Regulations and Curriculum

for

B. Tech. Electronics and Communication Engineering

2014-2015

PONDICHERRYUNIVERSITY
BACHELOR OF TECHNOLOGY PROGRAMMES
(EIGHT SEMESTERS)

<u>REGULATIONS</u>

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 Naduor 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 semester B.Techprogramme:

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:

Brach 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 PondicherryUniversity 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 dulyrecommended by the Head of the Institution along with the revaluation feeprescribed 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 = (Sum of(C × GP)/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

% Mark = (CGPA - 0.5) × 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 1st to 8th semester alone should be considered and it is mandatory that the candidate should have passed all the subjects from 1st to 8th 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.

(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 Circuits Laboratory	-	-	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	Numerical Methods and Techniques	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 Signal Processing 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

V Semester

EC E51	Operating Systems
EC E52	Consumer Electronics
EC E53	Semiconducting Materials and Optoelectronics
EC E54	Introduction to Nanoscience and Technology

VI Semester

EC E61	Soft Computing
EC E62	VLSI Design
EC E63	Digital Signal Processors and Applications
EC E64	Object Oriented Programming
EC E65	Nanomaterials: Preparation and Characterization
EC E66	Mobile Computing

VII Semester

EC E71	Digital Image Processing
EC E72	Telecommunication and Switching Networks
EC E73	Special Topics in Communication Engineering
EC E74	Cryptography and Network Security
EC E75	Spread Spectrum Communication
EC E76	Satellite Communication Systems
EC E77	Nanoscale Fabrication and Techniques
EC E78	Microwave Integrated Circuit Design
EC E79	Biometric System

VIII Semester

EC E81	Cellular Mobile Communication
EC E82	Optoelectronic Devices
EC E83	RF Circuit Design
EC E84	Speech Processing
EC E85	Nanotechnology and Nanoscale Processing
EC E86	Medical Electronics
EC E87	Intellectual Property Rights and Cyber Security

MA T31-MATHEMATICS III

COURSE OBJECTIVE

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

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.

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.

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).

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.

UNIT V

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

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, 7th 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 utilization of different home appliances.*

UNIT - I

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

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.

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.

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.

UNIT - V

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

Text Book:

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 sytems 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, "Utilisation 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 OBJECTIVES

- *To acquaint students with data structures used when programming for the storage and manipulation of data.*
- *The concept of data abstraction and the problem of building implementations of abstract data types are emphasized.*
- *To understand the concepts of object oriented programming*
- *To expertise the 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.

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.

UNIT III

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

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 .

UNIT V

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

Text Books:

1. Ellis Horowitz and SartajSahni, "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 and the physics of semiconductors.*
➢ *To understand in detail the operation, characteristics and various parameters of diodes.*
➢ *To learn and gain insight into the operation, characteristics and functional aspects of BJT in different configurations.*
➢ *To understand in depth the construction, operation, characteristics and various parameters of JFET and MOSFET.*
➢ *To study the construction, operation and characteristics several special semiconductor devices.*
➢ *To design the different types of biasing in BJT, FET and MOSFET.*
➢ *To acquaint the various rectifier circuits with filters and IC regulator circuits.*

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.

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.

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.

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.

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.

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*
➢ *To explore the use of Resonant circuits and tuned circuits in the field of communication*
➢ *To analyze the transient behavior of Electrical circuits*
➢ *To identify the ways and means to solve magnetically coupled circuits*
➢ *To understand the use of network topology in circuit solving*

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.

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.

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.

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.

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.

Text Book:

1. William H. Hayt, Jr. Jack E. Kemmerly and Steven M. Durbin, "Engineering Circuit Analysis", McGraw Hill Science Engineering, 8th Edition, 2013.

Reference Books:

1. Joseph Edminister and MahmoodNahvi, "Electric Circuits", Schaum's Outline Series, Fourth Edition, Tata McGraw Hill Publishing Company, New Delhi, 2003.
2. David A. Bell, "Electric Circuits", Sixth Edition, PHI Learning, New Delhi, 2003.

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.*

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

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.

UNIT-III

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

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.

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.

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 NUMERICAL METHODS AND TECHNIQUES

COURSE OBJECTIVE

- *To introduce some basic concepts in numerical methods to enable the students to solve engineering problems numerically.*
- *To make students to understand the methods for solvingnonlinear, linear algebraic equationsand Eigen value problems.*
- *To understand and workout problems ininterpolation, differentiation and integration.*
- *To solve problems in ordinary and partial differential equations by some basic methods.*

UNIT - I

Solution of Algebraic and Transcendental Equation and Eigen Value Problem:
Solution of algebraic and transcendental equation by the method of bisection, the method of false position, Newton-Raphson method and Graeffe's root squaring method.Eigen value problem by power method and Jacobi method.

UNIT-II

Solution of System of Equations and Matrix Inversion: Solution of linear algebraic equation: Gauss and Gauss-Jordan elimination methods- Method of Triangularization and Crout's reduction. Iterative methods: Gauss-Jacobi, Gauss-Seidel and Relaxation methods. Matrix inversion by Gauss - Jordan elimination and Crout's methods.

UNIT-III

Interpolation: Finite Differences, Relation between operators - Interpolation by Newton's forward and backward difference formulae for equal intervals. Newton's divided difference method and Lagrange's method for unequal intervals.Numerical differentiation in one variable.Numerical Integration by Trapezoidal and Simpson's rules with respect to one variable.

UNIT-IV

Solution of Ordinary Differential Equation: Single step methods: Taylor series method, Picard's method of successive approximation, Euler and Improved Euler methods, Runge-Kutta method of fourth order only. Multistep methods: Milne and Adams - Bashforth methods.

UNIT - V

Solution of Partial Differential Equations: Laplace and Poison equations-Liebmann's iterative method. Diffusion equation: Explicit and Crank-Nicholson implicit difference schemes. Wave equation: Explicit difference method.

Text Book:

1. P. Kandasamy, K. Gunavathy and K. Thilagavathy, "Numerical Methods", S. Chand &Company Ltd, New Delhi.

References:

1. M.K. Venkataraman, "Numerical methods in Science and Engineering", National Publishing Company, Madras.

2. 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 amplifier using h-parameters and low frequency FET model.*
➢ *To pioneer the high frequency analysis of BJT*
➢ *To familiarize the theory of multistage amplifiers like cascade, cascode and Darlington pair.*
➢ *To understand the fundamentals of feedback amplifiers*
➢ *To understand the concepts of oscillators*
➢ *To understand the concepts of Wave Shaping Circuits,Multivibrators*
➢ *To conceptualize the working of Time Base Generators*
➢ *To gain the knowledge in Large Signal Amplifiers*

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.

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.

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 bistablemultivibrators using transistors– Schmitt trigger circuit.

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.

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.

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

<h1 style="text-align:center">EC T43-SIGNALS AND SYSTEMS</h1>

COURSE OBJECTIVE

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

<h2 style="text-align:center">UNIT I</h2>

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.

<h2 style="text-align:center">UNIT II</h2>

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

<h2 style="text-align:center">UNIT III</h2>

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

<h2 style="text-align:center">UNIT IV</h2>

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

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.

Text Books:

1. Simon Haykins and Barry Van Veen, "Signals and Systems", Second Edition, John Wiley and Sons, 2002.

Reference Books:

1. Allan V.Oppenheim, Allan S.Willsky and S.HamidNawab, "Signals and Systems", Second Edition, PHI Learning, New Delhi, 2007.

2. Douglas K. Lindner, "Signals and Systems", McGraw-Hill International Edition, 1999.

3. 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 and their design.*
- ➤ *To undestand the concepts of control system components and mathematical modeling of electrical system, mechanical system, etc.*
- ➤ *To study the concept of time response and frequency response of the system.*
- ➤ *An understanding of the relationship between ordinary differential equations, impulse response functions, frequency response function, and transfer function description of a system.*
- ➤ *An understanding of the concept of marginal stability, asymptotic stability, and bounded-input bounded-output stability for continuous and discrete systems.*
- ➤ *To pioneer the basics of different plots such as Bode plot, Nyquist plot, Root locus method and Polar plot.*
- ➤ *To familiarize the theory of Z-transform, inverse Z-transform and their properties in the digital control system.*
- ➤ *To study the concept of state space analysis this is a modern approach and powerful tool for the design and analysis of modern control system.*

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.

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.

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.

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.

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 acontrol system -State space representation using physical, phase and canonical variables-diagonal canonical form-Jordan canonical form.

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*
➢ *To understand the concepts of Boolean Algebra, Simplification of Boolean Function*
➢ *To understand the concepts of Combinational Logic Design, Programmable Logic Devices*
➢ *To conceptualize the working of Sequential Circuits, Synchronous Sequential Circuits*
➢ *To gain the knowledge in Memory*

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.

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.

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.

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).

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.

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 OBJECTIVES

➤ *To obtain the knowledge on modulation and need for it and methods of generation and detection of AM signals*
➤ *To study the frequency and phase modulation. To recognize the key specification of FM audio transmitter.*
➤ *To acquire knowledge on different types of AM and FM detectors and receivers*
➤ *To study the basic principles of RADAR and different types of RADAR.*
➤ *To obtain the knowledge on Television systems and standards-Black and white transmission-black and white reception-colour transmission and 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.

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.

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.

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

UNIT-V

Television: Introduction of Television-Television systems and standards-Black and whiteTransmission-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

Text Book:

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

Reference Books:

1. Roddy and Coolen, "Communication Systems", PHI learning, 2001.
2. Wayne Tomasi, "Electronic Communication Systems- Fundamentals Theory Advanced", Fourth Edition, Pearson Education, 2001.

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

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

5. 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 measurethe frequency response, input impedance and output impedance ofi. 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 andVoltage Multipliers
   b) To design, construct and study theUJT relaxation oscillator

8. a) To design, construct and study the BJT basedAstablemultivibrator andMonostablemultivibrator
   b) To design, construct and study the BJT based Bistablemultivibrator and Schmitt trigger circuits.

9. a) To design, construct and study the Miller integrator and Bootstrap ramp generator
   b) To simulate the Bootstrap ramp generatorcircuitusing PSPICE

10. a) To obtain the frequency Vs. power and load Vs. power characteristicsof Class A power amplifier
    b) To obtain the frequency Vs. power and load Vs. power characteristicsof Class Bcomplementary symmetry amplifier

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

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*
- *To have an in depth knowledge of standard distribution which can describe real life phenomena.*
- *To analyze the stochastic process*
- *To understand and characterize phenomena which evolve with respect to time in probabilistic manner.*
- *To analyze the response of random inputs to linear time invariant systems.*

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.

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.

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.

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.

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).

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 Queueing 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

➢ *Introduce the different network models.*
➢ *To elaborate the concept and various features of data link layer and network layer.*
➢ *To examine the effectiveness of the congestion and traffic management for TCP and ATM packets.*
➢ *To study on various network security schemes.*

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.

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.

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.

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.

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.

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, PearsonEducation 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 and its assembly language programming*
➢ *To study the 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*

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.

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.

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.

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.

UNIT V

8051 Microcontroller based Systems Design: Interfacing-ADC and DAC chips-Square and Sine wavegeneration, push button switch, Microcontroller Application Examples—Stopwatch,Interfacing DC Motors, stepper motor and Servomotors,

Thermometer, Traffic light control.

RTC Interfacing using I²C Standard-Details of I^2C bus, Subroutines used to implement I^2C bus, DS1307—Serial I^2C real-time clock IC.

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 and to understand its applications in the field of Engineering.*

➢ *To understand the functionalities of IC Regulators and their series IC 7800 and IC 7900.*

➢ *To acquire knowledge in other Linear IC's like IC555 and PLL565 and their related applications.*

➢ *To understand the design concepts of Analog to Digital and Digital to Analog Converters.*

➢ *To acquire knowledge of the different Digital IC Families, their Standards and to compare the characteristics related to them.*

➢ *To completely understand the design of Synchronous and Asynchronous Sequential Logic circuits.*

➢ *To understand the steps involved in the design of the Processor and Control Unit.*

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 MonostableMultivibrators, V-I and I-V Converters. Filter and its types – Instrumentation amplifier – Precision rectifiers - Logarithmic and antilog amplifiers – Multiplier.

UNIT II

Other LICs and Data Converters: 555 timer – Block diagram and features – AstableMultivibrator – Applications - Square wave oscillator, Ramp generator, Triangular waveform generator and Voltage to frequency converter – MonostableMultivibrator –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.

UNIT III

Digital Integrated Circuits: Digital IC characteristics, Digital IC families -RTL and DTL, TL, I2L, TTL, ECL, MOS and CMOS logic circuits, Comparison of digital IC families.

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

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.

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.*

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.

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.

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.

UNIT IV

Guided Waves andRectangular 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.

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 mode sin circular wave guides. Microwave resonators introduction – Coaxial resonator-Waveguide, rectangular and circular cavity resonator - Cavity excitation and tuning – Qfactor of micro wave cavities (Qualitative treatment only).

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 2nd 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. astablemultivibrator
                                         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.

ECT 53 - 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 the various filters and receivers*
- *To understand the basic types of modulation*
- *To analyze the basic concepts of spread spectrum technology*
- *To understand the concept of synchronization*
- *To analyze the different encryption standards*

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

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

UNIT- III

Spread Spectrum Communication: Spread spectrum technologies - spreading techniques-   PN sequences - Direct sequence spread spectrum systems - Frequency hopping spread spectrum systems - Hybrid systems - Demodulation schemes - RAKE Receivers - Use of spread spectrum with code division multiple access

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

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

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.

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.
.

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.

UNIT III

SIGNAL PROCESSING IN WIRELESS SYSTEMS: Principle of Diversity, Macro diversity, Micro diversity, Signal Combining Techniques, Transmit diversity, Equalizers- Linear and Decision Feedback equalizers, Review of
Channel coding and Speech coding techniques.

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.

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.

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-GenerationWireless NetworksSystems, Architectures, and Protocols," John Wiley & Sons, Inc.Publication, 2006.

EC T63-DIGITAL SIGNAL PROCESSING

COURSE OBJECTIVE

- *To introduce the advantages of digital signal processing.*
- *To introduce 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 and the concepts and applications of multirate sampling.*
- *To introduce 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.

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 poly phase realization structures.

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.

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.

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.

Text Book:

1. John G. Proakis and Dimitris G. Manolakis, "Digital Signal Processing: Principles, Algorithms, and Applications", PHI learning, New Delhi, Fourth edition 2008.

Reference Books:

1. L. R. Rabiner and B. Gold, "Theory and Application of Digital Signal Processing" PHI Learning, New Delhi, 1998.
2. Sanjit K. Mitra, "Digital Signal Processing: A Computer Based Approach, Tata McGraw – Hill, Third Edition, 2005.
3. 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*

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.

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.

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.

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.

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.

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

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 OBJECTIVES

- ➢ *To learn the principles, operation, performance and applications of various microwave tubes and semiconductor devices*
- ➢ *To understand the operation and applications of microwave components. To become familiar with the concepts of S-parameters and also to derive the S-matrix of different microwave components*
- ➢ *To learn the techniques of microwave and antenna measurements*
- ➢ *To gain an insight of the light propagation in optical fibers, to understand the signal degradation in optical fibers and to study the operation of different optical sources, detectors and amplifiers*
- ➢ *To design an optical fiber link and study the principles of 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

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

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.

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

UNIT - V

Optical Networks: Principle ofSONET / 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.

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 students to the embedded systems, its hardware and software.*
- ➢ *To introduce 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.*
- ➢ *To provide an understanding on how to design and implement a small embedded 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.

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.

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.

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.

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.

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. Santanu Chattopadhyay, " 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.

Web Reference:
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 7th and 8th semesters and has to be completed by the end of the 8th semester. In the phase I of the project work, the progress of the work carried out in the 7th 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 and their applications*
➢ *To pioneer the methods of comparison to be implemented for Engineers*
➢ *To understand the concepts of General Management*
➢ *To study the concepts of 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.

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

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.

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.

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.

Text / Reference Books:

1. O.P. Khanna, "Industrial Engineering and Management", Dhanpat Rai& sons,1999.
2. R.PannerSelvam, "Production and Operations Management", PHI Learning, 2002.
3. Mart and Telsang – Industrial Engineering and Production Management, S.Chand and Co., 1998.
4. 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.

ELECTIVES OF FIFTH SEMESTER

EC E51– OPERATING SYSTEMS

COURSE OBJECTIVE

- *To understand the fundamentals of operating systems*
- *To understand the concepts of process management*
- *To understand the concepts of storage management*
- *To conceptualize the working of I/O systems*
- *To gain knowledge in distributed systems*

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.

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.

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.

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.

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.

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

ReferencesBooks:

1. Harvey M. Deitel, Operating Systems, Second Edition, Pearson Education Pvt. Ltd, 2002.
2. Andrew S. Tanenbaum, Modern Operating Systems, Prentice Hall of India Pvt. Ltd, 2003
3. William Stallings, Operating System Prentice Hall of India, 4th Edition, 2003

Web References:

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

EC E52-CONSUMERELECTRONICS

COURSE OBJECTIVE

➢ *To introduce the fundamental principles of equipment used by consumers*
➢ *To introduce the theory and applications of various types of microphones.*
➢ *To impart knowledge on the various Television systems and standards in use*
➢ *To introduce the concepts of audio and video signal processing and telecommunications.*
➢ *To introduce the students to the basic principle of working of commonly used 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.

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.

UNIT- III

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

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.

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.

Text Book:

1. S.P.Bali,"ConsumerElectronics",PearsonEducation,2005

Reference Books:

1. Jochen Schiller, Mobile Communications, 2nd Edition, Addison-Wesley, 2001.

2. William Stallings, Wireless communications and Networks,2nd Edition, Pearson Education Asia, 2000.

3. 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 E53 - SEMICONDUCTING MATERIALS AND OPTOELECTRONICS

COURSE OBJECTIVE

➢ *To understand the basics of semi conducting materials*
➢ *To understand the concept of Quantum wells, wires, dots, self assembly and catalysis*
➢ *To understand the more knowledge of Light emitting diodes, Semiconductor lasers, photodetectors and solar cells*

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.

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.

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

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.

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.

Text Books:

1. Semi conducting Optoelectronics devices, Pallab Bhattacharya, prentice hall international editions, 2002.
2. Solid state physics, S O Pillai, 5th edition, 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 E54 - INTRODUCTION TO NANOSCIENCE AND TECHNOLOGY

COURSE OBJECTIVE:

- *To understand the detailed introduction of the nanoscale systems*
- *To understand the concepts of Quantum Dots and Synthesis of Nanostructure Materials*
- *To understand 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.

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.

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

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 – nanomechanical characterization – nanoindentation

UNIT V

Nanotechnology Applications: Applications of nanoparticles, quantum dots, nanotubes and nanowires for nanodevice 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.

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.

ELECTIVES OF SIXTH SEMESTER

EC E61 - SOFT COMPUTING

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

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.

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.

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.

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.

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.

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 KalyanmoyDeb.John Wiley and sons, 2002

Web References

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

EC E62-VLSI DESIGN

COURSE OBJECTIVE

- ➢ *To know about the operating principles of MOS transistor.*
- ➢ *To study about construction of NMOS, CMOS and Bi-CMOS based logic gates.*
- ➢ *To learn techniques of chip design using programmable devices.*
- ➢ *To learn the concepts of designing VLSI subsystems.*
- ➢ *To learn the concepts of modelling a digital system using Verilog HDL.*

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.

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.

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.

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.

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.

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 E63 - DIGITAL SIGNAL PROCESSORS AND APPLICATIONS

COURSE OBJECTIVE

- ➢ *To understand the architecture and instruction set of DSP56XXX processor*
- ➢ *To analyze the implementation of digital filters*
- ➢ *To understand the architecture and operation of TMS320C6X processor*
- ➢ *To analyze the core optimization*
- ➢ *To analyze the real time analysis and scheduling*

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.

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.

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.

UNIT-IV

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

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.

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 E64 - OBJECT ORIENTED PROGRAMMING

COURSE OBJECTIVE

> *To model the object oriented programming: 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 take the statement of a business problem and from this determine suitable logic for solving the problem; then be able to proceed to code that logic as a program written in 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.

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.

UNIT - III

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

UNIT - IV

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

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.

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 E65-NANOMATERIALS: PREPARATION AND CHARACTERIZATION

COURSE OBJECTIVE

➢ *To understand the concepts of basic properties of nanoparticles and nanotubes*

➢ *To understand the concepts of nanowires &nanofibers and its characterization*

➢ *To analyze in depth issues in the nano device*

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

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

UNIT III

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

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)

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

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 E66-MOBILE COMPUTING

COURSE OBJECTIVE

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

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.

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.

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.

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 .

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.

Text book:

1. Prasant Kumar Pattnaik, Rajib Mall, "Fundamentals of Mobile Computing", PHI Learning Pvt. Ltd, New Delhi – 2012.

Reference books:

1. Jochen H. Schller, "Mobile Communications", Second Edition, Pearson Education, New Delhi, 2007.
2. Dharma PrakashAgarval, Qing and An Zeng, "Introduction to Wireless and Mobile systems", Thomson Asia Pvt Ltd, 2005.
3. UweHansmann, LotharMerk, Martin S. Nicklons and Thomas Stober, "Principles of Mobile Computing", Springer, 2003.
4. William.C.Y.Lee,"Mobile Cellular Telecommunications-Analog and Digital Systems", Second Edition,TataMcGraw Hill Edition ,2006.
5. 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/

ELECTIVES OF SEVENTH SEMESTER

EC E71-Digital Image Processing

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

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 procesing

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

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

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

UNIT V

Image Segmentation Techniques : Need for image segmentation – detection of discontinuities – Thresholding – Region based segmentation

Text Book:

1. R.C. Gonzalez, "Digital Image Processing", Addison Wesley,2009.

Reference Books:

1. Anil K Jain, "Fundamentals of Digital Image Processing", PHI Learning, 1999.
2. S.Jayaraman, S.Esakkirajan and T.Veerakumar, "Digital Image Processing", TMH Pvt. Ltd., 2009
3. 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 E72- TELECOMMUNICATION SWITCHING AND NETWORKS

COURSE OBJECTIVE

- ➢ *To introduce the concepts of Frequency and Time division multiplexing.*
- ➢ *To introduce digital multiplexing and digital hierarchy namely SONET/SDH*
- ➢ *To introduce the concepts of space switching, time switching and combination switching, example of a switch namely No.4 ESS Toll switch.*
- ➢ *To introduce the need for network synchronization and study synchronization issues. To outline network control and management issues.*
- ➢ *To study the enhanced local loop systems in digital environment. To introduce ISDN, DSL/ADSL, and fiber optic systems in subscriber loop.*
- ➢ *To introduce statistical modeling of telephone traffic. To study blocking system characteristics and queuing system characteristics.*
- ➢ *To characterize blocking probability holding service time distribution for speech and data networks.*

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.

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.

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.

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.

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.

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 E73 - SPECIAL TOPICS IN COMMUNICATION ENGINEERING

COURSE OBJECTIVE

- *To enable the students to know the concepts and standards of ISDN*
- *To make the students realize the importance of ATM Network and its Architecture*
- *To introduce different types of Mobile communication systems*

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.

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.

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.

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.

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.

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 E74-CRYPTOGRAPHY AND NETWORK SECURITY

COURSE OBJECTIVE

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

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.

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.

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

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.

UNIT- V

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

Text Book:

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

COURSE OBJECTIVE

- ➢ *To enable the students to know about the hidden 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.*

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

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

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

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.

UNIT-V

Applications: Space systems – Satellite communication. Anti jam military communication – Low probability of intercept communication – Mobile communications.

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 E76 - 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.*

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

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

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

UNIT-IV

Laser Satellite Communication: Inter satellite links- optical communication for satellite networks- laser cross link analysis- optical beam acquisition, tracking and pointing.

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.

Text Book:

1. Pratt and Bostian, "Satellite communication", John Wiley and Sons, 2007

Reference Books:

1. Tri. T. Ha, "Digital satellite communication system", McGraw Hill
2. Pritchend and sciulli, "Satellite communication systems engineering", PHI Learning, 1986
3. Robert M. Gagliendi, "Satellite communication", John Wiley and Sons, 1988
4. 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 E77 - NANOSCALE FABRICATION AND TECHNIQUES

COURSE OBJECTIVE:

➢ *To understand the concepts of the scaling laws in miniaturization and clean room*
➢ *To analyze the different kinds of preparation techniques*
➢ *To 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

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

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

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

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.

Text Books:

1. T.R. Hsu, MEMS & microsystems design and manufacture, Boston, McGraw Hill, 2002.
2. S.E. Lyshevski, Nano- and microelectromechanical 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 E78- MICROWAVE INTEGRATED CIRCUIT DESIGN

COURSE OBJECTIVE

> *To understand the conventional microwave transmission structures and principles*
> *To conceptualize the working of various microwave components and its design parameters*
> *To analyze the industrial oriented microwave components*
> *To gain knowledge in microwave semiconductors and its applications*
> *To focus on processing techniques and industrial fabrication of components*

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.

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.

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.

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.

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.

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 E79 BIOMETRIC SYSTEM

COURSE OBJECTIVE
- *To understand the fundamentals of Biometric terms*
- *To acquire knowledge on Fingerprint Identification and Iris Recognition*
- *To gain better understanding of Face Recognition its real time application*
- *To frame ideas on working of Voice Scan and integrating it with other 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- ataxonomy of application environment, a system model, biometrics and privacy.

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.

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.

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.

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.

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 Books:

1. John D. Woodword Jr., Biometrics, Dreamtech Press, New Delhi, 2003.

ELECTIVES OF EIGHT SEMESTER

EC E81- CELLULAR MOBILE COMMUNICATION

COURSE OBJECTIVE

➢ *To understand the fundamentals of cellular communications*
➢ *To 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*
➢ *To look forward on emerging technologies and its benefits.*

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

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

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.

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.

UNIT-V

Special Topics: Third generation mobile services - Wireless local loop – Wireless enterprise networks - Bluetooth technology.

Text Book:

1. Yi-Bing Lin and Imrichchlantae, "Wireless and Mobile Network Architecture", John Wiley 2006.

Reference Books:

1. KauchPahlavan and Prahant Krishna moorthy, "Principles of Wireless Networks", PHI Learning, 2007
2. T. S. Rappaport, "Wireless and Mobile Communication", Pearson Education, 2008

Web References:

1. www.etsi.org
2. www.globecommsystems.com/wireless

EC E82-OPTO ELECTRONIC DEVICES

COURSE OBJECTIVE

- *To understand the nature and characteristics of light.*
- *To understand 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.*
- *To understand different light modulation techniques and the concepts and applications of optical switching.*
- *To study the integration process and application of opto-electronic integrated circuitsin transmitters and receivers*

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

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

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

UNIT – IV

Optoelectronic modulation and switching devices: Franz-Keldysh and Stark effect modulators, Quantum well electroabsorption 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.

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.

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. AsitBaranMaity, "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 E83 - RF CIRCUIT DESIGN

COURSE OBJECTIVE

➢ *To understand the need for various components to design complicated RF circuits*
➢ *To explore the use of resonator and filter implementation in the field of communication*
➢ *To analyze the networks using BJT, RF diodes, RF FETs.*
➢ *To identify the ways and means to solve RF amplifier designs*
➢ *To understand the use of mixers and oscillator inrfcircui deigns*

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.

UNIT II

RF FILTER DESIGN: Overview, Basic resonator and filter configuration, Special filter realizations, Filter implementations, Coupled filter.

UNIT III

ACTIVE RF COMPONENTS & APPLICATIONS:RF diodes, BJT, RF FETs, High electron mobility transistors; Matching and Biasing Networks –Impedance matching using discrete components, Microstripline matching networks, Amplifier classes of operation and biasing networks.

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.

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.

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 E84-SPEECH PROCESSING

COURSE OBJECTIVE

- *To understand the fundamentals of speech recognition*
- *To introduce the models for speech production*
- *To develop time and frequency domain techniques for estimating speech parameters*
- *To introduce models for auditory perception*
- *To understand 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.

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.

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

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.

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.

Text Book:

1. B.Gold and N. Morgan, "Speech and Audio Signal Processing", John Wiley, 2011.

Reference Book:

1. M. Kondoz, "Digital Speech", John Wiley, 2007.
2. L.R.Rabiner and K.W. Schafer, "Digital Processing of Speech Signals", Dorling Kindersley (India) Pvt. Ltd., 2008.
3. J. L. Flanagan, "Speech Analysis, Synthesis and Perception", Second edition, Spriger, 1983.
4. 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 E85 - NANOTECHNOLOGY AND NANOSCALE PROCESSING

COURSE OBJECTIVE

 ➢ *To understand various properties of individual nanoparticles*
 ➢ *To understand the concepts of carbon nanostructure and nanostructured ferromagnetism*
 ➢ *To understand the concepts of bulk nanostructures materials and also processing & fabrication I*
 ➢ *To analyze the concepts of processing and fabrication II*

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.

Unit II

Carbon nanostructures and Nanostructured ferromagnetism: Introduction – carbon molecules – carbon clusters – discovery – structure – carbon nanotubes – properties and application.Nanostructured ferromagnetism – dynamics - nanocarbonferromagnets – Giant and colossal magnetoristance – Ferro fluids.

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.

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.

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.

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,DonaldW.Brenner, Sergey Edward Lyshevsky, and Gerald J.Iafrate.

EC E86 - MEDICAL ELECTRONICS

COURSE OBJECTIVE

- *To gain knowledge about the various electrical and non-electrical physiological parameters*
- *To study the methods of recording and also the method of transmitting these parameters.*
- *To study about the various assist devices used in the hospitals.*
- *To gain knowledge about equipment used for physical medicine*
- *To understand the various recently developed 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.

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.

UNIT III

ASSIST DEVICES: Cardiac pacemakers, DC Defibrillator, Dialyser, Heart lung machine

UNIT IV

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

UNIT V

RECENT TRENDS IN MEDICAL INSTRUMENTATION: Thermograph, endoscopy unit, Laser in medicine, cryogenic application, Introduction to telemedicine

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 E87 – INTELLECTUAL PROPERTY RIGHTS AND CYBER SECURITY

COURSE OBJECTIVES

- *To gain knowledge on cryptography and its types*
- *To understand the different types of attacks*
- *To implement security in Smart Grid*
- *Introduction to 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.

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.

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.

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.

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.

Text books:

1. Cybersecurity Operations Handbook, Rittinghouse and Hancock, 1st edition, 2009, Elsevier publications.
2. Applied Cyber Security and the Samart Grid-Implementing Security Controls into the Modern Power Infrastructurem 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 /	-	1

 LVDT / Transducer kit

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

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 2009-2010]

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

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)