Regulations and Curriculum

for

B. Tech. Electronics and Communication Engineering

2014-2015

PONDICHERRYUNIVERSITY

BACHELOR OF TECHNOLOGY PROGRAMMES

(EIGHT SEMESTERS)

REGULATIONS

1. CONDITIONS FOR ADMISSION:

(a) Candidates for admission to the first semester of the 8 semester B.Tech. Degree programme should be required to have passed:

The Higher Secondary Examination of the (10+2) curriculum (Academic Stream) prescribed by the Government of Tamil Nadu or any other examination equivalent there to with minimum of 45% marks(a mere pass for OBC and SC/ST candidates) in aggregate of subjects – Mathematics, Physics and any one of the following optional subjects: Chemistry / Biotechnology/ Computer Science / Biology (Botany & Zoology) or an Examination of any University or Authority recognized by the Executive Council of the Pondicherry University as equivalent thereto.

(b) For Lateral entry in to third semester of the eight semesters B.Tech programme:

The minimum qualification for admission is a pass in three year diploma or four year sandwich diploma course in engineering / technology with a minimum of 60 % marks (50% marks for OBC and a mere pass for SC/ST candidates) in aggregate in the subjects covered from 3rd to final semester or a pass in any B.Sc. course with mathematics as one of the subjects of study with a minimum of 60 % marks (50% marks for OBC and a mere pass for SC/ST candidates) in aggregate in main and ancillary subjects excluding language subjects. The list of diploma programs approved for admission for each of the degree programs is given in **Annexure A**.

2. AGE LIMIT:

The candidate should not have completed 21 years of age as on 1st July of the academic year under consideration. For Lateral Entry admission to second year of degree programme, candidates should not have completed 24 years as on 1st July of the academic year under consideration. In the case of SC/ST candidates, the age limit is relaxable by 3 years for both the cases.

3. DURATION OF PROGRAMME:

The Bachelor of Technology degree programme shall extend over a period of 8 consecutive semesters spread over 4 academic years – two semesters constituting one academic year. The duration of each semester shall normally be 15 weeks excluding examinations.

4. ELIGIBILITY FOR THE AWARD OF DEGREE:

No candidate shall be eligible for the award of the degree of Bachelor of Technology, unless he/she has undergone the course for a period of 8 semesters (4 academic years) / 6 semesters (3 academic years for Lateral Entry candidates) in the faculty of Engineering and has passed the prescribed examinations in all the semesters.

5. BRANCHES OF STUDY:

Branch I - Civil Engineering
Branch II - Mechanical Engineering
Branch III - Electronics & Communication Engineering
Branch IV - Computer Science & Engineering
Branch V - Electrical& Electronics Engineering
Branch VI - Chemical Engineering
Branch VII -Electronics & Instrumentation Engineering
Branch VIII - Information Technology
Branch IX - Instrumentation & Control Engineering
Branch X - Biomedical Engineering

or any other branches of study as and when offered. The branch allocation shall be ordinarily done at the time of admission of the candidate to the first semester.

6. SUBJECTS OF STUDY:

The subjects of study shall include theory and practical courses as given in the curriculum and shall be in accordance with the prescribed syllabus. The subjects of study for the first two semesters shall be common for all branches of study.

7. EXAMINATIONS:

The theory and practical examinations shall comprise continuous assessment throughout the semester in all subjects as well as university examinations conducted by Pondicherry University at the end of the semester (November / December or April / May).

(a) Theory courses for which there is a written paper of 75 marks in the university examination**.**

The Internal Assessment marks of 25 has to be distributed as 10 marks each for two class tests and 5 marks for class attendance in the particular subject. The distribution of marks for attendance is as follows:

5 marks for 95% and above
4 marks for 90% and above but below 95%
3 marks for 85% and above but below 90%
2 marks for 80% and above but below 85%
1 mark for 75% and above but below 80%

A minimum of three tests are to be conducted for every theory subject and, of them two best are to be considered for computation of internal assessment marks.

(b) Practical courses for which there is a university practical examination of 50marks:

Every practical subject carriesan internal assessment mark of 50 distributed as follows: (i) Regular laboratory exercises and records – 20 marks (ii) Internal practical test-15 marks (iii) Internal viva-voce – 5 marks and (iv) Attendance – 10 marks.

The marks earmarked for attendance are to be awarded as follows:

10 marks for 95% and above
8 marks for 90% and above but below 95%
6 marks for 85% and above but below 90%
4 marks for 80% and above but below 85%
2 marks for 75% and above but below 80%

8. REQUIREMENT FOR APPEARING FOR UNIVERSITY EXAMINATION:

A candidate shall be permitted to appear for university examinations at the end of any semester only if:

(i) He / She secures not less than 75% overall attendance arrived at by taking into account the total number of periods in all subjects put together offered by the institution for the semester under consideration.

(Candidates who secure overall attendance greater than 60% and less than 75% have to pay a condonationfee as prescribed by theUniversity along with a medical certificate obtained from a medical officer not below the rank of Assistant Director)

(ii) He / She earns a progress certificate from the Head of the institution for having satisfactorily completed the course of study in all the subjects pertaining to that semester.

(iii) His / Her conduct is found to be satisfactory as certified by the Head of the institution.

A candidate who has satisfied the requirement (i) to (iii) shall be deemed to have satisfied the course requirements for the semester.

9. PROCEDURE FOR COMPLETING THE COURSE:

A candidate can join the course of study of any semester only at the time of its normal commencement and only if he/she has satisfied the course requirements for the previous

semester and further has registered for the university examinations of the previous semester in all the subjects as well as all arrear subjects if any.

However, the entire course should be completed within 14 consecutive semesters (12 consecutive semesters for students admitted under lateral entry).

10. PASSING MINIMUM:

(i) A candidate shall be declared to have passed the examination in a subject of study only if he/she secures not less than 50% of the total marks (Internal Assessment plus University examination marks) and not less than 40%of the marks in University examination.

(ii) A candidate who has been declared "Failed" in a particular subject may reappear for that subject during the subsequent semesters and secure a pass. However, there is a provision for revaluation of failed or passed subjects provided he/she fulfills the following norms for revaluation.

(a) Applications for revaluation should be filed within 4 weeks from the date of declaration of results or 15 days from the date of receipt of marks card whichever is earlier.

(b) The candidate should have attended all the college examinations as well as university examinations.

(c) If a candidate has failed in more than two papers in the current university examination, his/her representation for revaluation will not be considered.

(d) The request for revaluation must be made in the format prescribed duly recommended by the Head of the Institution along with the revaluation fee prescribed by the University.

The internal assessment marks obtained by the candidate shall be considered only in the first attempt for theory subjects alone. For the subsequent attempts, University examination marks will be made up to the total marks. Further the University examination marks obtained in the latest attempt shall alone remain valid in total suppression of the University examination marks obtained by the candidate in earlier attempts.

11. AWARD OF LETTER GRADES:

The assessment of a course will be done on absolute marks basis. However, for the purpose of reporting the performance of a candidate, letter grades, each carrying certain points, will be awarded as per the range of total marks (out of 100) obtained by the candidate, as detailed below:

Range of Total Marks	Letter Grade	Grade Points
90 to 100	S	10
80 to 89	A	9
70 to 79	B	8
60 to 69	C	7
55 to 59	D	6
50 to 54	E	5
0 to 49	F	0
Incomplete	FA	

Note: 'F' denotes failure in the course. 'FA' denotes absent / detained as per clause 8.

After results are declared, grade sheets will be issued to the students. The grade sheets will contain the following details:

(a) The college in which the candidate has studied.

(b) The list of courses enrolled during the semester and the grades scored.

(c) The Grade Point Average (GPA) for the semester and The Cumulative Grade Point Average (CGPA) of all enrolled subjects from first semester onwards.

(d) GPA is the ratio of sum of the products of the number of credits (C) of courses registered and the corresponding grades points (GP) scored in those courses, taken for all the courses and sum of the number of credits of all the courses

$$GPA = (\text{Sum of}(C \times GP)/\text{Sum of } C)$$

CGPA will be calculated in a similar manner, considering all the courses enrolled from first semester. FA grades are to be excluded for calculating GPA and CGPA.

(e) The conversion of CGPA into percentage marks is as given below

$$\% \text{ Mark} = (CGPA - 0.5) \times 10$$

12. AWARD OF CLASS AND RANK:

(i) A candidate who satisfies the course requirements for all semesters and who passes all the examinations prescribed for all the eight semesters (six semesters for lateral entry candidates) within a maximum period of 7 years (6 years for lateral entry

candidates) reckoned from the commencement of the first semester to which the candidate was admitted shall be declared to have qualified for the award of degree.

(ii) A candidate who qualifies for the award of the degree passing in all subjects pertaining to semesters 3 to 8 in his/her first appearance within 6 consecutive semesters (3 academic years) and in addition secures a CGPA of 8.50 and above for the semesters 3 to 8 shall be declared to have passed the examination in **FIRST CLASS** with **DISTINCTION**.

(iii) A candidate who qualifies for the award of the degree by passing in all subjects relating to semesters 3 to 8 within a maximum period of eight semesters after his/her commencement of study in the third semester and in addition secures CGPA not less than 6.5 shall declared to have passed the examination in **FIRST CLASS**.

(iv) All other candidates who qualify for the award of degree shall be declared to have passed the examination in **SECOND CLASS**.

(v) For the Award of University ranks and Gold Medal for each branch of study, the CGPA secured from 1^{st} to 8^{th} semester alone should be considered and it is mandatory that the candidate should have passed all the subjects from 1^{st} to 8^{th} semester in the first attempt. Rank certificates would be issued to the first ten candidates in each branch of study.

13. PROVISION FOR WITHDRAWAL:

A candidate may, for valid reasons, and on the recommendation of the Head of the Institution be granted permission by the University to withdraw from writing the entire semester examination as one Unit. The withdrawal application shall be valid only if it is made earlier than the commencement of the last theory examination pertaining to that semester. Withdrawal shall be permitted only once during the entire course. Other conditions being satisfactory, candidates who withdraw are also eligible to be awarded DISTINCTION whereas they are not eligible to be awarded a rank.

14. DISCONTINUATION OF COURSE:

If a candidate wishes to temporarily discontinue the course for valid reasons, he/she shall apply through the Head of the Institution in advance and obtain a written order from the University permitting discontinuance. A candidate after temporary discontinuance may rejoin the course only at the commencement of the semester at which he/she discontinued, provided he/she pays the prescribed fees to the University. The total period of completion of the course reckoned from the commencement of the first semester to which the candidate was admitted shall not in any case exceed 7 years, including of the period of discontinuance.

15. REVISION OF REGULATIONS AND CURRICULUM:

The University may from time to time revise, amend or change the regulations of curriculum and syllabus as and when found necessary.

ANNEXURE – A

(Diploma programs for admission for B.Tech. Lateral Entry)

B.Tech courses in which admission is sought	**Diploma courses eligible for admission**
Civil Engineering	Civil Engineering Civil and Rural Engineering Architectural Assistantship Architecture Agricultural Engineering
Mechanical Engineering	Mechanical Engineering Automobile Engineering Agricultural Engineering Mechanical and Rural Engineering Refrigeration and Air-conditioning Agricultural Engineering & Farm Equipment Technology Metallurgy Production Engineering Machine Design & Drafting Machine tool maintenance and Repairs Printing Technology / Engineering Textile Engineering / Technology Tool Engineering
Electrical and Electronics Engineering Electronics & Communication Engineering Electronic and Instrumentation Engineering Instrumentation and Control Engineering Bio Medical Engineering	Electrical Engineering Electrical and Electronics Engineering Electronics and Instrumentation Engineering Instrumentation Engineering / Technology Electronics and Communication Engg. Electronics Engineering Medical Electronics Instrumentation and Control Engineering Applied Electronics
Chemical Engineering	Chemical Engineering Chemical Technology Petrochemical Technology Petroleum Engineering Ceramic Technology Plastic Engineering Paper & Pulp Technology Polymer Technology
Information Technology Computer Science & Engineering	Computer Science and Engineering Computer Technology Electrical and Electronics Engineering Electronics & Communication Engineering Electronics & Instrumentation Engineering Instrumentation Engineering / Technology

PONDICHERRY UNIVERSITY B.Tech (Electronics and Communication Engineering) CURRICULUM

I Semester

Code No.	Name of the Subjects	Periods			Credits	Marks		
		L	T	P		IA	UE	TM
	Theory							
T101	Mathematics – I	3	1	-	4	25	75	100
T102	Physics	4	-	-	4	25	75	100
T103	Chemistry	4	-	-	4	25	75	100
T110	Basic Civil and Mechanical Engineering	4	-	-	4	25	75	100
T111	Engineering Mechanics	3	1	-	4	25	75	100
T112	Communicative English	4	-	-	4	25	75	100
	Practical							
P104	Physics Laboratory	-	-	3	2	50	50	100
P105	Chemistry Laboratory	-	-	3	2	50	50	100
P106	Workshop Practice	-	-	3	2	50	50	100
	Total	22	2	9	30	300	600	900

II Semester

Code No.	Name of the Subjects	Periods			Credits	Marks		
		L	T	P		IA	UE	TM
	Theory							
T107	Mathematics – II	3	1	-	4	25	75	100
T108	Material Science	4	-	-	4	25	75	100
T109	Environmental Science	4	-	-	4	25	75	100
T104	Basic Electrical and Electronics Engineering	3	1	-	4	25	75	100
T105	Engineering Thermodynamics	3	1	-	4	25	75	100
T106	Computer Programming	3	1	-	4	25	75	100
	Practical							
P101	Computer Programming Laboratory	-	-	3	2	50	50	100
P102	Engineering Graphics	2	-	3	2	50	50	100
P103	Basic Electrical & Electronics Laboratory	-	-	3	2	50	50	100
P107	NSS / NCC *	-	-	-	-	-	-	-
	Total	22	4	9	30	300	600	900

* To be completed in I and II semesters, under Pass / Fail option only and not counted for CGPA calculation.

III Semester

Code No.	Name of the Subjects	Periods			Credits	Marks		
		L	T	P		IA	UE	TM
	Theory							
MA T31	Mathematics –III	3	1	-	4	25	75	100
EC T32	Electrical Engineering	4	-	-	4	25	75	100
EC T33	Data Structures and Object Oriented Programming	3	1	-	4	25	75	100
EC T34	Electronic Devices and Circuits	4	-	-	4	25	75	100
EC T35	Circuit Theory	3	1	-	4	25	75	100
EC T36	Engineering Electromagnetics	3	1	-	4	25	75	100
	Practical							
EC P31	Electrical Engineering Laboratory	-	-	3	2	50	50	100
EC P32	Data Structures and Object Oriented Programming Laboratory	-	-	3	2	50	50	100
EC P33	Electronic Devices and CircuitsLaboratory	-	-	3	2	50	50	100
	Total	20	4	9	30	300	600	900

IV Semester

Code No.	Name of the Subjects	Periods			Credits	Marks		
		L	T	P		IA	UE	TM
	Theory							
MA T41	Mathematics-IV	3	1	-	4	25	75	100
EC T42	Electronic Circuits and Analysis	3	1	-	4	25	75	100
EC T43	Signals and Systems	3	1	-	4	25	75	100
EC T44	Linear and Digital Control Systems	3	1	-	4	25	75	100
EC T45	Digital Circuits	3	1	-	4	25	75	100
EC T46	Electronic Communication Systems	3	1	-	4	25	75	100
	Practical							
EC P41	Electronic Circuits Design Laboratory	-	-	3	2	50	50	100
EC P42	Digital Circuits Laboratory	-	-	3	2	50	50	100
EC P43	Communication Laboratory-I	-	-	3	2	50	50	100
SP P44	Physical Education *	-	-	-	-	-	-	-
	Total	18	6	9	30	300	600	900

* Student is required to secure a pass and no grade will be awarded

V Semester

Code	Name of the Subjects	Periods			Credits	Marks		
		L	T	P		IA	UEE	TM
	Theory							
MAT51	Probability and Random Processes	3	1	-	4	25	75	100
EC T52	Data Communication Networks	3	1	-	4	25	75	100
EC T53	Microprocessors and Microcontrollers	4	-	-	4	25	75	100
EC T54	System Design using Integrated Circuits	3	1	-	4	25	75	100
EC T55	Transmission Lines and Waveguides	3	1	-	4	25	75	100
	Elective-I	4	0	-	4	25	75	100
	Practical							
EC P51	Microprocessor and Microcontroller Laboratory	-	-	3	2	50	50	100
EC P52	System Design using Integrated Circuits Laboratory	-	-	3	2	50	50	100
EC P53	Networks and Transmission Lines Laboratory	-	-	3	2	50	50	100
HS P54	General Proficiency – I	-	-	3	1	100	-	100
	Total	20	4	12	31	400	600	1000

VI Semester

Code No.	Name of the Subjects	Periods			Credits	Marks		
		L	T	P		IA	UE	TM
	Theory							
EC T61	Digital Communication	3	1	-	4	25	75	100
ECT62	Wireless Communication	3	1	-	4	25	75	100
EC T63	Digital Signal Processing	3	1	-	4	25	75	100
EC T64	Antennas and Wave Propagation	3	1	-	4	25	75	100
	Elective-II	3	1	-	4	25	75	100
	Practical							
EC P61	Communication Laboratory- II	-	-	3	2	50	50	100
EC P62	Computer Networks Laboratory	-	-	3	2	50	50	100
EC P63	Digital SignalProcessing Laboratory	-	-	3	2	50	50	100
HS P64	General Proficiency – II	-	-	3	1	100	-	100
	Total	15	5	12	27	375	525	900

VII Semester

Code No.	Name of the Subjects	Periods			Credits	Marks		
		L	T	P		IA	UE	TM
	Theory							
EC T71	Microwave and Optical Engineering	3	1	-	4	25	75	100
EC T72	Embedded Systems	4	-	-	4	25	75	100
	Elective-III	4	-	-	4	25	75	100
	Elective-IV	4	-	-	4	25	75	100
	Practical							
EC P71	Communication Laboratory- III	-	-	3	2	50	50	100
EC P72	Embedded Systems Laboratory	-	-	3	2	50	50	100
EC P73	Seminar	-	-	3	1	100	-	100
EC P74	Industrial Visit/Training	-	-	-	1	100	-	100
EC PW7	Project Work-I	-	-	6	4	100	-	100
	Total	15	1	15	26	500	400	900

VIII Semester

Code No.	Name of the Subjects	Periods			Credits	Marks		
		L	T	P		IA	UE	TM
	Theory							
EC T81	Professional Ethics	3	-	-	1	100	-	100
ECT82	Industrial Management and Engineering Economics	4	-	-	4	25	75	100
	Elective-V	4	-	-	4	25	75	100
	Elective-VI	4	-	-	4	25	75	100
	Practical							
EC P81	Advanced Communication Laboratory	-	-	3	2	50	50	100
EC P82	Comprehensive Viva	-	-	3	1	50	50	100
EC PW8	Project Work-II	-	-	9	8	50	50	100
	Total	15	-	15	24	325	375	700

LIST OF ELECTIVES

Group – A (5th and 6th Semesters)

EC E01	Operating Systems
EC E02	Consumer Electronics
EC E03	Semiconducting Materials and Optoelectronics
EC E04	Introduction to Nanoscience and Technology
EC E05	Soft Computing
EC E06	VLSI Design
EC E07	Digital Signal Processors and Applications
EC E08	Object Oriented Programming
EC E09	Nanomaterials
EC E10	Mobile Computing

Group – A (7th and 8th Semesters)

EC E11	Digital Image Processing
EC E12	Telecommunication and Switching Networks
EC E13	Special Topics in Communication Engineering
EC E14	Cryptography and Network Security
EC E15	Spread Spectrum Communication
EC E16	Satellite Communication Systems
EC E17	Nanoscale Fabrication and Techniques
EC E18	Microwave Integrated Circuit Design
EC E19	Biometric System
EC E20	Cellular Mobile Communication
EC E21	Optoelectronic Devices
EC E22	RF Circuit Design
EC E23	Speech Processing
EC E24	Nanotechnology and Nanoscale Processing
EC E25	Medical Electronics
EC E26	Intellectual Property Rights and Cyber Security

T101 - MATHEMATICS – I

COURSE OBJECTIVE

- *To introduce functions of several variables and the idea of applying calculus concepts to problems in Engineering.*
- *To acquaint the student with mathematical tools needed in evaluating multiple integrals and their usage.*
- *To introduce effective mathematical tools for the solutions of differential equations that model physical processes.*

COURSE OUTCOME

On successful completion of the module students will be able to:

- *Apply knowledge of mathematics to solve functions of several variables.*
- *Identify, formulate, and solve engineering problems likemultiple integrals and their usage.*
- *To solve differential equations that model physical processes using effective mathematical tools*

UNIT – I

Calculus: Curvature, radius of curvature, evolutes and involutes. Beta and Gamma functions and their properties. **(12)**

UNIT – II

Function of Several variables: Partial derivatives, Total derivatives, Differentiation of implicit functions, Change of variables, Jacobians and their properties, Taylor's series for functions of two variables, Maxima and minima, Lagrange's method of undetermined multipliers. **(12)**

UNIT – III

Multiple Integrals and Applications: Multiple Integrals, change of order of integration and change of variables in double integrals (Cartesian to polar). Applications: Areas by double integration and volumes by triple integration (Cartesian and polar). **(12)**

UNIT – IV

Differential Equations: Exact equations, First order linear equations, Bernoulli's equation, orthogonal trajectories, growth, decay and geometrical applications: Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type. **(12)**

UNIT – V

Differential Equations (Higher order): Linear differential equations of higher order – with constant coefficients, the operator D, Euler's linear equation of higher order with variable coefficients - simultaneous linear differential equations, solution by variation of parameters method– simple applications to electric circuits. **(12)**

Text Books:

1. Venkataraman, M. K, Engineering Mathematics (First Year), Second Edition, The National Publishing Company, Chennai 2010 (For units I, III, IV, V)
2. Grewal B.S., Higher Engineering Mathematics, Khanna Publishers, New Delhi, 41stEdition, 2011. (For Unit II only)

Reference Books:

1. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
2. Kandasamy P. et al, Engineering Mathematics, Vol.1 & 2, S. Chand & Co., New Delhi.
3. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
4. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, New Delhi, 8th Edition.
5. Bali, N. P, and Manish Goyal, A Text Book of Engineering Mathematics, Lakshmi Publications, New Delhi, 2007

T 102 – PHYSICS

COURSE OBJECTIVE

- *To understand the concepts of physics and its significant contributions in the advancement of technology and invention of new products that dramatically transformed modern-day society.*
- *To expose the students to different areas of physics which have direct relevance and applications to different Engineering disciplines*
- *To understand the concepts and applications of Ultrasonics, optics and some optical devices, Lasers and Fiber optics, Nuclear energy sources and wave mechanics*

COURSE OUTCOME

On successful completion of the module students will be able to:

- *Apply knowledge of science and engineering to understand physics and its significant contributions in the advancement of technology and invention of new products that dramatically transform modern-day society.*
- *Identify different areas of physics which have direct relevance and applications to different Engineering disciplines.*
- *Apply fundamental knowledge to understand applications of Ultrasonics, optics and some optical devices, Lasers and Fiber optics, Nuclear energy sources and wave mechanics.*

UNIT – I

Acoustics & NDT: Ultrasonics- Ultrasonic Waves Productions (Piezoelectric & Magnetostriction method) – Detections (Acoustic Grating). NDT application – Ultrasonic Echo method – Liquid Penetrant method

Acoustics - Factors affecting Acoustic of Buildings (Reverberation, Loudness, Focusing, Echo, Echelon Effect and Resonance) and their Remedies - Sabine's formula for Reverberation Time–Doppler effect and its application to Random's (elementary idea) **(12)**

UNIT – II

Optics: Interference- Air Wedge – Michelson's Interferometer – Wavelength Determination – Interference Filter – Antireflection Coatings.

Diffraction - Diffraction Grating – Dispersive power of grating - Resolving Power of Grating & Prism Polarization –Basic concepts of Double Refraction - Huygens Theory of Double Refraction – Quarter and Half Wave Plates – Specific Rotary Power – Laurent Half Shade Polari meter. **(12)**

UNIT – III

Lasers & Fiber Optics: Lasers - Principles of Laser – Spontaneous and Stimulated Emissions - Einstein's Coefficients – Population Inversion and Laser Action – Types of optical resonators(qualitative Ideas) – Types of Lasers - NdYAG, CO2 laser, GaAs Laser – Application of Lasers.

Fiber Optics - Principle and Propagation of light in optical fiber – Numerical aperture and acceptance angle – Types of optical fibers (material, refractive index, mode)- Application to sensors and Fiber Optic communication. **(12)**

UNIT – IV

Wave Mechanics: Matter Waves – de Broglie Wavelength – Uncertainty Principle – Schrödinger Wave Equation – Time Dependent – Time Independent – Application to Particle in a One Dimensional potential Box – Quantum Mechanical Tunneling – Tunnel Diode. **(12)**

UNIT – V

Nuclear energy source: General Properties of Nucleus (Size, Mass, Density, Charge) – Mass Defect – Binding Energy - Disintegration in fission – Nuclear Reactor: Materials Used in Nuclear Reactors. – PWR – BWR – FBTR. Nuclear fusion reactions for fusion reactor – D-D and D-T reactions, Basic principles of nuclear fusion reactors. **(12)**

Text Books

1. V Rajendran, Engineering Physics, 2nd Ed., TMH, New Delhi 2011 (For Units I to IV only)
2. Arthur Beiser, Concept of Modern Physics, 6th Ed, TMH, New Delhi 2008 (For Unit V Only)

Reference Books

1. Ajay Ghatak, Optics, TMH, New Delhi, 2007.
2. Thiagarajan and Ghatak, Laser and Application, TMH, New Delhi 2008.
3. R. Murugeshan, Modern Physics, S. Chand & Co, New Delhi 2006
4. K.R.Nambiar, Lasers, New Age International, New Delhi, 2008
5. Science of Engineering Materials, 2nd Edition, C.M. Srivastava and C. Srinivasan, New Age Int. (P) Ltd, New Delhi, 1997
6. Avadhanulu M N Engineering Physics, Vol-I, S. Chand & Co,2009.

T 103 – CHEMISTRY

COURSE OBJECTIVE

- *To know about the importance of Chemistry in Engineering domain*
- *To understand the chemistry background of industrial process*
- *To apply chemistry knowledge for engineering disciplines*

COURSE OUTCOME

On successful completion of the module students will be able to:

- *Apply knowledge of science and engineering to understand the importance of Chemistry in Engineering domain*
- *Identify different Electrochemical cells and their usage for industrial process*
- *Apply fundamental knowledge of chemistry for industrial applications in the field of engineering*

UNIT – I

Water: Hardness of water – units and calcium carbonate equivalent. Determination of hardness of water- EDTA method. Disadvantages of hardwater-boiler scale and sludge, caustic embrittlement, priming & foaming and boiler corrosion. Water softening method – internal & external conditioning – lime-soda process, zeolite process and ion exchange process. Desalination – reverse osmosis & electrodialysis. **(12)**

UNIT – II

Polymers: Classification, types of polymerization reactions – mechanism of radical, ionic and Ziegler-Natta polymerizations. Polymer properties – chemical resistance, crystallinity and effect of temperature, Mn and Mw. Thermoplastics and thermosets. Preparation, properties and uses of PVC, TEFLON, Nylons, Bakelite, Polyurithane, Rubbers – vulcanization, synthetic rubber, BuNa-S, BuNa-N, silicone and butyl rubber. Conducting polymers – classification and applications. Polymer composites – FRP – laminar composites. Moulding constituents of plastic, moulding techniques – compression, injection, transfer and extrusion moulding. **(12)**

UNIT – III

Electrochemical Cells: Galvanic cells, single electrode potential, standard electrode potential, electromotive series. EMF of a cell and its measurement. Nernst equation. Electrolyte concentration cell. Reference electrodes-hydrogen calomel, Ag /AgCl & glass electrodes. Batteries - primary and secondary cells, laclanche cell, lead acid storage cell, Ni-Cd battery & alkaline battery. Fuel cells - H2-O2 fuel cell. **(12)**

UNIT – IV

Corrosion and Its Control: Chemical & electrochemical corrosion-Galvanic series-galvanic, pitting, stress and concentration cell corrosion. Factors influencing corrosion-corrosion control methods - cathodic protection and corrosion inhibitors. Protective coating - types of protective coatings-metallic coating-tinning and galvanizing, cladding, electroplating and anodizing. **(12)**

UNIT – V

Phase Rule: Definition and derivation of phase rule. Application to one component system - water and sulphur systems. Thermal analysis, condensed phase rule. Two component alloy systems - Pb-Ag, Cu-Ni and Mg-Zn systems. **(12)**

Text Books:

1. P.C. Jain and Monika Jain, Engineering Chemistry, Dhanpat Rai and Sons, New Delhi 2010.

Reference Books:

1. S. S. Dara, A Textbook of Engineering Chemistry, S. Chand & Co., Ltd. New Delhi., 2008.
2. B. K. Sharma, Engineering Chemistry, 3rd edition Krishna Prakashan Media (P) Ltd., Meerut, 2001
3. P. Kannan and A. Ravi Krishnan "Engineering Chemistry" Hi-Tech Sri Krishna Publications, Chennai, 9th Ed, 2009
4. N. Krishnamurthy, P. Vallinayagam and D. Madhavan, Engineering Chemistry, 2nd edition. PHI Learning PVT., LTD, New Delhi, 2008

T 110 - BASIC CIVIL AND MECHANICAL ENGINEERING

COURSE OBJECTIVE

- *To be able to differentiate the types of buildings according to national building code and understand building components and their functions as well as different types of roads, bridges and dams.*
- *To explain the concepts of thermal systems used in power plants and narrate the methods of harnessing renewable energies*
- *To explain the role of basic manufacturing processes and develop an intuitive understanding of underlying working principles of mechanical machines and systems*

COURSE OUTCOME

On successful completion of the module students will be able to:

- *Apply knowledge of mathematics, science and engineering to analyze the types of buildings according to national building code and understand building components and their functions as well as different types of roads, bridges and dams.*
- *Design and conduct experiment, as well as to analyze the concepts of thermal systems used in power plants and the methods of harnessing renewable energies.*
- *Design, construct and analyze the role of basic manufacturing processes and develop an intuitive understanding of underlying working principles of mechanical machines and systems*

PART - A Civil Engineering

UNIT – I

Buildings, Building Materials: Buildings-Definition-Classification according to NBC-plinth area, Floor area, carpet area, floor space index-construction materials-stone, brick, cement, cement-mortar, concrete, steel- their properties and uses. **(10)**

UNIT – II

Buildings and their components: Buildings- Various Components and their functions. Soils and their classification Foundations-Functions and types of foundations, Masonry Function and types, Floors-Definition and types, Roofs Definition and types. **(10)**

UNIT – III

Basic Infrastructure: Surveying-classification, general principles, types, uses, instruments used. Roads - Components, types and their advantage and disadvantage. Bridges-components and types of bridges. Dams-Purpose, need & Principles, types of dams and components. Water supply-sources and quality requirements. Rainwater harvesting. **(10)**

PART - B Mechanical Engineering

UNIT – IV

Internal and external combustion systems: IC engines – Classification – Diesel and petrol engines: two stroke and four stroke engines. Merits and demerit Steam generators(Boilers) – Classification – Constructional features (of only low pressure boilers)– Boiler mountings and accessories. Merits and .demerits- Application. **(10)**

UNIT – V

Power Generation Systems: Conventional and Non-Conventional: Hydraulic – Thermal – Nuclear power plants – Schemes and layouts (Description Only) – Solar – Wind – Geothermal – Wave – Tidal and Oceans thermal Energy Conversion systems – Basic power plant schemes and layouts (Description only). **(10)**

UNIT – VI

Manufacturing Process: Machines – Lathe – Drilling – Bending – Grinding – Shearing (Description only)
Machining Processes – Turning – Planning – Facing – Blanking – Drilling – Punching – Shearing – Bending – Drawing – Filing – Sawing – Grinding.
Moulding and Metal Joining - Pattern making – Green and dry sand moulding – Arc and Gas welding – Brazing – Soldering (process description only). **(10)**

Text Books:

1. Natarajan, K V, Basic Civil Engineering, 11th Edition, Dhanalakshmi Publications Chennai, 2011. (For Units I to III)
2. Venugopal , K and Prabhu Raja, Basic Mechanical Engineering, Anuradha Publisher, 2012 (For Units IV to VI).

Reference Books:

1. Purushothama Raj.P., Basic civil engineering, 3rd Edn., Dhanam Publications, Chennai,2001
2. Rajput, R K, Engineering Materials, S Chand & Co. Ltd., New Delhi, 2012.
3. Punmia, B.C., et. al., Surveying , Vol-I, Laxmi Publishers, New Delhi, 2012.
4. Punmia, B.C., et.al Building Construction, Laxmi Publishers, New Delhi ,2012.
5. El. Wakil, M.M., Power Plant Technology, Mc Graw Hill Book Co.,1985.
6. Hajra Choudhry, et. al., Workshop Technology Vol I and II, Media Promoters Publishers Pvt. Ltd., Bombay, 2004.
7. Lindberg, R .A. Process and Materials of Manufacture, PHI, 1999.
8. N.Gupta, R.C.Gupta and Arun Mittal, Manufacturing Processes, New Age Publications, 2001
9. Nagpal, Power Plant Engineering, Khanna Publishers, Delhi, 1998.

T 111 - ENGINEERING MECHANICS

COURSE OBJECTIVE

- *To understand the vector and scalar representation of forces and moments, static equilibrium of particles and rigid bodies in two dimensions*
- *To comprehend the effect of friction on equilibrium and the laws of motion, the kinematics of motion and the interrelationship and to learn to write the dynamic equilibrium equation*
- *To emphasis the concepts through solved examples*

COURSE OUTCOME

On successful completion of the module students will be able to:

- *Apply knowledge of mathematics, science and engineering to analyze the vector and scalar representation of forces and moments, static equilibrium of particles and rigid bodies in two dimensions*
- *Design and conduct experiment, as well as to analyze the effect of friction on equilibrium and the laws of motion, the kinematics of motion and the interrelationship and analyze dynamic equilibrium equation*
- *Design, construct and analyze Engineering Mechanics through solved examples*

UNIT – I

Fundamental of Mechanics: Basic Concepts Force System and Equilibrium, Definition of Force, Moment and Couple, Principle of Transmissibility, Varignon's theorem, Resultant of force system – Concurrent and non-concurrent coplanar forces, Condition of static equilibrium for coplanar force system, stability of equilibrium, applications in solving the problems on static equilibrium of bodies.

(12)

UNIT – II

Practical Application of Force System: Structural member: definition, Degree of freedom, concept of free body diagrams, types of supports and reactions, types of loads, Analysis of Trusses-method of joints, method of sections.
Friction: Introduction, Static dry friction, simple contact friction problems, ladders, wedges **(12)**

UNIT – III

Properties of Surfaces: Properties of sections – area, centroids of lines, areas and volumes, moment of inertia first moment of inertia, second moment of inertia and product moment of inertia, polar moment of inertia, radius of gyration, mass moment of inertia. **(12)**

UNIT – IV

Kinematics and Kinetics of Particles: Equations of motion - Rectilinear motion, curvelinear motion, Relative motion, D'Alembert's principle, work- Energy equation – Conservative forces and principle of conservation of energy, Impulse – momentum, Impact – Direct central impact and oblique central impact. **(12)**

UNIT – V

Kinematics and Kinetics of Rigid bodies: Plane motion, Absolute motion, Relative motion, translating axes and rotating axes, work and energy, impulse and momentum. **(12)**

Text Books:

1. Rajesekaran, S and Sankara Subramanian., G., Engineering Mechanics, Vikas Publishing House Private Ltd., 2012.

Reference Books:

1. Palanichamy, M.S. Nagan, S., Engineering Mechanics – Statics & Dynamics, Tata McGraw-Hill,2001.
2. Beer, F.P and Johnson Jr. E.R, Vector Mechanics for Engineers, Vol. 1 Statics and Vol.2 Dynamics, McGraw – Hill International Edition, 1997
3. Bhavikatti,S.S and K.G.Rajashekarappa, Engineering Mechanics, New Age International (P) Ltd, New Delhi,2010

T112 - COMMUNICATIVE ENGLISH

COURSE OBJECTIVE

- *To improve the LSWR skills of I year B.Tech students*
- *To instill confidence and enable the students to communicate with ease*
- *To equip the students with the necessary skills and develop their language prowess*

COURSE OUTCOME

On successful completion of the module students will be able to:

- *Apply fundamental knowledge to improve the LSWR skills of I year B.Tech students*
- *To enable the students to communicate with ease*
- *Apply basic knowledge to equip the students with the necessary skills and develop their language prowess*

UNIT – I

Basic Communication Theory: Importance of Communication – stages of communication, modes of communication – barriers to communication – strategies for effective communication – Listening: Importance, types, barriers – Developing effective listening skills. **(12)**

UNIT – II

Comprehension And Analysis: Comprehension of technical and non-technical material – Skimming, scanning, inferring-Note making and extension of vocabulary, predicting and responding to context- Intensive Reading and Reviewing. **(12)**

UNIT – III

Writing: Effective sentences, cohesive writing, clarity and conciseness in writing – Introduction to Technical Writing – Better paragraphs, Definitions, Practice in Summary Writing – Four modes of writing – Use of dictionaries, indices, library references – making bibliographical entries with regard to sources from books, journals, internet etc. **(12)**

UNIT – IV

Business Writing / Correspondence: Report writing – Memoranda – Notice – Instruction – Letters – Resumes – Job applications. **(12)**

UNIT – V

Oral Communication: Basics of phonetics – Presentation skills – Group Discussions – Dialogue writing – Short Extempore – Debates-Role Plays-Conversation Practice **(12)**

Text Books:

1. Robert J.Dixson. ,Complete Course in English, Prentice-Hall of India Pvt. Ltd., New Delhi,2006

Reference Books

1. Ashraf M.Rizvi., Effective Technical Communication. Tata-McGraw, 2005.
2. Boove, Courtland R et al., Business Communication Today. Delhi. Pearson Education ,2002.
3. Meenakshi Raman and Sangeeta Sharma., Technical Communication Principles And Practice,OUP, 2007.
4. Robert J.Dixson., Everyday Dialogues in English, Prentice-Hall of India Pvt. Ltd., New Delhi,2007.
5. Sethi,J and Kamalesh Sadanand., A Practical Course in English Pronunciation, Prentice-Hall of India Pvt. Ltd, New Delhi,2007.

P 104 - PHYSICS LABORATORY

List of experiments (Any 10 Experiments)

1. Thermal conductivity – Lee's DISC
2. Thermal conductivity - Radial flow
3. Spectrometer – Prism or Hollow prism
4. Spectrometer – Transmission grating
5. Spectrometer - Ordinary & Extraordinary rays
6. Newton's rings
7. Air – wedge
8. Half shade polarimeter – Determination of specific rotatory power
9. Jolly's experiment – determination of α
10. Magnetism: i – h curve
11. Field along the axis of coil carrying current
12. Vibration magnetometer – calculation of magnetic moment & pole strength
13. Laser experiment: wavelength determination using transmission grating, reflection grating (vernier calipers) & particle size determination
14. Determination of optical absorption coefficient of materials using laser
15. Determination of numerical aperture of an optical fiber
16. Electrical conductivity of semiconductor – two probe / four probe method
17. Hall effect in semiconductor

P105 - CHEMISTRY LABORATORY

List of experiments (Any 10 Experiments)

1. Determination of dissolved oxygen in water.
2. Determination of total hardness of water by EDTA method.
3. Determination of carbonate and bicarbonate in water.
4. Estimation of chloride content in water.
5. Estimation of magnesium by EDTA.
6. Estimation of vinegar.
7. Estimation of ferrous by permanganometry.
8. Estimation of ferrous and ferric iron in a solution mixture by dichrometry.
9. Estimation of available chlorine in bleaching powder.
10. Estimation of copper in copper sulphate solution.
11. Estimation of calcium by permanganometry.
12. Estimation of iron by colorimetry

Demonstration Experiments (Any two of the following)

1. Determination of COD of water sample.
2. Determination of lead by conductometry.
3. Percentage composition of sugar solution by viscometry

P 106 - WORKSHOP PRACTICE

I - Fitting

Study of tools and Machineries. Exercises on symmetric joints and joints with acute angle

1. Study of tools and Machineries
2. Symmetric fitting
3. Acute angle fitting

II - Welding

Study of arc and gas welding equipment and tools – Edge preparation – Exercises on lap joint and V Butt joints –Demonstration of gas welding

1. Study of arc and gas welding equipment and tools
2. Simple lap welding (Arc)
3. Single V butt welding (Arc

III - Sheet metal work

Study of tools and Machineries – exercises on simple products like Office tray and waste collection tray

1. Study of tools and machineries
2. Funnel
3. Waste collection tray

IV - Carpentry

Study of tools and Machineries – Exercises on Lap joints and Mortise joints

1. Study of tools and machineries
2. Half lap joint
3. Corner mortise joint

T 107 - MATHEMATICS – II

COURSE OBJECTIVE

- *To develop the use of matrix algebra techniques for practical applications and to introduce the concepts of Curl, Divergence and integration of vectors in vector calculus which is needed for many application problems.*
- *To introduce Laplace transform which is a useful technique in solving many application problems and to solve differential and integral equations*
- *To acquaint the students with Fourier transform techniques used in wide variety of situations in which the functions used are not periodic.*

COURSE OUTCOME

On successful completion of the module students will be able to:

- *Apply knowledge of mathematics to solve matrix algebra techniques for practical applications and Curl, Divergence and integration of vectors in vector calculus for many application problems.*
- *Identify, formulate, and solve engineering problems like Laplace transform which is a useful technique in solving many application problems and to solve differential and integral equations*
- *Apply formulae and analyze problems of Fourier transform techniques*

UNIT – I

Matrices: Eigenvalues and Eigen vectors of a real matrix, Characteristic equation, Properties of Eigenvalues and Eigenvectors. Cayley-Hamilton Theorem, Diagonalization of matrices. Reduction of a quadratic form to canonical form by orthogonal transformation. Nature of quadratic forms **(12)**

UNIT – II

Vector Calculus: Gradient, divergence and curl, their properties and relations. Gauss divergence theorem and Stoke's theorem (without proof). Simple application problems **(12)**

UNIT – III

Laplace Transform: Definition, Transforms of elementary functions, properties. Transform of derivatives and integrals. Multiplication by t and division by t. Transform of unit step function, transform of periodic functions. Initial and final value theorems **(12)**

UNIT – IV

Applications of Laplace Transform: Methods for determining inverse Laplace Transforms, convolution theorem, Application to differential equations and integral equations. Evaluation of integrals by Laplace transforms. **(12)**

UNIT – V

Fourier Transform: Fourier Integral theorem (statement only), Fourier transform and its inverse, properties. Fourier sine and cosine transforms, their properties, convolution and Parseval's identity. **(12)**

Text Books:

1. Venkataraman M.K, Engineering Mathematics The National Publishing Company, Chennai, 2012.
2. Kandasamy P. et al, Engineering Mathematics, Vol.2 & 3, S. Chand & Co., New Delhi.

Reference Books:

1. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
2. Grewal B.S., Higher Engineering Mathematics, Khanna Publishers, New Delhi,41st Edition, 2011.
3. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
4. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, New Delhi.
5. Bali N. and Goyal M., Advanced Engineering Mathematics, Lakshmi Publications Pvt. Ltd., New Delhi, 7th Edition, 2010

T 108 - MATERIAL SCIENCE

COURSE OBJECTIVE

- *To understand the importance of Material Science as a subject that revolutionized modern day technologies*
- *To understand the significance of material science in the development of new materials and devices for all branches of Engineering*
- *To impart knowledge to the Engineering students about some of the important areas of Materials Science so as to enable them perceive the significant contributions of the subject in Engineering and Technology*

COURSE OUTCOME

On successful completion of the module students will be able to:

- *Apply knowledge of mathematics, science and engineering to understand the importance of Material Science as a subject that revolutionized modern day technologies*
- *To analyze the significance of material science in the development of new materials and devices for all branches of Engineering*
- *Identify and analyze some of the important areas of Materials Science so as to enable them perceive the significant contributions of the subject in Engineering and Technology*

UNIT – I

Crystal structure and Defects: Crystal structure - Bravais Lattices , Crystal Systems - Coordination Number, Atomic Radius, Packing Factor for FCC & HCP structures – Miller Indices- Powder X Ray Diffraction Method Lattice defects – Qualitative ideas of point, line, surface and volume defects. **(12)**

UNIT – II

Dielectric properties: Dielectric Polarization and Mechanism –Temperature dependence of polarization, Internal or local Field - Clausius-Mossotti relation. Basic ideas of Dielectric loss - frequency dependence of dielectric constant – Measurement of Dielectric constant and loss using Scherring bridge – Elementary ideas of Piezoelectrics, Ferroelectrics and Pyroelectric materials and Applications. **(12)**

UNIT – III

Magnetic Properties: Origin of atomic magnetic moment – Bohr magneton-Elementary Ideas of classification of magnetic materials (Dia, Para, Ferro, antiferro & Ferri). – Quantum theory of Para & Ferro Magnetism – Domain Theory of Hysteresis –

Heisenberg Theory of Exchange Interaction (without derivation) – Qualitative ideas of Anti ferromagnetic Ordering – Structure and Properties of Ferrites – Properties of Soft & Hard Magnetic Materials – Applications. Magnetic data storage – Magnetic tapes, Hard disks, Magneto optical recording. **(12)**

UNIT – IV

Semiconductors and superconductors: Semiconductors -Derivation of Carrier concentration in intrinsic Semiconductors –Basic ideas of Electrical conductivity in intrinsic and extrinsic semiconductors (without derivations) -temperature dependence of carrier concentration and electrical conductivity in semiconductors (qualitative ideas), Hall effect in Semiconductors --Application of Hall Effect, Basic Ideas of Compound Semiconductors (II-VI & III-V)

Superconductivity - Basic concepts – transition temperature – Meissener effect – Type I and II superconductors – High Temperature Superconductors – 123 superconductor – Applications of superconductors. **(12)**

UNIT – V

Advanced Materials: Liquid Crystals – Types – Application as Display Devices

Metallic Glasses – preparation by melt spinning. Twin roller system, properties and applications

Shape Memory alloys (SMA), Shape memory effect, Properties and applications of SMA

Nanomaterials - Nano materials (one, Two& three Dimensional) –Methods of synthesis (PVD, CVD, Laser Ablation, Solgel, Ball-milling Techniques), Properties and applications of nanomaterials. carbon nanotubes – synthesis, Properties and applications. **(12)**

Text Books:

1. V Rajendran, Engineering Physics, 2nd Edition, TMH, New Delhi 2011.

Reference Books:

1. Ali Omar M, Elementary Solid State Physics, Addison Wesley Publishing Co., 2009.
2. William D Callister Jr., Material Science and Engineering, 6th Edition, John Wiley and sons, 2009.
3. Charles Kittel, Introduction to Solid State Physics, 7th Edition, John Wiley & sons, Singapore, 2007.
4. V Raghavan , Materials Science and Engineering- A First Course, 5th Edition, Prentice Hall of India, 2008.

5. B.S. Murty, P. Shankar, Baldev Raj, B.B. Rath, and James Murday, Text book of Nanoscience and Nanotechnology, Universities Press, Hyderabad 2012
6. M.N. Avadhanulu, Enginerring Physics- Volume-II, S.Chand &Co, New Delhi, 2009
7. Pillai S.O, Solid State Physics, 6th Edition – New Age International, 2005.

T 109 - ENVIRONMENTAL SCIENCE

COURSE OBJECTIVE

- *To know about the environment*
- *To understand about environmental pollution*
- *To apply the knowledge in understanding various environmental issues and problems*

COURSE OUTCOME

On successful completion of the module students will be able to:

- *Apply fundamental knowledge to understand about the environment*
- *Identify environmental pollution through science*
- *Apply basic knowledge to solve various environmental issues and problems*

UNIT – I

Environment And Energy Resources: Environmental segments – atmosphere, hydrosphere, lithosphere and biosphere. Atmospheric layers. Pollution definition and classification.Pollutants classification. Forest resources – use and over exploitation, deforestation, forest management. Water resources – use and conflicts over water, dams – benefits and problems. Mineral resources – mineral wealth of India, environmental effects of extracting and using mineral resources. Food resources – world food problems, environmental impact of modern Agriculture – fertilizer and pesticides. Energy resources – growing needs, renewable and non-renewable energy resources and use of alternate energy sources. From unsustainable to sustainable development. **(12)**

UNIT – II

Ecosystem & Biodiversity: Concept of an ecosystem - structure and function of an ecosystem. Producers, consumers, and decomposers. Energy flow in the ecosystem. Food chains, food webs and ecological pyramids. Introduction, types, characteristic features, structure and function of forest, grassland, desert and aquatic (fresh water, esturine and marine) ecosystems. Biodiversity – definition, genetic species and ecosystem diversity. Value of biodiversity - consumptive use, productive use, social, ethical, aesthetic and option values. Hot spots of biodiversity. Threats to biodiversity, habitat loss, poaching of wildlife, human wildlife conflicts. Endangered and endemic species.Conservation of biodiversity – in-situ and ex-situ conservation of biodiversity. **(12)**

UNIT – III

Air Pollution: Definition and classification. Chemical and photochemical reaction in different layers of atmosphere. Causes, sources, effects and control measures of air pollutants - oxides of Nitrogen, oxides of Carbon, oxides of Sulfur, hydrocarbons, chloro-fluoro carbons and particulates. Mechanism and effects of air pollution phenomenon – Global Warming, Ozone Depletion, Acid Rain, Sulfurous Smog and Photochemical Smog. **(12)**

UNIT – IV

Water and Land Pollution: Water pollution – causes and effects of organic water pollutants – pesticides, insecticides, detergents and surfactants. Causes and effects of inorganic water pollutants – heavy metal pollution due to Hg, Pb, Cr & Cu. Water pollution control and monitoring – DO, COD, BOD & TOC. Land Pollution – Solid waste management – causes, effect and control measures of urban and industrial wastes. Thermal and radioactive pollution. **(12)**

UNIT – V

Pollution Control and Monitoring: Basic concepts and instrumentation of IR, UV-VIS, atomic absorption spectrometry, Gas Chromatography and Conductometry. Analysis of air pollutants – NOx, COx, SOx, H2S, Hydrocarbons and particulates. **(12)**

Text Books:

1. Raghavan Nambiar K., "Text Book of Environmental Studies" 2nd edition, Scitech Publications, India, Pvt. Ltd, Chennai, 2008.
2. A.K. De, "Environmental chemistry" 6rd edition; New age international (P) Ltd, New Delhi, 2006

Reference Books:

1. B.K. Sharma, "Environmental chemistry" 11th Ed, KRISHNA Prakashan Media (P) Ltd, Meerut, 2007.
2. S.S.Dara, and D.D. Mishra "A text book of environmental chemistry and pollution control, 5th Ed, S.Chandand Company Ltd, New Delhi, 2012.
3. Richard T. Wright, Environmental Science: Toward a Sustainable Future, 10thedition, Prentice Hall, 2008
4. G. S. Sodhi, Fundamental concepts of environmental chemistry, I Ed, Alpha Science International Ltd, India, 2000

T 104 - BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

COURSE OBJECTIVE

- *To understand and gain basic knowledge about magnetic and electrical circuits, single phase and three phase power measurement and the operating principles of stationary and rotating machines*
- *To understand the basic operation, functions and applications of PN junction diode, transistor, logic gates and flip flops.*
- *To gain knowledge on various communication systems and network models and the use of ISDN*

COURSE OUTCOME

On successful completion of the module students will be able to:

- *Will gain basic knowledge about magnetic and electrical circuits, single phase and three phase power measurement and the operating principles of stationary and rotating machines*
- *Design and conduct experiment, as well as to analyze the basic operation, functions and applications of PN junction diode, transistor, logicgates and flip flops.*
- *Identify and analyze various communication systems and network models and the applications of ISDN*

PART A – Electrical

UNIT – I

DC Circuit: Definition of Voltage, Current, Power & Energy, circuit parameters, Ohm's law, Kirchoff's law & its applications – Simple Problems - Division of current in Series& parallel circuits - star/delta conversion - Node and mesh methods of analysis of DC circuits. **(10)**

UNIT – II

AC Circuit: Concepts of AC circuits – rms value, average value, form and peak factors – Simple RLC series circuits – Concept of real and reactive power – Power factor - Introduction to three phase system - Power measurement by two wattmeter method. **(10)**

UNIT – III

Electrical Machines and Power Plants: Law of Electromagnetic induction, Fleming's Right & Left hand rule - Principle of DC rotating machine, Single phase transformer and single phase induction motor(Qualitative approach only) - Simple layout of thermal and hydro generation (block diagram approach only).Fundamentals of fuses and circuit breakers. **(10)**

PART – B – Electronics

UNIT – IV

Electronic Circuit: V-I Characteristics of diode - Half-wave rectifier and Full-wave rectifier – with and without capacitor filter - Transistor - Construction & working - Input and output characteristics of CB and CE configuration - Transistor as an Amplifier - Principle and working of Hartley oscillator and RC phase shift oscillator - Construction and working of JFET & MOSFET. **(10)**

UNIT – V

Digital Electronics: Boolean algebra – Reduction of Boolean expressions - De-Morgan's theorem – Logic gates -Implementation of Boolean expressions - Flip flops - RS, JK, T and D. Combinational logic - Half adder, Full adder and Subtractors. Sequential logic - Ripple counters and shift registers. **(10)**

UNIT – IV

Communication and Computer Systems: Model of communication system – Analog and digital – Wired and wireless channel. Block diagram of various communication systems – Microwave, satellite, optical fiber and cellular mobile system. Network model – PAN, LAN, MAN and WAN – Circuit and packet switching – Overview of ISDN. **(10)**

Text Books:

1. Kothari D P and Nagrath I J , Basic Electrical Engineering , Tata McGraw Hill,2009. (For Units I to III)
2. Rajendra Prasad , " Fundamentals of Electronic Engineering", Cengage learning, New Delhi, First Edition, 2011 (For Unit IV)
3. Morris Mano, "Digital design", PHI Learning, Fourth Edition, 2008 (For Unit V)
4. Wayne Tomasi, "Electronic Communication Systems- Fundamentals Theory Advanced", Sixth Edition, Pearson Education, 2004. (For Unit VI)

Reference Books:

1. R.Muthusubramaniam, S.Salivahanan and K.A. Mureleedharan, Basic Electrical Electronics and Computer Engineering, Tata McGraw Hill, 2004..
2. J.B.Gupta, A Course in Electrical Power, Katson Publishing House, New Delhi, 1993.
3. David. A. Bell, "Electronic Devices and Circuits", PHI Learning Private Ltd, India, Fourth Edition, 2008

4. Donald P Leach, Albert Paul Malvino and Goutam Saha, “Digital Principles and Applications,” 6th edition, Tata McGraw Hill Publishing Company Ltd., New Delhi,2008.
5. S.K. Sahdev, Fundamentals of Electrical Engineering and Electronics, Dhanpat Rai & Co, 2013.
6. Jacob Millman and Christos C. Halkias, “Electronic Devices and Circuits” Tata McGraw Hill,2008
7. R.L. Boylestad and L. Nashelsky, “Electronic Devices and Circuit Theory”, PHI Learning Private Limited, Ninth Edition, 2008.
8. M.S.Sukhija and T.K.Nagsarkar, “ Basic Electrical and Electronics Engineering”, Oxford University Press, 2012

T 105 - ENGINEERING THERMODYNAMICS

COURSE OBJECTIVE

- *To understand the basics of the thermodynamic principles and establish the relationship of these principles to thermal system behaviors*
- *To develop methodologies for predicting the system behavior and establish the importance of laws of thermodynamics applied to energy systems*
- *To explain the role of refrigeration and heat pump as energy systems and develop an intuitive understanding of underlying physical mechanism and a mastery of solving practical problems in real world*

COURSE OUTCOME

On successful completion of the module students will be able to:

- *Apply knowledge of mathematics, science and engineering to understand the basics of the thermodynamic principles and establish the relationship of these principles to thermal system behaviors*
- *Design and conduct experiment, as well as to analyze and develop methodologies for predicting the system behavior and understand the importance of laws of thermodynamics applied to energy systems*
- *Identify and analyze role of refrigeration and heat pump as energy systems and develop an intuitive understanding of underlying physical mechanism and a mastery of solving practical problems in real world*

UNIT – I

Basic Concepts and Definitions: Energy conversion and efficiencies - System, property and state - Thermal equilibrium - Temperature - Zeroth law of Thermodynamics – P, V, and T Diagrams, - Thermodynamic Diagram. **(12)**

UNIT – II

First Law of Thermodynamics: The concept of work and adiabatic process - First law of thermodynamics - Conservation of Energy principle for closed and open systems - Calculation of work for different processes of expansion of gases.

(12)

UNIT – III

Second Law of Thermodynamics: Equilibrium and the second law - Heat engines - Kelvin-Planck statement of second law of thermodynamics - Reversible and irreversible processes - Carnot principle - Clausius inequality- Entropy. **(12)**

UNIT – IV

Gas Power Cycles: Air standard cycles: The air standard Carnot cycle - Air standard Otto cycle, diesel cycle, dual cycle and Bryton cycles and their efficiencies. **(12)**

UNIT – V

Refrigeration Cycles and Systems: Reverse Carnot cycle - COP - Vapor compression refrigeration cycle and systems (only theory) - Gas refrigeration cycle - Absorption refrigeration system - Liquifaction and solidification (only theory) **(12)**

Text Books:

1. Nag, P. K., "Engineering Thermodynamics", 4th edition, Tata Mc Graw Hill Publishing Co. Ltd., New Delhi,1995

Reference Books:

1. Arora, C.P., "Thermodynamics", Tata Mc Graw Hill Publishing Co. Ltd., New Delhi,1998.
2. Burghardt, M.D., "Engineering Thermodynamics with Applications", 4th edition, Harper & Row, N.Y., 1986.
3. Huang, F.F., "Engineering Thermodynamics" 2nd edition , Macmillan Publishing Co. Ltd., N.Y.,1989.
4. Cengel, Y.A. and Boles, M.A., "Thermodynamics - An Engineering Approach", 5thedition, Mc-Graw Hill, 2006
5. Wark, K., "Thermodynamics", 4th edition ,Mc Graw Hill, N.Y.,1985

T 106 - COMPUTER PROGRAMMING

COURSE OBJECTIVE

- *To introduce the basics of computers and information technology and educate problem solving techniques.*
- *To impart programming skills in C language.*
- *To practice structured programming to solve real life problems.*

COURSE OUTCOME

On successful completion of the module students will be able to:

- *Apply fundamental knowledge of science and engineering to understand the basics of computers and information technology and educate problem solving techniques.*
- *Apply logical thinking to create programs in C language.*
- *Design system, component and demonstrate structured programming to solve real life problems*

UNIT – I

History of Computers – Block diagram of a Computer – Components of a Computer system – Classification of computers - Hardware – Software – categories of Software – Operating System – Applications of Computers –Network Structure - Internet and its services – Intranet – Study of word processor – Preparation of worksheets. **(12)**

UNIT – II

Problem solving techniques – Program – Program development cycle – Algorithm design – Flowchart - Pseudo code. Introduction to C – History of C – Importance of C - C tokens – data types – Operators and expressions – I/O functions. **(12)**

UNIT – III

Decision making statements – branching and looping – arrays – multidimensional arrays – Functions – Recursion – Passing array to functions .Storage classes – Strings – String library functions. **(12)**

UNIT – IV

Structures – Arrays and Structures – nested structures – passing structures to functions – user defined data types– Union. Pointers – pointers and arrays – pointers and functions - pointers and strings - pointers and structures. **(12)**

UNIT – V

Files – operations on a file – Random access to files – command line arguments .Introduction to preprocessor – Macro substitution directives – File inclusion directives – conditional compilation directives – Miscellaneous directives. **(12)**

Text Books:

1. Balagurusamy. E, "Programming in ANSI C", Tata McGraw Hill, 12th Edition, 2012

Reference Books:

1. Vikas Verma, "A Workbook on C ",Cengage Learning, Second Edition,2012
2. Ashok N Kamthane, "Computer Programming", Pearson education, Second Impression, 2008.

P 101 - COMPUTER PROGRAMMING LAB

List of Exercises

1. Study of OS Commands
2. Write a C program to find the Area of the triangle.
3. Write a C program to find the total and average percentage obtained by a student for 6 subjects.
4. Write a C program to read a three digit number and produce output like
   1 hundreds
   7 tens
   2 units for an input of 172.
5. Write a C program to check whether a given character is vowel or not using Switch – Case statement.
6. Write a C program to print the numbers from 1 to 10 along with their squares.
7. Write a C program to find the sum of 'n' numbers using for, do – while statements.
8. Write a C program to find the factorial of a given number using Functions.
9. Write a C program to swap two numbers using call by value and call by reference.
10. Write a C program to find the smallest and largest element in an array.
11. Write a C program to perform matrix multiplication.
12. Write a C program to demonstrate the usage of Local and Global variables.
13. Write a C program to perform various string handling functions: strlen, strcpy, strcat, strcmp.
14. Write a C program to remove all characters in a string except alphabets.
15. Write a C program to find the sum of an integer array using pointers.
16. Write a C program to find the Maximum element in an integer array using pointers.
17. Write a C program to create student details using Structures.
18. Write a C program to display the contents of the file on the monitor screen.
19. Create a File by getting the input from the keyboard and retrieve the contents of the file using file operation commands.
20. Write a C program to pass the parameter using command line arguments

P 102 - ENGINEERING GRAPHICS

UNIT – I

Introduction to Standards for Engineering Drawing practice, Lettering, Line work and Dimensioning Conic sections, Involutes, Spirals, Helix, Projection of Points, Lines and Planes

UNIT – II

Projection of Solids and Sections of Solids

UNIT – III

Development of surfaces - Intersection of surfaces (cylinder-cylinder, cylinder-cone)

UNIT – IV

Isometric projections and Orthographic projections

UNIT – V

Computer Aided Drafting: Introduction to Computer Aided Drafting hardware - Overview of application software - 2D drafting commands (Auto CAD) for simple shapes - Dimensioning

Text Books:

1. Gopalakrishna K.R. and Sudhir Gopalakrishna, Engineering Graphics, Inzinc Publishers, 2007.

Reference Books:

1. Bhatt N.D., Engineering Drawing, 49th edition, Chorotar Publishing House, 2006.
2. Venugopal K., Engineering Drawing and Grahics + Auto CAD, 4th edition, New Age International Publication Ltd., 2004 .
3. David I cook and Robert N Mc Dougal, Engineering Graphics and Design with computer applications, Holt – Sounders Int. Edn. 1985.
4. James D Bethune and et. al., Modern Drafting, Prentice Hall Int., 1989
5. Natarajan K.V., A Text Book of Engineering Drawing, Dhanalakshmi Publishers, 2006. BIS, Engineering Drawing practice for Schools & College, 2006.
6. BIS, Engineering Drawing practice for Schools & College, 1992.

P103 - BASIC ELECTRICAL AND ELECTRONICS LAB

Electrical Laboratory Experiments

1. Electrical Safety, Precautions, study of tools and accessories.
2. Practices of different joints.
3. Wiring and testing of series and parallel lamp circuits.
4. Staircase wiring.
5. Doctor's room wiring.
6. Bed room wiring.
7. Godown wiring.
8. Wiring and testing a ceiling fan and fluorescent lamp circuit.
9. Study of different types of fuses, circuits breakers and A.C and D.C meters

Electronics Laboratory Experiments

1. Study of CRO

(a) Measurement of AC and DC voltages

(b) Frequency and phase measurements (using Lissajou's figures)

2. Verification of Kirchoff's Voltage and Current Laws

Determine the voltage and current in given circuits using Kirchoff's laws theoretically and verify the laws experimentally.

3. Characteristics and applications of PN junction diode.

Forward and Reverse characteristics of PN junction diode.

Application of Diode as Half wave Rectifier – Measurement of ripple factor with and without capacitor filter

4. Frequency Response of RC Coupled Amplifiers

Determination of frequency response of given RC coupled amplifier - Calculation of bandwidth.

5. Study of Logic Gates

(a) Verification of Demorgan's theorems

(b) Verification of truth tables of OR, AND, NOT, NAND, NOR, EX-OR, EX-NOR gates and Flipflops - JK, RS, T and D

(c) Implementation of digital functions using logic gates and Universal gates

P107 NCC / NSS

NCC/NSS training is compulsory for all Undergraduate students

1. The activities will include Practical/field activities/Extension lectures.
2. The activities shall be carried out outside class hours.
3. For the above activities, the student participation shall be for a minimum period of 45 hours.
4. The activities will be monitored by the respective faculty in charge and the First Year Coordinator.
5. Pass /Fail will be determined on the basis of participation, attendance, performance and behavior. If a candidate Fails, he/she has to repeat the course in the subsequent years
6. Pass in this course is mandatory for the award of degree

MA T31-MATHEMATICS III

COURSE OBJECTIVE

- *To provide the concepts of functions of a complex variable, conformal mapping and complex integration.*
- *To understand Fourier series expansion of complex functions, Harmonic analysis and Parseval's theorem.*
- *To make the students understand and work out problems of constructing analytic functions, conformal mapping, bilinear transformation, contour integration and expanding functions into Fourier.*

COURSE OUTCOME

On successful completion of the module students will be able to:

- *Apply knowledge of mathematics to Solve complex variable, conformal mapping and complex integration problems.*
- *Identify, formulate, and solve engineering problems like Fourier series expansion of complex functions, Harmonic analysis and Parseval's theorem.*
- *Apply formulae and solve problems in bilinear transformation, contour integration and Fourier series.*

UNIT I

Function of a complex variable: Continuity, derivative and analytic functions – Necessary conditions -Cauchy-Riemann equations (Cartesian and polar form) and sufficient conditions (excluding proof) – Harmonic and orthogonal properties of analytic function – Construction of analytic functions. **(12)**

UNIT II

Conformal mapping – Simple and standard transformations like w = z+c, cz, z2, ez, sin z, cosh z and z+1/z - Bilinear transformation and cross ratio property (excluding Schwarz-Christoffel transformation). Taylor's and Laurent's theorem (without proof) - Series expansion of complex valued functions - classification of singularities. **(12)**

UNIT III

Complex Integration: Cauchy's integral theorem and its application, Cauchy's integral formula and problems. Residues and evaluation of residues – Cauchy's residue theorem – Contour integration: Cauchy's and Jordan's Lemma (statement only) - Application of

residue theorem to evaluate real integrals – unit circle and semicircular contour (excluding poles on boundaries). **(12)**

UNIT IV

Fourier Series: Dirichlet's conditions – General Fourier series - Expansion of periodic function into Fourier series – Fourier series for odd and even functions – Half-range Fourier cosine and sine series – Change of interval – Related problems. **(12)**

UNIT V

Root Mean Square Value – Parseval's theorem on Fourier Coefficients. Complex form of Fourier series – Harmonic Analysis.**(12)**

Text books:

1. Veerarajan T., Engineering Mathematics for first year, Tata-McGraw Hill, 2010.
2. Venkataraman M.K., Engineering Mathematics, Vol. II & III, National Publishing Company, Chennai, 2012.

Reference books:

1. Kandasamy P. et al, Engineering Mathematics, Vol. II & III, S. Chand & Co., New Delhi, 2012.
2. Bali N. P and Manish Goyal, Text book of Engineering Mathematics, 3rd Edition, Laxmi Publications (p) Ltd., 2008.
3. Grewal B.S., Higher Engineering Mathematics, 40th Edition, Khanna Publishers, Delhi 2007.
4. Erwin Kreyszig, Advanced Engineering Mathematics, 7^{th} Edition, Wiley India, (2007).

EC T32 - ELECTRICAL ENGINEERING

COURSE OBJECTIVE

- *To identify the ways and means to solve magnetically coupled circuits.*
- *To understand the different operations of DC and AC machines.*
- *To analyze the special machines and utilization of different home appliances.*

COURSE OUTCOME

On successful completion of the module students will be able to:

- *Design and conduct experiments on magnetically coupled circuits.*
- *Analyze different DC and AC machines.*
- *Design special machines, demonstrate domestic wiring and electroplating.*

UNIT - I

Transformers - Principle of operation – Single Phase transformer – Equivalent circuit – Regulation – Losses and Efficiency – Introduction to 3 phase transformers – Autotransformers. **(12)**

UNIT - II

D.C. Machines - Construction, Principles of operation of DC Generators – types - EMF equation – No load and Load characteristics of series and shunt generators – DC motor – Torque – Speed – Torque characteristics of series and shunt motors – Speed control methods and application. **(12)**

UNIT - III

A.C. Machines - Principle of operation of 3-phase Induction Motor – Torque, slips characteristics – Speed control methods – Single-phase Induction motor starting methods – Principle of operation of Alternators. **(12)**

UNIT - IV

Special Machines - Servo motor – DC and AC servomotors; stepper motors – variable reluctance and permanent magnet stepper motors; single phase synchronous motor – reluctance motor and hysteresis motor – universal motor – Repulsion motor –synchronous motor. **(12)**

UNIT - V

Utilisation - Domestic wiring – principle of electrical heating – The laws of illumination – Electric lamps – Photometers – Electroplating – Electric Traction – Air conditioning – Earthing. **(12)**

Text Books:

1. B.L. Theraja, "Electrical Technology Vol.II AC/DC Machines", S. Chand, 2008
2. A.Chakrabarti, M.I.Soni, P.V.Gupta,"Textbook on power systems engineering", DhanpatRai, 2008.

Reference Books:

1. Battacharya S K, "Electrical Machines", Technical Teachers Training institute", 2nd edition.2003.
2. J.B.Gupta, "Theory and Performance of Electrical Machines", J.K.Kataria & Sons, 13th edition, 2004.
3. S.L.Uppal, "Electrical power" Khanna Publications (p) Ltd, Delhi, 2002.
4. G.C.Garg, "Utilization of Electric power and electric traction" Khanna Publications (p) Ltd, Delhi, 2006.

Web References

1. http://www.galco.com/comp/prod/trnsfmrs.htm
2. http://www.animations.physics.unsw.edu.au/jw/electricmotors.html

EC T33 - DATA STRUCTURES AND OBJECT ORIENTED PROGRAMMING

COURSE OBJECTIVE

- *To acquaint students with data structures used in programming for the storage and manipulation of data.*
- *To explore the concept of data, Stacks, Queues and Trees.*
- *To understand the concepts of object oriented programming and expertise the programming skills through C++ language.*

COURSE OUTCOME

On successful completion of the module students will be able to:

- *Apply logical thinking to create and analyze programs.*
- *Design and conduct simulations, as well as to analyze and interpret data of Stacks, Queues and Trees.*
- *Identify, formulate, and solve engineering problems using programming skills through C++ language.*

UNIT-I

Introduction to Algorithm – Programming principles – Creating programs- Analyzing programs. Arrays: One dimensional array, multidimensional array. Pointers - Searching: Linear search, Binary Search. Sorting techniques: Internal sorting - Insertion Sort, Selection Sort, Shell Sort, Bubble Sort, Quick Sort, Merge Sort and Radix Sort. **(12)**

UNIT II

Stacks: Definition – operations - applications of stack. Queues: Definition - operations - Priority queues - De queues – Applications of queue. Linked List: Singly Linked List, Doubly Linked List, Circular Linked List, linked stacks, Linked queues, Applications of Linked List. **(12)**

UNIT III

Trees: Binary tree, Terminology, Representation, Traversals, Applications Graph: Terminology, Representation, Traversals – Applications - spanning trees, shortest path and Transitive closure, Hash tables.**(12)**

UNIT IV

Principles of Object Oriented Programming - Beginning With C++ - Tokens-Expressions-control Structures – Functions in C++, classes and objects, constructors and destructors ,operators overloading and type conversions. **(12)**

UNIT V

Inheritance: Extending classes, Pointers, Virtual functions and polymorphism, File Handling Templates, Templates – Exception Handling. **(12)**

Text Books:

1. Ellis Horowitz and Sartaj Sahni, "Fundamentals of Data Structures", Galgotia Book Source, Pvt. Ltd., 2004
2. D. Samanta, "Classic Data Structures", Second Edition, Prentice-Hall of India, Pvt. Ltd., India 2012.
3. E. Balagurusamy, " Object Oriented Programming with C++", McGraw Hill Education (India)Private Limited, 6th Edition 2013

Reference Books:

1. Robert Kruse, C.L. Tondo and Bruce Leung, "Data Structures and Program Design in C", Prentice-Hall of India, Pvt. Ltd., Second edition, 2007.
2. Seymour, "Data Structures", the McGraw-Hill, 2007.
3. Jean – Paul Tremblay & Paul G. Sorenson, An Introduction to data structures with applications, Tata McGraw Hill edition, II Edition, 2002.

Bjarne Stroustrup, The C++ Programming Language, Addison Wesley, 200

Web References:

1. http://www.cse.unt.edu
2. http://nptel.iitm.ac.in

EC T34 – ELECTRONIC DEVICES AND CIRCUITS

COURSE OBJECTIVE

- *To introduce the concepts of electron ballistics, the physics of semiconductors and various parameters of diodes.*
- *To learn and gain insight into the operation, characteristics and functional aspects of BJT, JFET, MOSFET, several special semiconductor devices.*
- *To design the different types of biasing in BJT, FET and MOSFET and analyze various rectifier circuits with filters and IC regulator circuits*

COURSE OUTCOME

On successful completion of the module students will be able to:

- *Apply knowledge science and engineering to understand semiconductor diodes, diode equation and characteristics.*
- *To analyze functional aspects of BJT, JFET, MOSFET and its biasing.*
- *Design and construct simple circuits like rectifiers, filters and IC regulators.*

UNIT I

Semiconductor Diodes - PN junction diode – operation, forward, reverse bias characteristics- theory of diode currents - diode equation - temperature effects – DC and AC resistance – diode equivalent circuit – transition and diffusion capacitances – diode switching times – Avalanche and Zener breakdown – Zener diode characteristics.**(12)**

UNIT II

Bipolar Junction Transistor - PNP and NPN transistors – transistor current components – characteristics of transistor in CB, CE, CC configurations – Early effect - Ebers-Moll model.

Field Effect Transistors - JFET – construction – operation - drain and transfer characteristics – current equations – pinch-off voltage and its significance. MOSFET – construction, operation and characteristics of EMOSFET, DMOSFET and VMOSFET.**(12)**

UNIT III

Special Semiconductor Devices - Construction, principle of operation and characteristics of Schottky barrier diode, Varactor diode, Tunnel diode, PIN diode, LED, LCD, UJT, SCR, DIAC and TRIAC. Photoconductivity – photodiode, APD, phototransistor, LDR, optocoupler, solar cell, LASER diode and MESFET.**(12)**

UNIT IV

Biasing and Stabilization: DC load line and Q-point – Need for biasing – Different types of BJT biasing – Fixed bias, Collector to base bias, Self bias –Stability factor – Bias compensation: Diode, Thermistor and Sensistor compensation – FET biasing: Gate bias, Voltage divider bias and Self bias – MOSFET biasing. **(12)**

UNIT V

Power Supplies: Rectifiers – Half wave, Full wave and bridge rectifier – Ripple factor calculation for C, L, LC and CLC filter. Voltage regulators – Shunt voltage regulator – Series voltage regulator – Short circuit protection circuit – Current limiting circuit – Foldback limiting – Op-Amp voltage regulator – Switching regulator – Step up and step down converters. **(12)**

Text Books:

1. Jacob Millman and Christos C. Halkias, "Integrated Electronics" Tata McGraw-Hill, Second Edition, 2009.
2. R.L. Boylestad and L. Nashelsky, "Electronic Devices and Circuit Theory", Pearson Education, Tenth Edition, 2009

Reference Books:

1. David A. "Bell Electronic Devices and Circuits", Oxford university press, 5th Edition, 2010.
2. Donald A Neaman, "Semiconductor Physics and Devices", Tata McGraw-Hill, Third Edition, 2007
3. S. Salivahanan, N. Suresh Kumar and A. Vallavaraj, Electronic Devices and Circuits, 2nd Edition, TMH, 2007.

Web References:

1. www.nptel.iitm.ac.in
2. http://nptel.iitm.ac.in/courses/Webcourse-contents/IIT-Delhi/Semiconductor%20Devices/
3. http://www.electronic-circuits-diagrams.com/tutorials.shtml

EC T35- CIRCUIT THEORY

COURSE OBJECTIVE

- *To understand the need for various theorems to solve complicated Electrical circuits, Resonant circuits and Tuned circuits.*
- *To analyze the transient behavior of Electrical circuits and identify the ways and means to solve magnetically coupled circuits.*
- *To understand the use of network topology in circuit solving.*

COURSE OUTCOME

On successful completion of the module students will be able to:

- *To analyze various network theorem in the field of Engineering.*
- *Design and analyze AC Circuits using Mesh and Nodal analysis.*
- *Design, construct and analyze Transient circuits and Magnetically coupled circuits.*

UNIT- I

DC Circuit Analysis: Sources-Transformation and manipulation, Network theorems -Superposition theorem, Thevenin's theorem, Norton's theorem, Reciprocity theorem, Millman's theorem, Compensation theorem, Maximum power transfer theorem and Tellegen's theorem – Application to DC circuit analysis. **(12)**

UNIT- II

AC Circuit Analysis: Series circuits - RC, RL and RLC circuits and Parallel circuits –RLC circuits - Sinusoidal steady state response - Mesh and Nodal analysis - Analysis of circuits using Superposition, Thevenin's, Norton's and Maximum power transfer theorems.

Resonance - Series resonance - Parallel resonance - Variation of impedance with frequency - Variation in current through and voltage across L and C with frequency – Bandwidth – Q factor -Selectivity. **(12)**

UNIT- III

Transient Analysis: Natural response-Forced response - Transient response of RC, RL and RLC circuits to excitation by DC and exponential sources - Complete response of RC, RL and RLC Circuits to sinusoidal excitation-Transient analysis by Laplace Transformation Technique. **(12)**

UNIT- IV

Magnetically Coupled Circuits: Self inductance - Mutual inductance - Dot rule - Coefficient of coupling - Analysis of multi winding coupled circuits - Series,

Parallel connection of coupled inductors - Single tuned and double tuned coupled circuits. **(12)**

UNIT -V

Network Topology: Network terminology - Graph of a network - Incidence and reduced incidence matrices – Trees –Cutsets - Fundamental cutsets - Cutset matrix – Tiesets – Link currents and Tieset schedules -Twig voltages and Cutset schedules, Duality and dual networks. **(12)**

Text Books:

1. William H. Hayt, Jr. Jack E. Kemmerly and Steven M. Durbin, "Engineering Circuit Analysis", McGraw Hill Science Engineering, 8th Edition, 2013.
2. Joseph Edminister and Mahmood Nahvi, "Electric Circuits", Schaum's Outline Series, Fourth Edition, Tata McGraw Hill Publishing Company, New Delhi, 2003.

Reference Books:

1. David A. Bell, "Electric Circuits", Sixth Edition, PHI Learning, New Delhi, 2003.
2. P. Ramesh Babu, "Circuits and Networks", Scitech Publications, First Edition 2010, Chennai.

Web References:

1. www.circuit_magic.com
2. www.learnabout_electronics.org

EC T36 - ENGINEERING ELECTROMAGNETICS

COURSE OBJECTIVE

- *To impart knowledge on the basics of static electric and magnetic field and the associated laws.*
- *To make students have depth understanding of EM waves and the propagation of EM waves.*
- *To make the students understand and work out problems of Electromagnetic wave equation and wave propagation.*

COURSE OUTCOME

On successful completion of the module students will be able to:

- *Apply fundamental knowledge of mathematics, science and engineering to understand and analyze electrostatic field and its theorems.*
- *Identify, formulate, and solve engineering problems like Electric Flux Density, Dipole Moment and Magnetic Fields.*
- *Design and analyze Electromagnetic Induction and Electromagnetic Waves.*

UNIT-I

Electrostatic Field I: Introduction - Orthogonal co-ordinate systems –Vector fields,Gradient, Divergence, Curl, Divergence theorem, Stoke's theorem. Coulomb's law - Electric field intensity, electric fields due to point charge, line charge, surface charge and volume charge distributions – Electric flux density - Gauss's law and its applications. **(12)**

UNIT-II

Electrostatic Field II: Electric potential – Potential gradient, Poisson and Laplace equations - Dipole and dipole moment – Polarization –Conductors and Dielectrics – Continuity equation - Capacitors - Capacitance of system conductors –Energy density. **(12)**

UNIT-III

Magnetostatic Field: Magnetic force on moving charge- Biot-savart's law- Magnetic flux density and magnetic field intensity-magnetic field intensity due to straight conductor, circular coil, solenoid and toroid– Ampere's law - Force between current carrying conductors – Torque on closed conductors - Vector magnetic potential. **(12)**

UNIT-IV

Electromagnetic Induction and Wave Equations: Faraday's law of electromagnetic induction– Inductance of solenoids, toroids, transmission lines and cables –Energy stored in magnetic fields and energy density – Force and torque on closed circuits. Maxwell's equation in point and integral form– Poynting's theorem – Boundary conditions at the surface of dielectric and conductor -Electromagnetic wave equation for free space and conducting medium. **(12)**

UNIT-V

Electromagnetic Waves: Uniform plane wave - Characteristics impedance or intrinsic impedance – Wave propagation in a lossless medium, conducting medium, good dielectric, good conductor – phase velocity and group velocity – Depth of penetration – Polarization, linear polarization, circular polarization and elliptical polarization - Reflection and refraction of plane waves – Surface waves. **(12)**

Text Books:

1. David K. Cheng, "Field and Wave Electromagnetics", Second Edition, Pearson Education, Asia, 2008.
2. Edward C. Jordan and Keith G. Balaman, "Electromagnetic waves and radiating systems", Second Edition, PHI Learning, 2007.
3. P. Dananjayan, "Electromagnetic Theory" Lakshmi Publications, Chennai, 2012

Reference Books:

1. William H. Hayt, "Engineeering Electromagnetics", McGraw Hill, Fifth Edition, 2008.
2. J. D. Kraus, "Electromagnetics", McGraw Hill, 2007
3. Sadiku MH, "Principles of Electromagnetics", Oxford University Press Inc, New Delhi, 2009

Web References:

1. http://www.physicsclassroom.com/mmedia/waves/em.cfm
2. http://www.phy.iitb.ac.in/~dkg/PH-102/emw.pdf

EC P31 - ELECTRICAL ENGINEERING LABORATORY

1. OC and SC test on single phase transformer.
2. Load test on single phase transformer.
3. Load test on DC shunt motor.
4. OCC characteristics of generator.
5. Two wattmeter method of power measurement.
6. Swinburne's test.
7. Load test on single phase IM.
8. Load test on 3 phase transformer.
9. Load test on 3 phase induction motor.
10. Speed control methods of DC motor.

EC P32 - DATA STRUCTURES AND OBJECT ORIENTED PROGRAMMING LAB

(The following experiments (1-8) are to be implemented only in C Language)

1. Searching Techniques
2. Sorting Techniques
3. Imp Linked List and doubly linked and its applications
4. Stack and its applications
5. Binary tree traversal
6. Graph traversal
7. Spanning Tree
8. Shortest path algorithms

(The following experiments (9-14) are to be implemented only in C++)

9. Programs to implement classes and objects with constructors and destructors
10. Programs to implement different types of inheritances like multiple, Multilevel and hybrid.
11. Programs to implement virtual functions to demonstrate the use of run time polymorphism
12. Programs to implement template
13. Programs to implement Exception handling
14. Programs to implement Queue and its applications

EC P33 - ELECTRONIC DEVICES AND CIRCUITS LABORATORY

1. V-I characteristics of semiconductor diodes
   a) PN Junction diode
   b) Point contact diode
   c) Zener diode

2. Characteristics of BJT in CB configuration
    a) Determination of input and output characteristics
    b) Determination of voltage gain, current gain, input and output resistances from the characteristics

3. Characteristics of BJT in CE configuration
    a) Determination of input and output characteristics
    b) Determination of voltage gain, current gain, input and output resistances from the characteristics

4. Characteristics of JFET
    a) Determination of output and transfer characteristics
    b) Determination of pinch off voltage, r_d, g_m and μ from the characteristics

5. Characteristics of MOSFET
    a) Determination of output and transfer characteristics
    b) Determination of pinch off voltage, r_d, g_m and μ from the characteristics

6. Characteristics of UJT, SCR and TRIAC

7. Characteristics of photonic devices
    a) Determination of V-I characteristics of LED
    b) Determination of V-I and intensity characteristics of phototransistor

8. Design and testing of biasing circuits
    a) Fixed bias
    b) Collector to base bias
    c) Self bias

9. Rectifier and Voltage Regulators
    a) Determination of ripple factor for different types of rectifiers with and without filters.
    b) Voltage regulation characteristics of shunt, series and IC regulators

10. i) Clipper circuits using diodes
    Positive, negative, biased and combinational clippers
    ii) Switching circuit
        a) AND and OR logic gates using diodes
        b) NOT gate using transistor

MA T41-MATHEMATICS IV

COURSE OBJECTIVE

- *To develop the skills of problems solving techniques in Partial Differential Equations.*
- *To make the students knowledgeable in the areas of Boundary Value Problems like vibrating string (wave equation), heat equation in one and two dimensions.*
- *To make the students understand concepts of Theory of sampling and work out problems.*

COURSE OUTCOME

On successful completion of the module students will be able to:

- *Apply knowledge of mathematics to Solve partial differential equations, Boundary value problems.*
- *Identify, formulate, and solve engineering problems like Fourier series expansion, heat flow equation.*
- *Apply formula and workout problems of applied statistics and Chi-square test.*

UNIT - I

PARTIAL DIFFERENTIAL EQUATIONS: Formation by elimination of arbitrary constants and arbitrary functions – General, singular, particular and integrals – Lagrange's linear first order equation – Higher order differential equations with constant coefficients. **(12)**

UNIT-II

Solution of partial differential equation by the method of separation of variables – Boundary value problems – Fourier series solution – Transverse vibration of an elastic string. **(12)**

UNIT-III

Fourier series solution for one dimensional heat flow equation – Fourier series solutions for two dimensional heat flow equations under steady state condition – (Cartesian and Polar forms). **(12)**

UNIT-IV

APPLIED STATISTICS: Curve fitting by the method of least squares – fitting of straight lines, second degree parabolas and more general curves. Test of significance: Large samples test for single proportions, differences of proportions, single mean, difference of means and standard deviations. **(12)**

UNIT - V

Small samples – Test for single mean, difference of means and correlations of coefficients, test for ratio of variances – Chi-square test for goodness of fit and independence of attributes. **(12)**

Text Books:

1. Venkataraman M. K, "Engineering Mathematics, Third year Part A& B", 12th Edition, The National Publishing Company, Madras 1996.
2. S. C. Gupta and V. K. Kapoor, "Fundamentals of Mathematical Statistics", Sultan Chand and sons, 1975.

Reference:

1. B.S. Grewal, "Numerical methods in Engineering & Science", Khanna Publishers, New Delhi.

Web References:

1. www.math.niu.edu
2. nm.mathforcollege.com

EC T42- ELECTRONIC CIRCUITS AND ANALYSIS

COURSE OBJECTIVE

- *To analyze transistor low frequency FET model and high frequency BJT model.*
- *To familiarize the theory of multistage amplifiers like cascade, cascode, Darlington pair, feedback amplifiers and oscillators.*
- *To understand the concepts of Wave Shaping Circuits, Multivibrators, Time Base Generators and Large Signal Amplifiers*

COURSE OUTCOME

On successful completion of the module students will be able to:

- *Apply knowledge of mathematics, science and engineering to analyze transistor low frequency and high frequency models.*
- *Design and conduct experiment, as well as to analyze multistage amplifiers like cascade, cascode, Darlington pair, feedback amplifiers and oscillators.*
- *Design, construct and analyze Wave Shaping Circuits, Multivibrators and Time Base Generator.*

UNIT– I

Transistor Low Frequency Analysis: Definition of h–parameters – Small signal low frequency h-parameter model –Mid band analysis of CB, CE and CC amplifier to obtain gain, input impedance and output impedance – Analysis of CE amplifier with an emitter resistance – Low frequency FET model – CS, CD and CG amplifiers.

Transistor High Frequency Analysis: Hybrid pi CE transistor model – Hybrid pi conductances and capacitances – CE short circuit current gain using Hybrid pi model - Current gain with resistive load. **(12)**

UNIT– II

Multistage Amplifiers: Need for cascading – Cascade amplifier – Cascode amplifier – Darlington Pair – Basic emitter coupled differential amplifier – Tuned amplifiers – single tuned –double tuned –stagger tuned amplifiers.

Feedback Amplifiers: Concept of feedback- topological classification-voltage series, voltage shunt, current series, current shunt - effect of feedback on gain, stability, distortion, band width, input and output impedances – practical feedback amplifier circuits and their analysis. **(12)**

UNIT– III

Oscillators: Barkhausen criterion for sustained oscillations - RC oscillators – RC phase shift oscillator and Wien bridge oscillator- LC oscillators - Hartley and Colpitts oscillators – crystal oscillators and frequency stability.
Multivibrators: Astable, monostable and bistable multivibrators using transistors– Schmitt trigger circuit. **(12)**

UNIT– IV

Wave Shaping Circuits: RC Integrator and Differentiator circuits – Storage, Delay and Calculation of Transistor Switching Times – Speed-up Capacitor- Clamper circuits – positive, negative and biased clampers -Voltage doubler, tripler and quadrupler circuits.
Time Base Generators: General features of time base signals – RC ramp generator – constant current ramp generator, UJT saw tooth generator – Bootstrap ramp generator – Miller integrator ramp generator – triangular waveform generator – pulse generator circuit – function generator – sine wave converter. **(12)**

UNIT– V

Large Signal Amplifiers: Classification of power amplifiers - Class A power amplifier-direct and transformer coupled amplifiers; - Class B - Push-pull arrangements and complementary symmetry amplifiers; conversion efficiency calculations, cross over distortion – class AB amplifier - amplifier distortion – power transistor heat sinking – Class C and D amplifiers. **(12)**

Text Books:

1. Millman J and Halkias C, “Integrated Electronics”, Tata McGraw Hill International Edition, 2007.
2. David A. Bell, “Solid State Pulse circuits”, PHI Learning Private Ltd, Fourth Edition, 2007

Reference Books:

1. R.L. Boylestad and L. Nashelsky, “Electronic Devices and Circuit Theory”, PHI Learning Pvt. Ltd, India, Ninth Edition, 2008
2. David A. “Bell Electronic Devices and Circuits”, Oxford university press, 5th Edition, 2010.
3. R. L. Boylestad and L. Nashelsky, “Electronic Devices and Circuit Theory”, PHI Learning Pvt. Ltd, Ninth Edition, 2008.
4. Sedra and Smith, Micro Electronic Circuits, Oxford University Press, 2004.

5. S. Salivahanan, N. Suresh Kumar and A. Vallavaraj, Electronic Devices and Circuits, 2nd Edition, TMH, 2007.

Web References:

1. http://www.electronics-tutorials.ws
2. http://www.uta.edu/ee/hw/pspice
3. http://www.ni.com/multisim
4. www.ibiblio.org
5. www.gobookee.org

EC T43-SIGNALS AND SYSTEMS

COURSE OBJECTIVE

- *To introduce the concepts of continuous time, discrete time signals and systems including their classification and properties.*
- *To comprehend and analyze the frequency domain representation of continuous time signals and discrete time signals.*
- *To learn and investigate the different types of representing continuous time LTI systems, discrete time LTI systems and their properties.*

COURSE OUTCOME

On successful completion of the module students will be able to:

- *Apply knowledge of mathematics to understand the continuous time, discrete time signals and systems including their classification and properties.*
- *Identify, formulate, and solve engineering problems like frequency domain representation of continuous time signals and discrete time signals.*
- *Apply formula and solve problems in continuous time, discrete time signals, continuous time LTI systems and discrete time LTI systems.*

UNIT I

REPRESENTATION AND CLASSIFICATION OF SIGNALS AND SYSTEMS: Continuous time signals - Discrete time signals – Representation of signals – Step, Ramp, Pulse, Impulse, Sinusoidal, Exponential signals, Classification of continuous and discrete time signals -Operations on the signals.

Continuous time and discrete time systems: Classification of systems – Properties of systems. **(12)**

UNIT II

ANALYSIS OF CONTINUOUS TIME SIGNALS: Fourier series: Properties - Trigonometric and Exponential Fourier Series -Parsavel's relation for periodic signals - Fourier Transform: Properties - Rayleigh's Energy Theorem - Laplace Transformation: Properties, R.O.C -Inverse Laplace transform. **(12)**

UNIT III

ANALYSIS OF DISCRETE TIME SIGNALS: Discrete Time Fourier Transform: Properties; Z- Transformation: Properties – Different methods of finding Inverse Z-Transformation. **(12)**

UNIT IV

CONTINUOUS AND DISCRETE TIME SYSTEMS: LTI continuous time systems- Differential equations – Transfer function and Impulse response – Convolution Integral- Block diagram representation and reduction -State variable techniques – State equations

LTI Discrete time systems – Difference equations – System function and impulse response – Convolution Sum – Block diagram representation – Convolution Sum – State equations for discrete time systems **(12)**

UNIT V

DISCRETE FOURIER TRANSFORM: DFT – Properties - FFT algorithms – advantages over direct computation of DFT – radix 2 algorithms – DIT and DIF algorithms – Computation of IDFT using FFT. **(12)**

Text Books:

1. Simon Haykins and Barry Van Veen, "Signals and Systems", Second Edition, John Wiley and Sons, 2002.
2. Allan V.Oppenheim, Allan S.Willsky and S.HamidNawab, "Signals and Systems", Second Edition, PHI Learning, New Delhi, 2007.

Reference Books:

1. Douglas K. Lindner, "Signals and Systems", McGraw-Hill International Edition, 1999.
2. P. Ramesh Babu, "Signals and Systems", Fifth Edition, Scitech Publishers,2014.

Web References:

1. http://www.cdeep.iitb.ac.in/nptel/Electrical%20&%20Comm%20Engg/Signals%20and%20System/Course%20Objective.htm
2. http://ocw.mit.edu/resources/res-6-007-signals-and-systems-spring-2011/
3. http://www.ece.jhu.edu/~cooper/courses/214/signalsandsystemsnotes.pdf
4. http://techteach.no/publications/discretetime_signals_systems/discrete.pdf

EC T44-LINEAR AND DIGITAL CONTROL SYSTEMS

COURSE OBJECTIVE

- *To acquire a fundamental understanding of linear and digital control systems, components and mathematical modeling of electrical system, mechanical system, etc.*
- *To study the concept of time response and frequency response of the system, understanding the relationship between ordinary differential equations, impulse response functions, frequency response function, and transfer function.*
- *To understand the concept of stability, different plots such as Bode plot, Nyquist plot, Root locus method and Polar plot, Z-transform, inverse Z-transform and state space analysis of modern control system using MATLAB.*

COURSE OUTCOME

On successful completion of the module students will be able to:

- *Apply knowledge of mathematics, science and engineering to understand linear and digital control systems*
- *Analyze time response, frequency response and impulse response functions of LDCS system.*
- *Use techniques, skills, and modern engineering tools like MATLAB to analyze different plots such as Bode plot, Nyquist plot, Root locus method and Polar plot.*

UNIT - I

System Modeling: Introduction to control system-Basic elements of control system-Open and closed loop control systems-Differential equation representation of physical systems-Transfer function-Mathematical modeling of electrical and mechanical systems (Translational and Rotational)-Analogous system-Block diagram reduction techniques-Signal flow graph. **(12)**

UNIT - II

Time Domain Analysis: Time response analysis-Analysis of transient and steady state behavior of control systems-Standard test signals –Time response of First order system-step, ramp and impulse response analysis-Second order system – step response analysis-steady state error-generalized error co-efficient–Response with P, PI, PD and PID controllers-Analysis using MATLAB. **(12)**

UNIT - III

Frequency Domain Analysis: Frequency response-Frequency domain specifications-Correlation between time domain and frequency domain specifications-Bode plot-Stability analysis using Bode plot- transfer function from Bode plot-Polar plot-Analysis using MATLAB. **(12)**

UNIT – IV

Stability Analysis and Root Locus: Concepts of stability-Location of poles on s-plane for stability-Routh-Hurwitz stability criterion-Nyquist stability criterion-Root locus Techniques-Analysis using MATLAB. **(12)**

UNIT - V

Digital Control System: Basic digital control system-Z transform and its properties-Inverse Z transform-Response of linear discrete time systems-Pulse transfer function-Stability analysis-Jury's stability criterion.

State Space Analysis: State space model of a control system -State space representation using physical, phase and canonical variables-diagonal canonical form-Jordan canonical form. **(12)**

Text Books:

1. Benjamin.C.Kuo, "Digital control systems", Second Edition, Oxford University Press, 2012.
2. I.J.Nagrath, M. Gopal, "Control Systems Engineering", Fifth Edition, New Age International, New Delhi, 2011.

Reference Books:

1. R.Anandanatarajan, P. Ramesh Babu, "Control Systems Engineering", Second edition ,Scitech Publications, 2005.
2. Benjamin C. Kuo, "Automatic Control Systems", Seventh Edition, PHI Learning, New Delhi, 1997.
3. Katsuhiko Ogata, "Discrete Time Control Systems", Second Edition, PHI Learning, New Delhi, 2006.

Web References:

1. http://ctms.engin.umich.edu/CTMS/index.php?aux=Home
2. http://www.mathworks.in/academia/student_center/tutorials/controls-tutorial-launchpad.html
3. http://ctms.engin.umich.edu/CTMS/index.php?example=Introduction&section=ControlDigital
4. http://www.library.cmu.edu/ctms/ctms/
5. http://www.ee.usyd.edu.au/tutorials_online/matlab/PID/PID.html

EC T45-DIGITAL CIRCUITS

COURSE OBJECTIVE

- *To understand the fundamentals of number systems, Boolean algebra, Simplification of Boolean Function and Karnaugh map method.*
- *To understand the concepts of Combinational Logic Design, Programmable Logic Devices.*
- *To conceptualize the working of Sequential Circuits, Synchronous Sequential Circuits and Classifications of Memory.*

COURSE OUTCOME

On successful completion of the module students will be able to:

- *To implement number systems, Boolean algebra and Karnaugh map simplification method in the design of digital systems.*
- *Design and analyze Combinational Logic Design and Programmable Logic Devices.*
- *Design and construct Combinational Logic circuits and Synchronous Sequential Circuits.*

UNIT- I

Number System: Binary Number Representations – Signed Numbers and Complements, Unsigned, Fixed point, and Floating point numbers. Addition and subtraction with 1's and 2's complements. **Codes:** Binary code for decimal numbers-Gray code-Codes for detecting and correcting errors: Even and Odd parity codes, Hamming Codes, Checksum codes, m-out–of-n-codes. **(12)**

UNIT – II

Boolean Algebra: Basic theorems- Postulates- Duality – Boolean Function- Canonical form-Standard form. **Simplification of Boolean Function:** Karnaugh map method – Quine-McCluskey method -Incompletely specified functions. Realization of logic functions - NAND gate realization - NOR gate realization - Multilevel synthesis.

(12)

UNIT - III

Combinational Logic Design: Half adder - Full adder– Parallel Adder- Carry Look Ahead Adder – BCD Adder – Magnitude Comparator – Encoders and Decoders – Multiplexers – Code converters – Parity generator, Parity checker- Combinational circuit implementation using multiplexers and decoders.

Programmable Logic Devices: PROM – EPROM – EEPROM- Programmable Logic Array (PLA) – Programmable Array Logic (PAL) -Realization of combinational circuits using PROM,PLA and PAL. **(12)**

UNIT – IV

Sequential Circuits: General model of sequential circuits –latches – Master-slave Configuration- Flip-Flops - Concept of State – State diagram – State Table.

Synchronous Sequential Circuits – Binary ripple counters-Design of Synchronous counters- binary counters- Arbitrary sequence counter - BCD counter – Shift Registers – Ring Counter – Johnson Counter – Timing diagram – Serial Adder – PN sequence generator.

Sequential PLDs – Block diagrams of CPLD and Field programmable Gate Array (FPGA). **(12)**

UNIT – V

Memory: Classification of Memories – RAM Organization – Write Operation – Read Operation – Memory Cycle – Timing Waveforms – Memory Decoding – Memory Expansion – Static RAM Cell –Dynamic RAM Cell. **(12)**

Text Books:

1. John F. Wakerly, "Digital Design Principles and Practices", PHI Private Ltd., New Delhi, Fourth Edition, 2006
2. Morris Mano, "Digital design", PHI Learning, Fourth Edition, 2008.

Reference Books:

1. Donald P Leach, Albert Paul Malvino and GoutamSaha, "Digital Principles and Applications," 6thedition,Tata McGraw Hill Publishing Company Ltd.,New Delhi,2008.
2. Thomas L. Floyd, "Digital Fundamentals," Dorling Kindersley (India) Pvt. Limited, 8th ed., 2008.
3. Tocci R J, "Digital systems: Principles and Applications", PHI learning, New Delhi, Tenth Edition 2006.

Web References:

1. www.technologystudent.com
2. www.facstaff.bucknell.edu
3. www.chegg.com

EC T46-ELECTRONIC COMMUNICATION SYSTEMS

COURSE OBJECTIVE

- *To obtain the knowledge of modulation, methods of generation and detection of AM, FM and PM signal.*
- *To study the basic principles of Noise, Noise Figure, RADAR and different types of RADAR.*
- *To obtain the knowledge on Television systems and standards, Black and white transmission and reception, colour transmission, reception and Digital TV.*

COURSE OUTCOME

On successful completion of the module students will be able to:

- *To understand different modulation techniques and their for different communication systems.*
- *Identify, and understand different types of Noise signals, Noise Figure, RADAR and different types of RADAR.*
- *Apply fundamental knowledge of engineering to understand Television systems and standards, Black and white transmission and reception, colour transmission, reception and Digital TV.*

UNIT-I

Amplitude Modulation and Demodulation:
Need for modulation-Amplitude modulation-Frequency spectrum-Power relation-Different types of AM modulators-SSB and VSB generation-AM transmitters-Block diagram-Functions of each block-High level transmitter. Detection - Diode detectors-Synchronous detection. Receivers- different types AM receivers- Block diagram-choice of IF and oscillator frequencies-Tracking-Alignment-AVC, AFC-Communication receivers- AM characteristics. **(12)**

UNIT-II

Angle Modulation and Demodulation: Principle of frequency and phase modulation-Relation between FM and PM waves-Bandwidth of FM-Narrow band and wideband FM-Generation of FM wave-Direct and Indirect methods-FM transmitters-Block diagram-Function of each block. Detection –FM detectors-Slope detectors-Phase discriminators-Ratio detectors. Receivers- different types FM receivers - Block diagram.FM – Receiver characteristics. **(12)**

UNIT-III

Noise: External and internal noise-Noise figure and noise temperature-AWGN. Noise performance of AM system- Introduction –Destination SNR of a Base band system-Model for linear modulation system-S/N for SSB-SC, DSB-SC and AM systems. Noise

performance of frequency modulated system. Pre-emphasis and De-emphasis-Threshold effect in FM. **(12)**

UNIT-IV

RADAR: Basic principles of RADAR system- Range equation- Pulse radar system- Basic Pulsed radar system-antennas and scanning-display methods-pulsed radar system- MIT radar- radar beacons. CW Doppler Radar- FM CW Radar –Phased array radars-Planar array radar. **(12)**

UNIT-V

Television: Introduction of Television-Television systems and standards-Black and white Transmission-black and white reception-colour transmission and reception-Digital Television-Digital TV receivers – colour receiver of new generation- EDTV-HDTV- colour receiver of the future. Introduction to modern TV cameras, LCD and plasma displays. **(12)**

Text Books:

1. George Kennedy and Bernard Davis, "Electronic Communication Systems", TataMcGraw Hill, Fourth Edition, 2008.

2. Wayne Tomasi, "Electronic Communication Systems- Fundamentals Theory Advanced", Fourth Edition, Pearson Education, 2001.

Reference Books:

1. Roddy and Coolen, "Communication Systems", PHI learning, 2001.

2. A.M. Dhake, "Television and Video Engineering", McGraw Hill Publications, 2008.

3. P.Ramakrishna Rao, "Analog Communication", McGraw Hill Publications, 20011.

4. R.R Gulati, "Colour Television and Priciples and Practice",New Age International (P) Ltd.

EC P41 - ELECTRONIC CIRCUITS DESIGN LABORATORY

1. a) Design and measurement of frequency response, signal handling capacity, input and output impedances of CE amplifier.

   b) Differential amplifier.

   Differential mode performance, Common mode performance and measurement of CMRR.
2. Design and measurement of frequency response, signal handling capacity, input and output impedances of Emitter follower and Darlington Pair.
3. Design and measurement of frequency response, signal handling capacity, input and output impedances of common source and common drain FET amplifier.
4. Design and measurement of frequency response, signal handling capacity, input and output impedances of cascade amplifier and cascode amplifier.
5. To design, construct and measure the frequency response, input impedance and output impedance of (i) voltage shunt (ii) voltage series negative feedback amplifiers with and without feedback.
6. To design, construct and study the low frequency and high frequency oscillators.
7. a) To design, construct and study the RC Integrator, RC Differentiator,Clampers and Voltage Multipliers

   b) To design, construct and study the UJT relaxation oscillator
8. a) To design, construct and study the BJT based Astable multivibrator and Monostable multivibrator

   b) To design, construct and study the BJT based Bistable multivibrator and Schmitt trigger circuits.
9. a) To design, construct and study the Miller integrator and Bootstrap ramp generator

   b) To simulate the Bootstrap ramp generator circuit using PSPICE
10. a) To obtain the frequency Vs. power and load Vs. power characteristics of Class A power amplifier

    b) To obtain the frequency Vs. power and load Vs. power characteristics of Class B complementary symmetry amplifier

*Practical performance is to be compared with PSPICE simulated results.

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EC P42-DIGITAL CIRCUITS LABORATORY

2. Design and implementation of the following Code convertors
   i. BCD to excess-3 code and vice versa
   ii. Binary to gray code and vice-versa

3. Design and implementation of 4 bit binary Adder/ Subtractor and BCD adder using IC7483

4. Magnitude comparator
   a) Study of 4-bit magnitude comparator IC
   b) Realization of 8-bit magnitude comparator using 4-bit magnitude comparator ICs

5. Multiplexers and Encoders
   i. Study of an 8×1 multiplexer IC
   ii. Realization of 16×1 multiplexer using 8×1 multiplexer ICs
   iii. Realization of a combinational circuit using multiplexer
   iv. Construction and study of a simple Priority Encoder

6. Decoders and Demultiplexers
   a) Study of a 3 to 8 line decoder IC
   b) Study of a 3 to 8 line decoder as demultiplexer
   c) Sudy of the cascading arrangement of an 8×1 multiplexer IC and a corresponding demultiplexer IC
   d) Realization of 4 to 16 line decoder using 3 to 8 line decoder ICs
   e) Realization of a combinational circuit using a decoder IC

7 Shift register
   a) Study of a universal shift register IC
   b) Construction of ring counter and Johnson counter using a shift register IC and study of their timing diagrams
   c) Designing a PN Sequence Generator using a shift register IC

8 Ripple Counters and their timing diagrams
   a) 3-bit binary counter
   b) 3-bit binary up/down counter
   c) A modulo-N-counter($N \neq 2^n$ where n is the no. of FFs used to construct the counter)
   d) BCD counter using mod-10 counter ICs

9 Design and implementation of Synchronous Counters and study of their timing diagrams
   a) Binary counter
   b) Non-sequential binary counter
   c) 3-bit binary up/down counter

9. Study of a Memory IC
    a) READ and WRITE operations involving memory chips
    b) Expansion of memory size

10. Writing Verilog code for the following circuits:
    i. Ex-OR Gate
    ii. Full Adder
    iii. Multiplexer
    iv. Binary Up-Counter
    v. Binary Up-down Counter
    vi. Shift Register

EC P43 - COMMUNICATION LABORATORY-I

1) AM modulator and demodulator
   a) To construct AM modulator and demodulator circuit and to trace message, carrier, modulated and demodulated signal.
   b) To determine the modulation index of AM by classical method and trapezoidal method.
2) FM modulator and demodulator
   a) To construct frequency modulator and demodulator circuit and to trace message, carrier, modulated and demodulated signal.
3) Sample & hold and PAM
   a) To construct sample and hold circuit and to trace the message and sample and hold signal.
   b) To construct PAM circuit and to trace the input and PAM signal.
4) Pre-emphasis and de-emphasis
   a) To construct pre-emphasis and de-emphasis circuit and to determine the frequency response.
5) Tuned and wideband amplifiers
   a) To construct tuned and wideband amplifiers and to determine the frequency response.
6) Frequency mixer and ring modulator
   a) To construct a frequency mixer and to test its operation.
   b) To construct a ring modulator and to trace the DSB-SC waveform.
7) Simple and delayed AGC
   a) To construct simple and delayed with and without AGC circuit and to test its impact.
8) PWM and PPM
   a) To construct PWM and PPM circuit and trace the output waveforms.
9) TDM
   a) To construct TDM circuit and to trace the multiplexed and de-multiplexed waveform.
10) Simulation of AM, FM, PAM, PWM and PPM
   a) To simulate AM modulator and demodulator using PSPICE/EWB and to trace the time domain and frequency domain signal.
   b) To simulate Direct and Indirect FM generation and detection using MATLAB and to trace the time domain and frequency domain waveform.
   c) To simulate PAM, PWM and PPM circuits using PSPICE/EWB and to trace the time domain signal.
   d) To simulate PAM, PWM and PPM using MATLAB and to trace the time domain and frequency domain waveform.
11) Simulation of Pre-emphasis, De-emphasis, TDM and FDM
   a) To simulate TDM and FDM using PSPICE/EWB and to trace the multiplexed and demultiplexed signal.
   b) To simulate Pre-emphasis and De-emphasis using PSPICE/EWB and to trace their characteristics.

SP P44 - PHYSICAL EDUCATION

Physical Education is compulsory for all the Undergraduate students

1. The above activities will include games and sports / extension lectures.
2. In the above activities, the student participation shall be for a minimum period of 45 hours.
3. The above activities will be monitored by the Director of Physical Education.
4. Pass /Fail will be determined on the basis of participation, attendance, performance and behaviour. If a candidate Fails, he/she has to repeat the course in the subsequent years
5. Pass in this course is mandatory for the award of degree.

MA T51 - PROBABILITY AND RANDOM PROCESSES

COURSE OBJECTIVE

- *To understand the basic probability concepts and analyze stochastic process.*
- *To understand and characterize discrete, continuous random variables and Markov Chains.*
- *To have an in depth knowledge of standard distribution which can describe real life phenomena.*

COURSE OUTCOME

On successful completion of the module students will be able to:

- *Apply knowledge of mathematics to solve problems on basic probability and analyze stochastic process.*
- *Identify, formulate, solve and characterize discrete, continuous random variables and Markov Chains.*
- *Apply formula and solve problems of Markov Chains and standard distribution which can describe real life phenomena.*

UNIT - I

Discrete Random Variables: Random Variables and their event spaces, The probability mass function, Distribution functions, Special discrete distributions - Bernoulli, Binomial, Geometric, Negative Binomial, Poisson, Hypergeometric, Discrete Uniform, Constant and Indicator, Probability Generating function. **(12)**

UNIT - II

Continuous Random Variables: The Exponential distribution, The Reliability, Failure density and Hazard function - Some important distributions: Hypoexponential, Erlang, Gamma, Hyper exponential, Weibull, Gaussian, Uniform and Pareto distributions.

(12)

UNIT - III

Stochastic Processes: Definition, Classification of Stochastic Processes, Strictly Stationary process, Wide Sense Stationary, Bernoulli Process, Poisson process, Renewal process (Fundamental Renewal equation only), Availability analysis.

(12)

UNIT - IV

Discrete Parameter Markov Chains: Introduction, Computation of n-step transition Probabilities, Chapman - Kolmogorov equation State classification and limiting Probabilities, M/G/1 queueing system, Pollaczek-Khinchine transform equation.**(12)**

UNIT - V

Continuous Parameter Markov Chain: The Birth and Death process (M/M/1, M/M/c, M/M/1/N, M/M/c/N (c<N), M/M/c/c, M/M/∞ models only, Derivation of mean number of customer in the system, in the queue and waiting time- Simple applications), Special case of Birth and Death model (Pure Birth and Pure Death Processes). **(12)**

Text Books:

1. KishorS.Trivedi**,** "Probability and Statistics with Reliability," Queueing and Computer Science Applications, John Wiley & Sons Inc. Second Edition, 2002
2. D.Gross and C.M.Harris, "Fundamentals of Queuing Theory," Wiley Students Edition, Third Edition, 1985.
3. T. Veerarajan, "Probability, statistics and Random Processes," Tata Mc.Graw-Hill Publishing Company Ltd.,3rd Edition, 2008.

Reference Book:

1. J.Medhi, Stochastic Processes, New Age International (P) Ltd., Second Edition, 1994.

Web References:

1. ocw.mit.edu
2. npteliitmacincourses11110504

EC T52 –DATA COMMUNICATION NETWORKS

COURSE OBJECTIVE

- *To introduce different network models, Types of error, Error detection and correction.*
- *To elaborate the concept of data link layer, various features of network layer and routing protocols.*
- *To examine the effectiveness of the congestion and traffic management for TCP, ATM packets and various network security schemes.*

COURSE OUTCOME

On successful completion of the module students will be able to:

- *Apply knowledge of science and engineering to understand and analyze different network models, Types of error, Error detection and correction.*
- *Identify, formulate, and analyse protocols and network routing.*
- *Apply fundamental knowledge to understand, as well as to analyze and interpret data about transport congestion and network security.*

UNIT- I

Network Models: Data communications- Networks-PAN,LAN, MAN and WAN-Internet, Intranet and Extranets- Protocols and standards- OSI/ISO reference model-TCP/IP protocol suite- Broadband ISDN- ATM protocol reference model--SONET/SDH architecture-Bluetooth and UWB –WiFi-WiMax-Cognitive Radios-Adhoc and Sensor Networks-Green communications. **(12)**

UNIT- II

Data Link Control and Medium Access: Types of errors- Error detection and correction- Checksum- Framing-Flow control-Stop and wait protocol- Go-back N-Selective repeat protocolsHDLC-Random access protocols- Controlled access- Wired LANs- IEEE standards, IEEE 802.3, 802.4, 802.5 and 802.6- - Fast Ethernet- Gigabit Ethernet -WirelessLANs- IEEE 802.11. **(12)**

UNIT- III

Network Routing : Logical addressing- IPv4 addresses- IPv6- Internet protocol-Transition from IPv4 to IPv6- Mapping logical to physical address- Mapping physical to logical address- ICMP-Direct Vs indirect delivery- Forwarding- Unicast and Multicast routing protocols- Different Routing Algorithms-Internetworking-Routers and gateways. **(12)**

UNIT- IV

Transport and Congestion: Elements of Transport Protocols: addressing, Connection Establishment, Connection Release, Error Control and Flow Control – Congestion control: Desirable Bandwidth Allocation, Regulating the Sending Rate, Wireless Issues-UDP, RPC -TCP Protocol, TCP connection management, TCP sliding window and congestion control. **(12)**

UNIT- V

Security: Introduction to Cryptography, Cipher text, symmetric key cryptography – AES and DES, RSA public key and private keys- Digital signature.Security in the Internet: IPSec, PGP, VPN and Firewalls. Authentication Protocols: Shared Secret Key, The Diffie-Hellman Key Exchange, Authentication Using Kerberos. Wireless Security-issues and challenges-Advantages and Applications-Security for mobile devices, network and server levels. **(12)**

Text Books:

1. Behrouz. A. Forouzan, "Data Communication and Networking", Fifth Edition, McGraw Hill, New Delhi, 2013.
2. William Stallings," Data and computer communications", Ninth Edition,Pearson Education, New Delhi, 2014.
3. Pallapa Venkatram and Sathish Babu.B, "Wireless &Mobile Network security", Tata Mc. Graw Hill, New Delhi, 2010

References :

1. Andrew .S. Tanenbaum, "Computer Networks", Fourth Edition, PHI Learning Private
2. Ltd, New Delhi, 2012.
3. William Stallings, "High Speed Networks and Internets", Second Edition, Pearson Education Asia, New Delhi, 2008.
4. Peterson. L and Davie. B, "Computer Networks", Morgan Kauffmann, New Delhi,2008.

Web references:

1. http://www.iaria.org/conferences2008/filesCTRQ08/CTRQ_2008_WiMAX_tutorial_EB- v1.3.pdf
2. http://www.intel.com/technology/itj/q22001/pdf/art_4.pdf
3. http://www.cs.tut.fi/kurssit/TLT-6556/Slides/5-CognitiveRadio.pdf
4. http://www.wirelessinnovation.org/cognitive_radio_concept_architecture

EC T53 - MICROPROCESSORS AND MICROCONTROLLERS

COURSE OBJECTIVE

- *To understand the Architecture of 8085, assembly language programming and interfacing of peripheral devices.*
- *To understand the features of 8-bit Microcontroller and system design.*
- *To explore the features of 16 bit and higher Microprocessors' architectures*.

COURSE OUTCOME

On successful completion of the module students will be able to:

- *Apply logical thinking to create assembly language programs and interfacing of peripheral devices.*
- *Apply fundamental knowledge of science and engineering to understand architecture of microprocessor and its hardware interfacing.*
- *Design and analyze microcontroller controller based system and its peripheral interfaces.*

UNIT I

INTEL 8085 Architecture and Programming:– Microprocessors—Introduction and Evolution, Architecture of 8085–ALU, general purpose and special registers, timing and control unit; Pin layout and Description of signals-address and data buses, control, status and I/O signals; Instruction Set and Execution –classification of instructions, format, addressing modes, instruction set, execution and timing diagram; Assembly Language Programming-looping, branching, code conversion, bit manipulation, stacks and subroutines. **(12)**

UNIT II

Hardware Interfacing with INTEL 8085: Methods of Data Transfer and Interrupt Structure; Interfacing Memory and I/O Devices; Interfacing of programmable devices-programmable peripheral interface- 8255, Keyboard and display interface 8279–Programmable timer 8253, USART 8251,Programmable Interrupt controller 8259, DMA controller 8237. **(12)**

UNIT III

Intel 8051 Microcontrollers: Microcontrollers Vs Microprocessors; 8051 Architecture -Instruction set and programming; Special Function Registers, Hardware Features – Parallel ports, Counters and Timers – Serial I/O– Interrupts.

Introduction to PIC16F877 Microcontroller- Architecture and features. Introduction to ARM processor. **(12)**

UNIT IV

INTEL 8086—16-Bit Microprocessors: 8086 Microprocessor Architecture, Features, and Signals, Addressing Modes, Instruction Set, and Programming. Features of Advanced Microprocessors 80286, 80486 and Pentium Processors. **(12)**

UNIT V

8051 Microcontroller based Systems Design: Interfacing-ADC and DAC chips-Square and Sine wave generation, push button switch, Microcontroller Application Examples—Stopwatch, Interfacing DC Motors, stepper motor and Servomotors, Thermometer, Traffic light control.

RTC Interfacing using I^2C Standard-Details of I^2C bus, Subroutines used to implement I^2C bus, DS1307—Serial I^2C real-time clock IC. **(12)**

Text books:

1. N.Senthil Kumar, M.Saravanan and S.Jeevananthan, "Microprocessor and Microcontrollers", OXFORD UNIVERSITY PRESS, November, 2010.
2. Ramesh Goankar, "Microprocessor Architecture Programming and Applications with8085", Penram International Publishing, 1999.

Reference books:

1. KennethJ.Ayala, "The 8051 Microcontroller Architecture Programming andApplications", Penram International Publishing (India). 1996.
2. Uffenbeck, "The 8086/8088 family: The design, Programming and Interfacing",Prentice Hall of India Pvt, Ltd, 2008.
3. John B Peatman, "Design with PIC Microcontrollers", Pearson Education Asia,1998.
4. Ajit Paul, "Microprocessor Principles and Applications", Tata McGraw Hill Publishing Co. Ltd, 2000.

Web references:

1. www.PICmicrocontroller.com
2. www.embeddedelectronics.org

EC T54 SYSTEM DESIGN USING INTEGRATED CIRCUITS

COURSE OBJECTIVE

- *To gain knowledge on Linear IC-Operational Amplifier IC 741, IC Regulators, IC555 and PLL565 its applications in the field of Engineering.*
- *To understand the design concepts of Analog to Digital, Digital to Analog Converters and the different Digital IC Families.*
- *To design Synchronous and Asynchronous Sequential Logic circuits.*

COURSE OUTCOME

On successful completion of the module students will be able to:

- *Implement different IC's like Operational Amplifier IC 741, IC Regulators, IC555 and PLL565 in various fields of Engineering.*
- *Design and conduct experiments using Data converters and Digital Integrated circuits.*
- *Design system and demonstrate state diagrams and state machines using Sequential Logic circuits.*

UNIT I

Linear IC- Operational amplifier: Introduction to linear ICs – Operational amplifier IC741 – Block diagram and characteristics – DC and AC performance – Open loop configurations – Feedback configurations – Inverting , Non inverting and Differential amplifier – Summer, Subtractor, Integrator, Differentiator – Zero crossing detector – Schmitt trigger – Window detector – Astable and Monostable Multivibrators, V-I and I-V Converters. Filter and its types – Instrumentation amplifier – Precision rectifiers - Logarithmic and antilog amplifiers – Multiplier. **(12)**

UNIT II

Other LICs and Data Converters: 555 timer – Block diagram and features – Astable Multivibrator – Applications - Square wave oscillator, Ramp generator, Triangular waveform generator and Voltage to frequency converter – Monostable Multivibrator – applications - Frequency divider.

PLL565, Principle, Building blocks – Applications – Frequency multiplication, Frequency translation, AM and FM detection.

Data converters – DAC characteristics – Binary weighted DAC, R-2R DAC, Monolithic DAC-08– ADC characteristics–Flash ADC, Successive Approximation ADC, Dual slope integrating type ADC. **(12)**

UNIT III

Digital Integrated Circuits: Digital IC characteristics, Digital IC families -RTL and DTL, TL, I^2L, TTL, ECL, MOS and CMOS logic circuits, Comparison of digital IC families. **(12)**

UNIT IV

Design of sequential machines: Analysis and design of synchronous sequential machines– Mealey and Moore machines – State table – State diagram – State reduction and assignments – Analysis and design of asynchronous sequential logic – Race conditions –Design problems from specifications – Hazards in combinational and sequential circuits. **(12)**

UNIT V

Processor and control unit design: Registers – Register transfer logic – inter register transfer, bus transfer and memory transfer, Arithmetic logic and shift micro operations –Macro operations – Processor logic design – Processor organization- Bus organization –Processor unit employing a scratch pad memory – Accumulator– Design of ALU – Design of status register- Design of processor unit with control variables – Design of accumulator– Control logic design – Single flip-flop/state method –Sequence register and decoder method. **(12)**

Text Books:

1. Ramakant A. Gayakwad, "Op-amps and Linear Integrated Circuits", Prentice Hall PTR, 2008.
2. M. Morris Mano and Michael D. Ciletti, "Digital Design", PHI Learning Pvt. Ltd,Fourth Edition, 2008.

Reference Books:

1. Robert.F.Coughlin and Frederick F. Driscoll, "Operational Amplifiers and Linear Integrated Circuits", PHI Learning Pvt. Ltd, Sixth Edition, 2008.
2. B. S. Sonde, System design using Integrated Circuits , New Age Pub, 2nd Edition, 2001 Gray and Meyer, Analysis and Design of Analog Integrated Circuits, Wiley International, 2005.
3. Michael Jacob, Applications and Design with Analog Integrated Circuits, Prentice Hall of India, 1996.
4. William D. Stanley, Operational Amplifiers with Linear Integrated Circuits, Pearson Education, 2004.

5. K. Lal Kishore, Operational Amplifier and Linear Integrated Circuits, Pearson Education, 2006.
6. S. Salivahanan& V.S. KanchanaBhaskaran, Linear Integrated Circuits, TMH, 2008

Web References:

1. www.sapnaonline.com/index.php?...linear-integrated-circuits...
2. www.vidyarthiplus.in/2011/10/linear-integrated-circuits-lecture.html
3. http://www.infibeam.com/Books/info/Roy-Choudhury/LinearIntegratedCircuits/9788122420906.html
4. www.analog.com/static/imported-files/data_sheets/AD633.pdf

EC T55 - TRANSMISSION LINES AND WAVEGUIDES

COURSE OBJECTIVE

- *To introduce the various types of transmission lines and to discuss the losses associated.*
- *To give thorough understanding about impedance transformation and matching.*
- *To use the Smith chart in problem solving.*

COURSE OUTCOME

On successful completion of the module students will be able to:

- *Apply fundamental knowledge of science and engineering to understand the various types of transmission lines and losses associated.*
- *Identify, formulate, and solve engineering problems in transmission lines and waveguides.*
- *Design and conduct experiments, as well as to analyze about Electromagnetic Induction and Electromagnetic Waves.*

UNIT- I

Network Parameters: Open circuit impedance (Z) parameters - short circuit admittance (Y) parameters - transmission (ABCD) parameters and inverse transmission parameters - Hybrid (h) parameters and inverse hybrid parameters - Conversion between parameters –Design of K type and m-derived filters – Switched twin T network , attenuators and equalizers. **(12)**

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UNIT- II

Transmission Line Theory: Transmission line equation – Primary and secondary constants - Infinite line- attenuation and phase constants- skin effect- wavelength- velocity of propagation- group velocity. Waveform distortion- distortion less transmission line-telephone cable- inductance loading of telephone cables. Open and short circuit lines. **(12)**

UNIT-III

Transmission Line at Radio Frequencies: Line with any termination- Input impedance, input impedance of a lossless line, Reflection coefficient- Standing wave ratio. Ultra high frequency lines- Characteristics impedance, SWR, Smith chart- applications of smith chart- Quarter wave transformer-Stub matching- Single and double. **(12)**

UNIT IV

Guided Waves and Rectangular waveguides: Introduction - Waves between parallel planes - Transverse electric waves, Transverse magnetic waves, Transverse electromagnetic waves and their characteristics -Wave impedances. Rectangular

waveguides - TE and TM waves in rectangular waveguide- Dominant mode - Impossibility of TEM waves in wave guides - Wave impedance and characteristic impedance - Excitation methods for various modes. **(12)**

UNIT V

Circular Wave Guides: Introduction – TE and TM waves in circular waveguide- Wave impedance - Attenuation factor and Q of wave guides- Wave impedance- Excitation modes in circular wave guides. Microwave resonators introduction – Coaxial resonator-Waveguide, rectangular and circular cavity resonator - Cavity excitation and tuning – Q factor of micro wave cavities (Qualitative treatment only). **(12)**

Text Books:

1. John. D. Ryder, "Network lines and fields", PHI Learning, Second Edition, 2005.
2. Edward C.Jordan and Keith G.Balaman, "Electromagnetic waves and radiating systems", Second Edition, PHI Learning, 2007.
3. P. Dananjayan, "Transmission Lines And Wave Guides" Lakshmi Publications, Chennai, 2012

Reference Books:

1. M.E. Van Valkenburg, "Network Analysis", PHI, Third Edition, 2008.
2. William H Hayt and Jr John A Buck, "Engineering Electromagnetics" Tata Mc Graw-Hill Publishing Company Ltd, New Delhi, 2008
3. David K Cheng, "Field and Wave Electromagnetics", Pearson Education Inc, Delhi, 2004
4. John D Kraus and Daniel A Fleisch, "Electromagnetics with Applications", Mc Graw Hill Book Co, 2005

Web references:

1. Transmission Line Parameter Calculator
2. SPICE Simulation of Transmission Lines

EC P51 - MICROPROCESSOR AND MICROCONTROLLER LABORATORY

Experiments based on 8085 Microprocessor

- 8 bit and 16 bit Arithmetic Operations
- Array operations
- Bit Manipulation operations
- Code conversions
- Subroutines
- Digital Clock simulation
- Block operations

Experiments based on 8051/PIC microcontroller

- LCD interface
- ADC /DAC interface
- Stepper motor interface
- Serial communication (kit-to-kit and/or pc-to-kit)
- Watch dog timer
- Real-time clock
- Printer interfacing
- Water level indicator
- Traffic light controller
- Elevator simulation
- Pulse width modulation
- Interfacing of relay switches

EC P52 - SYSTEM DESIGN USING INTEGRATED CIRCUITS LABORATORY

1. Applications of Op-amp
   To study the application of Opamp IC741 as
   a. Inverting amplifier
   b. Non-inverting amplifier
   c. Voltage follower
   d. Summer
   e. Subtractor
2. Differentiator and Integrator
   To study the op-amp performance as differentiator and integrator for various time constants
3. Comparator circuits
   To study zero crossing detector, window detector and Schmitt trigger using opamp 741
4. Signal converters
   To study operation of op-amp as V to I and I to V converters
5. Active filters using Op-amp
   To design and test the performance of a 2^{nd} order LPF, HPF, BPF and BSF
6. Log, antilog and instrumentation amplifier
   To study 1.logarithmic and antilog amplifiers
   2. Instrumentation amplifier
7. Multivibrators using Op-Amp
   To design and study the working of a. Astable Multivibrator
   b. Monostable Multivibrator using IC 741.
8. Data converters
   Construction and study performance of a. DAC circuits – R-2R and ladder type.
   b. Successive approximation type ADC.
9. Multivibrators using IC 555
   To design and study the working of a. Astable Multivibrator
   b. Monostable Multivibrator using IC 555.
10. Frequency synthesizers
    To study performance of a. Frequency multiplier using PLL IC 565
    b. Frequency synthesizer using IC XR2240
11. Precision rectifiers
    To study performance of half wave and full wave precision rectifiers using IC 741.

EC P53 - NETWORKS AND TRANSMISSION LINES LABORATORY

1. Design of k type Low pass and high pass filters.
   a. Frequency and phase response of the Low pass filter using Lumped elements.
   b. Frequency and phase response of the High pass filter using Lumped elements.

2. Design of k type Band pass and Band stop filters.
   a. Frequency and phase response of the Band pass filter using Lumped elements.
   b. Frequency and phase response of the Band stop and notch filter using Lumped elements.

3. Design of m derived filters.
   a. Frequency and phase response of the m derived low pass filter.
   b. Frequency and phase response of the m derived high pass filter.

4. Simulation of filters.
Design of LPF/HPF/BPF/BEF, T / π, constant k/m derived /composite for the given cutoff frequency using MATLAB - phase and frequency response.

5. Design of switched Twin T network.
Frequency and phase response of a Twin T network.

6. Characteristics of Attenuators and Equalizers.
   a. Measurement of attenuation of a transmission line for various lengths (like 25, 50, 75, 100 meters) - frequency response of the line at a fixed length.
   b. Study of frequency response of an equalizer that can boost or attenuate frequencies 50Hz, 1 KHz and 10 kHz.

7. Simulation of equalizer.
Design of an attenuator/phase equalizer and obtain the relevant responses.

8. Impedance (Z) and ABCD Parameters of a transmission line
   a. Measurement of Z parameters of a transmission line constructed using Lumped elements.
   b. Measurement of ABCD parameters of a transmission line constructed using Lumped elements.

9. Design of LC resonant circuit
Frequency response – measurement of quality factor of a LC resonant circuit.

10. Characteristics of a low-loss transmission line.
   a. Measurement of characteristic impedance of the twin pair transmission line.
   b. Measurement of capacitance and inductance per unit length of a coaxial cable.
   c. Measurement of voltage reflection coefficient and voltage standing wave ratio of a twin pair using VSWR meter.

11. Impedance matching on transmission line
   a) Maximizing the power across a given load connected to a twin pair transmission line using a single stub and smith chart analysis
   b) Maximizing the power across a given load connected to a twin pair transmission line using a double stub and smithchart analysis

HS P54 - GENERAL PROFICIENCY-I

UNIT - I

Art of Communication: Verbal and Non-verbal Communication – Barriers to Communication – Importance of Body Language – Effective Listening – Feedback

UNIT - II

Introduction to Soft Skills: Attitude – Self-Confidence – Leadership Qualities – Emotional Quotient – Effective Time Management Skills – Surviving Stress – Overcoming Failure – Professional Ethics – Interpersonal Skills

UNIT - III

Writing: Importance of Writing – Written Vs Spoken Language – Formal and Informal Styles of writing – Resources for improving writing – Grammar and Usage – Vocabulary Building – SWOT analysis

UNIT - IV

Speaking Practice: Dialogue – Telephone Etiquette – Public Speaking – Debate – Informal Discussions – Presentations

UNIT - V

Aptitude: Verbal and Numerical aptitude.

References:

1. Nicholls, Anne. Mastering Public Speaking. Jaico Publishing House,2003.
2. Aggarwal, R.S. Quantitative Aptitude. S.Chand&Co.,2004.
3. Leigh, Andrew and Michael Maynard. The Perfect Leader. Random House Business Books,1999.
4. Whetton .A.David and Kim S. Cameron. Developing Management Skills. Pearson Education, 2007.
5. K.R. Lakshminarayan. Developing Soft Skills. Scitech, 2009.
6. Sherfield M Robert. Developing Soft Skills Pearson Education, 2005.
7. Hair O' Dan, Friedrich W. Gustav and Lynda Dee Dixon. Strategic Communication in Business and the Professions. Pearson Education,2008.
8. Chaney Lilian and Jeanette Martin. Intercultural Business Communication, Fourth Edition. Pearson Education, 2008.

EC T61- DIGITAL COMMUNICATION

COURSE OBJECTIVE

- *To analyze various filters receivers and basic types of modulation.*
- *To analyze the basic concepts of spread spectrum technology.*
- *To understand the concept of synchronization and analyze the different encryption standards.*

COURSE OUTCOME

On successful completion of the module students will be able to:

- *Apply fundamental knowledge of engineering to understand and analyze various filters, receivers and basic types of modulation schemes*
- *Design and conduct experiments, as well as to analyze and interpret data about Spread spectrum technologies, frequency hopping and CDMA.*
- *Apply the knowledge of mathematics and engineering to understand and solve encryption and decryption algorithms.*

UNIT I

Base Band Transmission: Base band transmission - Wave form representation of binary digits - PCM, DPCM, DM, ADM systems - Detection of signals in Gaussian noise -Matched filter - Application of matched filter - Error probability performance of binary signaling - Multilevel base band transmission - Inter symbol interference - Eye pattern -Companding - A law and μ law- correlation receiver. **(12)**

UNIT- II

Band Pass Transmission: ASK, FSK, PSK, QPSK, DQPSK, MSK, QAM - Detection of signals in noise - Coherent and Non-coherent detection of ASK, FSK and PSK - Comparison of error performance of non- coherently and coherently detected ASK, FSK and PSK systems - M-ary signaling - Vectorial view of MPSK and MFSK - error performance. **(12)**

UNIT- III

Spread Spectrum Communication: Spread spectrum technologies - spreading techniques- PN sequences - Direct sequence spread spectrum systems - Frequency hopping spreadspectrum systems - Hybrid systems - Demodulation schemes - RAKE Receivers - Use ofspread spectrum with code division multiple access. **(12)**

UNIT- IV

Synchronization: Receiver synchronization - Coherent systems - Symbol and frame synchronization - Network synchronization - Open and closed loop transmitter synchronization - Tracking and acquisition in spread spectrum system. **(12)**

UNIT- V

Encryption and Decryption: Model encryptor - decryptor - Classical encryption techniques - Cipher principles - Data encryption standard - Stream encryption- Key management - Diffie-Hellman key exchange - Elliptic curve architecture and cryptography- Public key encryption system- RSA algorithm. **(12)**

Text Books:

1. Bernard Sklar, "Digital Communication", Second Edition, Prentice Hall, Upper Saddle River, NJ, 2008.
2. Simon Haykin, "Digital Communications", John Wiley and Sons, 2008.

Reference Books:

1. Bruce Carlson, "Principles of Digital Communication", Tata McGraw Hill, 2008.
2. Taub and Schilling, "Principles of Communication systems", Tata McGraw Hill, India, 2008.
3. William Stallings, "Cryptography and Network Security - Principles and Practices", PHI Learning, Third Edition, 2008.
4. Proakis. JG, "Digital Communications", McGraw Hill Publications, 2008.

Web references:

1. www.dsplog.com
2. www.learnabout_electronics.org

EC T62 WIRELESS COMMUNICATION

COURSE OBJECTIVE

- *To introduce the concepts of wireless / mobile communication using cellular environment.*
- *To make the students to know about the various propagation models, coding and multi access techniques used in the mobile communication.*
- *To introduce various wireless network systems and standards.*

COURSE OUTCOME

On successful completion of the module students will be able to:

- *Apply fundamental knowledge of engineering to understand the concepts of wireless / mobile communication using cellular environment.*
- *Design and conduct experiments, as well as to analyze and interpret data about the various propagation models, coding and multi access techniques used in the mobile communication.*
- *Design and understand various wireless network systems and standards.*

UNIT I

SERVICES AND TECHNICAL CHALLENGES: Types of Services, Requirements for the services, Multipath propagation, Spectrum Limitations, Noise and Interference limited systems, Principles of Cellular networks, Multiple Access schemes. **(12)**

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UNIT II

WIRELESS PROPAGATION CHANNELS (Qualitative Treatment only): Free space propagation model- basic propagation mechanisms –reflection- ground reflection model-diffraction-scattering- -outdoor and indoor propagation models. Small scale fading and multipath: Small scale multipath propagation-Impulse response model of multipath channel –small scale multipath measurements –parameters of mobile multipath channels -types of small scale fading. **(12)**

UNIT III

SIGNAL PROCESSING IN WIRELESS SYSTEMS: Principle of Diversity, Macrodiversity, Microdiversity, Signal Combining Techniques, Transmit diversity, Equalizers- Linear and Decision Feedback equalizers, Review of
Channel coding and Speech coding techniques. **(12)**

UNIT IV

ADVANCED TRANSCEIVER SCHEMES: Spread Spectrum Systems- Cellular Code Division Multiple Access Systems- Principle, Power control, Effects of multipath propagation on Code Division Multiple Access, Orthogonal Frequency Division

Multiplexing – Principle, Cyclic Prefix, Transceiver implementation, Second Generation(GSM, IS–95) and Third Generation Wireless Networks and Standards. **(12)**

UNIT V

WIRELESS DATA SERVICES: First Wave of Mobile Data Services: Text-Based Instant Messaging. Second Wave of Mobile Data Services: Low-Speed Mobile Internet Services. Current Wave of Mobile Data Services: High-Speed and Multimedia Mobile Internet Services. IP-Based Wireless Networks - 3GPP, 3GPP2. **(12)**

Text Books:

1. Andreas.F. Molisch, "Wireless Communications", John Wiley – India, 2006.
2. Simon Haykin & Michael Moher, "Modern Wireless Communications", Pearson Education, 2007.

Reference Books:

1. Rappaport. T.S., "Wireless communications", Pearson Education, 2003.
   Gordon L. Stuber, "Principles of Mobile Communication", Springer InternationalLtd.,2001.
2. Andrea Goldsmith, Wireless Communications, Cambridge University Press, 2007.
3. Jyh-Cheng Chen and Tao Zhang, "IP-Based Next-Generation Wireless Networks Systems, Architectures, and Protocols," John Wiley & Sons, Inc. Publication, 2006.

EC T63-DIGITAL SIGNAL PROCESSING

COURSE OBJECTIVE

- *To introduce the advantages of digital signal processing, the theory and applications of IIR and FIR filters.*
- *To impart knowledge on the various types of errors that affect signals during digital signal processing.*
- *To introduce the concepts of power spectral density estimation for random signals, applications of multirate sampling and the architecture of DSP processors.*

COURSE OUTCOME

On successful completion of the module students will be able to:

- *Apply knowledge of mathematics, science and engineering to understand the advantages of digital signal processing, the theory and applications of IIR and FIR filters.*
- *Identify, formulate, and solve engineering problems related to various types of errors that affect signals during digital signal processing.*
- *Apply formulae and solve problems in power spectral density estimation for random signals, applications of multirate sampling and the architecture of DSP processors.*

UNIT- I

IIR Filter Design: IIR filters - advantages and disadvantages - Design of IIR filters from analog Butterworth and Chebyschev filters - Impulse invariance and bilinear transformation methods of IIR digital filter design – Realization of IIR filters – Direct form I, II, cascade, parallel and ladder realization. **(12)**

UNIT- II

FIR Filter Design:FIR filters – Introduction - Symmetric and asymmetric FIR filters – Linear phase FIR filters – Design of FIR using frequency sampling techniques – Design of FIR filters using windowing technique. Realization of FIR filters – Transversal, linear phase and polyphase realization structures. **(12)**

UNIT- III

Finite Word Length Effects: Fixed point and binary floating point number representations – Truncation and rounding errors - Quantization noise – quantization noise power– input quantization error – coefficient quantization error – product quantization error - Overflow limit cycle -Scaling to prevent overflow –Limit cycle oscillations. **(12)**

UNIT- IV

Spectrum Estimation and Multirate Signal Processing: Periodogram estimation – nonparametric methods – Bartlett and Welch methods – parametric methods – AR, MA and ARMA models. Principles of multirate DSP – Decimation and Interpolation by integer factors – subband coding of speech signals – QMF filters. **(12)**

UNIT- V

Digital Signal Processors: Introduction to programmable DSP processors – Von-Neumann architecture- Harvard architecture- VLIW architecture – MAC unit-pipelining.- Special addressing modes in P-DSPs- On chip peripherals, PDSPs with RISC and CISC- Architecture and addressing modes of TMS320C50 and TMS320C6X. **(12)**

Text Books:

1. John G. Proakis and Dimitris G. Manolakis, "Digital Signal Processing: Principles, Algorithms, and Applications", PHI learning, New Delhi, Fourth edition 2008.
2. L. R. Rabiner and B. Gold, "Theory and Application of Digital Signal Processing" PHI Learning, New Delhi, 1998.

Reference Books:

1. Sanjit K. Mitra, "Digital Signal Processing: A Computer Based Approach, Tata McGraw – Hill, Third Edition, 2005.
2. P.RameshBabu, "Digital Signal processing", Scitech Publications, Sixth Edition, 2014.

Web References:

1. https://engineering.purdue.edu/~bouman/ece438/lecture/module
2. http://freevideolectures.com/Course/2339/Digital-Signal-Processing-IITKharagpur
3. http://www.analog.com/en/content/beginners_guide_to_dsp/fca.html
4. http://www.mathworks.in/academia/student_center/tutorials/signal-processing-switchyard.html

EC T64 - ANTENNAS AND WAVE PROPAGATION

COURSE OBJECTIVE

- *To give insight of the radiation phenomena.*
- *To give a thorough understanding of the radiation characteristics of different types of antennas.*
- *To create awareness about the different types of propagation of radio waves at different frequencies.*

COURSE OUTCOME

On successful completion of the module students will be able to:

- *Apply fundamental knowledge of engineering to understand the concepts of the radiation phenomena.*
- *Design and conduct experiments, as well as to analyze and interpret the radiation characteristics of different types of antennas.*
- *Design and understand the different types of propagation of radio waves at different frequencies.*

UNIT I

Antenna Fundamentals: Power density, directivity, gain, radiation resistance, input impedance, radiation patterns, beam width, bandwidth and polarization. Retarded potential- Radiation from a current element and monopole – Radiation of half-wave and centre-fed dipole – Near and far fields, current distribution of dipole antennas. Linear array antennas - Arrays of two point sources – Broad side and end fire arrays, binomial array - Principle of pattern multiplication –Adaptive arrays. **(12)**

UNIT II

Aperture and Slot Antennas: Radiation from rectangular apertures, Uniform and Tapered aperture, Aperture blockage, Feeding structures, Horn antenna, Reflector antenna, Cassegrain reflector, Babinet's principle, Slot antennas, Lens antenna, Microstrip antennas – Radiation mechanism – Application. **(12)**

UNIT-III

Travelling Wave and Broadband Antenna: Travelling wave wire, V and Rhombic antenna, folded dipole, Yagi-Uda antenna, Log-periodic antenna, Biconical antenna, Spiral antenna, Helical antenna, Loop antenna. **(12)**

UNIT-IV

Special Antenna and Antenna measurements: Electromagnetic compatibility antenna –Calibration- Reconfigurable antenna, Active antenna, Dielectric antennas, Electronic band gap structure and applications, Patch antenna, Smart antenna - Antenna Measurements-Test Ranges, Measurement of Gain, Radiation pattern, Polarization, VSWR. **(12)**

UNIT-V

Propagation: Factors involved in the propagation of radio waves - Ground wave, reflection of radio waves by the surface of the earth - Space wave propagation, considerations in space wave propagation, atmospheric effect in space wave propagation - Ionosphere and its effect on radio waves, Mechanism of ionospheric propagation- Ray paths – Skip distance -Critical frequency-Maximum usable frequency - Fading of signal - Types of fading- Diversity reception. **(12)**

Text Books:

1. Edward C.Jordan and Keith G.Balaman, "Electromagnetic waves and radiating systems", Second Edition, PHI Learning, 2000.
2. Sisir K Das and Annapurna Das, "Antenna and Wave Propagation", Tata McGraw Hill Education Private Ltd.,2013.

Reference Books:

1. A.R.Harish and M.Sachidananda, "Antennas and wave propagation" , Oxford University Press, 2008.
2. J.D.Kraus, "Antennas", McGraw Hill 2005.

EC P61 - COMMUNICATION LABORATORY- II

1. Construct an Amplitude Shift Keying (ASK) modulator and demodulator circuit. Obtain the ASK modulated and demodulated waveforms.

2. Construct a Frequency Shift Keying (FSK) modulator and demodulator circuit. Obtain the FSK modulated and demodulated waveforms.

3. Construct a Binary Phase Shift Keying (BPSK) modulator and demodulator circuit. Obtain the BPSK modulated and demodulated waveforms.

4. To study the different line coding techniques 1) NRZ unipolar format 2) NRZ polar format 3) NRZ bipolar format and 4) Manchester format. Obtain the waveforms of the different formats.

5. Construct a Pulse code modulator and demodulator circuit. Obtain the coded output for the given sine wave.

6. Construct a Delta modulator and demodulator circuit. Obtain the coded output for the given sine wave.

7. To design and construct DS-CDMA circuit and verify its operation. Obtain the DS-CDMA waveform.

8. Construct a time division multiplexing circuit to combine two different data streams onto a single channel by assigning time slots to each. Obtain the TDM output.

9. Construct a frequency synthesizer circuit using PLL for the given frequency. Obtain the synthesized waveform.

10. Simulate BASK, BFSK and BPSK circuits using Matlab. Obtain the time domain and frequency domain response of the above modulation schemes. Compare its bit error performance.
11. Simulate M-ary ASK, FSK and PSK circuits for M = 2, 4,8,16 using Matlab. Compare its bit error performance.

12. Implementation of data encryption and decryption using Matlab.

EC P62 - COMPUTER NETWORKS LABORATORY

1. Generation of PDF

To study, generate and trace the following PDF

i. Gaussian distribution
ii. Uniform distribution
iii. Exponential distribution
iv. Rayleigh distribution
v. Binomial distribution
vi. Negative binomial distribution
vii. Gamma distribution
viii. Poisson distribution

2. Simulation of ON-OFF and voice traffic model

a) To simulate the ON-off traffic model and plot the following waveform

i. User numbers Vs ON period.
ii. Time slot Vs number of users.
iii. Time slot Vs bandwidth allotted.

b) To simulate voice traffic model and obtain

i. Time slot Vs bandwidth plot.
ii. Time slot Vs error plot.
iii. Average error rate.
iv. The optimum buffer size for which error rate will be less than stipulated value.

3. Simulation of data traffic and video traffic model

To simulate the data traffic and multiple rate video traffic for multiple users and to obtain

i. Time slot Vs bandwidth plot.
ii. Time slot Vs BER plot.
iii. The optimum buffer size for which error rate will be less than stipulated value.

4. Simulation of ISDN traffic model

To simulate the ISDN traffic model for multiple users and to obtain

i. Time slot VS bandwidth plot.
ii. Time slot Vs BER plot.
iii. Time slot Vs un-served video user.
iv. Time slot Vs un-served data user.

5. PN sequence generation and testing

To generate maximal and non maximal length PN sequence and test its randomness properties.

6. M/M/I queuing model

To simulate M/M/I queuing model and obtain

i. Time slot Vs packet loss plot.
ii. Maximum and average packet loss without buffer.
iii. Buffer size for the given loss.
iv. Maximum and average packet loss with buffer.

7. M/G/I and G/G/I queuing model.

To simulate a M/G/I and G/G/I queuing model and obtain

i. Time slot Vs packet loss plot.
ii. Maximum average packet loss without buffer.
iii. Buffer size for the given loss.
iv. Maximum and average packet loss with buffer.

8. Encryption and decryption

To simulate and test the following encryption and decryption algorithm.

i. Mono alphabetic cipher- caeser cipher.
ii. Poly alphabetic cipher- Trithemius key, Vigenere key, Vigenere plain and
Cipher key.
iii. RSA with and without digital signature.

9. Flow control

To simulate and test

i. Stop and wait protocol
ii. Go back N protocol
iii. Selective repeat protocol

10. Error control protocol

To simulate and test

i. Cyclic redundancy check
ii. Hamming code

11. Routing algorithms

To simulate and test

i. Shortest path routing algorithm
ii. Hierarchical routing algorithm
iii. AODV routing algorithm
iv. DV routing algorithm
v. DSR routing algorithm

12. Wireless LAN

To establish wireless LAN test bed (or) wireless LAN environment and perform

i. Uni-cast
ii. Multicast
iii. File transfer protocol

EC P63 - DIGITAL SIGNAL PROCESSING LABORATORY

The lab involves experiments using MATLAB/equivalent software package based experiments along with hardware experiments illustrating the programming of real time processing algorithms on a floating point DSP processor.

I .Experiments using MATLAB or an equivalent software package.

1. Computation of Linear and Circular convolution
2. Spectrum analysis of different signals using DFT/ FFT.
3. Design of FIR filter for the given specifications using frequency sampling and windowing technique
4. Design IIR filter for the given specifications using impulse invariant and bilinear transformation technique
5. Design of Multirate LPF filters for the given specifications
6. Study and comparison of different non-parametric spectral estimation techniques.
7. Equalization of digital audio signals.

II. DSP Processor based Experiments

8. Study of aliasing effects and quantization effects (distortions arising from using wrong sampling and less number of bits)
9. Study of MAC operation using various addressing modes
10. Implementation of Linear and Circular convolution
11. FFT Implementation
12. Waveform generation
13. IIR filter design for the given specifications
14. FIR filter design for the given specifications

HS P64 GENERAL PROFICIENCY – II

UNIT – I

Composition Analysis: Technical and Non-Technical Passages (GRE Based) – Differences in American and British English – Analyzing Contemporary issues – Expanding Terminology

UNIT – II

Writing: Job Application Letter Writing – Resume Writing

UNIT – III

Oral Skills: Group Discussion – Introduction and Practice – Team Work – Negotiation Skills – Organizing and Attending Meetings – Facing Interviews

UNIT – IV

Adapting to Corporate Life: Corporate Etiquette – Grooming and Dressing

UNIT – V

Aptitude: Verbal and numerical aptitude

Reference Books:

1. Pushplata and Sanjay Kumar, Communicate or Collapse: A Handbook of Effective Public Speaking, Group Discussions and Interviews, PHI Learning, Delhi, 2007.
2. Thorpe, Edgar. Course in Mental Ability and Quantitative Aptitude. Tata McGraw-Hill, 2012.
3. Thorpe, Edgar, Test of Reasoning, Tata McGraw-Hill, 2013.
4. Prasad, H.M, How to prepare for Group Discussion and Interview, Tata McGraw-Hill, 2012.
5. Career Press Editors,101 Great Resumes, Jaico Publishing House,2003.
6. Aggarwal, R.S, A Modern Approach to Verbal and Non-Verbal Reasoning, S.Chand& Co., 2012.
7. Mishra Sunita and Muralikrishna, Communication Skills for Engineers, First Edition, Pearson Education, 2011.

EC T71 - MICROWAVE AND OPTICAL ENGINEERING

COURSE OBJECTIVE

- *To learn the principles, operation, performance, applications of various microwave tubes, semiconductor devices, the concepts of S-parameters and derive the S-matrix of different microwave components.*
- *To introduce the techniques of antenna measurement, light propagation, signal degradation in optical fibers and to study the operation of different optical sources, detector.*
- *To design an optical fiber link and study the principles of WDM and optical networks.*

COURSE OUTCOME

On successful completion of the module students will be able to:

- *Apply fundamental knowledge of engineering to understand and analyze the principles, operation, performance, applications of various microwave tubes, semiconductor devices, the concepts of S-parameters*
- *Design, analyze various types of antennae and measure the light propagation, signal degradation in optical fibers*
- *Demonstrate the working principle of optical fiber link, WDM and optical networks.*

UNIT - I

Microwave Active Devices: Gunn diode and its modes of operation, IMPATT and TRAPATT diodes, Microwave bipolar transistor, MESFET and Parametric amplifiers. Two cavity klystron amplifier – Power and efficiency considerations. Reflex Klystron oscillators – Modes and efficiency considerations. Operation and applications of cylindrical Magnetrons and Helix TWT. **(12)**

UNIT - II

S Parameters: Scattering parameters, properties of S matrix, Operation and applications of Wave guide Tee, Hybrid Tee, Hybrid rings (rat-race), attenuators, matched load, waveguide corners, bends and twists. Operation, applications and S-matrix derivation for Directional couplers, Circulators and Isolators.

Microwave Measurements: VSWR, power, frequency, impedance, scattering parameters and dielectric constant measurements. Antenna radiation pattern and gain measurements. **(12)**

UNIT - III

Optical Fibers: Element of an Optical Fiber Transmission link, Propagation of light, Optical fiber structures, acceptance angle, Numerical aperture. Fiber attenuation - absorption, scattering and bending losses. Dispersion –Material and waveguide dispersion. Signal distortion in SM fibers, Polarization Mode dispersion, Design Optimization of SM fibers-RI profile and cut-off wavelength. **(12)**

UNIT – IV

Optical Sources, detectors and amplifiers:

LED- structures -Light source materials -Quantum efficiency and LED power, Modulation of LED. Laser Diodes-Modes and Threshold condition -Rate equations - External Quantum efficiency -Resonant frequencies .

Optical detectors – PIN diode and APD –operation and characteristics. Erbium Doped Fiber Amplifiers-principle, operation and applications. Link Power budget and Rise time budget calculations. **(12)**

UNIT - V

Optical Networks: Principle of SONET / SDH and WDM, Basic principle and architectures of Broadcast – and –select WDM Networks and Wavelength Routed Networks. Solitons, Optical CDMA, PON and FTTH. Optical network management functions. **(12)**

Text Books:

1. Samuel Y. Liao, "Microwave devices and circuits", Third Edition, Pearson Education, 2003
2. Gerd Keiser, "Optical Fiber Communications", Fifth Edition, McGraw Hill Companies, 2013.
3. Annapurna Das and Sisir K. Das, "Microwave Engineering", Tata McGraw Hill, 2004
4. Rajiv Ramaswami and Kumar N. Sivarajan, "Optical Networks – A Practical perspective", Third Edition, Elsevier, 2010

Reference Books:

1. K.C. Gupta, "Microwaves", Wiley Eastern Ltd, 1983,
2. R. E. Collins, "Foundation of Microwave Engineering", McGraw Hill, 1987
3. David Pozar, "Microwave Engineering", John Wiley, Third Edition, 2004.
4. John. D. Kraus, R.J. Marhefka and Ahmad S. Khan, Antennas, Fourth Edition, Tata McGraw Hill, 2010
5. John. M. Senior, "Optical Fiber Communications Principles and Practice", Second Edition, PHI, 1992.
6. Amnon Yariv and PochiYeh, " Photonics", Sixth Edition, Oxford University Press, 2007

Web References:

1. www.advaoptical.com
2. www.opticsexpress.org
3. www.ciena.com
4. www.lightreading.com
5. www.photonicsonline.com
6. www.tellabs.com
7. www.mtt.org

EC T72 - EMBEDDED SYSTEMS

COURSE OBJECTIVE

- *To introduce embedded systems, its hardware, software, devices and buses used for embedded networking.*
- *To explain programming concepts and embedded programming in C and C++.*
- *To explain real time operating systems and inter-task communication*

COURSE OUTCOME

On successful completion of the module students will be able to:

- *Apply fundamental knowledge engineering to understand embedded systems, its hardware, software, devices and buses used for embedded networking.*
- *Apply logical thinking to understand the programming concepts and create embedded programming in C and C++.*
- *Design and demonstrate novel embedded system with real time operating system*

UNIT I

Introduction to Embedded Processors, Devices and Communication Buses: Introduction to Embedded Systems - Design Metrics – Optimization Challenges in Embedded system Design - Embedded Processors – General Purpose Processor – Single Purpose Processor and Application Specific Instruction Set Processor - IC Terminology – Full-Custom/VLSI – Semi-Custom ASIC - PLD Introduction to RISC architecture, VLIW and DSP processors. Introduction to I/O Devices – Types - Synchronous, Iso-synchronous and Asynchronous Communications - Serial Communication – I2C, USB, CAN – Wireless Communication – IrDA – Bluetooth.

(12)

UNIT II

Embedded Program Modeling Concepts in C: Programming in assembly language (ALP) vs High Level Language - C Program Elements:- Macros and functions, Use of Date Types, Structure, Pointers, Function Calls – Program Modeling Concepts – Program Models- DFG Models – FSM Models – Modeling of Multiprocessor Systems.

(12)

UNIT III

Real Time Operating Systems: Real Time Systems – Issues in Real Time Computing – Structure of a real time system – Process – Task – Threads – Classification of Tasks – Task Periodicity – Periodic Tasks- Sporadic Tasks – Aperiodic Tasks – Task Scheduling – Classification of Scheduling Algorithms – Event Driven Scheduling –

Rate monotonic scheduling – Earliest deadline first scheduling. Inter Process Communication:- Shared data problem, Use of Semaphore(s), Priority Inversion Problem and Deadlock Situations - Evaluating operating system performance – Power optimization strategies for processes. **(12)**

UNIT IV

Reliability and Clock Synchronization: Introduction to Reliability Evaluation Techniques – Reliability Models for Hardware Redundancy – Permanent faults only - Transient faults. Introduction to clock synchronization – A Non-Fault-Tolerant Synchronization Algorithm - Fault-Tolerant Synchronization in Hardware – Completely connected zero propagation time system – Sparse interconnection zero propagation time system –Fault tolerant analysis with Signal Propagation delays. **(12)**

UNIT V

Low Power Embedded System Design: Sources of Power Dissipation–Power Reduction Techniques–Algorithmic Power Minimization–Architectural Power Minimization– Logic and Circuit Level Power Minimization – Control Logic Power Minimization – System Level Power Management. **(12)**

Text Books:

1. Rajkamal, "Embedded Systems Architecture, Programming and Design," TATA McGraw-Hill, Second reprint 2008.
2. C.M.Krishna and Kang G. Shin, "Real Time Systems," TATA McGraw-Hill, Third reprint 2010.
3. Wayne Wolf, "Computers as Components: Principles of Embedded Computing System Design," Harcourt India, Morgan Kaufmann Publishers, Third reprint 2012.
4. SantanuChattopadhyay, " Embedded System Design," Prentice Hall of India Learning, 2013

Reference Books:

1. Steve Heath, "Embedded Systems Design," Second Edition, Elsevier India Pvt. Ltd.,2007.
2. David E.Simon, "An Embedded Software Primer", Pearson Education Asia, First Indian Reprint 2000.
3. Frank Vahid and Tony Givargis, "Embedded Systems Design – A unifie Hardware/Software Introduction," John Wiley, Third reprint 2009.

WebReference:

1. www.cs.ucr.edu/~vahid/ucr_cs121_sum12
2. www.eeherald.com/section/design-guide/esmod

EC P71 – COMMUNICATION LABORATORY-III

1. Mode characteristics of Reflex Klystron

Mode characteristics measurement of Reflex Klystron Oscillator and estimation of ETS and ETR.

2**.** Gunn diode characteristics and standing wave pattern

a) V-I and V-P characteristics of Gunn diode.

b) Measurement of standing wave pattern, wavelength and operating frequency of Gunn diode using slotted waveguide.

3. Determination of VSWR and impedance of unknown load

a) To measure VSWR of a matched load.

b) To measure impedances of load such as capacitive iris, horn antenna, etc,

4. Radiation pattern of antenna

Estimation of FNBW, HPBW and side lobe level of the given antenna

5. Determination of gain of an antenna

a) To determine gain of identical horn antenna.

b) To determine gain of unknown parabolic reflector

6. Characteristics of microwave components

Characteristics of given passive microwave components such as directional coupler, magic tee, circulator and isolator.

. 7. Determination of dielectric constant of given material

Measurement of relative and absolute dielectric constant of given dielectric materials such as wood, Teflon, Nylatron, rubber, ebonite, etc., using basic microwave setup

8. Study of optical fiber characteristics

a) Frequency response of fiber

b) Attenuation

c) Coupling loss and bending loss

d) Numerical aperture and acceptance angle

9. Characteristics of digital link using optical fiber

a) To establish a digital fiber optic link and obtain its frequency response.

b) To obtain BER of the digital fiber optic link.

10. Characteristics of optical link using LASER source

a) To obtain frequency response of free space optical link using laser source.

b) To obtain frequency response of fiber optic link using laser source.

EC P72 - EMBEDDED SYSTEMS LABORATORY

1. Voltage Measurement with display
   Designing a voltmeter to measure voltage from 0 to 5 volts and displaying the measured value using 7 segment displays

2. Design of Water Pump Controller to sense the water level in a tank

3. Digital Clock with LCD display

4. Temperature Measurement with 7 segment display

5. PC Communication
   Interfacing the microcontroller to a PC through RS232 interface and displaying the messages sent by the microcontroller on the PC using Visual Basic program running in PC

6. Remote Control through FM Link
   Establishing an FM link between two microcontrollers for data transfer.

7. Hot Chamber Controller to maintain the temperature at the set point.

8. Obstacle Detector using ultrasonic transmitter- receiver

9. Moisture sensor and sprinkler controller design

10. Designing a lamp controller having a light sensor and a timer

EC P73 - SEMINAR

Each one of the students will be assigned a Seminar Topic in the current and frontier areas. The student has to conduct a detailed study/survey of the material available on the assigned topic and prepare a report, running to 30 or 40 pages. The student will make on oral presentation for a period of about 30 minutes, followed by a brief question and answer session. The Seminar (presentation and report) will be evaluated by the internal assessment committee (comprising of the Head of the Department and two faculty members) for a total of 50 marks.

EC P74 - INDUSTRIAL VISIT/TRAINING

The students are required to undergo in plant training for a period of two weeks /four industrial visits during the summer vacation after the fourth semester. Each student has to submit a detailed report on the training programme undergone. Each student will be evaluated by an internal assessment committee (comprising of the Head of the Department and two faculty members) for a total of 50 marks

EC PW7 - PROJECT WORK-I

Each batch of 2 or 3 students will be assigned an experimental or a theoretical project to be carried out under the supervision of a guide. The project work has to be carried out in the 7^{th} and 8^{th} semesters and has to be completed by the end of the 8^{th} semester. In the phase I of the project work, the progress of the work carried out in the 7^{th} semester will be monitored and assessed internally for a total of 50 marks. A committee of departmental faculty members comprising the project guide, the Head of the Department and one more faculty member will conduct the internal assessment.

EC T81 - PROFESSIONAL ETHICS

The course should cover the following topics by way of Seminars, Expert Lectures and Assignments:

1. Engineering Ethics – Moral issues, Ethical theories and their uses
2. Engineering as Experimentation – Code of Ethics
3. Engineer's responsibility for safety
4. Responsibilities and rights
5. Global issues of engineering ethics

Reference Book:

1. Charles D.Fleddermann, "Engineering Ethics", Prentice Hall, New Mexico, 1999

EC T82 –INDUSTRIAL MANAGEMENT AND ENGINEERING ECONOMICS

COURSE OBJECTIVE

- *To explore the knowledge about Industrial Economics and their applications.*
- *To analyze the Interest formulae, their applications and the methods of comparison.*
- *To understand the concepts of Depreciation, General Management and Financial Management.*

COURSE OUTCOME

On successful completion of the module students will be able to:

- *Apply fundamental knowledge to understand Industrial Economics and its impact on engineering.*
- *Investigate and solve engineering problems like Interest formulae and understand their applications.*
- *Apply formulae and solve problems of Depreciation, General Management and Financial Management.*

UNIT - I

Introduction to Economics:– Flow in an Economy, Law of supply and Demand, Concept of Engineering Economics – Engineering Efficiency, Economic Efficiency, Scope of Engineering Economics, Elements of costs, Marginal Cost, Marginal Revenue, Sunk cost, Opportunity cost, Break-Even Analysis, P/V ratio, Elementary Economics Analysis-Function, Aims, Value Engineering procedure, Interest Formulas and their Applications – Time Value of Money, Single Payment Compound Amount Factor, Single Payment Present Worth Factor, Equal Payment Series, Compound Amount Factor, Equal Payment Series Sinking Fund Factor, Equal Payment Series Present Worth Factor, Equal Payment Series Capital Recovery Factor, Uniform Gradient Series Annual Equivalent Factor, Effective Interest Rate, Examples in all the methods. **(12)**

UNIT - II

Methods of Comparison of Alternatives: Present Worth Method (Revenue Dominated Cash Flow Diagram, Cost Dominated Cash Flow Diagram), Future Worth Method (Revenue Dominated Cash Flow Diagram, Cost Dominated Cash Flow Diagram), Annual Equivalent Method (Revenue Dominated Cash Flow Diagram, Cost Dominated Cash Flow Diagram), Rate of Return Method, Examples in all the methods. **(12)**

UNIT - III

Depreciation: Introduction, Straight Line Method of Depreciation, Declining Balance Method of Depreciation, Sum-of-the-Years-Digits Method of Depreciation, Sinking Fund Method of Depreciation/Annuity Method of Depreciation, Service Output Method of Depreciation, Evaluation of Public Alternatives- Introduction, Examples, Inflation Adjusted Decisions – Procedure to Adjust Inflation, Examples on comparison of alternatives and Determination of Economics Life of asset. **(12)**

UNIT - IV

General Management: Basic concepts of management – Scientific management – Henry Fayal's principles of management – Types and functions of management. Types of organization – characteristics, merits and demerits. Types of industrial ownership – characteristics, merits and demerits. **(12)**

UNIT-V

Financial Management: Fixed and variable costs – cost ladder – Break even analysis (simple problems) – Types of capital – working capital – Sources of finance (internal and external) - Evaluation of investments – Present Worth Method, Future Worth Method, Annuity Method and Rate of return Methods (simple problems) – Preparation of balance sheet and profit and loss statements. **(12)**

Text Books:

1. O.P. Khanna, "Industrial Engineering and Management", DhanpatRai& sons,1999.
2. R.PannerSelvam, "Production and Operations Management", PHI Learning, 2002.

Reference Books:

1. MartandTelsang – Industrial Engineering and Production Management, S.Chand andCo., 1998.
2. Shailendra Kale– Production and Operations Management, McGraw Hill, India 2013.

EC P81-ADVANCED COMMUNICATION LABORATORY

1. **Establishment of Microwave Communication Systems**

   To set up a communication link using a microwave source and two antenna and to transmit receive signals (sine, square and ramp wave).

   To test the link for voice transmission and reception.

2. **Study of Time Division Multiplexing in a fibre optic link.**

   To set up a TDM link using fibre optics and transmit the multiplexed audio and data and receive the same.

   To understand the concepts of audio codec and obtain the compander/expander curves.

3. **Study of Spectrum of modulated signals using Spectrum Analyzer.**

   To study the spectrum analyser and use it for obtaining spectrum of different types of modulated signals (AM, FM, FSK, PSK)

   To validate the results through MATLAB simulation

4. **Design and testing of LP/HP/BP/BS filters using Vector Network Analyzer**

   To study the Vector network analyser and use it for testing the frequency response different types of filters.

5. **Study of GMSK modulator.**

   To design a GMSK modulator for the GSM system and test the same.

6. **Study of Direct sequence spread spectrum**

   To design a PN sequence generator and use it to construct a DSSS system and study the waveforms at various stages.

7. **Computer-to-Computer communication using fibre link.**

   Establish a PC to PC link using optical fibre link and to transmit and receive data and image using MATLAB programming.

8. **Design and testing of antenna using Vector Network Analyzer**

   To design an antenna and obtain its SWR and return loss performance using a vector network analyzer.

9. **System link budget for microwave, optical and satellite communication systems**

   To use MATLAB to design a link budget and analyse the power budget of microwave, optical and satellite communication systems.

10. **Performance analysis of various digital modulation schemes.**

    To write MATLAB programs to simulate the digital modulation schemes such as FSK, BPSK and QPSK and study their BER performance in AWGN and fading channels.

EC P82 - COMPREHENSIVE VIVA-VOCE

The student will be tested for his understanding of the basic principles of the core engineering subjects. The internal assessment for a total of 50 marks will be made by a committee comprising of the faculty members of the department. The committee will conduct three written examinations of short questions type from the subjects (Test1- Analog and Digital Electronic Circuits, Electric Circuits, Microprocessor and VLSI; Test 2-Signal Processing, Electromagnetic Waves and Waveguides, Antennas Control Systems; Test 3-Analog and digital communication, Advanced communication systems). The external university examination, which carries a total of 50 marks, will be a Viva Voce examination conducted by a committee of one external examiner and one internal examiner appointed by the university.

EC PW8 - PROJECT WORK (PHASE II)

Extension and completion of project work started in the previous semester. On completion of the project work, each student has to prepare a project report and submit the same to the department. In the Phase II, the project work and the report will be evaluated by the internal assessment committee by conducting two reviews and one demo for a total of 50 marks. The external university examination, which carries a total of 50 marks, will have report evaluation and viva voce examination conducted by a committee of one external examiner and one internal examiner appointed by the university.

LIST OF ELECTIVES

Group – A (5th and 6th Semesters)

EC E01– OPERATING SYSTEMS

COURSE OBJECTIVE

- *To understand the fundamentals of operating systems, process management and Multithreading models.*
- *To understand the concepts of storage management, Virtual Memory and File System Implementation.*
- *To conceptualize the working principles of I/O systems and gain knowledge in distributed systems.*

COURSE OUTCOME

On successful completion of the module students will be able to:

- *Apply fundamental knowledge engineering to understand operating systems, process management and Multithreading models.*
- *Design and analyze storage management, Virtual Memory and File System Implementation and understand their applications.*
- *Design distributed systems and demonstrate the applications in real life.*

UNIT - I

Operating Systems - An Overview :Introduction to OS - Mainframe systems - Desktop Systems - Multiprocessor Systems - Distributed Systems - Clustered Systems - Real Time Systems - Handheld Systems. Computer-System Operation - I/O Structure - Storage Structure - Storage Hierarchy - Hardware Protection - Network Structure. System Components - Operating-System Services - System Calls - System Programs - System Structure - Virtual Machines - System Design and Implementation - System Generation. **(12)**

UNIT - II

Process Management: Process Concept - Process Scheduling - Operations on Processes - Cooperating Process - Interprocess Communication - Communication in client-server systems. Threads - Overview - Multithreading models - Threading issues- CPU Scheduling - Basic Concepts - Scheduling Criteria - Scheduling Algorithms - Multiple-Processor Scheduling - Real Time Scheduling - Process Scheduling Models. The Critical-Section Problem - Synchronization Hardware - Semaphores - Classic problems of Synchronization - Critical regions - Monitors - Atomic transactions. System Model - Deadlock Characterization - Methods for handling Deadlocks - Deadlock Prevention - Deadlock avoidance - Deadlock detection - Recovery from

Deadlock. **(12)**

UNIT - III

Storage Management: Storage Management - Background - Swapping - Contiguous Memory allocation - Paging - Segmentation - Segmentation with Paging. Virtual Memory - Background - Demand Paging - Process creation - Page Replacement - Allocation of frames - Thrashing. File System Implementation - File Concept - Access Methods - Directory Structure - File - System Mounting - File Sharing - Production. File System Structure - File System Implementation - Directory Implementation - Allocation Methods - Free-space Management - Efficiency and Performance - Recovery. **(12)**

UNIT - IV

I/O Systems: I/O Hardware - Application I/O Interface - Kernel I/O Subsystem - Transforming I/O to Hardware Operations - Streams - Performance. Disk Structure - Disk Scheduling - Disk Management - Swap-Space Management - RAID Structure - Disk Attachment - Stable - Storage Implementation - Tertiary Storage Structure.

(12)

UNIT - V

Distributed Systems: Background - Topology - Network Types - Communication - Communication Protocols - Robustness - Design Issues. Naming and Transparency - Remote File Access - Stateful Versus Stateless Service - File Replication. Event Ordering - Mutual Exclusion - Atomicity - Concurrency Control - Deadlock Handling - Election Algorithms - Reaching Agreement. **(12)**

Text Books:

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts, Windows XP Update", Sixth Edition, John Wiley & Sons (ASIA) Pvt.Ltd, 2003.

2. Harvey M. Deitel, Operating Systems, Second Edition, Pearson Education Pvt. Ltd, 2002.

ReferencesBooks:

1. Andrew S. Tanenbaum, Modern Operating Systems, Prentice Hall of India Pvt. Ltd, 2003.

2. William Stallings, Operating System Prentice Hall of India, 4th Edition, 2003

Web References:

1. www.computerhope.com
2. www.personal.kent.edu

EC E02-CONSUMERELECTRONICS

COURSE OBJECTIVE

- *To introduce theory and applications of various types of loud speakers and microphones.*
- *To impart knowledge on the various Television systems and its standards*
- *To introduce the concepts of audio and video signal processing, telecommunications and the basic working principle of commonly used home appliances.*

COURSE OUTCOME

On successful completion of the module students will be able to:

- *Apply fundamental knowledge of engineering to understand applications of various types of loud speakers and microphones.*
- *Investigate and compare the performances of various Television systems and standards like NTSC, PAL, SECAM.*
- *Design and analyze various audio and video signal processing and compare performances of home appliances.*

UNIT- I

Loudspeakers and Microphones : Crystal Loudspeaker, Dynamic Loudspeaker, Electrostatic loudspeaker, Permanent Magnet Loudspeaker, Woofers and Tweeters - Microphone Characteristics, Crystal Microphone, Carbon Microphones, Dynamic Microphones and Wireless Microphones. **(12)**

UNIT- II

Television Standards and systems: Components of a TV system – interlacing – composite video signal. Colour TV – Luminance and Chrominance signal; Monochrome and Colour Picture Tubes – Colour TV systems–NTSC, PAL, SECAM- Components of a Remote Control and TV camera tubes, HDTV, LED and LCD TVs, DTH TV. **(12)**

UNIT- III

Optical Recording and Reproduction : Audio Disc – Processing of the Audio signal – read out from the Disc – Reconstruction ofthe audio signal– Video Disc – Video disc formats-recording systems –Playback Systems, CD player and DVD player, Blue ray discs. **(12)**

UNIT- IV

Telecommunication Systems: Public switched Telephone networks – Switching system principles–PABX switching– ISDN, Cellular mobile communication systems – GSM, GPRS, DECT, UMTS, IMT2000, Limited range Cordless Phones and Facsimile, Wifi and Bluetooth. **(12)**

UNIT- V

Home Appliances: Basic principle and block diagram of microwave oven; washing machine hardware and software, components of air conditioning and refrigeration systems, Proximity Sensors and accelerometer sensors in home appliances.**(12)**

Text Books:

1. S.P.Bali,"ConsumerElectronics",PearsonEducation,2005.
2. Jochen Schiller, Mobile Communications, 2nd Edition, Addison-Wesley, 2001.

Reference Books:

1. William Stallings, Wireless communications and Networks,2nd Edition, Pearson Education Asia, 2000.
2. R.R.Gulati "Monochrome and colour television ", New age International Publisher, 2010

Website:

1. http://www.scientificamerican.com/article.cfm?id = experts.bluetooth-work
2. http://www.cosc.brocku.ca/Offerings/3P92/seminars/HDTV.ppt
3. http://www.circuitstoday.com/blu-ray-technology-working

EC E03 - SEMICONDUCTING MATERIALS AND OPTOELECTRONICS

COURSE OBJECTIVE

- *To understand the basics of semi conducting materials, intrinsic and extrinsic semiconductors.*
- *To impart knowledge on Quantum wells, wires, dots, Light Emitting diodes, Semiconductor lasers and Photodetectors.*
- *To gain more knowledge on solar cells, Optoelectronics Modulation and switching devices.*

COURSE OUTCOME

On successful completion of the module students will be able to:

- *Apply fundamental knowledge of engineering to understand the basics of semi conducting materials, intrinsic and extrinsic semiconductors.*
- *Investigate and compare various Quantum wells, wires, dots, Light Emitting diodes, Semiconductor lasers and Photodetectors.*
- *Design novel solar cells, Optoelectronics Modulation circuits and switching devices and analyze their performances.*

UNIT I

Semi conducting materials: Introduction- band structure of semiconductors – element and compound semiconductors – intrinsic and extrinsic semiconductors – electron density – hole density – electrical conductivity - hall effect. **(12)**

UNIT II

Quantum wells, wires, dots, self assembly and catalysis: Quantum wells, wires, dots - introduction – preparation of quantum nanostructures – size effects - excitons – single electron tunneling – applications. Self assembly – Process - Semiconductors islands - monolayers – catalysis – nature – surface area of Nanoparticles – porous materials - pillared clays - colloids. **(12)**

UNIT III

Light Emitting diodes, Semiconductor lasers, Photodetectors: Introduction – Light Emitting diodes (LED) – radiative transition - semiconductor laser diodes – Photoconductor, Photodiode – Avalanche Photodiode – Phototransistors-white LEDs. **(12)**

UNIT IV

Solar cells: Introduction – basic principle – I-V characteristics – spectral response – Photovoltaic effect in a pn junction, Schottky barrier, thin film and cascade solar cells - materials and design considerations – application. **(12)**

UNIT V

Optoelectronics Modulation and switching devices: Introduction – analog and digital modulation, Franz – Keldysh and stark effect modulators – quantum well electro-absorption modulators – electro optic modulators - optical switching and logic devices.

(12)

Text Books:

1. Semi conducting Optoelectronics devices, Pallab Bhattacharya, prentice hall international editions, 2002.
2. Solid state physics, S O Pillai, 5th edition n, New Age International (P) Ltd, 2004.
3. Optical Electronics, Ajay Ghatak &K.Thiyagarajan, Cambridge University Press, 1994.

Reference Books:

1. Solid State physics, M A Wahab, Narosa Publishing House, 2005.
2. Physics of Semi conducting devices, S M sze, 2nd Edition, John – Wiley &Sons, 2005.
3. Optoelectronics, Jasprit Singh, McGrew Hill international Editors, 1996.
4. Semiconductor Optoelectronics, Jasprit Singh, McGrew Hill International Editors, 1996.

EC E04 - INTRODUCTION TO NANOSCIENCE AND TECHNOLOGY

COURSE OBJECTIVE

- *To understand the detailed introduction of the Nano scale systems*
- *To understand the concepts of Quantum Dots and Synthesis of Nanostructure Materials*
- *To understand the concepts of characterization and Nanotechnology application*

COURSE OUTCOME

On successful completion of the module students will be able to:

- *Have a knowledge of Nano science and nanotechnology including theory practical application*
- *Potentially apply the concepts of Quantum Dots and Synthesis of Nanostructure Materials in research projects*
- *Propose novel ideas using the concepts of characterization and Nanotechnology application*

UNIT I

Nanoscale Systems: Length, energy, and time scales - Quantum confinement of electrons in semiconductor nanostructures: Quantum confinement in 3D, 2D, 1D and zero dimensional structures -Size effect and properties of nanostructures- Landauer - Buttiker formalism for conduction in confined geometries - Top down and Bottom up approach. **(12)**

UNIT II

Quantum Dots: Excitons and excitonic Bohr radius – difference between nanoparticles and quantum dots - Preparation through colloidal methods - Epitaxial methods- MOCVD and MBE growth of quantum dots - current-voltage characteristics - magneto tunneling measurements - spectroscopy of Quantum Dots: Absorption and emission spectra - photo luminescence spectrum - optical spectroscopy - linear and nonlinear optical spectroscopy. **(12)**

UNIT III

Synthesis Of Nanostructure Materials: Gas phase condensation – Vacuum deposition -Physical vapor deposition (PVD) - chemical vapor deposition (CVD) – laser ablation- Sol-Gel- Ball milling –Electro deposition- electroless deposition – spray pyrolysis – plasma based synthesis process (PSP) - hydrothermal synthesis. **(12)**

UNIT IV

Characterization: Principle and working of Atomic Force Microscopy (AFM) and Scanning tunneling microscopy (STM) - near-field Scanning Optical Microscopy – Principle of Transmission Electron Microscopy (TEM) – applications to nanostructures – nano mechanical characterization – nano indentation. **(12)**

UNIT V

Nanotechnology Applications: Applications of nanoparticles, quantum dots, nanotubes and nanowires for nano device fabrication – Single electron transistors, coulomb blockade effects in ultra-small metallic tunnel junctions - nanoparticles based solar cells and quantum dots based white LEDs – CNT based transistors – principle of dip pen lithography. **(12)**

Text Books:

1. Nanotechnology, G. Timp. Editor, AIP press, Springer-Verlag, New York, 1999
2. Nanostructured materials and nanotechnology, Concise Edition, Editor:- Hari Singh Nalwa; Academic Press, USA (2002).

Reference Books:

1. Hand book of Nanostructured Materials and Technology, Vol.1-5, Editor:- Hari Singh Nalwa; Academic Press, USA (2000).
2. Hand book of Nanoscience, Engineering and Technology (The Electrical Engineering handbook series), Kluwer Publishers, 2002
3. Sol-Gel Science, C.J. Brinker and G.W. Scherrer, Academic Press, Boston (1994).
4. Nanoscale characterization of surfaces & interfaces, N John Dinardo, Weinheim Cambridge: Wiley-VCH, 2nd ed., 2000.

EC E05 - SOFT COMPUTING

COURSE OBJECTIVE

- *To gain knowledge of the basic concepts of fuzzy systems and architecture of neural networks*
- *To analyze the binary and real parameter genetic algorithm and its applications in various fields*
- *To understand the structure and operation of genetic algorithm*

COURSE OUTCOME

On successful completion of the module students will be able to:

- *Acquire knowledge in fundamental theories of fuzzy systems and architecture of neural networks*
- *Design simple neural networks using supervised and unsupervised learning networks*
- *Design program systems using the binary and real parameter genetic algorithm*

UNIT-I

Fuzzy Systems: Crisp sets – Fuzzy sets – Operation and properties. Fuzzy relations – Equivalence and tolerance relations. Fuzzy membership function- Types and definitions. Membership value assignments – Rule based systems. Type of fuzzy inference. Structure and parameters of a Fuzzy system- Computer assignment. **(12)**

UNIT-II

Neural Networks: Biological inspiration – Neuron model and Network architectures perception – Architecture, learning rule. Limitations of multiplayer perception- Back propagation algorithm – Learning rule – Computer assignments. **(12)**

UNIT-III

Genetic Algorithm: Goals of optimization – Introduction to GA – Terminologies. Simple GA - Data structure. Genetic operation – Crossover, mutation, fitness scaling, Inversion- A Multi parameter mapped fixed point coding – Computer assignments. **(12)**

UNIT-IV

Evolutionary Programming: Single and multi objective optimization-General algorithm-Binary GA, Real parameter GA, constraint handling in GA Evolution strategies general programming – Computer assignments. **(12)**

UNIT-V

Applications: Applications to various branches of Engineering and science- Application of fuzzy, neural, GA and EP in computer science, electrical, communication,

instrumentation and control, mechanical and civil engineering. **(12)**

Text Books:

1. Timothy J. Ross 'Fuzzy logic with Engineer application' McGraw Hill, 1997.
2. Martin T. Hagam Howard B. Deruth and Mark Beale 'Neural Network Design', Thompson Learning, 2002.
3. David E. Gold Berg 'Genetic Algorithm' Pearson Education 2002.
4. Multi-objective optimization using Evolutionary Algorithm – by Kalyanmoy Deb.John Wiley and sons, 2002

Web References

1. www.geneticengg.com
2. www.neuralnetworks.org

EC E06-VLSI DESIGN

COURSE OBJECTIVE

- *To understand MOS transistor, CMOS Design and power reduction techniques.*
- *To gain knowledge of Combinational, sequential circuit design and Programmable Logic Array.*
- *To learn the concepts of CMOS Testing and modelling of VLSI subsystem design using Verilog HDL*

COURSE OUTCOME

On successful completion of the module students will be able to:

- *Acquire knowledge on MOS transistor and CMOS circuits.*
- *Design Combinational and sequential circuits and implement in PLA for functional verification.*
- *Design VLSI subsystems using Verilog HDL and test using ATPG Algorithm.*

UNIT I

CMOS Technology: Introduction to MOS transistors and VLSI fabrication(NMOS, PMOS, CMOS and BiCMOS)- Introduction to power reduction techniques-Dynamic Power Reduction-Static Power Reduction- NMOS and CMOS inverter- Determination of pull up to pull down ratios – propagation delays – power dissipation - Stick Diagram -MOS layers - design rules and layout- choice of layers and Scaling. **(12)**

UNIT II

Combinational And Sequential Circuit Design : Pass transistor and transmission gates-inverter-NAND gates and NOR Gates for n MOS, CMOS and Bi CMOS – parity generator – multiplexers- code converters – Programmable Logic Devices (nMOS PLA and CMOS PLA) – Clocked sequential circuits – D-Latch and D- Flip-Flop –Memories (DRAM cell, SRAM Cell and Pseudo Static RAM cell) – Inverting and Non-inverting Registers – Barrel Shifter. **(12)**

UNIT III

Subsystem Design : Circuit Families – Dynamic CMOS logic, Domino CMOS logic and Pseudo NMOS logic- One bit adder- multi bit adder –Ripple carry- Carry Skip Adder-Carry Look Ahead Adder- Design of signed parallel adder-comparison of different schemes in terms of delay –Multipliers – Design of serial and parallel multipliers- different schemes and their comparison. 2's complement array multiplication-Booth encoding. **(12)**

UNIT IV

CMOS Testing : Need for testing- Test Procedure, Design for Testability – Ad Hoc Testing – Scan-Based Test-Boundary-Scan Design – Built-in-Self-Test(BIST)- Test-Pattern Generation – Fault Models – Automatic Test Pattern Generation – Fault Simulation. **(12)**

UNIT V

Introduction To Verilog: Basics of Verilog, operators, Data Types, Continuous assignments, Sequential and parallel statement groups. Timing control (level and edge sensitive) and delays, tasks and functions, control statements, Blocking &non blocking assignments, If-else and case statements, For- while-repeat and forever loops, Rise, fall, min, max delays, Behavioural and synthesizable coding styles for modelling combinational logic, Behavioural& synthesizable coding styles for modelling sequential logic. **(12)**

Text Books:

1. Neil H.E. Weste and K.Eshraghian, "Principles of CMOS VLSI design," Addison Wesley Publishing Company, 1993.
2. Neil He Weste,David Harris and Ayan Banerjee, "CMOS VLSI design-A circuits and Systems Perspective,"Dorling Kindersley (india) Pvt Ltd, 2009.
3. Jan M. Rabaey, AnanthaChandrakasan and BorivojeNikolic, " Digital Integrated Circuits – A Design Perspective," Prentice Hall of India, 2012.
4. J. Bhasker "A Verilog HDL Primer,"Star Galaxy Press,1997.
5. Wayne wolf, "Modern VLSI Design: System on Chip Design," Prentice Hall of India, 2012.

Reference Books:

1. E.D.Fabricious, "Introduction to VLSI design", McGraw Hill, 1990.
2. Thomas, D .E .,Philip.R. Moorby "The Verilog Hardware Description Language",2nd ed.,Kluwer Academic Publishers,2002.
3. Sebastian Smith, "Application Specific Integrated Circuits", Pearson Education,2001.
4. DebaPrasad Das, "VLSI Design", Oxford University Press, 2012.

Website:

1. www.cmosvlsi.com
2. www.vlsi-world.com
3. www.creativeworld9.com/2011/12/learning-videos-of-vlsi-design-1
4. www.btechbunks.com/2011/03/vlsi-design-study-material

EC E07 - DIGITAL SIGNAL PROCESSORS AND APPLICATIONS

COURSE OBJECTIVE

- *To understand the architecture and instruction set of DSP56XXX processor*
- *To analyze code optimization , scheduling and implementation of digital filters*
- *To understand the architecture and operation of TMS320C6X processor*

COURSE OUTCOME

On successful completion of the module students will be able to:

- *Apply the knowledge of engineering to understand the basic building blocks of DSP56XXX processor and instruction set*
- *Design digital filters with code optimization and perform real time analysis using Code composer studio.*
- *Design and Implement various DSP sub-blocks using TMS320C6X processor*

UNIT-I

Freescale DSP56XXX Architecture and Programming: Introduction, Core Architecture Overview, Data Arithmetic Logic Unit, Address Generation Unit, Program Control Unit, PLL and Clock Generator, Debugging Support, Instruction Cache, External Memory Interface, DMA Controller, Operating Modes and Memory Spaces, Instruction Set, Benchmark Programs. **(12)**

UNIT-II

FFT and Filter Implementation using DSP56XXX: Implementation of FFT: Radix- 2 fast Fourier transforms – Block floating point scaling – Optimized radix- 2 DIT FFT- Leakage- Implementation of digital filters: single and double precision FIR Filters – IIR Filters – Multirate filters. **(12)**

UNIT-III

TMS320C6x Architecture: CPU Operation – Pipelined CPU- VelociTI – C64x DSP- Software tools: EVM – DSK Target C6x board – Assembly file – Memory management-Compiler utility- Code initialization – Code composer studio – Interrupt data processing. **(12)**

UNIT-IV

Code Optimization: Word – wide optimization – Mixing C and assembly- software pipelining – C64x improvements - Real time filtering – Circular buffering- Adaptive filtering. **(12)**

UNIT-V

Frame Processing, Real Time Analysis and Scheduling: Frame processing: DMA DSP Host Communication- DFT and FFT Implementation- Real time FFT – Real time analysis-Real time scheduling – real time data exchange – DSP / BIOS – Data synchronization and communication. **(12)**

Text Books:

1. Digital Signal Processing Applications using the ADSP – 2100 Family, Volume 1 Analog devices , DSP Division Prentice Hall, 1992(Unit I,II).
2. Nasser Kehtarnavaz and Mansour Keramat, "DSP System design using the TMS320C600 Prentice hall 2001(Unit III,IV ,V)

Reference Books:

1. Mohammed El-Sharkawy, Digital Signal Processing Applications With Motorola's DSP56002.
2. Sophocles J. Orfanidis, " Introduction to signal processing " , Prentice Hall, 1996.
3. SenM.Kuo , Bob H. Lee," Real – time digital signal processing- Implementations, applications and experiments with the TMS320C55x" , John Wiley and Sons, 2001.
4. John G. Proakis and Dimitris G. Manolakis, " Digital processing – Principles , Algorithms and applications", Third Edition PHI,1997.
5. DSP56300 Family Manual from Freescale Semiconductors.

Web References:

1. www.dsplog.com
2. www.DSP56002processor.org

EC E08 - OBJECT ORIENTED PROGRAMMING

COURSE OBJECTIVE

- *To understand object oriented programming concepts: abstract data types, encapsulation, inheritance and polymorphism*
- *To understand the fundamental features of an object oriented language like Java: object classes and interfaces, exceptions and libraries of object collections*
- *To model a business problem and solveusingobject oriented programming.*

COURSE OUTCOME

On successful completion of the module students will be able to:

- *Gain knowledge on data types, encapsulation, inheritance and polymorphism*
- *Understand files, threads and Implement using object oriented programming in Java for real life scenario.*
- *Formulate a prototype for a business problem solve the problem using Java*

UNIT - I

Introduction - Comparison of programming paradigms - merits and demerits of object oriented methodology - object model- features of object oriented languages - **C++** Program Elements: Data types- variables- dynamic initialization- scope and life time of variables-arrays- strings- operators- operator overloading- type conversion and casting- input / output- enumeration types-expressions-statements. **(12)**

UNIT - II

Object Creation - Classes- constructors- destructors- member functions- inline implementation – overloading – inheritance – types - virtual functions - overloading functions – polymorphism – templates - exception handling. Storage classes - storage operators new – delete - I/O stream – console I/O operations - File streams – modes - file I/O manipulations. **(12)**

UNIT - III

Java - Introduction – variables- data types – operators – expressions – statements – control structures- loops – functions – arrays – classes – wrapper classes – strings – simple input/output- inheritance. **(12)**

UNIT - IV

Files and Threads: Files – serialization – threads- life cycle – multiple threads-synchronization – exception handling- throw catch blocks - Packages and Interfaces importing package – strings. **(12)**

UNIT - V

Object Oriented Design: Classification and Overview of methodologies, Object-Oriented Software life cycle models, process, analysis, design, prototyping, implementation, Testing, documentation and maintenance. **(12)**

Text Book:

1. H.M.Deitel, P.J.Deitel, "Java: How to Program", Seventh edition, PHI Learning, 2007. (Unit III, IV, V)
2. Robert Lafore, "Object Oriented Programming in C++", Fourth Edition, Pearson Education, 2002. (Unit I, II)
3. Grady Booch, "Object-Oriented Analysis and Design with Applications", Addison-Wesley, 2007. (Unit V)

Reference Books:

1. H.M.Deitel, P.J.Deitel "C++: How To Program", Sixth edition, PHI Learning, 2006
2. M.P.Bhave, S.A.Patekar, "Programming with Java" Pearson Education, 2009

Web References:

1. http://www.codeproject.com/Articles/22769/Introduction-to-Object-Oriented-Programming-Concep
2. http://docs.oracle.com/javase/tutorial/java/concepts/

EC E09-NANOMATERIALS

COURSE OBJECTIVE

- *To understand the concepts of basic properties of nanoparticles and nanotubes*
- *To have an insight in to nanowires & nano fibers and its characterization*
- *To analyze issues in the nano devices using Analytical Instruments like nano SEM.*

COURSE OUTCOME

On successful completion of the module students will be able to:

- *Apply the fundamental knowledge to understand nanoparticles and nanotubes to design and construct new products*
- *Characterize nanomaterials and nanodevices for real time using latest electronic analytical instruments.*
- *Design and analyze nano fibers, nanowire and nano devices for real life applications.*

UNIT I

Basic Properties Of Nanoparticles: Size effect and properties of nanoparticles - particle size - particle shape - particle density - melting point, surface tension, wettability - specific surface area and pore size – Reason for change in optical properties, electrical properties, and mechanical properties – advantages. **(12)**

UNIT II

Nanotubes: Single walled and Multi walled Nanotubes (SWNT and MWNT) - synthesis and purification - synthesis of carbon nanotubes by pyrolysis techniques - arc-discharge method - nanotube properties – Nanowires – methods of preparation of nanowires –VLS mechanism. **(12)**

UNIT III

Nanowires And Nanofibers: Semiconductor and oxide nanowires –preparation – solvothermal – electrochemical –PVD –Pulse laser deposition – template method (qualitative)- nanofibers –electro spinning technique. **(12)**

UNIT IV

Characterization: Nano SEM - Scanning Conducting microscopy (SCM) - near-field Scanning Optical Microscopy - High-resolution Transmission Electron Microscopy (HRTEM)- Absorption and emission spectra – PL spectrum - single nanoparticle characterization –Scanning capacitance microscopy – capillary electrophoresis-laser induced fluorescence (CE-LIF). **(12)**

UNIT V

Nanodevices: Magnetic storage: magnetic quantum well; magnetic dots - magnetic date storage - high density quantized magnetic disks - magnetic super lattices – MRAMS - MTJs using nanoscale tunneling junctions – nanomaterial sensors. **(12)**

Text Books:

1.Nanoparticle Technology Handbook, Masuo Hosokawa, Kiyoshi Nogi, Makio Naito, Toyokazu Yokoyama, Elsevier Publishers (2007).

2.Nanomaterials Synthesis, properties and applications, Editor:- A.S Edelstein, IOP Publishing, UK (1996).

Reference Books:

1. Nanostructured materials and nanotechnology, Concise Edition, Editor:- Hari Singh Nalwa; Academic Press, USA (2002).
2. Hand book of Nanostructured Materials and Technology, Vol.1-5, Editor:- Hari Singh Nalwa; Academic Press, USA (2000).
3. Carbon nanotubes: preparation and properties, Editor: - T.W. Ebbesen, CRC Press, USA (1997).
4. Zhon Ling Wang, Characterization of nanophase materials, ISBN: 3527298371, Wiley-VCH Verlag GmbH (2000)

EC E10-MOBILE COMPUTING

COURSE OBJECTIVE

- *To study the basic concepts of mobile computing and get familiarized with the network protocol stack.*
- *To understand the basics of mobile telecommunication system and Ad-Hoc networks.*
- *To gain knowledge about different mobile platforms and application development.*

COURSE OUTCOME

On successful completion of the module students will be able to:

- *Understand various mobile computing techniques and related protocols.*
- *Investigate the required resources to design and evaluate Ad-Hoc networks*
- *Design and implement different mobile networks for various Mobile platforms*

UNIT I

INTRODUCTION: Mobile Computing – Mobile Computing Vs wireless Networking – Mobile Computing Applications – Characteristics of Mobile computing – Structure of Mobile Computing Application. MAC Protocols – Wireless MAC Issues – Fixed Assignment Schemes – Random Assignment Schemes – Reservation Based Schemes. **(12)**

UNIT II

MOBILE INTERNET PROTOCOL AND TRANSPORT LAYER: Overview of Mobile IP – Features of Mobile IP and its versions – Key Mechanism in Mobile IP – route Optimization. Overview of TCP/IP – Architecture of TCP/IP- Adaptation of TCP Window – Improvement in TCP Performance. **(12)**

UNIT III

MOBILE WEB AND MANAGEMENT ISSUES: Overview on issues and challenges associated with WAP, IP for GPRS, UMTS and LTE, Location management and Application Design for computing environment, Approaches and middleware support for green computing. **(12)**

UNIT IV

MOBILE AD-HOC NETWORKS: Ad-Hoc Basic Concepts – Characteristics – Applications – Design Issues – Routing – Essential of Traditional Routing Protocols – Popular Routing Protocols – Vehicular Ad Hoc networks (VANET) – MANET Vs VANET – Security . **(12)**

UNIT V

MOBILE PLATFORMS AND APPLICATIONS: Mobile Device Operating Systems – Special Constrains & Requirements – Commercial Mobile Operating Systems – Software Development Kit: iOS, Android, BlackBerry, Windows Phone – M-Commerce – Structure – Pros & Cons – Mobile Payment System – Security Issues. **(12)**

Text books:

1. Prasant Kumar Pattnaik, Rajib Mall, "Fundamentals of Mobile Computing", PHI Learning Pvt. Ltd, New Delhi – 2012.
2. Jochen H. Schller, "Mobile Communications", Second Edition, Pearson Education, New Delhi, 2007.

Reference books:

1. Dharma PrakashAgarval, Qing and An Zeng, "Introduction to Wireless and Mobile systems", Thomson Asia Pvt Ltd, 2005.
2. UweHansmann, LotharMerk, Martin S. Nicklons and Thomas Stober, "Principles of Mobile Computing", Springer, 2003.
3. William.C.Y.Lee,"Mobile Cellular Telecommunications-Analog and Digital Systems", Second Edition,TataMcGraw Hill Edition ,2006.
4. C.K.Toh, "AdHoc Mobile Wireless Networks", First Edition, Pearson Education, 2002.

Web references:

1. Android Developers : http://developer.android.com/index.html
2. Apple Developer : https://developer.apple.com/
3. Windows Phone Dev Center : http://developer.windowsphone.com
4. BlackBerry Developer : http://developer.blackberry.com/

EC E11-Digital Image Processing

COURSE OBJECTIVE

- *To comprehend the fundamental concepts in image processing and the mathematical concepts related to image transforms.*
- *To investigate the different image enhancement techniques, image restoration techniques and image compression techniques.*
- *To understand the importance of different image segmentation techniques*

COURSE OUTCOME

On successful completion of the module students will be able to:

- *Acquire more knowledge on digital image processing algorithms and systems*
- *Analyze 2D signals in frequency domain through Image transforms.*
- *Design and implement digital image processing operations like image enhancement, restoration, compression and denoising algorithms using Matlab.*

UNIT I

Introduction To Image Processing :
Components of an image processing system - Image sensing and acquisition – Simple image formation model – representation of a digital image- Sampling and quantization – Aliasing – Zooming and Shrinking – Basic relations between pixels - .Image types - Image file formats – applications of image processing. **(12)**

UNIT II

Two Dimensional Signals &Systems And Transforms:
Two dimensional signals – 2D systems and classifications – 2D convolution -2D correlation – Need for transforms – 2D DFT – Walsh transform – Hadamard transform – Haar Transform – Slant transform – DCT – KL transform. **(12)**

UNIT III

Image Enhancement And Image Restoration: Basic gray level transformations – histogram processing – smoothing and sharpening spatial filters – Smoothing and sharpening frequency domain filters – Image degradation/restoration model – Inverse filtering – Wiener filtering. **(12)**

UNIT IV

Image Compression Techniques : Need for image compression – Lossless compression : Variable length coding , LZW coding ,Bit plane coding – Lossless predictive coding- - Lossy compression: Lossy predictive coding model , Transform coding – Image compression standards. **(12)**

UNIT V

Image Segmentation Techniques : Need for image segmentation – detection of discontinuities – Thresholding – Region based segmentation. **(12)**

Text Books:

1. R.C. Gonzalez, "Digital Image Processing", Addison Wesley, 2009.
2. Anil K Jain, "Fundamentals of Digital Image Processing", PHI Learning, 1999.

Reference Books:

1. S.Jayaraman, S.Esakkirajan and T.Veerakumar, "Digital Image Processing", TMH Pvt. Ltd., 2009
2. B.Chanda and D.DuttaMajumder, "Digital Image Processing and Analysis", PHI Pvt. Ltd.,2011

Website references:

1. www.nptel.iitm.ac.in.
2. www.wolfram.com
3. www.efg2.com/Lab/Library/ImageProcessing/Algorithms.htm

EC E12- TELECOMMUNICATION SWITCHING AND NETWORKS

COURSE OBJECTIVE

- *To introduce the concepts of Frequency and Time division multiplexing, SONET/SDH and digital switching functions.*
- *To introduce the framework for network synchronization, control and management issues and statistical modeling of telephone traffic.*
- *To study blocking system, queuing system characteristics, ISDN, DSL/ADSL, and fiber optic systems and characterize blocking probability.*

COURSE OUTCOME

On successful completion of the module students will be able to:

- *Analyze the different multiplexing techniques and understand their pros and cons*
- *Investigate the implementation of network synchronization, control and management issues and statistical modeling in telephone networks.*
- *Model traffic processes based on the concepts of blocking and queuing system characteristics for real time applications.*

UNIT – I

Multiplexing: Transmission Systems, FDM Multiplexing and modulation, Time Division Multiplexing, Digital Transmission and Multiplexing: Pulse Transmission, Line Coding, Binary N-Zero Substitution, Digital Biphase, Differential Encoding, Time Division Multiplexing, Time Division Multiplex Loops and Rings, SONET/SDH: SONET Multiplexing Overview, SONET Frame Formats, SONET Operations, Administration and Maintenance, Payload Framing and Frequency Justification, Virtual Tributaries, DS3 Payload Mapping, E4 Payload Mapping, SONET Optical Standards, SONET Networks. SONET Rings: Unidirectional Path-Switched Ring, Bidirectional Line- Switched Ring. **(12)**

UNIT – II

Digital Switching: Switching Functions, Space Division Switching, Time Division Switching, two dimensional Switching: STS Switching, TST Switching, No.4 ESS Toll Switch, Digital Cross-Connect Systems, Digital Switching in an Analog Environment. Elements of SS7 signaling. **(12)**

UNIT – III

Network Synchronization Control and Management: Timing: Timing Recovery: Phase-Locked Loop, Clock Instability, Jitter Measurements, Systematic Jitter. Timing Inaccuracies: Slips, Asynchronous Multiplexing, Network Synchronization, U.S Network Synchronization, Network Control, Network Management. **(12)**

UNIT – IV

Digital Subscriber Access: ISDN: ISDN Basic Rate Access Architecture, ISDN D Channel Protocol. High-Data-Rate Digital Subscriber Loops: Asymmetric Digital Subscriber Line VDSL. Digital Loop Carrier Systems: Universal Digital Loop Carrier Systems, Integrated Digital Loop Carrier Systems, Next-Generation Digital Loop Carrier, Fiber in the Loop, Hybrid Fiber Coax Systems, Voice band Modems: PCM Modems, Local Microwave Distribution Service, Digital Satellite Services.

(12)

UNIT – V

Traffic Analysis: Traffic Characterization: Arrival Distribution, Holding Time Distributions, Loss Systems, Network Blocking Probabilities: End-to-End Blocking Probabilities, Overflow traffic, Delay Systems: Exponential service times, Constant Service Times, Finite Queues. **(12)**

Text Books:

1. J.Bellamy, "Digital Telephony", John Wiley, 2003, 3rd Edition.
2. JE Flood, "Telecommunication Switching, Traffic and Networks", Pearson, 2012.

Reference Books:

1. R.A.Thomson, " Telephone switching Systems", Artech House Publishers, 2000.
2. W.Stalling, "Data and Computer Communications", Prentice Hall, 1993.
3. T.N.Saadawi, M.H.Ammar, A.E.Hakeem, "Fundamentals of Telecommunication Networks", Wiley Interscience, 1994.
4. W.D.Reeve, " Subscriber Loop SignallinganfTYransmission Hand book", IEEE Press(Telecomm Handbook Series), 1995.
5. Viswanathan.T., "Telecommunication Switching System and Networks", Prentice Hall of India Ltd.,1994.

EC E13 - SPECIAL TOPICS IN COMMUNICATION ENGINEERING

COURSE OBJECTIVE

- *To provide the concepts and standards of ISDN, architecture and protocols.*
- *To make the students realize the importance of ATM Network and its Architecture*
- *To introduce different types of Mobile communication systems*

COURSE OUTCOME

On successful completion of the module students will be able to:

- *Acquire knowledge and understand where ISDN architecture are incorporated in practical communication systems.*
- *Analyze ATM Networks architecture and implement novel protocols for ATM Networks.*
- *Gain knowledge of different types of Mobile communication systems and analyze its impact for real life scenario.*

UNIT - I

ISDN Overview: A conceptual view of ISDN- ISDN standards- service capabilities- Teleservice protocol architecture- facsimile- teletex message handling system. ISDN interfaces and function; transmission structure- user network interface configuration- ISDN protocol architecture- ISDN connection- terminal adaptation- addressing- internetworking. ISDN physical layer: line coding techniques, basic user network interface- primary user role- network interface. **(12)**

UNIT - II

ISDN Data Link Layer: Hap D, bearer channel link control using 465/ v 120, frame mode bearer service and protocol. ISDN network layer: ISDN call control, Frame relay connection control. Signaling system number Z: SS7 architecture, signaling- data link level-link level, network level- signaling connection control part- ISDN user part. ATM networking capabilities - ATM networking asynchronous technology problems address by ATM, ATM solution, ATM cell and its structure. **(12)**

UNIT - III

ATM Network Concepts and Architecture: ATM's position in the OSI model- BISDN protocol reference model- ATM functions and layers. ATM signaling principals, ATM performances: merging voice, audio, data and video, ATM traffic control, ATM operation and maintenance, ATM reference configuration. ATM protocol stack: lower layers fiber based networks and its advantages- ATM physical layer media. ATM transmission convergence sub layer - ATM switching principles, OAM function and signaling. **(12)**

UNIT - IV

Internet Concepts: The net and its features main Internet features, email news groups, telnet, gopher, browsing in WWW. Control modems: speed/ time continuum, communication software Internet finding tools, Archie, gopher commands: TCP/IP pictures, graphics and binary files via news groups: compression software: processing files-sound and images: animation. Internet resources- library card catalogues: establishing web services intranet- creating web home page. **(12)**

UNIT - V

Mobile Communication Systems: GSM – IS95 – Network aspects – Radio aspects – Security aspects – Low speed circuit switched data in digital cellular networks – High speed circuit switched data in GSM – Packet switched data in digital cellular networks – Data services over DECT, CT2 and PACS – GPRS – CDMA 1x, CDMA 3x, CDMA 2000 and WCDMA. **(12)**

Text Books:

1. R.G. Winch, Telecommunication transmission systems, McGraw Hill 1998.
2. W. Stallings, "ISDN and B.ISDN" Macmillan, 1995.

Reference Books:

1. A. Glosshrenner, Internet 101 Computing, McGraw Hill.
2. M. Y. Rhee, Cryptography and secure communications, McGraw Hill 1994.
3. Raj Pandya, Mobile and Personal communication system and services, PHI Learning, 2001.

EC E14-CRYPTOGRAPHY AND NETWORK SECURITY

COURSE OBJECTIVE

- *To comprehend the fundamental concepts of Security Services, Attacks and Mechanisms and the mathematical concepts related to Symmetric key Cryptography.*
- *To understand Public Key Cryptography and its types*
- *To learn about different Authentication and Signature techniques and recognize the importance of Network Security.*

COURSE OUTCOME

On successful completion of the module students will be able to:

- *Identify network security threats and determine efforts to counter them*
- *Design and Simulate cryptographic algorithms for secure communication.*
- *Determine authentication requirements and design their own network security techniques like digital signature and firewall.*

UNIT-I

Security Model: Security problem in computing- Security Attacks – Security Services– Security Mechanisms –OSI Security Architecture-Model for Network Security-Network Access Security Model-Spread Spectrum Technologies-Spreading Techniques and CDMA. **(12)**

UNIT-II

Symmetric Ciphers: Model of conventional cryptosystem - Substitution techniques-Transposition techniques-Block Cipher Principles-Data Encryption Standard –Strength of DES-Advanced Encryption Standard -Block cipher design principles-Block cipher modes of operation.-Triple DES-RC4Stream cipher. **(12)**

UNIT- III

Public Key Encryption and Key Exchange: Principles of Public Key Cryptosystems-RSA algorithm –Key Management-Diffie-Hellman key exchange algorithm-Elliptic Curve Cryptography.

Message Authentication and Digital Signature: Authentication requirements and Functions- Message authentication Codes-Hash Functions – MD5 Message Digest algorithm-Digital signatures-Authentication Protocols-Digital signature standards.

(12)

UNIT- IV

Network Security: IP security overview, IP security architecture, Authentication header, Encapsulating security payload-Web security considerations, Secure Sockets Layer, Secure Electronic Transaction-Electronic Mail Security-PGP. **(12)**

UNIT- V

System Security: Intruders and Intrusion detection-Password management-Malicious software, Viruses and related threats, virus counter measures-Firewalls Design principles. **(12)**

Text Books:

1. William Stallings, ”Cryptography and Network Security – Principles & Practice”, Fourth Edition Pearson Education.
2. Wenbo Mao, “Modern Cryptography-Theory and Practise”, First Edition Pearson Education 2004.

Reference Book:

1. Charles P. Pleeger, “Security in Computing”, PHI Learning, 1998

EC E15-SPREAD SPECTRUM COMMUNICATION

COURSE OBJECTIVE

- *To enable the students to know about the benefits of spectrum spreading.*
- *To make the students realize the importance of enhancing the system performance through spreading codes.*
- *To introduce different types of jamming techniques and their counter measures.*

COURSE OUTCOME

On successful completion of the module students will be able to:

- *Understand the basic operations of spectrum spreading and its types.*
- *Acquire knowledge on different types of jamming techniques and how they improve performance for mobile radio channels*
- *Characterize the trade-offs among different spread spectrum techniques and identify the pros and cons*

UNIT-I

Introduction: Origins of SS communications – Spread spectrum concept. Advantages of Spectrum spreading –Types of techniques used for spread spectrum – Processing gain and other fundamental parameters – Jamming methods – Linear Feedback shift register sequence generation – Msequence and their statistical properties. Introduction to Non-linear sequences – Gold codes; Kasami sequences & chaotic sequences.

(12)

UNIT-II

Direct Sequence Spread Spectrum System: Coherent direct sequence systems – Model of a DS/BPSK system, Chernoff bound – Performance of encoded DS/BPSK – Constant power and pulse jammer. Coded DS/BPSK Performance for known and unknown channel states. **(12)**

UNIT-III

Frequency Hopping SS System: Non-coherent FH system model – Uncoded FH/BFSK performance under constant power broadband jammer – Partial band noise jammer – Multitone jammer. Coded FH/BFSK performance for partial and multitone jammer.Performance of FH/MDPSK in the presence of partial band mutitone jamming.

(12)

UNIT-IV

Synchronization of SS Receivers: Acquisition and tracking in DS SS receivers & FH SS receivers – Sequential estimation – Matched filter techniques of acquisition and tracking – Delay locked loop – Tau-Dither loop. **(12)**

UNIT-V

Applications: Space systems – Satellite communication. Anti jam military communication – Low probability of intercept communication – Mobile communications. **(12)**

Reference Books:

1. R.C. Dixon, "Spread spectrum systems", John Wiley, 1994.
2. M.K. Simon, J.K.Omura, R.A. Schiltz and B.K.Levitt, "Spread spectrum communication", Vol-I, II & IV, Computer Science Press, USA, 1985.
3. G.R.Coopeand, CD.Mc.Gillem, "Modern communications and spread spectrum", McGraw Hill, 1986.

EC E16 - SATELLITE COMMUNICATION SYSTEMS

COURSE OBJECTIVE

- *Introduce the basic concept of Satellite Communication.*
- *To elaborate the concept and various features of Satellite communication link design model and parameters.*
- *To study on various applications and services of Satellite Communication.*

COURSE OUTCOME

On successful completion of the module students will be able to:

- *Design simple networks by applying the basic concept of Satellite Communication*
- *Understand the basic concept and features of Satellite communication link design model and parameters to maintain the wireless networks*
- *Acquire knowledge on various applications and services of Satellite Communication*

UNIT-I

Introduction to Satellite Communication: Types of satellites- Satellite orbit- satellite constellation- orbital mechanics- equation of orbit-orbital elements- look angle determination- limits of visibility- eclipse- sub satellite point- sun transit outage- 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. **(12)**

UNIT-II

Earth Station and Satellite Link Design: Earth station technology- terrestrial interface, receiver and transmitter, antenna systems-Basic transmission theory- satellite uplink and down link analysis and design for IMMARSAT, INTELSAT etc. Link budget and Eb/No calculation. Performance impairments – system noise, inter modulation and interference. Propagation characteristics and frequency consideration-system reliability and design life time. **(12)**

UNIT-III

Satellite Access: Types- FDMA concepts- inter modulation and back off- SPADE system-TDMA concept- frame and burst structure- satellite switch TDMA- CDMA concept- DS & FH CDMA system- comparison of multiple access scheme. **(12)**

UNIT-IV

Laser Satellite Communication: Inter satellite links- optical communication for satellite networks- laser cross link analysis- optical beam acquisition, tracking and pointing. **(12)**

UNIT-V

Satellite Services: Packet satellite networks and services, fixed satellite services, broadcast satellite services, mobile satellite services- VSAT, global positioning satellite system, maritime satellite services, gateways, ATM over satellite, role of satellite in future network. **(12)**

Text Books:

1. Pratt and Bostian, "Satellite communication", John Wiley and Sons, 2007.
2. Tri. T. Ha, "Digital satellite communication system", McGraw Hill

Reference Books:

1. Pritchend and sciulli, "Satellite communication systems engineering", PHI Learning, 1986
2. Robert M. Gagliendi, "Satellite communication", John Wiley and Sons, 1988
3. M. Richharia, "Satellite communication system design and analysis", Mc-Millan publishers, 1996

Web References:

1. http://www.faadooengineers.com/threads/5245-satelite-communication-dennis-roddy
2. http://www.ebook3000.com/Handbook-on-Satellite-Communications--3rd-Edition_23328.html
3. www.wit.net.in/wp-content/uploads/.../Satellite-Communications.pdf
4. www.webstatschecker.com/stats/.../satellite_communication_notes

EC E17 - NANOSCALE FABRICATION AND TECHNIQUES

COURSE OBJECTIVE

- *To understand the concepts of the scaling laws in miniaturization and clean room*
- *To understand the different kinds of preparation techniques like nanofabrication and LIGA*
- *To gain knowledge of different nanodevices and its application*

COURSE OUTCOME

On successful completion of the module students will be able to:

- *Fabricate simple systems based on the concepts of the scaling laws in miniaturization*
- *Design nano materials based on different kinds of preparation techniques*
- *Understand the concepts of nano fabrication and its application*

UNIT I

Scaling laws in miniaturization: Heat conduction in micro- and nano- systems: heat conduction equation, Newton's cooling law, heat conduction in multilayered thin films, heat conduction in submicron scale - Quantum phenomena in nano-systems: photonic band gap structure, quantum states in nano-sized structures, quantum transport. **(12)**

UNIT II

Clean room: Need for a clean room – Types of clean rooms – maintenance of different types of clean rooms – oxidization and metallization- masking and patterning. **(12)**

UNIT III

Preparation techniques: Basic micro- and nano-fabrication techniques: thin film deposition, ion implantation, diffusion, oxidation - surface micromachining, LIGA process -Packaging: die preparation, surface bonding, wire bonding, sealing, assembly Measurement techniques : scanning tunneling microscope, atomic force microscope, focused ion beam technique- nanoindentation, nanotribometer. **(12)**

UNIT IV

Nano-fabrication: principles and techniques: Etching technologies - wet and dry etching - photolithography – Drawbacks of optical lithography for nanofabrication - electron beam lithography – ion beam lithography -dip-pen nanolithography, stamping techniques, strain-induced self-assembly for Nanofabrication of quantum dot and molecular architectures - Polymer processing for biomedical applications. **(12)**

UNIT V

Applications and devices: Mechanics for micro- and nano-systems: bending of membrane and cantilever, resonance vibration, fracture, stress, nano Tribology -Fluid dynamics for micro- and nano- systems: surface tension, viscosity, continuity equation - laminar fluid flow, fluid flow in submicron and nanoscale- Surface acoustic wave (SAW) devices, microwave MEMS, field emission display devices, nanodiodes, nanoswitches, molecular switches, nano-logic elements- Super hard nanocomposite coatings and applications in tooling- Biochemistry and medical applications: lab-on-a-chip systems. **(12)**

Text Books:

1. T.R. Hsu, MEMS & microsystems design and manufacture, Boston, McGraw Hill, 2002.
2. S.E. Lyshevski, Nano- and micro electromechanical systems, Boca Raton, CRC Press, 2001.

Reference Books:

1. R. Waser (ed.), Nanoelectronics and information technology, Aachen, Wiley-VCH, 2003.
2. B. Bhushan, Springer handbook of nanotechnology, Berlin, Springer-Verlag, 2004.
3. J.A. Pelesko and D.H. Bernstein, Modeling MEMS and NEMS, Boca Raton, Chapman &Hall/CRC, 2003.

EC E18- MICROWAVE INTEGRATED CIRCUIT DESIGN

COURSE OBJECTIVE

- *To understand the conventional microwave transmission structures and principles and conceptualize the working of various microwave components and its design parameters*
- *To analyze the industrial oriented microwave components and gain knowledge in microwave semiconductors and its applications*
- *To focus on processing techniques and fabrication of components*

COURSE OUTCOME

On successful completion of the module students will be able to:

- *Design the parameters for working of microwave components for practical purposes by understanding the conventional microwave transmission structures and principle*
- *Understand the design limitations of the industrial oriented microwave components and applying in engineering practices*
- *Design microwave circuits and fabricate components based on industrial scale.*

UNIT-I

Transmission Lines: Characteristics of conventional transmission structures, various planar transmission lines for MICs, comparison of various MIC transmission media. Design of stripline and microstrip transmission lines. Design of coupled striplines and microstrip lines. Stripline and microstrip discontinuity.Losses of microstrip lines and frequency effects. Review of scattering, ABCD, impedance and admittance matrices for two port networks. **(12)**

UNIT-II

Microwaves Integrated Circuits Components: Lumped elements for MIC**:** Design of lumped elements, design of inductors, capacitors and resistors. Resonators**:** Resonator parameters, resonant frequency, quality factor, rectangular microstrip resonator. Hybrids and couplers: Basics of hybrids and couplers, types of hybrids and couplers, design of hybrids, directional couplers using aperture coupled lines. **(12)**

UNIT-III

Active and Passive Microwave Devices: Microwave transistor, equivalent circuit .Basic operation principles of FET, MESFET model, power FETs. Introduction, equivalent circuit and figure of merit of schottky barrier junctions, varactor diodes, step recovery diodes and pin diodes. **(12)**

UNIT-IV

Microwave Semiconductor Sources and Amplifiers: Oscillators**:** Introduction, concept of negative resistance, three port S-parameter characterization of transistors, oscillation and stability conditions, design of fixed frequency oscillators. Amplifiers**:** Two port representation of transistor, stability consideration, amplifier characterization, Non-linear behavior, biasing networks, and linear amplifier design. **(12)**

UNIT-V

Fabrication of MMC's/MMIC's: Introduction, materials, mask layouts and mask fabrication, hybrid MIC, Mimics- design considerations, design procedures and MMIC fabrication. Hybrid versus Mimics. **(12)**

Text Book:

1. J. Bahl and P. Bhartia, "Microwave solid state circuit design", John Wiley and Sons, 2003.

Reference Book:

1. G.D.Vendelin, A.M.Pavio and U.L.Rohde, "Microwave circuits design using linear and non- linear techniques", John Wiley and Sons, 1990.

Web References:

1. http://www.microwaveeng.com
2. http://mtt.etf.rs/index.eng.htm
3. http://www.ktclear.in/

EC E19 BIOMETRIC SYSTEM

COURSE OBJECTIVE

- *To understand the fundamentals of Biometric terms*
- *To acquire knowledge on Fingerprint Identification, Iris Recognition ,Face Recognition and learn about their real time applications*
- *To frame ideas on working of Voice Scan and integrating it with other Biometric systems*

COURSE OUTCOME

On successful completion of the module students will be able to:

- *Acquire knowledge on the fundamentals of Biometric terms*
- *Implement a biometric system based on the knowledge from brief concepts on different biometric systems*
- *Propose novel Biometric systems*

UNIT I

Biometric Fundamentals: Key Biometric terms and Processes – Definitions-verification and identification – matching, Accuracy in Biometric Systems – False match rate - False on match rate - Failure to enroll rate – Derived metrics - An Introduction to Biometric Authentication Systems- a taxonomy of application environment, a system model, biometrics and privacy. **(12)**

UNIT II

Fingerprint Identification Technology: History, Components, Application of Fingerprints, The Technology- Finger Scan Weaknesses, Criminal Applications, Civil Applications, Commercial Applications, Technology Evaluation of Fingerprint Verification Algorithms. **(12)**

UNIT III

Iris Recognition: Introduction, Anatomical and Physiological underpinnings, Components, Sensing, Iris Scan Representation and Matching, Iris Scan Strengths and Weaknesses, System Performance, Future Directions. **(12)**

UNIT IV

Face Recognition: Introduction, components, Facial Scan Technologies, Face Detection, Face Recognition-Representation and Classification, Kernel- based Methods and 3D Models, Learning the Face Spare, Facial Scan Strengths and Weaknesses, Methods for assessing progress in Face Recognition. **(12)**

UNIT V

Voice Scan: Introduction, Components, Features and Models, Addition Method for managing Variability, Measuring Performance, Alternative Approaches, Voice Scan Strengths and Weaknesses, NIST Speaker Recognition Evaluation Program, Biometric System Integration. **(12)**

Text Books:

1. James Wayman & Anil Jain, Biometric Systems – Technology, Design and Performance Evaluation, Springer-verlag London Ltd, USA, 2005
2. SanirNanavati, Michael Thieme, Biometrics Identity Verification in a Networked world, Wiley Computer Publishing Ltd, New Delhi,2003.

Reference Book:

1. John D. Woodword Jr., Biometrics, Dreamtech Press, New Delhi, 2003.

EC E20- CELLULAR MOBILE COMMUNICATION

COURSE OBJECTIVE

- *To understand the fundamentals of cellular communications and acquire knowledge on mobility and its procedures involved in mobile communication*
- *To gain better understanding of GSM technology and its real time application*
- *To frame ideas on working of various protocols involved in wireless communication and anticipate the emerging technologies and its benefits.*

COURSE OUTCOME

On successful completion of the module students will be able to:

- *Understand the fundamentals of cellular communications and design a wireless cellular system*
- *Implement real time applications using GSM technology*
- *Apply the concepts of various Wireless protocols and implement a cellular system using up-coming technologies*

UNIT-I

Introduction: The cellular concept – Frequency reuse – Interference and system capacity – Trunking and Grade of service – Improving coverage and capacity in cellular systems -Advanced Mobile Phone service - Global system for mobile communication - EIA/T IA IS-136 Digital cellular system - EIA/T IA IS-95 Digital cellular system - cordless telephony and low tier TCS - Third generation wireless system. **(12)**

UNIT-II

Mobility Management: Handoff - Roaming management - Handoff detection – channel Assignment techniques - Radio link transfer IS-41 Network signaling – Intersystem handoff and Authentication - PACS Network Signaling - cellular digital packet data. **(12)**

UNIT-III

GSM: GSM Network signaling - GSM Mobility management GSM short message service - International roaming for GSM - GSM operation, Administration and maintenance -Mobile number Mobile number portability's, VoIP service for mobile networks. **(12)**

UNIT-IV

Wireless Application Protocol: WAP model - WAP Gateway - WAP Protocol, WAP UAProf and caching - Wireless bearer for WAP - WAP developer tool kits – Mobile station application execution environment. **(12)**

UNIT-V

Special Topics: Third generation mobile services - Wireless local loop – Wireless enterprise networks - Bluetooth technology. **(12)**

Text Books:

1. Yi-Bing Lin and Imrichchlantae, “Wireless and Mobile Network Architecture”, John Wiley 2006.
2. T. S. Rappaport, “Wireless and Mobile Communication”, Pearson Education, 2008.

Reference Books:

1. Kauch Pahlavan and Prahant Krishna moorthy, “Principles of Wireless Networks”, PHI Learning, 2007

Web References:

1. www.etsi.org
2. www.globecommsystems.com/wireless

EC E21-OPTO ELECTRONIC DEVICES

COURSE OBJECTIVE

- *To understand the nature and characteristics of light and study the operation and structures of LEDs, display devices and different types of lasers.*
- *To learn the principle of optical detection mechanism in different detection devices and understand different light modulation techniques, concepts and applications of optical switching*
- *To study the integration process and application of opto-electronic integrated circuits in transmitters and receivers*

COURSE OUTCOME

On successful completion of the module students will be able to:

- *Understand semiconductor opto-electronic devices*
- *Make an in-depth analysis of optical detection mechanism, light modulation techniques, and optical switching*
- *Understand the state-of-the art of opto-electronic technology in integrated circuits*

UNIT – I

Elements of light and optical processes in semiconductors: Wave nature of light-Polarization, Interference and Diffraction. Electron-hole pair formation and recombination, absorption and radiation in semiconductors

Light emitting diodes and displays: Electro luminance process, choice of LED materials, device configuration and efficiency, LED structures, device performance, frequency response and bandwidth, plasma and LCD displays. **(12)**

UNIT - II

Lasers: Emission and absorption of radiation in a two level systems, gain in a two level lasing medium, lasing condition in a semiconductor, need for cavity, lasing threshold condition in a two level system, axial and transverse laser modes, heterojunction lasers, distributed feedback lasers, quantum well lasers, rare-earth doped lasers, mode locking of semiconductor laser, long wavelength semiconductor lasers.

(12)

UNIT - III

Photodetectors: Junction photodiodes- PIN and heterojunction diodes, Avalanche photodiodes-multiplication and ionization and noise performance. Modulated barrier photodiode, Schottky barrier photodiode, metal-semiconductor-metal (MSM) photodiode, detectors for long wavelength operation, multicavity photodiodes. **(12)**

UNIT – IV

Optoelectronic modulation and switching devices: Franz-Keldysh and Stark effect modulators, Quantum well electro absorption modulators, electro-optic modulators-Birefringence and electro-optic effect, electro-optic amplitude modulation, quantum electro-optic effect, Magneto-optic devices and acousto-optic effect. Optical switching

and logic devices- self electro-optic devices, bipolar controller modulator. **(12)**

UNIT - V

Optoelectronic Integrated circuits: Need for integration, applications of OEICs, materials and processing for OEICs. Integrated transmitters and receivers- front-end photoreceivers, OEIC transmitter, complex circuits and arrays, optical control of microwave oscillators. Active guided wave devices, prospects for optical interconnects. **(12)**

Text Books:

1. Pallab Bhattacharya "Semiconductor Opto Electronic Devices", Second Edition, Prentice Hall of India Pvt., Ltd., New Delhi, 2011.
2. J. Wilson and J.F.B Hawkes, "Opto Electronics – An Introduction", Second Edition, Prentice Hall of India Pvt., Ltd. New Delhi, 1996.

Reference Books:

1. Jasprit Singh, "Opto Electronics – As Introduction to materials and devices", McGraw-Hill International Edition, 1998.
2. Asit Baran Maity, "Optoelectronics and optical fiber sensors", Prentice Hall of India, 2013**.**
3. S. C. Gupta, "Opto Electronic Devices and Systems", Prentice Hall of India, 2005.

Web References:

1. www.advancedphotonix.com
2. www.oe-company.com

EC E22- RF CIRCUIT DESIGN

COURSE OBJECTIVE

- *To understand the need for various components to design complicated RF circuits and explore the use of resonator and filter implementation in the field of communication*
- *To analyze the networks using BJT, RF diodes, RF FETs and identify the means to solve RF amplifier designs*
- *To identify the means to solve RF amplifier designs and understand the use of mixers and oscillator in RF circuit designs*

COURSE OUTCOME

On successful completion of the module students will be able to:

- *Model RF components and design complicated RF circuits*
- *Design RF amplifier and networks using RF diodes and RF FETs*
- *Understand the use of mixers and oscillator in RF circuit designs*

UNIT-I

RF ISSUES: Importance of RF design, Electromagnetic Spectrum, RF behavior of passive components, Chip components and Circuit Board considerations, Scattering Parameters, Smith Chart and applications. **(12)**

UNIT II

RF FILTER DESIGN: Overview, Basic resonator and filter configuration, Special filter realizations, Filter implementations, Coupled filter. **(12)**

UNIT III

ACTIVE RF COMPONENTS & APPLICATIONS:RF diodes, BJT, RF FETs, High electron mobility transistors; Matching and Biasing Networks –Impedance matching using discrete components, Microstrip line matching networks, Amplifier classes of operation and biasing networks. **(12)**

UNIT IV

RF AMPLIFIER DESIGNS: Characteristics, Amplifier power relations, Stability considerations, Constant gain circles, Constant VSWR circles, Low Noise circuits, Broadband , high power and multistage amplifiers. **(12)**

UNIT V

OSCILLATORS, MIXERS & APPLICATIONS: Basic Oscillator model, High frequency oscillator configuration, Basic characteristics of Mixers, Phase Locked Loops, RF directional couplers and hybrid couplers, Detector and demodulator circuits. **(12)**

Text Books:

1. Reinhold Ludwig and Powel Bretchko, RF Circuit Design – Theory and Applications, Pearson Education Asia, First Edition, 2001.
2. Pozar, Microwave Engineering, John Wiley,3rd ed.,2004.

References:

1. Joseph . J. Carr, Secrets of RF Circuit Design , McGraw Hill Publishers, Third Edition, 2000.
2. Mathew M. Radmanesh, Radio Frequency & Microwave Electronics, Pearson Education Asia, Second Edition, 2002.

Web References:

1. www.ssc.pe.titech.ac
2. www.qsl.net

EC E23-SPEECH PROCESSING

COURSE OBJECTIVE

- *To understand the fundamentals of speech recognition and introduce the models for speech production*
- *To develop time and frequency domain techniques for estimating speech parameters and introduce models for auditory perception*
- *To understand automatic speech recognition and speech coding*

COURSE OUTCOME

On successful completion of the module students will be able to:

- *Understand the fundamentals of speech recognition and construct the models for speech production*
- *Analyze time and frequency domain techniques and estimate speech parameters for developing models*
- *Acquire knowledge on automatic speech recognition and speech coding*

UNIT I

Speech Recognition Overview: Pattern classification, statistical pattern classification, wave basics, acoustic tube modeling of speech production, music production, room acoustics. **(12)**

UNIT II

Auditory Perception and Speech Features: Ear physiology, psychoacoustics, models of pitch perception, Speech perception, human speech recognition, the auditory system as filter bank, the cepstrum as a spectral analyzer, linear prediction. **(12)**

UNIT III

Time Domain and Frequency Domain Methods for Speech Processing: Time domain parameters for speech, Methods of extracting the parameters, Zero crossings, Auto correlation function, Pitch estimation -Frequency domain : Short time Fourier analysis, filter bank analysis, spectrographic analysis, Format extraction, pitch extraction, Analysis – Synthesis systems. **(12)**

UNIT IV

Automatic Speech Recognition: Feature extraction for ASR, linguistic categories for speech recognition, deterministic sequence recognition for ASR, statistical sequence recognition, statistical model training, discriminant acoustic probability estimation, Speech recognition and Understanding. **(12)**

UNIT V

Speech Coding: Formulation of linear prediction problem in time domain, solution of normal equations, interpretation of linear prediction in autocorrelation and spectral domains, vocoders. **(12)**

Text Book:

1. B.Gold and N. Morgan, "Speech and Audio Signal Processing", John Wiley, 2011.
2. L.R.Rabiner and K.W. Schafer, "Digital Processing of Speech Signals", Dorling Kindersley (India) Pvt. Ltd., 2008.

Reference Book:

1. M. Kondoz, "Digital Speech", John Wiley, 2007.
2. J. L. Flanagan, "Speech Analysis, Synthesis and Perception", Second edition, Spriger, 1983.
3. I. H. Witten, "Principles of Computer Speech", Academic Press, 1982

WebReferences:

1. http://speech.tifr.res.in/tutorials/fundamentalOfASR_picone96.pdf
2. www.speech-recognition.de/
3. math.unc.edu/Faculty/petersen/BIRSSlides/juang.pdf

EC E24 - NANOTECHNOLOGY AND NANOSCALE PROCESSING

COURSE OBJECTIVE

- *To understand various properties of individual nanoparticles and concepts of carbon nanostructure*
- *To understand the concepts of nanostructured ferromagnetism, bulk nanostructures materials and also processing & fabrication I*
- *To analyze the concepts of processing and fabrication II*

COURSE OUTCOME

On successful completion of the module students will be able to:

- *Have a working knowledge of Nano science and nanotechnology including theory and experiment*
- *Potentially process and design nanostructured materials*
- *Gain in-depth knowledge in fabrication processes and construct products in Nano scale*

Unit I

Introduction and Properties of Individual Nanoparticles: Introduction – nanomaterials - metal nanoclusters – magic numbers – theoretical modeling – geometric and electronic structure – magnetic clusters – semiconducting Nanoparticles - optical properties – photo fragmentation - columbic explosion – rare gas and molecular clusters – role of surface in nanotechnology devices – surface reconstruction – dangling bonds and surface states. **(12)**

Unit II

Carbon nanostructures and Nanostructured ferromagnetism: Introduction – carbon molecules – carbon clusters – discovery – structure – carbon nanotubes – properties and application.Nanostructured ferromagnetism – dynamics – nanocarbon ferromagnets – Giant and colossal magnetoristance – Ferro fluids. **(12)**

Unit III

Bulk nanostructures materials: Solid disordered nanostructures – synthesis – nanostructuered multilayers - mechanical and electrical properties – metal nanoclusters composite glasses – nanostructured crystals – natural nanocrystals – crystals of metal Nanoparticles – nanoparticles lattices in colloidal suspensions – Photonic crystals. **(12)**

Unit IV

Processing and fabrication I: Si processing methods – etching, Oxidation, gettering, doping, epitaxy, sputtering, chemical vapour Deposition (CVD), Plasma enhanced CVD, relative ion etching (RIE), Moore's law, Top down approach to nanolithography, photolithography, sol gel method, Plasma arcing, ball milling method, merits and demerits. **(12)**

Unit V

Processing and fabrication II: Chemical methods - thermolysis - Pulsed laser methods - processing of III - V semiconductors including nitrides – molecular beam epitaxy (MBE) – chemical beam epitaxy (CBE) - metal organic CVD (MOCVD), quantum wells, Si-Ge, SiC, Diamond: synthesis, defects and properties on the Nanoscale. **(12)**

Text Books:

1. Nanotechnology, Mick Wilson et al, Overseas Press, 2005.
2. Introduction to Nanotechnology, Charles P Poole Jr and Frank J.Owens, Wiley-Interscience, 2003.

Reference Book:

1. Handbook of Nanoscience, Engineering and Technology. Ed.by William A. Goddard III, Donald W. Brenner, Sergey Edward Lyshevsky, and Gerald J.Iafrate.

EC E25 - MEDICAL ELECTRONICS

COURSE OBJECTIVE

- *To gain knowledge about the various electrical and non-electrical physiological parameters and study the methods of recording together with transmission methods of these parameters.*
- *To study about the various assist devices used in the hospitals and gain knowledge about equipment used for physical medicine*
- *To understand the various recently developed diagnostic and therapeutic techniques.*

COURSE OUTCOME

On successful completion of the module students will be able to:

- *Gain knowledge about the various electrical and non-electrical physiological parameters and the methods of recording and transmission*
- *Gain an insight into different specialized devices and equipment which helps to improve standard care of patients*
- *Make novel proposals in recent diagnostic and therapeutic techniques*

UNIT I

ELECTRO-PHYSIOLOGY AND BIO-POTENTIAL RECORDING: The origin of Bio-potentials; biopotential electrodes, biological amplifiers, ECG, EEG, EMG, PCG, lead systems and recording methods, typical waveforms and signal characteristics. **(12)**

UNIT II

BIO-CHEMICAL AND NON ELECTRICAL PARAMETER MEASUREMENT: pH, PO2, PCO2, colorimeter, Auto analyzer, Blood flow meter, cardiac output, respiratory measurement, Blood pressure, temperature, pulse, Blood Cell Counters. **(12)**

UNIT III

ASSIST DEVICES: Cardiac pacemakers, DC Defibrillator, Dialyser, Heart lung machine. **(12)**

UNIT IV

PHYSICAL MEDICINE AND BIOTELEMETRY: Diathermies- Shortwave, ultrasonic and microwave type and their applications, Surgical Diathermy Telemetry principles, frequency selection, biotelemetry, radio pill, electrical safety. **(12)**

UNIT V

RECENT TRENDS IN MEDICAL INSTRUMENTATION: Thermograph, endoscopy unit, Laser in medicine, cryogenic application, Introduction to telemedicine. **(12)**

Text books:

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

Reference books:

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

EC E26 – INTELLECTUAL PROPERTY RIGHTS AND CYBER SECURITY

COURSE OBJECTIVE

- *To gain knowledge on cryptography and its types and understand the different types of attacks*
- *To implement security in Smart Grid*
- *Introduction to Patents and Intellectual Property Patent Law*

COURSE OUTCOME

On successful completion of the module students will be able to:

- *Propose cryptographic solutions based on fundamental knowledge of cyber attacks and remedies*
- *Design new models based on Smart Grid security concepts*
- *Gain knowledge regarding Patents and Intellectual Property Patent Law*

UNIT - I

CYBERSECURITY FUNDAMENTALS: Information assurance fundamentals-Basic Cryptography-symmetric encryption-public key encryption-firewalls-virtualization RF identification-Microsoft windows security principles. **(12)**

UNIT - II

ATTACKER TECHNIQUES AND MOTIVATION: Types of proxies-detecting use of proxies-tunneling techniques-HTTP-DNS-ICMP-Intermediaries-Steganography-Detection and Prevention-mobile malicious code-Botnets-fast flux-advanced fast flux-integer overflow vulnerabilities-stack based buffer overflows-SQL injection-malicious PDF files. **(12)**

UNIT - III

MALICIOUS CODE: Worms-viruses-evading detection and elevating privileges-obfuscation-hypervisiors-root kits-spyware-attacks against privileged user accounts-taken kidnapping-virtual machine detection-DLL injection-defense and analysis techniques-memory forensics-honey pots-automated malicious code analysis-intrusion detection systems. **(12)**

UNIT - IV

SECURING THE SMART GRID: Hacking the Smart Grid-Privacy Concerns with the Smart Grid-Security Models for CADA, ICS and Smart Grid-Securing the Supply Chain-Future of the Grid. **(12)**

UNIT - V

INTRODUCTION TO PATENTS AND OTHER INTELLECTUAL PROPERTY PATENT LAW: Copyright Law-Trademark Law-Trade Secret Law-Overview-Definitions-Forms-Statutes-The Three Types of Patents-The Novelty and Unobviousness Requirement-Patent Filling Deadlines- Solving Creativity Problems-Provisional Patent Application-Legal Requirements for a Utility patent-Make a Patentability Search-Patent and Trademarks Depository Libraries-Problems Searching Software and Business Inventions-Searches on the Internet-Micro Patent Searches on the Internet-NPL (Non-Patent Literature) Searches. **(12)**

Text books:

1. Cyber security Operations Handbook, Ritting house and Hancock, 1st edition, 2009, Elsevier publications.
2. Applied Cyber Security and the Smart Grid-Implementing Security Controls into the Modern Power Infrastructure by knapp & Samani, 1st Edition, 2013 Elsevier Publications.

Reference books:

1. Cyber Security Essentials by James Graham and Ryan Olson Auerbach publications, Taylor and Francis Group, 2011.
2. Patent, Copyright & Trademark-An Intellectual Property Desk Reference.
3. The leading IP reference by Richard Stim, Attorney 2012, 12th Edition, NOLA.
4. Patent it yourself by David Pressman, Attorney, 2012, 16th Edition, NOLA.

INFRASTRUCTURE AND FACULTY REQUIREMENTS

Infrastructure and faculty requirement for I year B.Techprogramme

Space requirement:

SI.No	Classroom/laboratory	Batch size	Area(Sqm)	No.required
01.	classroom	66	66	Total intake/60
02.	Drawing hall	66	175	1
03.	Physics laboratory	30	150	1
04.	Chemistry laboratory	30	150	1
05.	Basic electrical laboratory	15	75	1
06.	Basic electronics laboratory	15	75	1
07.	Computer laboratory	30	150	1
08.	Workshop practice	30	200	1

Requirement of Teaching and Non-Teaching Staff:

Teaching:

The number of faculty members required would be as per AICTE norms and course curriculum.

Faculty: student ratio=1:15

A minimum of two faculty members in each of the following disciplines are required

(i) Maths
(ii) Physics
(iii) Chemistry
(iv) Mechanical

A minimum of one faculty member in each of the following disciplines are required

(i) English
(ii) Electronics & Electronics Engineering/Electronics and Communication Engineering
(iii) Civil Engineering
(iv) Computer Science and Engineering

Non-Teaching:

Total number of non-teaching staff (includes technical & ministerial) shall be in the ratio of ***Teaching: Non- teaching = 1.2:1***

FACULTY QUALIFICATION:

Science and Humanities

A first class Master degree in the respective discipline with Net qualification / M.Phil / Ph.D.

Engineering discipline

B.E / B.Tech and ME/M.Tech in ECE and related branches with First Class or equivalent either in BE/B.Tech or ME/M.Tech.

COMPUTER PROGRAMMING LABORATORY

(*For a batch of 30 students*)

Hardware

1. 1 No. of computer system : Server
2. 35 Nos. of computer system : Node with Pentium 4 or above processor
3. 1 UPS 5k VA
4. Dot Matrix Printer / Laser Printer – 3 nos.
5. Node with Pentium 4 or above processor

Software

1. Licensed Microsoft Server OS / Linux Server OS / UNIX Server Software / Any other open source server software
2. Licensed client OS / Open source client OS for minimum of 30 user
3. Borland 'C' Complier / Microsoft 'C' Complier with 30 user license

   MS Office / any other open source word processor, spread sheet and presentation software with 30 user license.

BASIC ELECTRICAL AND ELECTRONICS LABORATORY

(For a batch of 30 students)

Electrical

1. 15 boards
2. 15 tool sets

   Each set includes Screw Driver, Poker, Cuttingpliers, Tester, Knife etc.
3. Accessories such as PVC pipes, boards, Ts, Wires, (single and multispread) electrical accessories like switches (SPST, SPDT, OPDT), lamp holders, bulbs etc.
4. Demo experiment with few workshop tools –fan, tube light, wiring etc.

Electronics

1. Regulated power supply (0-15v)	-	2
2. Signal Generator (0-1 MHz)	-	2
3. CRO (20 MHz)	-	2
4. Digital IC trainer kit	-	1
5. Transformer (230/6, 230/12)	-	2
6. Strain Gauge / Thermocouple / LVDT / Transducer kit	-	1

PHYSICS LABORATORY

(For a batch of 30 students)

List of Major equipments required

1. Lee's Disc Apparatus	-	3 nos.
2. Calorimeter with sterer	-	6nos.
3. Spectrometer	-	6nos.
4. Traveling Microscope	-	6nos.
5. Laurent Halt Shade Polari meter	-	3nos.
6. Jolly Bulb Apparatus	-	3nos.
7. Deflection Magnetometer	-	3nos.
8. He Ne Laser	-	3nos.
9. Stop watch, Vernier Caliper, Screw gauge	-	6nos. each
10. Electronic Weighting Machine	-	2nos

CHEMISTRY LABORATORY

(For a batch of 30 students)

1.	Burette	- 35 nos.
2.	Pipette	- 35nos.
3.	Conical flask	- 35nos.
4.	Wash bottle 500 ml	- 35nos.
5.	Funnel	-35nos
6.	Volumetric flask 1000 ml	-5nos
	100 ml	-70nos
7.	Beakers 1000 ml	-10nos
	500 m	-10nosl
	250 ml	-70nos
	100 ml	-15nos
8.	Reagent bottle 5000 ml	-5nos
	250 ml	-35nos
	60 ml	-35nos
9.	Measuring jar 100 ml	-10nos
	25ml	-10nos
	10ml	-10nos
	5ml	-10nos
	2ml	-10nos
10.	Round bottom flask 250ml	-35nos
11.	Condenser 300mm	-35nos
12.	COD bottle	-5nos

EQUIPMENT

1. Electronic weighing balance 0.1mg-200gm	-2nos
2. Conductivity meters	-7nos
3.Caloriometer	-7nos
4.Potientiometer	-7nos
5. Hot plates	-7nos
6. Polythene cans 10 liters	-10nos
5liters	-10nos
7. Viscometers	-35nos
8. Burners	-35 nos.
9. Water distillation plant 5 lit cap	-1 no.
10. Burette stands with clamp	-35 nos.

BASIC WORKSHOP
(For a batch of 30 students)

1. Work benches fitted with bench-wise / carpentry wise of 8 for a batch size of 30.
2. Fitting tools – 8 sets
3. Carpentry tools – 8 sets
4. Welding tools – 8 sets
5. Sheet metal tools – 8 sets
6. Power hacksaw – 1 no.
7. Drilling machines – 1 no.
8. Anvil – 1 no.
9. Welding work tables – 2 nos.
10. Welding Transformer – 2 nos.
11. Hand shear for sheet metal
12. Pedestal Grinder
13. Surface table with light gauge
14. Different stag for forming shapes

Infrastructure and Faculty Requirement for B.Tech. Electronics and Communication Engineering

Infrastructure

Sl.No.	Name of the Laboratory	Area(sq.m)	Maximum batch size	No. Required
1	Class Rooms	66	72	3
2	Electronics Lab	75	24	2
3	Communication Lab	75	24	2
4	Computer Lab	75	24	1
5	Embedded Systems/ DSP Lab	75	24	1

Requirement of Teaching and Non-Teaching Staff:

Teaching:

The number of faculty members required would be as per AICTE norms and course curriculum.
Faculty: Student Ratio=1.15
A total of 12 faculty members are required including a teaching faculty for mathematics (180/15).

Non-Teaching Staff:

Teaching:Non-Teaching=1.2:1

Each laboratory should have one laboratory attender/Mechanic. Inaddition, one more attender is required for department office.

Total requirement of Non-Teaching Staff is =6(5 Teaching +1 Non Teaching).

FACULTY QUALIFICATION:

B.E / B.Tech and ME/M.Tech in ECE and related branches with First Class or equivalent either in BE/B.Tech or ME/M.Tech.

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
LABORATORY EQIPMENTS LIST
[BASED ON REVISED SYLLABUS 2014-2015]

S.No.	REQUIREMENTS	QTY.
1	Regulated power supply	40
2	CRO (20MHz/30MHz/60MHz/100MHz)	45
3	Signal generator and Function generator	40
4	Multimeter	20
5	Digital trainer kit	10
6	Microwave test bench(Klystron)	4
7	Microwave test bench(Gunn diode)	3
8	Fiber optic trainer	3
9	Spectrum analyzer	1
10	Vector Network Analyser	1
11	OTDR	1
12	Radio communication	1
13	Arbitrary waveform generator	1
14	**VLSI trainer kit:** List of software required a) Simulator and Synthesizer tool with down loader (VHDL/Verilog)	5 user license
	No. of FPGA kits required with a) I/O cards Add on card for FPGA	5 nos.
15	DC Ammeter (100mA,10mA,250µA)	7(each)
16	DC Voltmeter(3V,10V,30V,300V)	7(each)
17	Decade resistance box	12
18	Decade inductance box	12
19	Decade capacitance box	12
20	Audio power meter	1

21	PC with LAN connection	30
22	Network Simulator Software	10
23	**Microcontroller 8051 kit with facility** a. 16×4(12×3) Keyboard b. 16×2 LCD display c. Four digit 7 segment display d. Parallel I/O pins are all available(Terminated) to interface to the circuits assembled while conducting experiments. e. Bread board to mount circuit components to build the interfaces. f. Connect to PC and on board programmable facility.	7
24	**DSP TI6000 Lab with Facility** a.DSP Starter Kit for TMS320C6713 b.Daughter Board Interfacing Kit c.LCD Matrix Keyboard Interfacing Kit	 5 Nos 5 Nos 5 Nos

S.No.	REQUIREMENTS	QTY.
24.	Pspice / Orcad / Multisim – Design Software.	10
25.	Flash Programmer	7
26.	Matlab software	10 users

The requirement specified below can be shared with the CSE, EEE or IT department lab.

S.No.	REQUIREMENTS	QTY
	Microprocessor and Microcontroller kit	
1.	8085	12
2.	Microcontrollers Kit (8051) a. 16 x 2 LCD display. b. Four digit 7 segment display. c. Parallel I/O pins are all available (terminated) to interface to the circuits assembled. d. Bread board to mount circuit components to build the interface.	12
3.	8257, ARM, PIC Processors	2(each)
4.	Various Interface Kits (Stepper motor, Key board, D/A, A/D converters, PI controller, serial.)	3(each)