF and Baseband Techniques for Software Defined Radio, Artech House, 2005.

EC-351 C	**Analog Integrated Circuits Lab**		
L T P CR	**Internal Marks**	**:**	**15**
0 0 2 1	**External Marks**	**:**	**35**
	Total	**:**	**50**
	Duration of Exam	**:**	**3 Hrs.**

List of Experiments

1. Design & measure the frequency response of an RC coupled amplifier using discrete components.
2. Design a two stage RC coupled amplifier and determine the effect of cascading on gain and bandwidth.
3. Design & realize inverting amplifier, non-inverting and buffer amplifier using 741 Op Amp.
4. Verify the operation of a differentiator circuit using 741 op amp and show that it acts as a high pass filter.
5. Verify the operation of a integrator circuit using 741 op amp and show that it ac ts as a low pass filter.
6. Design and verify the operations of op amp adder and subtractor circuits.
7. To design & realize Schmitt trigger using op amp 741.
8. Design and realize Wein-bridge oscillator using op amp 741
9. To design & realize square wave generator using op amp 741.
10. To design & realize zero crossing detector using op amp 741

Course Outcomes: On successful complete of this course, the students should be able to:

- Measure & verify the frequency response of RC coupled amplifier.
- Measure the effect of various types of feedback on amplifiers.
- Implement amplifiers, differentiator, Integrator and active filters circuit using op amp.
- Design op-amp as Wein-Bridge Oscillator, Square Wave Generator, Logarithmic Amplifier and Voltage Controlled Circuits.
- Write experimental reports and work in a team in professional way.

EI-353C **Microprocessors and Interfacing Lab**

L T P CR			
0 0 2 1	**Internal Marks**	**:**	**15**
	External Marks	**:**	**35**
	Total	**:**	**50**
	Duration of Exam	**:**	**3 Hrs.**

List of Experiments

1. Study of architecture of 8085 & familiarization with its hardware , commands & operation of Microprocessor kit.
2. Write a program using 8085 and verify for :
   (i) Addition of two 8-bit numbers.
   (ii) Addition of two 8-bit numbers (with carry).
3. Write a program using 8085 and verify for :
   (i) 8-bit subtraction (display borrow)
   (ii) 16-bit subtraction (display borrow)
4. Write a program using 8085 for multiplication of two 8- bit numbers by repeated addition method. Check for minimum number of additions and test for typical data.
5. Write a program using 8085 for multiplication of two 8- bit numbers by bit rotation method and verify.
6. Write a program using 8085 for division of two 8- bit numbers by repeated subtraction method and test for typical data.
7. Write a program using 8085 for dividing two 8- bit numbers by bit rotation method and test for typical data.
8. Write a program using 8086 and verify for:
   (i) Finding the largest number from an array.
   (ii) Finding the smallest number from an array.
9. Write a program using 8086 for arranging an array of numbers in descending order and verify.
10. Write a program using 8086 for arranging an array of numbers in ascending order and verify.
11. Write a program for finding square of a number using look-up table and verify.
12. Write a program to interface microprocessor with 8253 to generate square wave. Use 8085/8086 microprocessor.
13. Write a program to interface microprocessor with 8253 to generate interrupt on terminal count. Use 8085/8086 microprocessor.
14. Write a program to interface a two digit number using seven-segment LEDs. Use 8085/8086 microprocessor and 8255 PPI.
15. Write a program to control the operation of stepper motor using 8085/8086 microprocessor and 8255 PPI.

Course Outcomes: On successful complete of this course, the students should be able to:

- Identify various modules embedded on the kit.
- Write the assembly code for various operations on 8-bit and 16-bit numbers.
- Interface various peripherals with microprocessor and to write the program for same.
- Interface various devices such as seven segment LEDS & stepper motor with microprocessor through 8255 and to write the program for same.

EI-355C **Power Electronics Lab**

L T P CR			
0 0 2 1	**Internal Marks**	**:**	**15**
	External Marks	**:**	**35**
	Total	**:**	**50**
	Duration of Exam	**:**	**3 Hrs.**

List of Experiment

1. To plot characteristics of Diode , Thyristor and Triac.
2. To plot characteristics of Transistor and MOSFET .
3. To Use R and R-C firing circuits , UJT firing circuit .
4. Study of complementary voltage commutation using a lamp flasher , Ring Counter .
5. Study of Thyristorised DC circuit breaker .
6. Study of AC voltage Regulator .
7. Study of full wave Converter .
8. Study of DC chopper .
9. Study of Series Inverter.
10. Study of Bridge Inverter .
11. Study of Single phase Cycloconverter

COURSE OUTCOMES:

- Ability to design and conduct simulation of various types of power converters experiments.
- Ability to use the techniques, skills and modern engineering tools necessary for various experiments.
- Identification of various power electronic components and their uses in power electronic based circuits.
- Understanding of characteristics of various switching devices and practically achieve them.

EC-359C **Electronics Circuits Simulation Lab**

L T P CR			
0 0 2 1	**Internal Marks**	**:**	**15**
	External Marks	**:**	**35**
	Total	**:**	**50**
	Duration of Exam	**:**	**3 Hrs.**

List of Experiments

1. Simulate and study RL, RC, RLC using PSPICE windows.
2. Simulate and study half-wave, full-wave, and bridge-rectifier using PSPICE windows
3. Simulate and study diode clipper and clamper circuits using PSPICE windows
4. Simulate and study emitter bias and fixed bias BJT and JFET circuits using PSPICE windows and determine quiescent conditions.
5. Simulate a common emitter amplifier using self biasing and study the effect of variation in emitter resistor on voltage gain, input and output impedance using PSPICE windows .
6. Determine the frequency response of Vo/Vs for CE BJT amplifier using PSPICE windows. Study the effect of cascading of two stages on band width.
7. Simulate and study Darlington pair amplifier circuit using PSPICE windows and determine dc bias and output ac voltage.
8. Study an operational amplifier using PSPICE windows and find out: CMMR, gain band width product, slew rate, 3-db frequency, and input offset voltage.
9. Simulate and study active low pass, high pass, and band pass filters using PSPICE windows.
10. Simulate and study class A, B, C, and AB amplifier using PSPICE windows.
11. Simulate and study monostable multiviberator using PSPICE windows.
12. Simulate and study astable multiviberator using PSPICE windows.
13. Simulate logic expression, and determine its truth table.
14. Simulate logic expression of full adder circuit and determine its truth table.
15. Simulate a synchronous 4-bit counter and determine its count sequence.
16. Simulate a master-slave flip-flop using NAND gates and study its operation. Study the operation of asynchronous preset and clear.

Course Outcomes: On successful complete of this course, the students should be able to:

- Simulate and generate the wave form of rectifiers using PSPICE software.
- Simulate and determine quiescent conditions of various biasing circuits of BJT circuits using PSPICE software.
- Simulate & determine the frequency response of various types of active filters using PSPICE software.
- Determine the various parameter of op-amp using PSPICE software.
- Simulate the various applications of 555 on PSPICE software.
- Simulate the basic gates, universal gates & Combinational Circuits & Sequential Circuits on PSPICE software.
- Write experimental reports and work in a team in professional way.

EC-361C	**Workshop-V**		
L T P CR	**Internal Marks**	**:**	**60**
0 0 6 3	**External Marks**	**:**	**140**
	Total	**:**	**200**
	Duration of Exam	**:**	**8 Hrs.**

List of Job/ Experiments

1. Introduction of Microprocessor 8085.
2. Introduction of PPI 8255 in all three modes.
3. Generate the square wave of 1KHZ frequency using PPI 8255.
4. To Perform Interfacing with 4-LED and 4-switch using PPI 8255 with 8085.
5. To Perform Interfacing with SSD using PPI 8255 with 8085.
6. To Perform Interfacing with Speed control of DC motor through 8085 using PPI 8255.
7. To Perform Interfacing with Stepper motor through 8085 using PPI 8255.
8. To perform interfacing with hardware of Ic tester with 8085.
9. To Perform the Analog to Digital Conversion through 8085.
10. To Perform Digital to analog Conversion through 8085.
11. To Perform Interfacing with ac bulb & control by using TRIAC, optocoupler with 8085 using PPI 8255.
12. Design & construct a hardware circuit and Interface 8085 using PPI 8255 in BSR mode.
13. Introduction of Timer chip 8253.
14. Generate a delay of specific frequency/time using 8253.
15. Introduction of display and keyboard controller chip 8279.

EC-302 C	**Digital Systems Design**		
L T P CR	**Theory**	**:**	**75**
3 0 0 3	**Class Work**	**:**	**25**
	Total	**:**	**100**
	Duration of Exam	**:**	**3 Hrs.**

Course Objectives:

- To introduce the students to design, simulate, built and debug complex combinational and sequential circuits based on an abstract functional specification.
- To introduce the students to represent complex digital circuits in the form of the hierarchically organized VHDL design/simulation software tools
- To introduce the students apply entity/architecture modeling approaches in VHDL
- To introduce the students to develop VHDL architectural representations of systems and components.
- To introduce the students to decompose a complex digital system design problem
- To introduce the students to develop final technical documentation of a complex digital system using VHDL language descriptions.
- To introduce the students to represent circuit designs, simulations, and realizations within the documentation software tools provided by an HDL such as VHDL.
- To introduce the students to use digital simulation software verifying functional and timing correctness of a VHDL specified digital circuit/system.

Syllabus

UNIT1. INTRODUCTION TO HDL:

Design flow, Design Methodologies, Capabilities, Hardware abstraction, Model analysis.
Basic VHDL elements—Identifiers, data objects, data classes, data types, Operators.

UNIT2. TYPES OF MODELLINGS:

Behaviouralmodelling—Entity declaration, Architecture body, Various Sequential statements and constructs. Multiple processes, Postponed processes.
Dataflow modelling—Concurrent signal assignment statements, delta delay model, multiple drivers, block statement, concurrent assertion statement.
Structural modelling—Component Declaration, component instantiation, resolving signal values.

UNIT3. COMBINATIONAL CIRCUIT DESIGN:

VHDL Models and Simulation of combinational circuits such as Multiplexers, Demultiplexers, encoders, decoders, code converters, comparators, implementation of Boolean functions etc.

UNIT4. SUPPORTING CONSTRUCTS:

Generics, Configuration, subprogram overloading, operator overloading, Package declaration, package body, design libraries, visibility, Introduction to Test bench.
Subprograms: Application of Functions and Procedures.

UNIT5. SEQUENTIAL CIRCUITS DESIGN:

VHDL Models and Simulation of Sequential Circuits such as flip-flops, Shift Registers, Counters etc.

UNIT6. PROGRAMMABLE LOGIC DEVICES:

ROM, PLA, PAL, GAL, CPLD and FPGA. Designing using ROM, PLA and PAL.

Course Outcomes: On successful complete of this course, the students should be able to:

- Develop knowledge and use of hardware description language, its various elements and design unit.
- Apply various modelling approaches in VHDL using models representing structure, behaviour or dataflow concept and various statements.
- Design, debug and simulate complex combinational and sequential circuits based on various modelling styles.
- Code combinational and sequential circuits using supporting constructs and subprogram and to write test bench.
- Implement digital system on reconfigurable programmable logic devices.

TEXT BOOKS:

1. "A VHDL Primmer‖: Bhasker; Prentice Hall 1995.

2. Modern Digital Electronics- III Edition: R.P Jain; TMH (2003).

REFERENCE BOOKS:

1. IEEE Standard VHDL Language Reference Manual (1993).
2. Digital Design and Modelling with VHDL and Synthesis : KC Chang; IEEE Computer Society Press.
3. Digital System Design using VHDL‖ : Charles. H.Roth ; PWS (1998).
4. "VHDL-Analysis & Modelling of Digital Systems : Navabi Z; McGraw Hill.
5. VHDL-IV Edition :Perry; TMH (2002)
6. Introduction to Digital Systems‖ : Ercegovac. Lang & Moreno; John Wiley (1999).
7. Fundamentals of Digital Logic with VHDL Design : Brown and Vranesic; TMH (2000)

EC-304C	**Control Systems Engineering**		
L T P CR	**Theory**	**:**	**75**
3 1 0 4	**Class Work**	**:**	**25**
	Total	**:**	**100**
	Duration of Exam	**:**	**3 Hrs.**

Course Objectives:

- To develop the theoretical aspects of Control systems and feedbacks.
- To present the essential knowledge to understand AC, DC servo meters.
- To analyze steady state analysis of control systems.
- To study the concepts of root locus and adding of zeros and poles
- To understand the frequency response analysis and specifications of control systems with transfer function.
- To perform stability analysis in frequency domain.
- To provide knowledge in solving the time invariant state Equations.
- To understand the concept of various compensation techniques.

Syllabus

UNIT1. INTRODUCTORY CONCEPTS:

System/Plant model, types of models, illustrative examples of plants and their inputs and outputs, servomechanism, regulating system, Synchros, AC and DC techo-generators, servomotors, stepper motors, & their applications, magnetic amplifier.

linear time-invariant (LTI) system, time-varying system, causal system, open loop control system, closed loop control system, illustrative examples of open-loop and feedback control systems, continuous time and sampled data control systems. Effects of feedback on sensitivity (to parameter variations), stability, external disturbance (noise), overall gain etc. Introductory remarks about non-linear control systems.

UNIT2. MATHEMATICAL MODELLING:

Concept of transfer function, relationship between transfer function and impulse response, order of a system, block diagram algebra, signal flow graphs : Mason‘s gain formula & its application, characteristic equation, derivation of transfer functions of electrical and electromechanical systems. Transfer functions of cascaded and non-loading cascaded elements. Introduction to state variable analysis and design.

UNIT3. TIME DOMAIN ANALYSIS:

Typical test signals, time response of first order systems to various standard inputs, time response of 2nd order system to step input, relationship between location of roots of characteristics equation, w and wn, time domain specifications of a general and an under-damped 2nd order system, steady state error and error constants.Effect of adding pole-zero to a system,controllers.

UNIT 4: STABILITY IN TIME DOMAIN:

Necessary and sufficient conditions for stability, Hurwitz stability criterion, Routh stability criterion and relative stability, Root Locus technique for stability.

UNIT5. FREQUENCY DOMAIN ANALYSIS:

Relationship between frequency response and time-response for 2nd order system, polar, Nyquist, Bode plots, stability, Gain-margin and Phase Margin, relative stability, frequency response specifications.

UNIT6. COMPENSATION:

Necessity of compensation, compensation networks, application of lag and lead compensation.

Course Outcomes: On successful complete of this course, the students should be able to:

- Determine transfer function models of electrical, mechanical and electromechanical systems analogy.
- Represent a set of algebraic equations by block diagram and signal flow graphs, determine specified transfer functions from block diagrams and graphical methods and to evaluate robustness/sensitivity of systems with and without feedback.
- Relate transient performance parameters, overshoot, ride time, peak time and settling time, to poles and zeros of transfer function for continuous systems, evaluate steady state error from transfer functions.
- Determine the stability of system by different time domain and frequency domain methods.

TEXT BOOKS:

1. Control System Engineering : I.J.Nagrath&M.Gopal; New Age
2. Modern Control Engg : K.Ogata; PHI.

REFERENCE BOOKS:

1. Automatic Control Systems: B.C.Kuo, PHI.
2. Control Systems - Principles & Design : Madan Gopal; Tata McGraw Hill.
3. Modern Control Engineering. R.C.Dorl& Bishop; Addison-Wesley

EC-306C	**MOS IC Technology**		
L T P CR	**Theory**	**:**	**75**
3 1 0 4	**Class Work**	**:**	**25**
	Total	**:**	**100**
	Duration of Exam	**:**	**3 Hrs.**

Course Objectives:

- To introduce the micro-electronics technology, design concepts, circuit properties and modeling of Very Large Scale Integrated circuits.
- To learn the basics of MOS Circuit Design & modeling.
- To learn the basics of MOS process and fabrication Technology.
- To introduce both Circuits and System views on design together

Syllabus

UNIT1. REVIEW OF MOS TECHNOLOGY:

Introduction to IC technology, MOS Transistor enhancement mode and depletion mode operations, fabrication of NMOS, CMOS and BiCMOS devices. Equivalent circuit for MOSFET and CMOS.

UNIT2. MOS TRANSISTOR THEORY:

MOS device design equations, MOS transistor, Evaluation aspects of MOS transistor, threshold voltage, MOS transistor transconductance& output conductance, figure of merit, determination of pull-up to pull-down ratio for an n-MOS inverter driven by another n-MOS inverter & by one or more pass transistor, alternative forms of pull-up, CMOS and BiCMOS-inverters. Latch up in CMOS circuitry.

UNIT3. MOS CIRCUITS AND LOGIC DESIGN :

Basic physical design of simple logic gates using n-MOS, p-MOS and CMOS, CMOS logic gate design considerations, CMOS logic structures,stick diagrams..

UNIT4.CIRCUIT CHARACTERIZATION AND PERFORMANCE ESTIMATION

Resistance estimation, capacitance estimation, inductance, switching characteristics, CMOS gate transistor sizing, power dissipation.

UNIT5. VLSI FABRICATION:

Crystal growth, wafer preparation, epitaxy, oxidation, lithography, etching, diffusion, dielectric and poly-silicon film deposition, ion implantation, yield and reliability, metalization.

UNIT6. DESIGN EXAMPLE USING CMOS :

Incrementer / decrementer, left/right shift serial/parallel register, comparator for two n-bit number.

Course Outcomes: On successful complete of this course, the students should be able to:

- Understand about the trends in semiconductor technology, and how it impacts scaling and performance.
- Learn Layout, Stick diagrams, Fabrication steps, Static and Switching characteristics of inverters.
- Understand MOS transistor as a switch and its capacitance.
- Design digital systems using MOS circuits.

TEXT BOOKS :

1. Introduction to Digital Integrated Circuits : Rabaey,Chandrakasan&Nikolic.

2. Principles of CMOS VLSI Design : Neil H.E. Weste and Kamran Eshraghian; Pearson.

REFERENCE BOOKS :

1. Introduction to Digital Circuits : Rabaey LPE (PHI)

2. VLSI Fabrication: S.K.Gandhi.

3. VLSI Technology: S.M. Sze; McGraw-Hill.

4. Integrated Circuits: K.R. Botkar; Khanna

EC-308C	**Microwave and Radar Engineering**		
L T P CR	**Theory**	**:**	**75**
3 0 0 3	**Class Work**	**:**	**25**
	Total	**:**	**100**
	Duration of Exam	**:**	**3 Hrs.**

Course Objectives:

- To introduce the students about the concepts of waveguide
- To introduce the students about various types of Microwave Components
- To introduce the students about various types of Microwave tubes and solid state devices
- To introduce the students about various types of microwave measurements and basics of radar.

Syllabus

UNIT1. WAVEGUIDES:

Introduction, comparison with transmission lines, propagation in TE & TM mode, rectangular wave guide, TEM mode in rectangular wave guide, characteristic impedance, introduction to circular waveguides and planar transmission lines.

UNIT2 . MICROWAVE COMPONENTS:

Directional couplers, tees, hybrid ring, S-parameters, attenuators, cavity resonators ,mixers & detectors, matched Load, phase shifter ,wave meter, Ferrite devices: Isolators, circulators.

UNIT3. MICROWAVE TUBES:

Limitation of conventional tubes; Construction, operation and properties of Klystron amplifier, reflex Klystron, magnetron, TWT, BWO , crossed field amplifiers.

UNIT4. MICROWAVE SOLID STATE DEVICES:

Varactor diode, Tunnel diode, Schottky diode, GUNN diode, IMPATT, TRAPATT and PIN diodes. MASER, parametric amplifiers.

UNIT5. MICROWAVE MEASUREMENTS:

Power measurement using calorimeter & bolometers, measurement of SWR, frequency , wavelength and impedance. Microwave bridges.

UNIT6. INTRODUCTION TO RADAR :

Block Diagram and operation, Radar Frequencies, Simple form of Radar Equation, Prediction of Range Performance, Pulse Repetition frequency and Range Ambiguities, Applications of Radar

Course Outcomes: On successful complete of this course, the students should be able to:

- Understand the design and working of waveguide
- Describe and analyse the different microwave components.
- Describe and analyse the microwave tubes and the working of solid state devices.
- Understand of Microwave Measurement techniques and basics of radar.

TEXT BOOKS:

1. Microwave devices and circuits: Samuel Liao;PHI

2. Microwave devices & Radar Engg :M .Kulkarni;Umesh

REFERENCE BOOK:

1. Microwaves and Radar : A.K. Maini; Khanna

EC-310C	**Data Structures**		
L T P CR	**Theory**	**:**	**75**
3 0 0 3	**Class Work**	**:**	**25**
	Total	**:**	**100**
	Duration of Exam	**:**	**3 Hrs.**

Course Objectives:

- To study in detail the concept of Loops, Conditional statements, Arrays, Functions, pointers, structures, file handling file concepts, file organization in C language.
- To study link list, Header Link list, Multiway link list and perform various data structure operations.
- To study the concept of stack and Queues and implement the same using array and link list form.
- To implement Binary Trees type and implement the same in array and link list form
- To study the Graphs using set, linked and matrix representation
- To study and implement file handling concepts

Syllabus

Part-A

Overview of 'C': Introduction , Flow of Control, Input output functions, Arrays and Structures, Functions

Data structures and Algorithms: an overview: concept of data structure, choice ofright data structures, types of data structures, basic terminology Algorithms, how to design and develop an algorithm: stepwise refinement, use of accumulators and counters; algorithm analysis, complexity of algorithms Big-oh notation.

Arrays: Searching Sorting: Introduction, One Dimensional Arrays,

Operations Defined: traversal, selection, searching, insertion, deletion, and sorting.Multidimensional arrays, address calculation of a location in arrays.

Searching: Linear search, Recursive and Non recursive binary Search.

Sorting: Selection sort, Bubble sort, Insertion sort, Merge sort, Quick sort, Shell sort,Heap sort

Stacks and queues: Stacks, array representation of stack, Applications of stacks. Queues,Circular queues, array representation of Queues, Deque, priority queues, Applications of Queues.

Part-B Pointers and Linked Lists;

Pointers: Pointer variables, Pointer and arrays, array of pointers, pointers and structures,Dynamic allocation.

Linked Lists: Concept of a linked list,. Circular linked list, doubly linked list, operationson linked lists. Concepts of header linked lists. Applications of linked lists, linked stacks, linked Queues.

Part-C Trees and Graphs

Trees: Introduction to trees, binary trees, representation and traversal of trees, operationson binary trees, types of binary trees, threaded binary trees, B Trees, Application of trees.

Graphs: Introduction, terminology, ‗set, linked and matrix' representation, Graphtraversal techniques: BFS, DFS, operations on graphs, Minimum spanning trees, Applications of graphs.

Part-D File Handling and Advanced data Structure

Introduction to file handling, Data and Information, File concepts, File organization, files and streams, working with files. AVL trees, Sets, list representation of sets, applications of sets, skip lists

Course Outcomes: On successful complete of this course, the students should be able to:

- Understand the programming of C language from basic to advance level.
- Understand the working of link list, stack, queue alongwith their usage in real life.
- Understand the working of binary tree, graph along with their application.
- Understand the concept of files and their organization on memory.

Text Books:

1 Data Structures using C by A. M. Tenenbaum, Langsam, Moshe J. Augentem, PHI Pub.

2 Data Structures using C by A. K. Sharma, Pearson

Reference Books:

1 Data Structures and Algorithms by A.V. Aho, J.E. Hopcroft and T.D. Ullman, Original edition, Addison-Wesley, 1999, Low Priced Edition.

2 Fundamentals of Data structures by Ellis Horowitz & SartajSahni, Pub, 1983,AW

3 Fundamentals of computer algorithms by Horowitz Sahni and Rajasekaran.

4 Data Structures and Program Design in C By Robert Kruse, PHI,

5 Theory & Problems of Data Structures by Jr. SymourLipschetz, Schaum's outline by TMH

6 Introduction to Computers Science -An algorithms approach , Jean Paul Tremblay, Richard B. Bunt, 2002, T.M.H.

EC-312 C **Real Time Operating Systems**

L T P CR	**Theory**	**:**	**75**
3 0 0 3	**Class Work**	**:**	**25**
	Total	**:**	**100**
	Duration of Exam	**:**	**3 Hrs.**

Course Objectives:

- To introduce the students to recognize the need for Real-Time Systems
- To introduce the students about the architecture of Real-Time Operating Systems (RTOS)
- To introduce the students to identify the use of Task Management in Real-Time Operating Systems
- To introduce the students to outline the importance of RT Software Implementation
- To introduce the students about System Performance Analysis of RTOS

Syllabus

Unit 1: Introduction to Real Time Systems, Concepts and Misconceptions- Definitions for Real-Time Systems, Usual Misconceptions, Multidisciplinary Design Challenges-Influencing Disciplines, Birth and Evolution of Real-Time Systems-Diversifying Applications, Advancements behind Modern Real-Time Systems.

Unit 2: Real Time Operating Systems (RTOS) Architecture , Introduction, Defining an RTOS, Board Support Package, Kernel- Monolithic kernel, Microkernel, Exokernel, The Scheduler-Schedulable Entities, Multitasking, The Context Switch, The Dispatcher, Scheduling Algorithms-Preemptive Priority-Based Scheduling, Round-Robin Scheduling, Objects, Services, Key Characteristics of an RTOS.

Unit 3: Task Management, Introduction to Task Management, Task Object, Defining a Task, Task States and Scheduling, Typical Task Operations, Typical Task Structure. Task synchronization-Event Objects, Semaphores-Introduction, Defining Semaphores, Typical Semaphore Operations, Typical Semaphore Use, Inter task communication -Message queues-Introduction, Defining Message Queues, Message Queue States, Message Queue Content, Message Queue Storage, Typical Message Queue Operations, Typical Message Queue Use, Pipes, Timers and system clock-Introduction, Real-Time Clocks and System Clocks, Programmable Interval Timers, Timer Interrupt Service Routines, A Model for Implementing the Soft-Timer Handling Facility.

Unit 4: RT Software Implementation, Qualities of Real-Time Software, Software Engineering Principles, Procedural Design Approach, Object-Oriented Design Approach.

Unit 5: RT System Performance Analysis, Real-Time Performance Analysis-Theoretical Preliminaries, Arguments Related to Parallelization, Execution Time Estimation from Program Code, Analysis of Polled - Loop and Coroutine Systems, Analysis of Round - Robin Systems, Analysis of Fixed - Period Systems, Input/output Performance, Analysis of Memory Requirements- Memory Utilization Analysis, Optimizing Memory Usage.

Course Outcomes: On successful complete of this course, the students should be able to:

- Recognize the need for Real-Time Systems

- Understand the architecture of Real-Time Operating Systems (RTOS)
- Identify the use of Task Management in Real-Time Operating Systems
- Outline the importance of RT Software Implementation
- Evaluate System Performance Analysis of RTOS

Text Books:

1. Qing Li & Caroline Yao: Real-Time Concepts For Embedded Systems, 2003.
2. Phillip A. Laplante, Seppo J. Ovaska: Real-Time Systems Design And Analysis Tools for The Practitioner, 4th Edition 2012.
3. Rajkamal: Embedded Systems Architecture, Programming & Design: Architecture, Programming and Design, 2nd Edition, 2008.
4. K.V.K.K.Prasad: Embedded Real-Time Systems: Concepts, Design and Programming, Dreamtech Press, 2005.

EC-314C **Nano Technology**

L T P CR			
3 0 0 3	**Theory**	**:**	**75**
	Class Work	**:**	**25**
	Total	**:**	**100**
	Duration of Exam	**:**	**3 Hrs.**

Course Objectives:

- To introduce the fundamentals of Nanotechnology
- To give a general introduction to different classes of nanomaterials
- To impart basic knowledge on various technologies for nano devices
- To make the learner familiarize with nanotechnology potentialities

Syllabus

Unit 1: Basics and Scale of Nanotechnology

Introduction – Scientific revolutions –Time and length scale in structures – Moore's Law and its significance; Quantun Effects as limitation to the Miniaturization; Nanoelectronics and its development; Strategies for fabrication of nano devices; Development of Electronics-Semiconductor Transistors; Some tools of Micro-and Nanofabrication. Definition of a nanosystem –Dimensionality and size dependent phenomena – Surface to volume ratio - Fraction of surface atoms – Surface energy and surface stress- surface defects-Properties at nanoscale (optical, mechanical, electronic,and magnetic).

Unit 2: Different Classes of Nanomaterials:

What are nanomaterials? Preparation of nanomaterials- solid state reaction method, Chemical Vapor Deposition, Sol-gels techniques, Electrodeposition, Ball Milling, Introduction to lithography, pulse laser deposition (PLD), Applications of nanomaterials

Classification based on dimensionality-Quantum Dots,Wells and Wires- Carbon- based nano materials (buckyballs, nanotubes, graphene)– Metalbasednano materials (nanogold, nanosilver and metal oxides) -Nanocomposites- Nanopolymers – Nanoglasses –Nano ceramics -Biological nanomaterials.

Unit 3: Quantum Electronic Devices:

High Electron Mobility Transistors; Quantum Interference Transistors; Carbon Nanotube Transistors; Quantum Corrals in Electronics

Unit 4: Molecular Electronics:

Quantum Information and Quantum Computers;Difference between Quantum Computer and Classical Computer; Working of a Quantum Computer; Decoherence; Experimental Implementation of Quantum Computers.

Special Devices: Quantum Dot Devices; Resonant Tunneling Devices (RTDs); Electron Wavefunction Effect Devices; Carbon Nanotube Sensors

Optics, Photonics And Solar Energy: Light and nanotechnology, Interaction of light and nanotechnology, Nanoholes and photons, Solar cells.

Unit 5: Future Applications:

MEMs, Nanomachines, Nanodevices, quantum computers, Opto-electronic devices, quantum electronic devices, Environmental and Biological applications.

Applications in displays and other devices -Nanomaterials for data storage - Photonics, Plasmonics- Chemical and biosensors -Nanomedicine and Nanobiotechnology – Nanotoxicology challenges.

Course Outcomes: On successful complete of this course, the students should be able to:

- Understand the fundamentals of Nanotechnology
- Understand the different classes of nanomaterials
- Understand the various technologies for nano devices
- Understand and familiarize with nanotechnology potentialities

Text Books:

1. Nanotechnology-Basic Science and Emerging Technologies Mick Wilson, KamaliKannangra Geoff Smith, Michelle Simons and BurkhardRaguse, Overseas Press.
2. Carbon Nanotubes:Science and Applications Laurie Kelly, MeyyappanMeyyappen,CRC Press
3. Pradeep T., “A Textbook of Nanoscience and Nanotechnology”, Tata McGraw Hill Education Pvt. Ltd., 2012.

Reference Books:

1. Nabok A., “Organic and Inorganic Nanostructures”, Artech House, 2005. 2. Dupas C., Houdy P., Lahmani M., “Nanoscience: Nanotechnologies and Nanophysics”, Springer-Verlag Berlin Heidelberg, 2007.
2. Nanotechnology-A Gentle Introduction to the Next Big Idea Mark Ratner and Daniel Ratner, Prentice Hall
3. Nanotechnology Rebecca L Johnson, Lerner Publications. 4. Introduction to Nanotechnogy Charles P. Poole Jr., Chapman and Hall/CRS
4. Nanomaterials: Synthesis, Properties and Applications A.S. Edelstein and R.C.Cammarata(edits),Institute of Physics
5. Molecular Electronic Devices F.L.Carter et al (Ed); New York: North Holland

EC-316C	**Wireless Communication**		
L T P CR	**Theory**	**:**	**75**
3 0 0 3	**Class Work**	**:**	**25**
	Total	**:**	**100**
	Duration of Exam	**:**	**3 Hrs.**

Course Objectives:

- To introduce the students about various wireless communication systems
- To introduce the students second generation cellular networks, third generation wireless networks and modern wireless communication systems.
- To introduce the students about cellular mobile systems
- To introduce the students about cellular system design fundamentals
- To introduce the students about Multiple Access Techniques for Wireless Communication
- To introduce the students about concepts of wireless networking

Syllabus

UNIT1. INTRODUCTION TO WIRELESS COMMUNICATION SYSTEMS:

Evolution of mobile radio communications, examples of wireless comm. systems, paging systems, Cordless telephone systems, comparison of various wireless systems.

UNIT2. MODERN WIRELESS COMMUNICATION SYSTEMS:

Second generation cellular networks, third generation wireless networks, wireless in local loop, wireless local area networks, Blue tooth and Personal Area networks.

UNIT3. INTRODUCTION TO CELLULAR MOBILE SYSTEMS:

Spectrum Allocation, basic Cellular Systems, performance Criteria, Operation of cellular systems, analog cellular systems, digital Cellular Systems. ,architecture of GSM

UNIT4.CELLULAR SYSTEM DESIGN FUNDAMENTALS:

Frequency Reuse, channel assignment strategies, handoff Strategies, Interference and system capacity, tracking and grade off service, improving coverage and capacity.

UNIT5.MULTIPLE ACCESS TECHNIQUES FOR WIRELESS COMMUNICATION:

Introduction to Multiple Access, FDMA, TDMA, Spread Spectrum multiple Access, space division multiple access**,**,CDMA.

UNIT6. WIRELESS NETWORKING:

Difference between wireless and fixed telephone networks, development of wireless networks, fixed network transmission hierarchy, traffic routing in wireless networks, wireless data services, common channel signaling, ISDN (Integrated Services digital Networks), advanced intelligent networks**,**intelligent cell concept.

Course Outcomes: On successful complete of this course, the students should be able to:

- Gain knowledge about technologies used in wireless communication.
- Understand need of evolution of mobile radio communication.
- Gain knowledge about GSM Cellular concept.
- Gain knowledge about multiple access techniques and fundamentals of Cellular system design.
- Gain knowledge about Wireless networking and ISDN.

TEXT BOOKS:

1. Wireless Communications: Theodore S. Rappaport; Pearsons.
2. Mobile Cellular Telecommunication: W.C.Y.Lee; McGraw Hill

REFERENCE BOOK:

1. Mobile Communications: Jochen Schiller; Pearson

EC-318C	**Cellular and Mobile Communications**		
L T P CR	**Theory**	**:**	**75**
3 0 0 3	**Class Work**	**:**	**25**
	Total	**:**	**100**
	Duration of Exam	**:**	**3 Hrs.**

Course Objectives:

- To introduce the students about the evolution of cellular communication systems upto and beyond 3G
- To introduce the students about the design a cellular link and estimate the power budget.
- To introduce the students about the proper multiple accessing methods depending on channel model
- To introduce the students about the identify traffic channels for call processing
- To introduce the students about the key performance metrics of a cellular communication system.

Syllabus

Unit1: An Overview of Wireless Systems - Introduction - Everything moves - Mobility versus portability - Mobile devices – Wireless communication and the layer model - First- and Second- Generation Cellular Systems - Cellular Communications from 1G to 3G - Road Map for Higher Data Rate Capability in 3G - Wireless 4G Systems - Future Wireless Networks – Standardization Activities for Cellular Systems.

Unit2: Cellular System design concepts and fundamentals - Frequency Reuse – Channel Assignment - Handoff Strategies – Interference and System Capacity – Trunking and Grade of service – Improving Coverage and Capacity in cellular systems. Mobile Radio Wave propagation - I - Large scale path loss and propagation models – Reflection – Diffraction – Scattering – Practical link budget design – Outdoor propagation models – Indoor propagation models.

Unit3: Mobile Radio Wave propagation – II - Small- Scale fading and multipath propagation, Rayleigh and Ricean Distributions. Multiple Access Techniques for Wireless Communications -I – FDMA – TDMA –Spread Spectrum multiple access – FHMA, CDMA – SDMA.
Multiple Access Techniques for Wireless Communications – II - Packet radio – Pure ALOHA, Slotted ALOHA, CSMA, Reservation ALOHA, PRMA - Capacity of Cellular Systems. Wireless systems and standards – I – AMPS and ETACS – IS 54 and IS 136 – GSM features – Architecture – Radio subsystems – Traffic channels – call processing.

Unit 4: Wireless systems and standards – II – CDMA features – Architecture – IS 95 – Forward and reverse channels – power constrol - system capacity.

Unit 5: Wireless Networking – WLAN – PAN – Mobile network layer – Mobile Transport layer – Wireless data services, Common channel signalling. Wireless Networking – Satellite data communication - cellular data communications, third generation UMTS system features – WiMAX - RFID.

Course Outcomes: On successful complete of this course, the students should be able to:

- Understand the evolution of cellular communication systems upto and beyond 3G
- Design a cellular link and estimate the power budget.
- Choose proper multiple accessing methods depending on channel model
- Identify traffic channels for call processing
- Calculate key performance metrics of a cellular communication system.

Text Books:

1. William C Y Lee, “Mobile Cellular Telecommunications, McGraw Hill
2. Stallings, Wireless Communications and Networks, Prentice Hall.
3. Schwartz, Mobile Wireless Communications, Cambridge University Press.
4. Theodore S Rappaport, “Wireless Communications Principles and Practice”, Prentice Hall.

EC-352C	**Digital Systems Design Lab**		
L T P CR	**Internal Marks**	**:**	**15**
0 0 2 1	**External Marks**	**:**	**35**
	Total	**:**	**50**
	Duration of Exam	**:**	**3 Hrs.**

List of Experiments

1. Design all gates using VHDL.

2. Write VHDL programs for the following circuits, check the wave forms and the hardware generated

   a. half adder

   b. full adder

3. Write VHDL programs for the following circuits, check the wave forms and the hardware generated

   a. multiplexer

   b. demultiplexer

4. Write VHDL programs for the following circuits, check the wave forms and the hardware generated

   a. decoder

   b. encoder

5. Write a VHDL program for a comparator and check the wave forms and the hardware generated

6 Write a VHDL program for a code converter and check the wave forms and the hardware generated

7. Write a VHDL program for a FLIP-FLOP and check the wave forms and the hardware generated

8. Write a VHDL program for a up/down counter and check the wave forms and the hardware generated

9. Write a VHDL program for a mod-n counter and check the wave forms and the hardware generated

10. Write VHDL programs for the following circuits check the wave forms and the hardware generated

    a. Storage register

b. Shift register

11. Write a VHDL program for ALU of microcomputer and check the wave forms and the hardware generated

12. Implement any three (given above) on FPGA/CPLD kit

Course Outcomes: On successful complete of this course, the students should be able to:

- Develop VHDL code for basic gates.
- Create VHDL code for various combinational circuits using different statements.
- Create VHDL code for various sequential circuits using different statements.
- Develop VHDL code for ALU of microcomputer.
- Write experimental reports and work in a team in professional way.

EC-354C	**Control Systems Engineering Lab**		
L T P CR	**Internal Marks**	**:**	**15**
0 0 2 1	**External Marks**	**:**	**35**
	Total	**:**	**50**
	Duration of Exam	**:**	**3 Hrs.**

List of Experiments

1. To study potentiometer as an error detector
2. To study linear system simulator with various I/P
3. To study PID controller for level control of a plant.
4. To study PID controller for temperature control of a plant.
5. To study two speed control of a D.C. motor.
6. To study mynchro , transmitter receiver pair.
7. To plot transient responses. To step inputs for stable & unstable systems uses MATLAB.
8. To study the position control of a D.C motor.
9. To draw bode plot root locals plot & Nyquist plot of a given system and find its reliability.
10. To study the feedback control system. Model in simulator and study the performance of a, P, PI and PID controller.

Course Outcomes: On successful complete of this course, the students should be able:

- To know the basic control system & its responses for various inputs.
- To know the basics of a PID controller & use it for temperature & level control.
- To know the basic operation of position & speed control of a D.C motor.

EC-356C **MOSIC Technology Lab**

L T P CR			
0 0 2 1	**Internal Marks**	**:**	**15**
	External Marks	**:**	**35**
	Total	**:**	**50**
	Duration of Exam	**:**	**3 Hrs.**

List of Experiments:

1. To Study tanner EDA tool.
2. To design a CMOS inverter using the Schematic entry tool, Tanner and verify it's functioning.
3. To design a CMOS NAND and NOR gates using the Schematic entry tool, Tanner and verify its functioning.
4. To design a CMOS NOR gates using the Schematic entry tool, Tanner and verify its functioning
5. To design a half adder using the Schematic entry tool, Tanner and verify its functioning
6. To design a transmission gate logic using the Schematic entry tool, Tanner and verify its functioning.
7. To design a pass transistor logic using the Schematic entry tool, Tanner and verify its functioning.
8. To design an AND gate in Domino logic using the Schematic entry tool, Tanner and verify its functioning.
9. To design a CMOS D-Latch using the Schematic entry tool, Tanner and verify it's functioning.
10. To design a CMOS Differential Amplifier using the Schematic entry tool, Tanner and verify it's functioning.

Course outcome:

After completing the above course student will be able to

- Use Tanner EDA tool.
- Draw, design and simulate the basic digital gates.
- Draw and design different logic circuits using various techniques.
- Draw and design sequential circuit using the Schematic entry tool.

EC-358C	**Microwave Engineering Lab**		
L T P CR	**Internal Marks**	**:**	**15**
0 0 2 1	**External Marks**	**:**	**35**
	Total	**:**	**50**
	Duration of Exam	**:**	**3 Hrs.**

List of Experiments

1. Study of wave guide components.
2. To study the characteristics of reflex Klystron and determine its timing range.
3. To measure frequency of microwave source and demonstrate relationship among guide dimensions, free space wave length and guide wavelength.
4. To measure VSWR of unknown load and determine its impedance using a smith chart.
5. To match impedance for maximum power transfer using slide screw tuner.
6. To measure VSWR, insertion losses and attenuation of a fixed and variable attenuator.
7. To measure coupling and directivity of direction couplers.
8. To measure insertion loss, isolation of a three port circulator.
9. To measure the Q of a resonant cavity.
10. To study the V-I characteristics of GUNN diode.

Course Outcomes: On successful complete of this course, the students should be able to:

- Understand the various types of wave guide components
- Understand the working of reflex klystron
- Determine the impedance using a smith chart.
- Understand the measurements on attenuators and directional couplers
- Measure insertion loss on a three port circulator
- Measure the characteristics of GUNN diode

EC-362C	**Workshop-VI**		
L T P CR	**Internal Marks**	**:**	**60**
0 0 6 3	**External Marks**	**:**	**140**
	Total	**:**	**200**
	Duration of Exam	**:**	**8 Hrs.**

List of Job/ Experiments

1. **Amplitude Modulation:**
   a. To study and perform all experiments (almost ten) related to AM SSB and DSB generation/demodulation including voice transmission and reception.
   b. To study and perform experiments to draw, characteristics of various parts of modulator and demodulator.
   c. To explain the circuit diagram of Amplitude demodulator and design its circuitry using Diode Detector, Local Oscillator frequency, Mixer stages, IF Amplifiers stages etc.
2. **QAM/DQAM Modulation and Demodulation :**
   a. Principal of advanced Digital modulation Techniques
   b. Tribit Data coding technique.
   c. Differential encoding of Tribit.
   d. Quadrature Amplitude/Differential Quadrature Amplitude Modulation Technique
3. **Pulse Code Modulation:**
   a. PCM Technique/Sampling and Multiplexing Technique and Reconstruction
   b. Principle of A/D converter/D/A converter
   c. Pseudo Random Sequence, Error control coding Technique, Synchronization Techniques.
4. **Frequency/Phase Modulation:**
   a. To study and perform all experiments(almost 10) related to FM generation , FM Demodulation and various technique of modulation and demodulation (i.e. Varactor diode Reactance modulator ,Foster seeley , ratio detector , PLL Detector, Pre-emphasis and De-Emphasis circuits, Use of Mixer stage ,Product Detector etc) including voice transmission and reception.
   b. To explain the circuit description of modulator and demodulator and design its circuits using ICs like ICL 8038, opamp ICs like LM324, LM3086,CD 4046, etc.
   c. To explain the circuit diagram of Frequency Demodulator and design its circuitry using various Ics like PLL 4046 and filters etc.
5. **Pulse Amplitude/Width/Position Modulation:**
   a. To study and perform various experiments related to **PAM**/PWM/PPM and its demodulation including voice transmission and reception.
   b. Nyquist Criterion and its effect (aliasing) on the demodulated signals.
   c. Designing of PAM circuit using any IC 7408/ ICDG211/ ICL 8038/LM3086 etc.
   d. Design of Demodulator such as Low Pass Filters using IC TL 074(non inverting unity gain buffer/OPAMP) etc.
   e. Designing of PWM Circuit either using OPAMP or using Timer IC 555 in Monostable mode.
   f. Further designing of PPM circuit by differentiating the PWM signal and then passing it again through 555 timers IC in Monostable mode.

g. Designing of LPF(IC TL 074) depending upon the frequency of modulated signals frequency.

6. Global System for Mobile Communications(GSM):

a. To study and perform the various experiments related to GSM i.e. TDMA Technology, GSM Technology, GSM Modem, AT commands for data communications, flow code software for sending text messages.
b. To design the projects based upon this technology.
c. To implement application of GSM on the given kit e.g. to run motor and to display temperature on LCD etc.

7. Optical Communication:

a. Study of FO Digital link/ Analog Link/Numerical Aperture.
b. Losses in Optical Fiber, PC to PC Communication

8. Data Conditioning and Carrier Modulation:

a. Amplitude Shift Keying Communication
b. Frequency Shift Keying Communication
c. Phase Shift Keying Communication

9. Frequency Division Multiplexing:

a. Study of AM/Frequency Response of BP filter/Voice Communication

10. Data Communication:

a. Study of Serial Port/ Serial Communications/ Parallel Port/ Parallel communications/ Modem Communication/Printer Interface using parallel Port.
b. Study of Wireless Communication/HyperTerminal Communications.

11. Digital Communication:

a. Delta modulation
b. Adaptive Delta Modulation

12. RFID Application Board:

a. Write a program to display card no, name and to switch on/off relay section according to the card swapped on LCD screen.

13. CDMA and CDMA DSSS

14. Repair and Design of various kits

15. TO DESIGN PROJECTS BASED UPON VARIOUS MODULATION TECHNIQUES.

EI-402C	**Digital Signal Processing**		
L T P CR	**Theory**	**:**	**75**
3 1 0 4	**Class Work**	**:**	**25**
	Total	**:**	**100**
	Duration of Exam	**:**	**3 Hrs.**

Course Objectives:

- To introduce the students about various types of signals and their representation.
- To introduce the students about Discrete-Time Systems
- To introduce the students about sampling of signals
- To introduce the students about z-transform and its properties
- To introduce the students about various types of filters and their structures.
- To introduce the students about multirate digital signal processing

Syllabus

UNIT1. DISCRETE-TIME SIGNALS:

Signal classifications, frequency domain representation, time domain representation, representation of sequences by Fourier transform, properties of Fourier transform, discrete time random signals, energy and power theorems.

UNIT2. DISCRETE-TIME SYSTEMS:

Classification, properties, time invariant system, finite impulse Response (FIR) system, infinite impulse response (IIR) system.

UNIT3. SAMPLING OF TIME SIGNALS:

Sampling theorem, application, frequency domain representation of sampling, reconstruction of band limited signal from its samples. Discrete time processing of continuous time signals, changing the sampling rate using discrete time processing.

UNIT4. Z-TRANSFORM:

Introduction, properties of the region of convergence, properties of the Z-transform, inversion of the Z-transform, applications of Z-transform.

UNIT5. BASICS OF DIGITAL FILTERS:

Fundamentals of digital filtering, various types of digital filters, design techniques of digital filters : window technique for FIR, bi-linear transformation and backward difference methods for IIR filter design, analysis of finite word length effects in DSP,FIR &IIR Filter structure-direct1,direct2,cascade and parallel,
Application of DSP.

UNIT6. MULTIRATE DIGITAL SIGNAL PROCESSING:

Introduction to multirate digital signal processing, sampling rate conversion, filter structures, multistage decimator and interpolators, digital filter banks.

Course Outcomes: On successful complete of this course, the students should be able to:

- Understand about various types of signals and their representation and their implementation on MAT LAB.
- Understand Discrete-Time Systems, sampling of signals and their implementation on MAT LAB.
- Understand z-transform, its properties and their implementation on MAT LAB.
- Understand various types of filters, their structures and their implementation on MAT LAB.
- Understand multirate digital signal processing multirate digital signal processing

TEXT BOOKS :

1. Digital Signal Processing : Proakis and Manolakis; PHI
2. Digital Signal Processing: Salivahanan, Vallavaraj and Gnanapriya;TMH

REFERENCE BOOKS:

1. Digital Signal Processing: Alon V. Oppenhelm;PHI
2. Digital Signal processing(II-Edition): Mitra, TMH

EI-404C	**Embedded Systems Design**		
L T P CR	**Theory**	**:**	**75**
3 0 0 3	**Class Work**	**:**	**25**
	Total	**:**	**100**
	Duration of Exam	**:**	**3 Hrs.**

Syllabus

Course Objectives:

- To introduce the students about different components and blocks of embedded system
- To introduce the students about Architecture and Operations of 8051 Microcontroller
- To introduce the students about timers and programming techniques of 8051
- To introduce the students about Architecture and Operations of PIC Microcontroller
- To introduce the students about Timing diagram, Interrupts, Instruction set and Addressing modes of PIC Microcontroller
- To tudy of Interfacing of physical devices with microcontroller like SSD, LCD, Switches etc.

Syllabus

UNIT1. INTRODUCTION:

Different types of Micro-controllers, embedded micro-controller, external memory micro-controller, Processor architectures: Harvard vs Princeton, CISC vs. RISC, Micro-controller memory types.

Development tools/environment, Intel Hex Format object files, debugging.

UNITS2 ARCHITECTURE OF 8051:

Block diagram, pin Configuration, Functional descriptions of internal

Units-- registers, PSW, internal RAM, ROM, Stack, Oscillator and Clock. **Otherfeatures**--I/O Pins, Ports and Circuits, Counters and timers, Serial data transmission/reception.

Interrupts--Timer flag interrupt, serial communication interrupt, External interrupt,software generated interrupts.

UNIT3. PROGRAMMING OF 8051:

Instruction format, addressing modes, Data transfer instructions, logical instructions, arithmetic instructions, Jump and Call instructions. Interrupts and interrupt handler subroutines. Development of assembly Language programs

UNIT4. ARCHITECTURE OF PIC:

Block diagram, pin Configuration, Functional descriptions of internal blocks—program memory considerations, register file structure. registers, oscillators and clock.

Other features--I/O Pins, Counters and timers, Watchdog timer, SPI port USART.**Interrupts**—Interrupt structure.

UNIT5. APPLICATION DESIGN & HARDWARE INTERFACING WITH 8051 & PIC:

Hardware Interfacing with LED, Seven segment LED, LCD, Switches and stepper motor.

Course Outcomes: On successful complete of this course, the students should be able to:

- Understand embedded system, microcontrollers and its basis of classification.
- Understand the operation of microcontrollers 8051 and PIC.
- Understand the working of different working blocks of microcontrollers 8051 and PIC.
- Understand the instruction set and addressing modes of microcontrollers 8051 and PIC.
- Understand different inbuilt features/ modules of 8051 and PIC and way of writing assembly language programs using instructions, features and interfacing devices.

TEXT BOOKS:

1. Design with PIC Micro-controller by John B. Peatman, Pearson.
2. The 8051 microcontroller and embedded system by M.A.Mazidi, PHI

REFERENCE BOOKS: Programming and customizing the 8051 micro-controller- Predko, TMH.

1. Designing Embedded Hardware: John Catsoulis: Shroff Pub and Dist.
2. Programming embedded systems in C and C++: Michael Barr: Shroff Pub and distr.

EC-406C	**Computer Networks**		
L T P CR	**Theory**	**:**	**75**
3 0 0 3	**Class Work**	**:**	**25**
	Total	**:**	**100**
	Duration of Exam	**:**	**3 Hrs.**

Course Objectives:

- To study the basics computer networks: Hub, Switch, Router, Gateway, Modes of Transmission, Topology, Protocols.
- To study Reference Models such as OSI and TCP/IP
- To study various guided and un guided transmission media
- To study various issues of Data link layer, physical, network, transport, session and application layers
- To study various network security requirements and methods to achieve them.

Syllabus

UNIT 1 INTRODUCTION:

Uses of Computer Networks, Network Hardware and Software, Reference models (OSI & TCP/IP).

UNIT 2 THE PHYSICAL LAYER:

The Theoretical basis for Data communication, Transmission media, Wireless Communication, Communication Satellites, Network topology, switching techniques.

UNIT 3 THE DATA LINK LAYER:

Data Link Layer Design issues, Error Detection & correction, Elementary Data Link layer protocols, Sliding Window Protocols, Protocol Specification & Verification, Example of Data Link Protocols.

THE MEDIUM ACCESS SUBLAYER: Channel Allocation, Multiple access Protocols(ALOHA, CSMA, FDM, TDM).

UNIT4 NETWORK LAYER:

Design issues, routing algorithms, congestion control, and internetworking.

UNIT 5

TRANSPORT LAYER: Design issues, simple transport protocols (TCP, UDP)
SESSION LAYER: Design issues, remote procedure calls.

UNIT 6:

PRESENTATION LAYER: Design issues, data compression technique, cryptograph.
APPLICATION LAYER: Design issues, file transfer, access and management,electronic mail, virtual terminals, applications and examples.

Course Outcomes: On successful complete of this course, the students should be able to:

- Understand the types of topology and their advantages as well as disadvantages.
- Understand the concept of Ip addressing and its usage in networking.
- Understand the Concept of OSI and TCP/IP reference model in detail.
- Understand various error detection and correction mechanism used in data communication.
- Understand how the packet reaches from source to destination in communication networks.
- Understand the network security requirement and the concept of encryption decryption.
- Understand the working of protocols used at application layer

TEXT BOOKS:

1. Tanenbaum A.S, Computer Networks, PHI.
2. Forouzan B.A, Data Communications and Networking, Tata-Mc-Graw Hill.
3. Stallings W, Data and Computer Communications, PHI.

REFERENCE BOOKS;

1. Ahuja V, Design and Analysis of Computer Communication, McGraw Hill.
2. Bee K.C.S, Local Area Networks, NCC Pub.
3. Davies D. W. Barber, Computer Networks and their Protocols, John Wiley.

EC-408C	**Optical Communication Systems**		
L T P CR	**Theory**	**:**	**75**
3 0 0 3	**Class Work**	**:**	**25**
	Total	**:**	**100**
	Duration of Exam	**:**	**3 Hrs.**

Course Objectives:

- To introduce the students about various types of optical communication systems.
- To introduce the students about various types of fibres and their structures
- To introduce the students about various types of sources
- To introduce the students about various of detectors
- To introduce the students about recent trends in optical communication

Syllabus

UNIT1 INTRODUCTION TO OPTICAL COMMUNICATION SYSTEMS:
Electromagnetic Spectrum used for optical communication, Block diagram of optical communication system, Basics of transmission of Light rays, Advantages of optical fibrecommunication.

UNIT2 OPTICAL FIBERS:
Optical fiber structures & their types, Fiber characteristics: Attenuation, scattering, absorption, fiber band loss, Dispersion, Fiber couplers and connectors.

UNIT3 LED LIGHT SOURCE:
Light Emitting Diode: recombination process, LED characteristics, internal quantum efficiency, external quantum efficiency, LED structures, Lens coupling to Fiber.

UNIT4LASER LIGHT SOURCE:
Basic principles of laser action in semiconductors, optical gain, Lasing threshold, Laser structures and characteristics, Laser to Fiber coupling, Comparison with LED source.

UNIT5AVALANCHE & PIN PHOTO DETECTORS
Principles of Optical Detection, Quantum efficiency, responsivity, general principle of PIN photo detector, impulse & frequency response of PIN photo diodes. Noise in PIN photo diodes, Multiplication process, APD bandwidth, APD Noise.

UNIT6RECENT TRENDS IN OPTICAL COMMUNICATION
Optical Networking, Network Topologies, Optical TDM, Subscriber multiplexing, WDM.

Course Outcomes: On successful complete of this course, the students should be able to:

- Understand Electromagnetic spectrum used for optical communication.
- Recognize and classify the structures of Optical fibre and types.
- Discuss the channel impairments like losses and dispersion.
- Know about advantages of Optical fibre system.
- Classify the Optical sources and detectors and to discuss their principles and properties.
- Understand Optical networking.

TEXT BOOK:
Optical Fibre Communications: John M Senior:PHI

REFERENCE BOOKS:

1. Optical Communication Systems: John Gowar:PHI
2. Optical Fibre Communications: GerdKeiser:TMH
3. Optical Fibre Communications: selvarajan ,Kar,Srinivas: TMH
4. Computer Networks: Tanenbaum, PHI

EC-410C	**Image Processing**		
L T P CR	**Theory**	**:**	**75**
3 0 0 3	**Class Work**	**:**	**25**
	Total	**:**	**100**
	Duration of Exam	**:**	**3 Hrs.**

Course Objectives:

- To introduce the need for image transforms and their properties.
- To introduce appropriate technique for image enhancement both in spatial and frequency domains.
- To introduce causes for image degradation and apply restoration techniques.
- To introduce and compare the image compression techniques in spatial and frequency domains.
- To select feature extraction techniques for image analysis and recognition.

Syllabus

INTRODUCTION: Digital Image Representation, Fundamental Steps in Image Processing, Elements of Digital Image Processing Systems.

DIGITAL IMAGE FUNDAMENTALS: Elements of Visual Perception, A Simple image model, Sampling and Quantization, Neighborhood of Pixels, Pixel Connectivity, Labeling of Connected Components, Distance Measures, Arithmetic and Logic Operations, Image Transformations, Perspective Transformations, Stereo Imaging.

IMAGE ENHANCEMENT: Spatial Domain Methods, Frequency Domain Methods, Point processing, Intensity Transformations, Histogram Processing, Spatial filtering, Smoothing Filters, Sharpening Filters, Enhancement in the Frequency Domain, Low Pass Filtering, High Pass Filtering, Homomorphic filtering, Pseudo-Color Image Enhancement.

IMAGE COMPRESSION: Fundamentals of Compression, Image Compression Model, Error free Compression, Lossy Predictive Coding, Transform Coding.

IMAGE SEGMENTATION: Detection of Discontinuities, Line Detection, Edge Detection, Edge Linking and Boundary Detection, Thresholding, Threshold Selection on Boundary Characteristics, Region Growing , Region Splitting and Merging, Use of motion in Segmentation.

IMAGE REPRESENTATION AND DESCRIPTION: Chain Codes, Polygonal Approximations, Signatures, Skeleton, Boundary Descriptions, Shape Numbers, Fourier descriptors, Moments, Topological Descriptors.

IMAGE RECOGNITION AND INTERPRETATION: Elements of Image Analysis, Pattern and Pattern Classes, Minimum Distance Classifier, Matching by Correlation, Baye's Classifier, Neural Network Training Algorithm, Structural methods.

Course Outcomes: On successful complete of this course, the students should be able to:

- Understand the need for image transforms and their properties.
- Choose appropriate technique for image enhancement both in spatial and frequency domains.
- Identify causes for image degradation and apply restoration techniques.
- Compare the image compression techniques in spatial and frequency domains.
- Select feature extraction techniques for image analysis and recognition.

Text Books:

1. Rafael C Gonzalez and Richard E Woods, Digital Image Processing, Pearson Education Asia, New Delhi, 2000.
2. B. Chanda, D. Dutta Majumder, Digital Image Processing and Analysis, PHI, New Delhi, 2000.
3. A.K. Jain, Fundamentals of Digital Image Processing, PHI, New Delhi, 2001.

EC-412C	**IOT**		
L T P CR	**Theory**	**:**	**75**
3 0 0 3	**Class Work**	**:**	**25**
	Total	**:**	**100**
	Duration of Exam	**:**	**3 Hrs.**

Course Objectives:

- To understand and have a clear vision to IoT.
- To understand and determine IoT Markets perspective.
- Data and Knowledge Management and use of Devices in IoT Technology.
- To build State of the Art architecture – IoT Architecture.
- Application of IoT in real world, understand IoT Design Constraints, Industrial Automation and Commercial Building Automation in IoT.
- To meet the evolving IoT industry needs by addressing the challenges in Security in IoT, Integration of large scale heterogeneous network, Integration and interaction of uncertain data, and Service adaptation in the dynamic system environment.

Syllabus

Unit 1:

Introduction to Internet of Things (IoT), Definition of the Internet of Things (IoT), The Importance of the Internet of Things (IoT) in SocietyIoT Architecture, History of IoT, M2M Machine to Machine, Web of Things, Overview of IoTLab Hardware platforms, The Layering concepts, IoT Communication Pattern, IoT protocol Architecture, 6LoWPAN, Understand IoT Market perspective in different segments.

Operating System used for IoT

Linux Operating System introduction, Working with the command line and the Shell, Managing directories and files, Managing user access and security, Setting up a Linux file system, Understanding system initialization, Connecting a system to the network, Installing and Configuring Linux

Unit 2:

Sensors and Data Acquisition for IoT: Wireless Sensors and Transducers, Signal Conditioning Circuits, Data Acquisition Systems, ADC and DACs, Microcontrollers Interfaces for Data Interfaces, Architecture of IoT networks: Basic Network Architecture for IoT, Network and Transport Layer services, Wireless Local Area Network, Mobile Networking, Real Time Networking

Unit 3:

Hardware Interfacing for IoT Sensors interfacing, Actuators interfacing Communication Protocol study for IoT, UART Communication, RS485 Communication, I2C Protocol device interfacing, SPI Protocol device interfacing, Ethernet configuration, Automation for IoT: Basic of Automation, Embedded Computing Basics, Internet of Things Automation using Arduino, Internet of Things (IoT) Automation using Raspberry Pi 2, Eaglebone black IoT automation

Unit 4:

Case study & advanced IoT Applications with: Smart Agriculture Sensors, Smart Environment Sensors, Smart Industrial Sensors, Smart Water Sensors, Smart Home Automation, Smart Security Solutions, Smart Cities Concepts, IoT physical servers,

Course Outcomes: On successful complete of this course, the students should be able to:

- Understand and have a clear vision to IoT.
- Understand and determine IoT Markets perspective.
- Understand data and Knowledge Management and use of Devices in IoT Technology.
- build State of the Art architecture – IoT Architecture.
- Understand application of IoT in real world, understand IoT Design Constraints, Industrial Automation and Commercial Building Automation in IoT.
- Meet the evolving IoT industry needs by addressing the challenges in Security in IoT, Integration of large scale heterogeneous network, Integration and interaction of uncertain data, and Service adaptation in the dynamic system environment.

Textbook:

1. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, “From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence”, 1st Edition, Academic Press, 2014.

Reference Books:

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

EC-414C	**Satellite Communication**		
L T P CR	**Theory**	**:**	**75**
3 0 0 3	**Class Work**	**:**	**25**
	Total	**:**	**100**
	Duration of Exam	**:**	**3 Hrs.**

Course Objectives:

- To introduce the evolution, growth of communication satellite and advantages and applications of GEO, MEO & LEO satellite communication.
- To introduce orbital motion of satellite and satellite link design.
- To introduce digital modulation techniques.
- To introduce special purpose satellite and laser satellite communication.

Syllabus

UNIT1. PRINCIPLES OF SATELLITE COMMUNICATION :

Evolution & growth of communication satellite, Synchronous satellite, Satellite frequency allocation & Band spectrum, Advantages of satellite communication, Active & Passive satellite, Modem & Codec. Applications of satellite communication.

UNIT2. COMMUNICATION SATELLITE LINK DESIGN:

Introduction, General link design equations, System noise temperature, C/N & G/T ratio, Atmospheric &Ionospheric effects on link design, Complete link design, Earth station parameters.

UNIT3. DIGITAL & ANALOG SATELLITE COMMUNICATION :

Advantages of digital communication, Elements of digital satellite communication systems, Digital baseband signals, Digital modulation techniques, Satellite digital link design, Time Division Multiplexing,Baseband analog signal,FDM techniques.

UNIT4. MULTIPLE ACCESS TECHNIQUES:

Introduction, TDMA, TDMA-Frame structure, TDMA -Burst structure, TDMA-Frame efficiency, TDMA-superframe, TDMA-Frame acquisition & Synchronization, TDMA compared to FDMA, TDMA Burst Time Plan, Multiple Beam (Satellite switched) TDMA satellite system, Beam Hopping(Transponder Hopping) TDMA, CDMA & hybrid access techniques.

UNIT5. SATELLITE ORBITS:

Introduction, Synchronous orbit, Orbital parameters, Satellite location with respect to earth, Look angles, Earth coverage & slant range, Eclipse effect, Satellite stabilization. space craft technology-structural, primary power, attitude and orbit control, thermal, propulsion, telemetry, tracking and command, communication and antenna subsystems- launching procedures and launch vehicles

UNIT6. SPECIAL PURPOSE COMMUNICATION SATELLITES :

VSAT(data broadband satellite), MSAT(Mobile Satellite Communication technique), LEOs (Lower earth orbit satellite), Satellite communication with respect to Fiber Optic Communication, LANDSAT, Defense satellite,ATM over satellite, role of satellite in future network.

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UNIT7. LASER SATELLITE COMMUNICATION:

Introduction, Link analysis, Optical satellite link transmitter, Optical satellite link receiver, Satellite Beam Acquisition, Tracking & Positioning, Deep Space Optical Communication Link.

Course Outcomes: On successful complete of this course, the students should be able to:

- know the Evolution & growth of satellite communication, Synchronous satellite, Satellite frequency allocation & Band spectrum, Active & Passive satellite, Modem & Codec.
- formulate and the derive of various parameters like : General link design equations, System noise temperature, C/N & G/T ratio, Atmospheric & Ionospheric effects on link design, Complete link design etc
- Understand about Synchronous orbital telemetry, tracking and command, communication and antenna subsystems- launching procedures and launch vehicles VSAT, MSAT, LEOs,
- Able to know multiple access techniques and to learn about Link analysis of laser satellite communication, Optical satellite link transmitter, Optical satellite and Deep Space Optical Communication.

TEXT BOOK:

1. Satellite Communication: D.C. Aggarwal ; Khanna.

REFERENCE BOOK:

1. Satellite Communication: Gagliardi; CBS

EC-416C	**Network Security**		
L T P CR	**Theory**	**:**	**75**
3 0 0 3	**Class Work**	**:**	**25**
	Total	**:**	**100**
	Duration of Exam	**:**	**3 Hrs.**

Course Objectives:

- To make students know about the fundamentals of network security
- To make students know about Choose appropriate encryption and decryption algorithms for a given scenario
- To make students know about Implement authentication mechanisms through Public and Private keys
- To make students know about Implement authentication mechanisms through Public and Private keys

Syllabus

Introduction: Attacks, services and mechanisms, security attacks, security services, a model for internet work security, protection through cryptography, the role of cryptography in network security.

Conventional Encryption: Conventional encryption model, classical encryption techniques, substitution techniques and transposition techniques, block cipher principles, block cipher design principles, block cipher modes of operation.

Encryption Algorithms: The data encryption standard, triple DES, International data encryption algorithm, Blowfish, RC5, characteristics of advanced symmetric block ciphers. Principles of public-key cryptosystems, the RSA algorithm, key management.

Authentication protocols & Digital Signatures : Authentication requirements, authentication functions, message authentication codes, hash functions, security of hash functions and MAC's, Digital signatures, Digital signature standard, Authentication Protocols, MD5, message digest algorithm, secure hash algorithm, HMAC.

Mall security & IP security: Pretty good privacy, S/MIME, IP security overview, IP security architecture, Authentication header, key management. Introducers, viruses, Malware, Spyware, Spam. firewall design principles, trusted systems.Cyber crime, Cyber Law.

Course Outcomes: On successful complete of this course, the students should be able to:

- Understand fundamentals of network security.
- Choose appropriate encryption and decryption algorithms for a given scenario
- Implement authentication mechanisms through Public and Private keys
- Implement authentication mechanisms through Public and Private keys

Text Book:

1. Cryptography and Networking Security, Principles and Practice – by William Stallings, PHI/Pearson Education Asia, 2 nd Ed. 2000.

Reference Book:

1. Network Security-Private Communication in a Public World, 2nd ed., Kaufman, Perlman & Speciner, PHI, 2003

EC-418C	**MIMO Wireless Communications**		
L T P CR	**Theory**	**:**	**75**
3 0 0 3	**Class Work**	**:**	**25s**
	Total	**:**	**100**
	Duration of Exam	**:**	**3 Hrs.**

Course Objectives:

- To introduce basic terms of performance measurement.
- To introduce fading channel characteristics
- To introduce the students performance of multi channel receivers
- To introduce multi channel transmission
- To introduce error probability analysis

Unit1: Introduction:
System Performance Measures, Average Signal-to-Noise Ratio (SNR), Outage Probability, Average Bit Error Probability (BEP) , Amount of Fading , Average Outage Duration,Conclusions

Unit2: **Fading Channel Characterization and Modeling:** Main Characteristics of Fading Channels, Envelope and Phase Fluctuation, Slow and Fast Fading , Frequency-Flat and Frequency-Selective Fading, Modeling of Flat-Fading Channels, Multipath Fading, Rayleigh, Nakagami-*q* (Hoyt), Nakagami-*n* (Rice), Nakagami-*m* , Weibull , Log-Normal Shadowing ,
Composite Multipath/, Composite Gamma/Log-Normal Distribution , Suzuki Distribution, Rician Shadowed Distributions ,Modeling of Frequency-Selective Fading Channels

Unit 3: **Performance of Multichannel Receivers:** Diversity Combining , Diversity Concept, Mathematical Modeling , Brief Survey of Diversity Combining Techniques,Pure Combining Techniques, Complexity–Performance ,Maximal-Ratio Combining (MRC),Receiver, PDF-Based , MGF-Based Approach.

Unit 4: Multichannel Transmission—Transmit Diversity and Space-Time : A Historical Perspective, Transmit versus Receive Diversity—Basic Concepts, Alamouti's Diversity Technique—a Simple Transmit Diversity Scheme Using TwoTransmit Antennas, Generalization of Alamouti's Diversity Technique to Orthogonal Space-Time Block Codes. MIMO channel, MIMO information Theory.

Unit 5: Error probability analysis, Transmit diversity and space-time coding, Linear STBC design, Differential coding for MIMO, Precoding, Multiuser MIMO

Course Outcomes: On successful complete of this course, the students should be able to:

- Understand the basic terms of performance measurement.
- Understand fading channel characteristics
- Understand the students performance of multi channel receivers
- Understand multi channel transmission
- Understand error probability analysis

Textbook:

1. E. G. Larsson and P. Stoica, Space-Time Block Coding for Wireless Communications, Cambridge University Press, 2003.
2. Marvin K. Simon and Mohamed-Slim Alouini, Digital Communication over Fading Channels, Second Edition, A JOHN WILEY & SONS, INC., PUBLICATION

Reference book:

A. Paulraj, R. Nabar and D. Gore, Introduction to Space-Time Wireless Communications, Cambridge Univ. Press, 2003.

EI-452C	**Digital Signal Processing Lab**		
L T P CR	**Internal Marks**	**:**	**15**
0 0 2 1	**External Marks**	**:**	**35**
	Total	**:**	**50**
	Duration of Exam	**:**	**3 Hrs.**

List of Experiments

Perform the experiments using MATLAB:

1. To represent basic signals (Unit step, unit impulse, ramp, exponential, sine and cosine).
2. To develop program for discrete convolution.
3. To develop program for discrete correlation.
4. To develop program for amplitude modulation.
5. To understand noise effected signal & get filter signal.
6. To understand stability test.
7. To understand sampling theorem.
8. To design analog filter(low-pass, high pass, band-pass, band-stop).
9. To design digital IIR filters(low-pass, high pass, band-pass, band-stop).
10. To design FIR filters using windows technique.
11. To design a program to compare direct realization values of IIR digital filter
12. To develop a program for computing parallel realization values of IIR digital filter.
13. To develop a program for computing cascade realization values of IIR digital filter
14. To develop a program for computing inverse Z-transform of a rational transfer function.
15. To understand DFT & IDFT.

Course Outcomes: On successful complete of this course, the students should be able to:

- Implement various elementary signal function modules, standard sequences and computer the spectrums of various signals.
- Write a program for various operations of time signals using MATLAB.
- Write a program for the analysis of frequency response of LTI system.
- Implement the various types of filters.
- Implement the various structures of FIR & IIR filters.
- Write a program for calculating Z transform, inverse Z transform & its properties.
- Write experimental reports and work in a team in profession way.

EC-456C	**Network Programming Lab**		
L T P CR	**Internal Marks**	**:**	**15**
0 0 2 1	**External Marks**	**:**	**35**
	Total	**:**	**50**
	Duration of Exam	**:**	**3 Hrs.**

List of Experiments

The socket programming can be done on Unix/Linux operating or/and Windows. Socket programming, and the language can be C/VC++ and/or Java

1. Write a program to implement parity check.
2. Write a program to implement hamming code.
3. Write a program to implement two dimensional parity checks.
4. Write a program to determine the type of IP Address.
5. Write a program to implement slotted aloha.
6. Write a program to make an FTP Client.
7. Write a program to implement an adhock network.
8. To make cross and normal cable connection.
9. To implement a socket address.
10. To implement a LAN.

Course Outcomes: On successful complete of this course, the students should be able to:

- Understand & write the program to implement Parity Check, Hamming Code & Two Dimensional Parity Checks.
- Understand and write the program to determine the type of IP address & implement slotted aloha.
- Understand & write the program to implement an adhock network, socket address & local area network.
- Understand to make cross and normal cable connection.
- Understand & write the program to make an FTP client.
- Write experimental reports and work in a team in professional way.

EC-462C	**Workshop-VIII**		
L T P CR	**Internal Marks**	**:**	**60**
0 0 6 3	**External Marks**	**:**	**140**
	Total	**:**	**200**
	Duration of Exam	**:**	**8 Hrs.**

List of Job/ Experiments

Satellite Communication

1. To study about Uplink, downlink and transponder in satellite communication.
2. To study and perform experiment on active satellite communication link.
3. To study and perform experiment on passive satellite communication link.
4. To measure S/N & C/N Ratio in satellite communication system.
5. To study and perform experiment on GPS system.
6. To study and perform experiment on GSM system.

Advance Microprocessor & Microcontroller

1. Introduction of Microcontroller 8051.
2. Generation of square wave of 1 kHz through microcontroller 8051.
3. Generation of square wave of 1 kHz through microcontroller 8051 using PPI 8255.
4. Interface the L.E.D/SSD through microcontroller 8051 using PPI 8255.
5. Interface the ADC/DAC through microcontroller 8051 using PPI 8255.
6. Interface and control the any hardware circuit through microcontroller 8051 using PPI 8255.