FACULTY OF ENGINEERING

IASE Deemed University

Gandhi VidyaMandir

Sardarshahr (Rajasthan) – 331401

INDIA

Teaching and Examination Scheme and Syllabus

for

BACHELOR OF TECHNOLOGY

(Four-Year Full Time Degree Programme)

ELECTRONICS AND COMMUNICATION ENGINEERING

2nd TO 4th YEAR

(SEMESTER SCHEME)

Sessions 2016-17, 2017-18, 2018-19

RULES AND GUIDELINES FOR THE STUDENTS

1. **The Bachelor of Technology (Electronics and Communication Engineering) course is a four year (Eight Semester) full time integrated degree programme**.

2. **THE PROGRAMME**

The Bachelor of Technology (Electronics and Communication Engineering) is a four year (Eight semesters) full time degree programme .The course structure and programme administration are as follows.

3. **COURSE STRUCTURE**

The four year, eight semester teaching comprises of Theory (Lectures and Tutorials) and Practicals/Sessionals (Laboratory work, Engineering Graphics, Workshop Practice and Project etc.).Examination will be held at the end of the each semester. Details of these are given in the Teaching & Examination Scheme.

4. **PROGRAMME ADMINISTRATION**

4.1. Medium of Instruction

English shall be the medium of instruction and examination.

4.2. EVALUATION

(a) Each subject will be evaluated through a theory paper at the end of the semester carrying 80 marks along with continuous evaluation of sessional work, carrying 20 marks. The theory paper shall be of three hour duration. The sessional work will consist of continuous assessment of student's performance by teachers in tutorial classes, and class tests.

(b) Three class tests will be organized in each semester as per the scheme. The higher two out of the marks scored in the three tests will be considered for the sessional marks.

(c) Evaluation of laboratory practical work and Engineering Graphics (Drawing) will be through continuous assessment throughout the semester as well as examination at the end of the semester.

(d) At the end of the sixth semester the student will undergo practical training for a period of at least 45 working days in an industry / research organization related to his / her field of Study. At the end of the training, the student will submit its report to the Head of the Department within three weeks of the start of the seventh semester. The work of the practical training will be evaluated by a board of two teachers appointed by the Head of the Department. The later will counter sign the marks awarded by the board.

(e) Project: The project work will be carried out in the VII & VIII semester. The topic of the project will be approved by the Head of the Department and the entire project work will be carried out under the guidance of a teacher of the department approved as project supervisor by the Head of the Department. The nature of the project work will consist of varying proportions of designing, fabrication, testing and analysis of results. The project topic can also be taken from a live industrial problem. The report of the

completed project shall be signed by the guide and submitted to the Head of the Department on or before the last working day of the eighth semester. The evaluation of the project will be done by a board consisting of two examiners.

5. Promotion

5.1 The maximum span period of a programme is eight years from the date of registration in the programme.

5.2 The minimum grade for passing the examination for each semester shall be **"P"** of all the subjects (theory, sessional) of the semester.

5.3 A student will be permitted to attend the classes of the fourth/sixth/eighth semesters immediately after the examination of the third/fifth/seventh semester's examination, as the case may be, provided he/she has appeared in the first/third/fifth/seventh semester examination, respectively.

5.4 To be eligible for promotion to the 5^{th} semester of the programme a student must have successfully cleared 50% of the total subjects including practicals and sessionals of the third and fourth semesters taken together. In case of 50% of total number of papers is fractional number, the candidate must have cleared number of papers next higher number of the fraction so obtained.

5.5 To be eligible for promotion to the 7^{th} semester of the programme a student must have successfully cleared 50% of the total subjects including practicals and sessionals of the fifth and sixth semesters taken together. In case of 50% of total number of papers is fractional number, the candidate must have cleared number of papers next higher number of the fraction so obtained.

5.6 A student promoted to the third/fifth/seventh semesters, without having cleared all the papers, will have to appear and pass the backlog papers of the first/third/seventh semesters along with the regular examination of the first/third/fifth semesters and backlog papers of the second/fourth/sixth semesters along with the regular examination of the second/fourth/sixth semesters.

5.7 (a) Award of Grade:

- **Academic Year**: Two consecutive (one odd + one even) semesters constitute one academic year.
- **Choice Based Credit System (CBCS):** The CBCS provides choice for students to select from the prescribed courses (core, elective courses).
- **Course**: Usually referred to, as 'papers' is a component of a programme. All courses need not carry the same weight. The courses should define learning objectives and learning outcomes. A course has been designed to comprise lectures/ tutorials/laboratory work/ field work/ outreach activities/ project work/ vocational training/viva/seminars/term papers/assignments/presentations/self-study etc. or a combination of some of these.
- **Credit Based Semester System (CBSS)**: Under the CBSS, the requirement for awarding a degree is prescribed in terms of number of credits to be completed by the students.
- **Credit Point**: It is the product of grade point and number of credits for a course.

- **Credit**: A unit by which the course work is measured. It determines the number of hours of instructions required per week. One credit is equivalent to one hour of teaching (lecture or tutorial) or two hours of practical work/field work per week.
- **Cumulative Grade Point Average (CGPA)**: It is a measure of overall cumulative performance of a student over all the semesters. The CGPA is the ratio of total credit points secured by a student in various courses in all semesters and the sum of the total credits of all courses in all the semesters. It is expressed up to two decimal places.
- **Grade Point**: It is a numerical weight allotted to each letter grade on a 10-point scale.
- **Letter Grade:** It is an index of the performance of students in a said course/semester/programme. Grades are denoted by letters O, A+, A, B+, B, C, P and F.

Letter Grade	% Scale	Grade Point
O (Outstanding)	85% and Above	10
A+(Excellent)	75% to 84.99%	9
A(Very Good)	65% to 74.99%	8
B+(Good)	55% to 64.99%	7
B(Above Average)	50% to 54.99%	6
C(Average)	45% to 49.99%	5
P (Pass)	40% to 44.99%	4
F(Fail)	Less than 40%	0
Ab (Absent)	0 %	0

- **Programme**: An educational programme leading to award of a Degree.
- **Semester Grade Point Average (SGPA)**: It is a measure of performance of work done in a semester. It is ratio of total credit points secured by a student in various courses registered in a semester and the total course credits taken during that semester. It shall be expressed up to two decimal places.
- **Semester**: Each semester will consist of 15-18 weeks of academic work equivalent to 90 actual teaching days. The odd semester may be scheduled from July to December and even semester from January to June.
- **Transcript or Grade Card or Certificate:** Based on the grades earned, a grade certificate shall be issued to all the registered students after every semester. The grade certificate will display the course details (code, title, credit points, grade secured) along with SGPA of that semester and CGPA earned till that semester.

5.8 If a student (who has successfully completed the programme) wishes to reappear in one or more theory papers of the first, second, third, fourth, fifth, sixth, seventh or eighth semesters for the purpose of improving his/her marks, he/she will be permitted to do so on payment of requisite examination fee along with the regular examinations of that semester; however, the total number of

such attempts shall not exceed four theory papers during the span period of the programme. For this his/her previous performance in the paper/papers concerned shall be treated as cancelled. The application for such reappearing/re-examination must be submitted before the next examination of the corresponding semester. However, such candidates shall not be considered for award of gold medal.

5.9 A student to be eligible for award of degree has to clear all papers offered during four-year programme within the span period of eight years.

6. LATERAL ENTRY

Students who have passed 3 year diploma examination from the Board of Technical Education, Rajasthan, or its equivalent with a minimum of 60% marks can be admitted to the Third Semester of the B. E. programme. However, they will be required to pass a course on Special Mathematics (BE300) for Diploma pass students. Students will have to pass this course before they are admitted to the seventh semester. However, the marks obtained in this course will not be counted for deciding the division of the student.

7. Attendance: All students are required to have 75% attendance in each subject and there must be 75% attendance of the student before he/she could be permitted to appear in the examination.

8. RULES FOR CHANGE OF BRANCH FOR THE STUDENTS OF III SEM. B.TECH/ B.E.:

I The faculty, on the basis of applications received from desirous students up to the date and time notified by the Director, will prepare a merit list of the students. The list will be prepared on the basis of overall merit of the I(Semester) result only and the applications for change of branch will be processed as per the merit list.

ELIGIBILITY CRITERIA:

(a) The students must have passed the I Semester B.Tech. Examination in all components in one attempt with at least **"B+"** grade. The student with back papers or whose result has not been declared will not be considered for change of branch.

(b) In case any student has applied for re-valuation/ re-totalling of his/her marks of I Semester B.Tech and the result has not been received till the time of change of branch, such a student will not be entitled for change of branch on the basis of his/her subsequently revised result.

PROCEDURE:

1) Applications in a specified format (developed by the faculty) for change of branch will be invited by the Director/Principal of the faculty on the basis of the result of I (Semester) B. Tech. in duplicate, upto the date notified by IASE University. One copy of each such application be sent to IASE University by that date.

2) The students would submit a photo copy of I (Semester) Examination mark sheet of that year along with the application. The student may give as many preferences as possible against the vacant seats

in respective college.

3) A seat matrix shall be prepared by the faculty, as per the details of the vacant seats (admitted through direct admission) in the previous year.

4) Due to change of branch, the strength of student in any branch should not fall short of 75% of the enrolled students in that branch in that year. And under no circumstances, due to change of branch, the number of seats in a particular branch in a college shall exceed the sanctioned strength approved by the AICTE, for that batch.

5) All students who have applied for the change of branch in-time will be called for counselling by the admission council of the faculty and considered for change of branch as per merit, preference and availability of seat. However, at the time of the counselling, if any student wishes to withdraw his/her application he/she can do so by a written request. In case any student does not present himself/herself for counselling, his/her branch will be changed as per the preference mentioned in the application form, merit and availability of seat. Once a student has been permitted to change of a branch it will not be withdrawn.

TEACHING & EXAMINATION SCHEME

FOR B.TECH- FOUR YEAR (8 SEMESTER) FULL TIME DEGREE

B.TECH ELECTRONICS AND COMMUNICATION ENGINEERING SECOND YEAR

SEMESTER: III

Subject Code	Title	Hrs. / Week			Credit	IA		Exam		Total
		L	T	P		T	P	T	P	
ECE301	Mathematics-III	3	1		4	20		80		100
ECE302/302-P	Electronic Devices & Circuits	3	1	2	5	20	50	80	50	200
ECE303	Circuit Analysis & Synthesis	3	1		4	20		80		100
ECE304/304-P	Electronic Measurements & Instrumentation	3	1	2	5	20	50	80	50	200
ECE305	Electronic Materials and processes	3	1	-	4	20	-	80	-	100
ECE306/306-P	Data Structure & Algorithms	3		2	4	20	50	80	50	100
ECE307	Electronics Workshop	-	-	2	1	-	75	-	75	150
EE 308	Discipline & Extra Curricular Activity									50
	Total	**18**	**5**	**8**	**27**					**1000**

SEMESTER: IV

Subject Code	Title	Hrs. / Week			Credit	IA		Exam		Total
		L	T	P		T	P	T	P	
ECE401	Mathematics-IV	3	1		4	20		80		100
ECE402/402-P	Analog Electronics	3	1	2	5	20	50	80	50	200
ECE403/403-P	Digital Electronics	3	1	2	5	20	50	80	50	200
ECE404	Electromagnetic Field Theory	3	1	-	4	20		80		100
ECE405	Random Variables & Stochastic Processes	3	1		4	20		80		100
ECE406/406-P	Object Oriented Programming	3		2	4	20	50	80	50	200
ECE407-P	Computer Programming Lab-II.			2	1		30		20	50
EE 408	Discipline & Extra Curricular Activity									50
	Total	**18**	**5**	**8**	**27**					**1000**

IA- Internal Assessment **T- Tutorial**

L- Lecture **P- Practical**

TEACHING & EXAMINATION SCHEME

FOR B.TECH- FOUR YEAR (8 SEMESTER) FULL TIME DEGREE

B.TECH ELECTRONICS AND COMMUNICATION ENGINEERING THIRD YEAR

SEMESTER: V

Subject Code	Title	Hrs. / Week			Credit	IA		Exam		Total
		L	T	P		T	P	T	P	
ECE501/501-P	Single and systems	3	1	2	5	20	45	80	30	175
ECE502/502-P	Linear Integrated ckt	3	1	2	5	20	45	80	30	175
ECE503	Telecommunication Engineering	3	1	-	4	20	-	80	-	100
ECE504/504-P	Analog Communication	3	1	2	5	20	50	80	50	200
ECE505/505-P	Microwave Engineering-1	3	1	2	5	20	50	80	50	200
ECE 506 I	Biomedical Instrumentation	3		-	3	20	-	80	-	100
ECE 506 II	Advanced data Structures									
ECE 506 III	Computer Oriented Numerical & Statistical Methods									
ECE 507	Discipline & Extra Curricular Activity									50
	Total	**18**	**5**	**8**	**27**					**1000**

SEMESTER: VI

Subject Code	Title	Hrs. / Week			Credit	IA		Exam		Total
		L	T	P		T	P	T	P	
ECE601	Microwave Engineering-ll	3	1		4	20		80		100
ECE602/602-P	Microprocessor and Microcontroller	3	1	2	5	20	50	80	50	200
ECE603/603-P	Industrial Electronics	3	1	2	5	20	50	80	50	200
ECE604/604-P	Digital Communication	3	1	2	5	20	50	80	50	200
ECE605	Control Systems	3	1	2	5	20		80		100
EE 606 I	Neural Networks Parallel	3		-	3	20	-	80	-	100
ECE 606 II	Computation & Architecture									
ECE 606 III	Optimization Techniques									
ECE 607-P	Entrepreneurship Development						30		20	50
ECE 608	Discipline & Extra Curricular Activity									50
	Total	**18**	**5**	**8**	**27**					**1000**

IA- Internal Assessment **T- Tutorial**

L- Lecture **P- Practical**

TEACHING & EXAMINATION SCHEME

FOR B.TECH- FOUR YEAR (8 SEMESTER) FULL TIME DEGREE

B.TECH ELECTRONICS AND COMMUNICATION ENGINEERING FOURTH YEAR

SEMESTER: VII

Subject Code	Title	Hrs. / Week			Credit	*IA*		*Exam*		Total
		L	T	P		T	P	T	P	
ECE701/701-P	Antenna & Wave Propagation	3	1	2	5	20	45	80	30	175
ECE702/702-P	Digital Signal Processing	3	1	2	5	20	30	80	20	150
ECE703/703-P	Wireless Communication	3	1	2	5	20	45	80	30	175
ECE704	IC Technology	3		-	3	20	-	80	-	100
ECE705	VLSI Design	3	1	-	4	20	-	80	-	100
ECE 706 I	Advanced Microprocessors	3		-	3	20	-	80	-	100
ECE 706 II	Artificial Intelligence and Expert									
ECE 706 III	Systems Operating System									
ECE 707	Practical Training & Industrial visit			2	1	-	-	-	100	100
ECE 708	Project-1			2	1	-	50	-	-	50
ECE 709	Discipline & Extra Curricular Activity									50
	Total	**18**	**4**	**10**	**27**					**1000**

SEMESTER: VIII

Subject Code	Title	Hrs. / Week			Credit	*IA*		*Exam*		Total
		L	T	P		T	P	T	P	
ECE801/801-P	Computer Networks	3	1	2	5	20	45	80	30	175
ECE802	Radar & TV Engineering	3	1		4	20		80		100
ECE803/803-P	Optical Communicati	3	1	2	5	20	45	80	30	175
ECE 804 I	Image Processing and Pattern	3	-	-	3	20	-	80	-	100
ECE 804 II	Recognition VHDL									
ECE 804 III	Microcontroller and Embedded Systems									
ECE 805-P	Industrial Economics & Management			2	1	-	60	-	40	100
ECE 806	Project-2			2	1	-	120	-	80	200
ECE 807	Seminar			2	1	-	60	-	40	100
ECE 808	Discipline & Extra Curricular Activity									50
	Total	**12**	**3**	**10**	**20**					**1000**

IA- Internal Assessment **T- Tutorial**

L- Lecture **P- Practical**

ECE 301 MATHEMATICS-III

UNIT	CONTENTS	CONTACT HOURS
I	Laplace transform with its simple properties, applications to the solution of ordinary and partial differential equations having constant co-efficients with special reference to the wave and diffusion equations.	**8**
II	Expansion of simple functions in fourier series. Halfrange series, Change of intervals, Harmonic analysis. **Z TRANSFORM -** Introduction, Properties, Inverse ZTransform.	**8**
III	Complex form of Fourier Transform and its inverse, Fourier sine and transform and their inversion. Applications of Fourier Transform to solution of partial differential equations having constant co-efficient with special reference to heat equation and wave equation.	**8**
IV	Analytic functions, Cauchy-Riemann equations, Elementary conformal mapping with simple applications, Line integral in complex domain, Cauchy;s theorem. Cauchy's integral formula.	**8**
V	Taylor's series Laurent's series poles, Residues, Evaluation of simple definite real integrals using the theorem of residues. Simple contour integration.	**8**

Text Books:	
• M.Ray, J.C.Chaturvedi & H.C.Sharma-Differential Equations.	• Chandrika prasad-Advanced Mathematics for engineers • B.S.Grewal-Higher engineering mathematics • Gokhroo et al; Higher Engg.Maths III (3EE2) Unique Books, Ajme

ECE 302 - ELECTRONIC DEVICES & CIRCUITS

UNIT	CONTENTS	CONTACT HOURS
I	Mobility and conductivity, charge densities in a semiconductor, Fermi Dirac distribution, carrier concentrations and fermi levels in semiconductor, Generation and recombination of charges, diffusion and continuity equation, Mass action Law, Hall effect.	8
II	Junction diodes,Diode as a ckt. element, load line concept, clipping and clamping circuits, Voltage multipliers. Construction, characteristics and working principles of UJT.	8
III	**Polyphase Circuits:** General Circuit Relations: Three Phase Star, Three Phase Delta, Star and Delta Combination, Four Wire Star Connection. Balanced and unbalanced Three Phase Voltages, currents and Impedances. Power and Reactive Volt-Amperes in a 3-Phase System. **Power Relations in AC Circuits:** Instantaneous Power in AC Circuits, Power Factor, Apparent Power, Reactive Power, Power Triangle, Complex Power.	8
IV	**Non-Sinusoidal Waves:** Complex Periodic Waves and Their Analysis By Fourier Series. Different Kinds of Symmetry, Determination of Co-Efficient. Average and Effective Values of a Non-Sinusoidal Wave, Power in a Circuit of Non-Sinusoidal Waves of Current and Voltage, Form Factor, Equivalent Sinusoidal Wave and Equivalent Power Factor. Response of Linear Network to Non-Sinusoidal Periodic Waves.	8
V	**Time Domain and Frequency Domain Analysis:** Response of networks to step, ramp, impulse, pulse and sinusoidal inputs. Time domain and frequency domain analysis of circuits. Shifting theorem, initial and final value theorems. Special signal waveforms with Laplace transform & applications to circuit operations.	8

Text Books:	
• J.Millman C.C.Halkias-Integrated Electronics:analog & Digital ciruits system, TMH • A.S. Sedra and K.C. Smith, Microelectronic Circuits, Saunder's College Publishing	• Jacob Millman and Arvin Grabel-Microelectronics, McGraw Hill • Robert L.Boyle sted & Louis Nashelshky-Devices and Circuit Theory, PHI

ECE 302-P ELECTRONIC DEVICES LAB

1	Study the following devices: (a) Analog& digital multimeters (b) Function/ Signal generators (c) Regulated d. c. power supplies (constant voltage and constant current operations) (d) Study of analogCRO, measurement of time period, amplitude, frequency & phase angle using Lissajous figures.
2	Plot V-I characteristic of P-N junction diode & calculate cut-in voltage, reverse saturation current and static & dynamic resistances.
3	Plot V-I characteristic of zener diode and study of zener diode as voltage regulator. Observe the effect of load changes and determine load limits of the voltage regulator.
4	Plot frequency response curve for single stage amplifier and to determine gain bandwidth product.
5	Plot drain current - drain voltage and drain current – gate bias characteristics of field effect transistor and measure of Idss&Vp.
6	Application of Diode as clipper & clamper.
7	Plot gain- frequency characteristic of two stage RC coupled amplifier & calculate its bandwidth and compare it with theoretical value.
8	Plot gain- frequency characteristic of emitter follower & find out its input and output resistances.
9	Plot input and output characteristics of BJT in CB, CC and CE configurations. Find their h-parameters.
10	Study half wave rectifier and effect of filters on wave. Also calculate theoretical & practical ripple factor.
11	Study bridge rectifier and measure the effect of filter network on DC voltage output and ripple factor.

ECE 303- CIRCUIT ANALYSIS & SYNTHESIS

UNIT	CONTENTS	CONTACT HOURS
I	**NETWORK THEOREMS AND ELEMENTS: Thevenin's**, Norton's, Reciprocity, Superposition, Compensation, Miller's, Tellegen's and maximum power transfer theorems. Networks with dependent sources. Inductively coupled circuits – mutual inductance, coefficient of coupling and mutual inductance between portions of same circuits and between parallel branches. Transformer equivalent, inductively and conductively coupled circuits.	**8**
II	**TRANSIENTS ANALYSIS:** Impulse, step, ramp and sinusoidal response Analysis of first order and second order circuits. Time domain & transform domain (frequency, Laplace) analysis. Initial and final value theorems. Complex periodic waves and their analysis by Fourier analysis. Different kind of symmetry. Power in a circuit	**8**
III	**NETWORK FUNCTIONS:** Terminals and terminal pairs, driving point impedance transfer functions, poles and zeros. Procedure of finding network functions for general two terminal pair networks. Stability & causality.	**8**
IV	**TWO PORT NETWORKS:** Two port parameters and their interrelations – z-parameters, yparameters, h-parameters, ABCD parameters. Equivalence of two ports, transformer equivalent, Interconnection of two port networks. Image parameters. Attenuation & phase shift in symmetrical T and □□ networks	**8**
V	**NETWORK SYNTHESIS** : Hurwitz polynomial, positive real function, RL & RC networks synthesis, Foster First & Second form, Cauer forms.	**8**

Text Books:	
• Hayt & Kemmerly:Engineering circuit Analysis, TMH • A. Chakarvorty :Circuit Theory • Robbins – Circuit analysis : Theory and Practice, Cengage Learning	• J Edminster & M.Nahvi:Theory & Problems of electric circuits, Schaum's series • B.R.Gupta & Vandana singhal-Fundamentals of electrical Networks, Wheeler's Pub • G.K. Mithal-Network Analysis

ECE 304- ELECTRONIC MEASUREMENTS & INSTRUMENTAITON

UNIT	CONTENTS	CONTACT HOURS
I	**THEORY OF ERRORS:** Accuracy & precision, Repeatability, Limits of errors, Systematic & random errors Modeling of errors, Probable error & standard deviation, Gaussian error analysis, Combination of errors	8
II	**ELECTRONIC INSTRUMENTS FOR MEASURING BASIC PARAMETERS :** Electronic Voltmeter, Electronic Multimeters, Digital Voltmeter, Component Measuring Instruments, Q meter, Vector Impedance meter, RF Power & Voltage Measurements. Measurement of frequency. Introduction to shielding & grounding	8
III	**OSCILLOSCOPES :** CRT Construction, Basic CRO circuits, CRO Probes, Oscilloscope Techniques of Measurement of frequency, Phase Angle and Time Delay, Multibeam, multi trace, storage& sampling Oscilloscopes. Curve tracers.	8
IV	**SIGNAL GENERATION:** - Sine wave generators, Frequency synthesized signal generators, Sweep frequency generators. Signal Analysis **-** Measurement Technique, Wave Analyzers, Frequency - selective wave analyser, Heterodyne wave analyser, Harmonic distortion analyser, Spectrum analyser.	8
V	**TRANSDUCERS** - Classification, Selection Criteria, Characteristics, Construction, Working Principles, Application of following Transducers- RTD, Thermocouples, Thermistors, LVDT, RVDT, Strain Gauges, Bourdon Tubes, Bellows. Diaphragms, Seismic Accelerometers, Tachogenerators, Load Cell, Piezoelectric Transducers, Ultrasonic Flow Meters.	8

Text Books:	
• A.K.Sawhney:Electrical and electronic measurements and measuring instruments,Dhanpat Rai & Sons	• E.W.Golding:electrical Measurements

ECE-304-P ELECTRONIC MEASUREMENT & INSTRUMENTATION LAB

1	Measure earth resistance using fall of potential method
2	Plot V-I characteristics & measure open circuit voltage & short circuit current of a solar panel.
3	Measure unknown inductance capacitance resistance using following bridges (a) Anderson Bridge (b) Maxwell Bridge
4	To measure unknown frequency & capacitance using Wein's bridge
5	Measurement of the distance with the help of ultrasonic transmitter & receiver
6	Measurement of displacement with the help of LVDT.
7	. Draw the characteristics of the following temperature transducers: (a) RTD (Pt-100) (b) Thermistors (c) Thermocouple
8	Draw the characteristics between temperature & voltage of a K type thermocouple
9	Measure the speed of a Table Fan using stroboscope
10	Measurement of strain/ force with the help of strain gauge load cell
11	Study the working of Q-meter and measure Q of coils
12	To study the working of Spectrum analyzer and determine the bandwidth of different signals

ECE 305 ELECTRONIC MATERIALS & PROCESSES

UNIT	CONTENTS	CONTACT HOURS
I	**DIELECTRIC MATERIALS:** Polarisation phenomenon, spontaneous polarisation, dielectric constant and loss, piezo and ferro electricity.	8
II	**MAGNETIC MATERIALS:** Dia, para, ferro-ferrimagnetism; soft and hard magnetic materials and their applications.	8
III	**SEMI CONDUCTOR MATERIALS:** Crystal growth, zone refining, Degenerate and nondegenerate semiconductors, Direct and indiret band gap semiconductors. Electronic properties of silicon, Germanium, Compound Semiconductor, Gallium Arsenide, gallium phosphide & Silicon carbide.	8
IV	**CONDUCTIVE & SUPERCONDUCTIVE MATERIALS:** Electrical properties of conductive and resistive materials. Important characteristics and electronic applications of specific conductor & resistance materials. Superconductor phenomenon, Type I and Type II superconductors and their applications.	8
V	**PASSIVE COMPONENETS & PCB FABRICATION:** Brief study of fabrication methods of fixed and variable type of resistors; capacitors, Inductors, solenoid and toroid, air core, iron core and Ferro core conductors. Printed Circuit Boards – Types, Manufacturing of copper clad laminates, PCB Manufacturing process, Manufacturing of single and double sided PCBs. Surface mount devices – advantages & limitations.	8

Text Books:	
• C.S Indulkar & S. Thriuvengadam-An introduction to ELECTRONICS AND COMMUNICATION ENGINEERING Materials,S.Chand • S.P.Seth & P.V.Gupta-A course in ELECTRONICS AND COMMUNICATION ENGINEERING Materials,Dhanpat Rai & Sons	• B.D.Indu:ELECTRONICS AND COMMUNICATION ENGINEERING Materials,Jain Brothers • A.J.Dekkar-ELECTRONICS AND COMMUNICATION ENGINEERING Materials • R.M.Rose et al-Structure and properties of Materials, Wiley Eastern Ltd

ECE 306 DATA STRUCTURES & ALGORITHMS

UNIT	CONTENTS	CONTACT HOURS
I	**PERFORMANCE MEASUREMENT:** Space complexity and Time complexity, big oh, omega and theta notations and their significance. Linear Lists - Array and linked representation, Singly & Doubly linked lists. Concept of circular linked lists.	7
II	**ARRAY & MATRICES -** Row and Column Major mapping & representation, irregular 2D array, Matrix operations, Special matrices: diagonal, tri-diagonal, triangular, symmetric. Sparse matrices representation and its transpose.	7
III	**STACKS -** Representation in array & linked lists, basic operation, Applications of stacks in parenthesis matching, towers of Hanoi etc. Queues - Representation in array & linked lists, applications, circular queues.	7
IV	**TREES -** Binary Tree, representation in array & linked lists, basic operation on binary trees, binary tree traversal (preorder, post order, in order). Search Trees - Binary search tree, indexed-binary search tree, basic operation, AVL tree, B-tree.	7
V	**GRAPHS -** Representation of un weighted graphs, BFS, DFS, Minimum cost spanning trees, Single source shortest path. Sorting - Bubble sort, insertion sort, merge sort, selection sort, quick sort, heap sort.	7

Text Books:	
• S. Lioschutz: Data Structures, Mc Graw Hill International Edition • A.V. Aho., J.E. Hopcroft, and J.D. Ullman, Data Structures and Algorithms, Pearson Education Asia	• A. Michael Berman: Data Structures via C++, Oxford University Press • Sara Baase and Allen Van Gelder: Computer Algorithms, Pearson Education Asia • Jean-Paul Tremblay and Paul G. Sorenson, An Introduction to Data structures with applications, TMH Publishing Co.Ltd

ECE 306-P DATA STRUCTURES & ALGORITHMS

1	Simple array and sorting algorithm implementations.
2	Addition, multiplication and transpose of sparse matrices represented in array form.
3	Polynomial addition, multiplication (8^{th} degree polynomials), using array & linked lists.
4	Implementation of stack and queue using array & linked lists.
5	Implementation of circular queue using array.
6	Infix to postfix/prefix conversion.
7	Binary search tree creation and traversing.
8	Generation of spanning trees for a given graph using BFS & DFS algorithms
9	AVL tree implementation (creation, insertion, deletion.
10	Symbol table organization (Hash Table).

ECE 307-P ELECTRONICS WORKSHOP

1	Identification, Study & Testing of various electronic components : (a) Resistances-Various types, Colour coding (b) Capacitors-Various types, Coding, (c) Inductors (d) Diodes (e) Transistors (f) SCRs (g) ICs (h) Photo diode (i) Photo transistor (j) LED (k) LDR (l) Potentiometers.
2	Study of symbols for various Electrical & Electronic Components, Devices, Circuit functions etc.
3	To study and perform experiment on CRO demonstration kit.
4	Soldering & desoldering practice.
5	(a) To Design & fabricate a PCB for a Regulated power supply. (b) Assemble the Regulated power supply using PCB and test it.
6	To study and plot the characteristics of following Opto-Electronic devices – (a) LED (b) LDR (C) Photovoltatic cell (d) Opto-coupler (e) Photo diode (f) Photo transistor (g) Solar cell.
7	To study the specifications and working of a Transistor radio kit and perform measurements on it.
8	To study the specifications and working of a Tape Recorder kit.
9	To prepare design layout of PCBs using software tools.
10	To fabricate PCB and testing of electronics circuit on PCB.
11	To design and test regulated power supply using Ics.
12	To study the specifications and working of a VCD Player.
13	To study the specifications and working of color TV.

ECE 401 MATHEMATICS-IV

UNIT	CONTENTS	CONTACT HOURS
I	Finite differences – Forward, Backward and Central differences. Newton's forward and backward differences, interpolation formulae. Stirling's formula, Lagrange's interpolation formula.	8
II	Trapezoidal rule, Simpson's one third and three-eighth rules. Numerical solution of ordinary differential equations of first order - Picard's mathod, Euler's and modified Euler's methods, Miline's method and Runga-Kutta fourth order method Differentiation**.**	8
III	Bessel's functions of first and second kind, simple recurrence relations, orthogonal property of Bessel's , Transformation, Generating functions, Legendre's function of first kind. Simple recurrence relations, Orthogonal property, Generating function.	8
IV	Elementary theory of probability, Baye's theorem with simple applications, Expected value, theoretical probability distributions-Binomial, Poisson and Normal distributions. Lines of regression, co-relation and rank correlation.	8
V	Functional, strong and weak variations simple variation problems, the Euler's equation.	8

Text Books:	
• Chandrika Prasad-Advanced methematics for engineering • Engineering Mathematics, T Veerarajan, TMH	• B.S.Grewal-Higher engineering mathematics • Gokhroo and Mehta-Advanced Engg. Maths IV (4EE6.1) Unique Books,Ajmer

ECE 402– ANALOG ELECTRONICS

UNIT	CONTENTS	CONTACT HOURS
I	**FEEDBACK AMPLIFIERS:** Classification, Feedback concept, Transfer gain with feedback, General characteristics of negative feedback amplifiers. Analysis of voltage-series, voltage-shunt, currentseries and current-shunt feedback amplifier. Stability criterion	**8**
II	**OSCILLATORS:** Classification. Criterion for oscillation. Tuned collector, Hartley, Colpitts, RC Phase shift, Wien bridge and crystal oscillators, Astable, monostable and bistable multivibrators. Schmitt trigger. Blocking oscillators	**8**
III	**HIGH FREQUENCY AMPLIFIERS:** Hybrid Pi model, conductances and capacitances of hybrid-Pi model, high frequency analysis of CE amplifier, gain-bandwidth product. Emitter follower at high frequencies	**8**
IV	**TUNED AMPLIFIER -** Band Pass Amplifier, Parallel resonant Circuits, Band Width of Parallel resonant circuit. Analysis of Single Tuned Amplifier, Primary & Secondary Tuned Amplifier with BJT & FET. Double Tuned Transformer Coupled Amplifier. Stagger Tuned Amplifier. Pulse Response of such Amplifier. Shunt Peaked Circuits for Increased Bandwidth	**8**
V	**POWER AMPLIFIERS:** Power amplifier circuits, Class A output stage, class B output stage and class AB output stages, class C amplifiers, pushpull amplifiers with and without transformers. Complementary symmetry & quasi complimentary symmetry amplifiers.	**8**

Text Books:	
• J.Millman C.C.Halkias:Integrated electronics:analog and Digital circuits systems (TMH) • David A. BELL, Electronic Devices and Circuits, Oxford University Press. • Fundamentals of Analog Circuits 2e, Floyd, Pearson	• Jacob Millman and Arvin Grabel:Micro electronics.(McGraw Hill) • Robert L.Boyle sted and Louis Nashleshky:Electronic devices and circuit theory (PHI)

ECE 402-P ANALOG ELECTRONICS

1	Plot gain-frequency characteristics of BJT amplifier with and without negative feedback in the emitter circuit and determine bandwidths, gain bandwidth products and gains at 1kHz with and without negative feedback.
2	Study of series and shunt voltage regulators and measurement of line and load regulation and ripple factor.
3	Plot and study the characteristics of small signal amplifier using FET.
4	Study of push pull amplifier. Measure variation of output power & distortion with load.
5	Study Wein bridge oscillator and observe the effect of variation in R & C on oscillator frequency.
6	Study transistor phase shift oscillator and observe the effect of variation in R & C on oscillator frequency and compare with theoretical value.
7	Study the following oscillators and observe the effect of variation of C on oscillator frequency: (a) Hartley (b) Colpitts
8	Design Fabrication and Testing of k-derived filters (LP/HP).
9	Study of a Digital Storage CRO and store a transient on it.
10	To plot the characteristics of UJT and UJT as relaxation.
11	To plot the characteristics of MOSFET and CMOS.

ECE 403-DIGITAL ELECTRONICS

UNIT	CONTENTS	CONTACT HOURS
I	**NUMBER SYSTEMS, BASIC LOGIC GATES & BOOLEAN ALGEBRA:** Binary Arithmetic & Radix representation of different numbers. Sign & magnitude representation, complement notation, various codes & arithmetic in different codes & their inter conversion. Features of logic algebra, postulates of Boolean algebra. Theorems of Boolean algebra. Boolean function. Derived logic gates: Exclusive-OR, NAND, NOR gates, their block diagrams and truth tables. Logic diagrams from Boolean expressions and vica-versa. Converting logic diagrams to universal logic. Positive, negative and mixed logic. Logic gate conversion.	**8**
II	**DIGITAL LOGIC GATE CHARACTERISTICS:** TTL logic gate characteristics. Theory & operation of TTL NAND gate circuitry. Open collector TTL. Three state output logic. TTL subfamilies. MOS & CMOS logic families. Realization of logic gates in RTL, DTL, ECL, C-MOS & MOSFET. Interfacing logic families to one another	**8**
III	**MINIMIZATION TECHNIQUES:** Minterm, Maxterm, Karnaugh Map, K map upto 4 variables. Simplification of logic functions with K-map, conversion of truth tables in POS and SOP form. Incomplete specified functions. Variable mapping. Quinn-Mc Klusky minimization techniques.	**8**
IV	**COMBINATIONAL SYSTEMS:** Combinational logic circuit design, half and full adder, subtractor. Binary serial and parallel adders. BCD adder. Binary multiplier. Decoder: Binary to Gray decoder, BCD to decimal, BCD to 7-segment decoder. Multiplexer, demultiplexer, encoder. Octal to binary, BCD to excess-3 encoder. Diode switching matrix. Design of logic circuits by multiplexers, encoders, decoders and demultiplexers	**8**
V	**SEQUENTIAL SYSTEMS:** Latches, flip-flops, R-S, D, J-K, Master Slave flip flops. Conversions of flip-flops. Counters : Asynchronous (ripple), synchronous and synchronous decade counter, Modulus counter, skipping state counter, counter design. Ring counter. Counter applications. Registers: buffer register, shift register.	**8**

Text Books:	
• Malvino and Leach-Digital principles and Applications • Fundamentals of Digital circuits, A. Anand kumar, PHI	• M.Morris Mano-Digital Logic and computer Design • S.Salivahnan, S.Anvazhagar-Digital circuits and design

ECE 403-P DIGITAL ELECTRONICS LAB

1	To study and perform the following experiments. (a) Operation of digital multiplexer and demultiplexer. (b) Binary to decimal encoder. (c) Characteristics of CMOS integrated circuits.
2	To study and perform experiment- Compound logic functions and various combinational circuits based on AND/NAND and OR/NOR Logic blocks.
3	To study and perform experiment -Digital to analog and analog to digital converters.
4	To study and perform experiment- Various types of counters and shift registers.
5	To study and perform experiment - Interfacing of CMOS to TTL and TTL to CMOS ICs.
6	To study and perform experiment- BCD to binary conversion on digital IC trainer.
7	To study and perform experiment - (a) Astable (b) Monostable (c) Bistable Multivibrators and the frequency variation with different parameters, observe voltage waveforms at different points of transistor.
8	To study and perform experiment -Voltage comparator circuit using IC-710.
9	To study and perform experiment- Schmitt transistor binary circuit.
10	Design 2 bit binary up/down binary counter on bread board.

ECE 404 ELECTROMAGNETIC FIELD THEORY

UNIT	CONTENTS	CONTACT HOURS
I	**INTRODUCTION:** Vector Relation in rectangular, cylindrical, spherical and general curvilinear coordinate system. Concept and physical interpretation of gradient, Divergence and curl, Green's & Stoke's theorems.	8
II	**ELECTROSTATICS:** Electric field intensity & flux density. Electric field due to various charge configurations. The potential functions and displacement vector. Gauss's law. Poisson's and Laplace's equation and their solution. Uniqueness theorem. Continuity equation. Capacitance and electrostatics energy. Field determination by method of images. Boundary conditions. Field mapping and concept of field cells.	8
III	**MAGNETOSTATICS :** Magnetic field intensity, flux density & magnetization, Faraday's Law, Bio-Savart's law, Ampere's law, Magnetic scalar and vector potential, self & mutual inductance, Energy stored in magnetic field, Boundary conditions, Analogy between electric and magnetic field, Field maping and concept of field cells.	8
IV	**TIME VARYING FIELDS:** Displacement currents and equation of continuity. Maxwell's equations, Uniform plane wave in free space, dielectrics and conductors, skin effect sinusoidal time variations, reflection & refraction of Uniform Plane Wave, standing wave ratio. Pointing vector and power considerations.	8
V	**RADIATION, EMI AND EMC:** Retarded Potentials and concepts of radiation, Radiation from a small current element. Radiation resistance**:** Introduction to Electromagnetic Interference and Electromagnetic compatibility, EMI coupling modes, Methods of eliminating interference, shielding, grounding, conducted EMI, EMI testing: emission testing, susceptibility testing.	8

Text Books:	
• David K Cheng-Field and Vave Electromagnetic 2nd Ed. Wesley Publishing company • V.V. Sarwate-Electromagnetic field and waves,willey estern Ltd • J.K. Kraus-Applied Electromagnetic, 5th Ed	• J D Kraus, Electromagnetic. 5th, Mc Graw Hill Book company • P Lorrain, D R Corson-Electromagnetic field and waves. Willey Eastern Ltd

ECE 405 RANDOM VARIABLES & STOCHASTIC PROCESSES

UNIT	CONTENTS	CONTACT HOURS
I	**PROBABILITY: Definitions**, sample, space & events, joint & conditional probability, independent events.	**8**
II	**RANDOM VARIABLES:** Introduction, distribution & density functions, discrete & continuous random variables, special distributions: binominal, poisson, uniform, exponential, normal, rayleigh, conditional distribution & density functions.	**8**
III	**MULTIPLE RANDOM VARIABLES:** Vector random variable, joint distribution functions, joint probability density function, conditional distribution & density functions. Statistical independence, distribution & density function of sum of random variable, one function of two random variable, two function of two random variable., linear transformation.	**8**
IV	**OPERATION ON SINGLE & MULTIPLE RANDOM VARIABLES:** Mean & variance, moments, chebyshev's inequality, Central limit theorem, characteristic functions & moment generating function, covariance & correlation coefficient of multiple random variables.	**8**
V	**STOCHASTIC PROCESSES:** Introduction, random process concept, stationary & independence, ergodicity, correlation, functions. Gaussion Random Process, Transmission of Random process through linear systems. Power spectral Density, Cross Spectral density.	**8**

Text books:	
Probability, Variables and Random signals Principles, peebles,TMH	Random variables and stochostics,Gaur,Genius Publication

ECE 406 OBJECT ORIENTED PROGRAMMING

UNIT	CONTENTS	CONTACT HOURS
I	**OOP FUNDAMENTALS:** Concept of class and object, attributes, public, private and protected members, derived classes, single & multiple inheritance.	7
II	**PROGRAMMING IN C++:** Enhancements in C++ over C, Data types, operators and functions. Inline functions, constructors and destructors. Friend function, function and operator overloading. Working with class and derived classes. Single, multiple and multilevel inheritances and their combinations, virtual functions, pointers to objects. Input output flags and formatting operations. Working with text files.	7
III	**JAVA:** Variation from C++ to JAVA. Introduction to Java byte code, virtual machine, application & applets of Java, integer, floating point, characters, Boolean, literals, and array declarations.	7
IV	**OPERATORS AND CONTROL STATEMENTS:** Arithmetic operators, bit wise operators, relational operators, Boolean logic operators, the assignment operators, ?: operators, operator precedence. Switch and loop statements.	7
V	**PACKAGE AND INTERFACES:** Packages, access protection, importing & defining packages. Defining and implementing interfaces.	7

Text Books:	
• A.R.Venugopal, Rajkumar, T. Ravishanker "Mastering C++", TMH, 1997 • S. B. Lippman & J. Lajoie, "C++ Primer", 3rd Edition, Addison Wesley, 2000 • Schildt Herbert, "C++: The Complete Reference", 4th Ed., Tata McGraw Hill, 1999	• Tony Gaddis, Watters, Muganda, "Object-Oriented Programming in C++", 3rd Ed • Deitel and Deitel, Java, How to Program, Pearson Education Asia • E. Balaguruswmy, Programming with Java, Tata McGraw Hill

ECE 406-P OBJECT ORIENTED PROGRAMMING

1	Simple input output program integer, real character and string. (Formatted & Unformatted).
2	Conditional statement programs (if, if-else-if, switch-case)
3	Looping Program. (for, while, do-while).
4	Program based on array (one, two and three dimensions).
5	Program using Structure and Union.
6	Program using Function (with and without recursion).
7	Inheritance, polymorphism, overloading etc.
8	File handling.

ECE 407-P COMPUTER PROGRAMMING LAB-II

1	**Programs in C++** 1. Write a program to perform the complex arithmetic. 2. Write a program to perform the rational number arithmetic. 3. Write a program to perform the matrix operations. (Transpose, addition, subtraction, multiplication, Test if a matrix is symmetric/ lower triangular/ upper triangular) 4. Implement Morse code to text conversion and vice-versa. 5. To calculate Greatest Common Divisor of given numbers. 6. To implement tower of Hanoi problem.
2	**Program in Java** 7. To implement spell checker using dictionary. 8. To implement a color selector from a given set of colors. 9. To implement a shape selector from a given set of shapes. 10. By mapping keys to pens of different colors, implement turtle graphics. 11. To implement a calculator with its functionality. 12. To implement a graph and display BFS/DFS order of nodes.

ECE501 SIGNALS AND SYSTEMS

UNIT	CONTENTS	CONTACT HOURS
I	**INTRODUCTION:** Continuous time and discrete time systems, Properties of systems. Linear time invariant systems - continuous time and discrete time. Properties of LTI systems and their block diagrams. Convolution, Discrete time systems described by difference equations.	**8**
II	**FOURIER SERIES REPRESENTATION OF SIGNALS**: Fourier series representation of continuous periodic signal & its properties, Fourier series representation of Discrete periodic signal & its properties, Continuous time filters & Discrete time filters described by Diff. equation.	**8**
III	**FOURIER TRANSFORM:** The continuous time Fourier transform for periodic and aperiodic signals, Properties of CTFT. Discrete time Fourier transform for periodic and aperiodic signals. Properties of DTFT. The convolution and modulation property.	**8**
IV	**Z-TRANSFORM & LAPLACE TRANSFORM:** Introduction. The region of convergence for the Z-transform. The Inverse Z-transform. Two dimensional Z-transform. Properties of Z transform. Laplace transform, Properties of Laplace Transform, Application of Laplace transform to system analysis.	**8**
V	**SAMPLING**: Mathematical theory of sampling. Sampling theorem. Ideal & Real sampling. Interpolation technique for the reconstruction of a signal from its samples. Aliasing. Sampling in freq. domain. Sampling of discrete time signals.	**8**

Text Books:	
• Ziemer-signals and Systems, Pearson Education. • A.V. Oppenheim, A.S. Willsky and I.J. Young-"Signals & Systems", Prentice Hall of India Ltd. • Signals And Systems: A Simplified Approach, Ganesh Rao, 4e, Pearson	• Tabub & Schilling-"Principles of Communication System", Tata Mc-graw Hill. • Prokins & Manolakis-Digital Signal Processing: Principles algorithms *Applications, Prentice Hall Pvt. Ltd

ECE501-P SIGNALS AND SYSTEMS

1	Generation of continuous and discrete elementary signals (periodic and non-periodic) using mathematical expression.
2	Generation of Continuous and Discrete Unit Step Signal.
3	Generation of Exponential and Ramp signals in Continuous & Discrete domain.
4	Continuous and discrete time Convolution (using basic definition).
5	Adding and subtracting two given signals. (Continuous as well as Discrete signals).
6	To generate uniform random numbers between (0, 1).
7	To generate a random binary wave.
8	To generate random sequences with arbitrary distributions, means and variances for following : (a) Rayleigh distribution (b) Normal distributions: N (0,1). (c) Gaussion distributions: N (m, sx).
9	To plot the probability density functions. Find mean and variance for the above distributions.

ECE502 LINEAR INTEGRATED CIRCUITS

UNIT	CONTENTS	CONTACT HOURS
I	**OPERATIONAL AMPLIFIERS**: Basic differential amplifier analysis, Single ended and double ended configurations, Op-amp configurations with feedback, Op-amp parameters, Inverting and Non-Inverting configuration, Comparators, Adder.	8
II	**OPERATIONAL AMPLIFIER APPLICATIONS:** Integrator, Differentiator, Voltage to frequency & Frequency to voltage converters. **Oscillators:** Phase shift, Wien bridge, Quadrature, square wave, triangular wave, sawtooth oscillators. Voltage controlled oscillators.	8
III	Low pass, high pass, band pass and band reject filters,All pass filter, Switched capacitor filter, Butterworth filter design, Chebyshev Filter design.	8
IV	Operating Principles of PLL, Linear Model of PLL, Lock range, Capture range, Applications of PLL as FM detector, FSK demodulator, AM detector, frequency translator, phase shifter, tracking filter, signal synchronizer and frequency synthesizer, Building blocks of PLL, LM 565 PLL.	8
V	Four quadrant multiplier & its applications, Basic blocks of linear IC voltage regulators, Three terminal voltage regulators, Positive and negative voltage regulators. The 555 timer as astable and monostable multivibrators. Zero crossing detector, Schmitt trigger.	8

Text Books:	
• R.A. Gayakwad-Op-amplifiers & Linear ICs, Prentice Hall of India.	• Taubay-Operational Amplifiers. • K.R. Botkar-Integrated Circuits. Pearson Education.

ECE502-P LINEAR INTEGRATED CIRCUITS

1	Design Op-Amp characteristics and get data for input bias current, measure the output-offset voltage and reduce it to zero and calculate slew rate.
2	Op-Amp in inverting and non-inverting modes.
3	Op-Amp as scalar, summer and voltage follower.
4	Op-Amp as differentiator and integrator.
5	Design LPF and HPF using Op-Amp 741.
6	Design Band Pass and Band reject Active filters using Op-Amp 741.
7	Design Oscillators using Op-Amp (i) RC phase shift (ii) Hartley (iii) Colpitts.
8	Design (i) Astable (ii) Monostable multivibrators using IC-555 timer.
9	Design Triangular & square wave generator using 555 timer.
10	Design Amplifier (for given gain) using Bipolar Junction Transistor.

ECE503 TELECOMMUNICATION ENGINEERING

UNIT	CONTENTS	CONTACT HOURS
I	**TRANSMISSION LINE:** Types of transmission lines, general transmission line equation, line constant, equivalent circuits, infinite line, and reflection on a line, SWR of line with different type of terminations. Distortion less and dissipation less lines, Coaxial cables, Transmission lines at audio and radio frequencies, Losses in transmission line,. Characteristics of quarter wave, half wave and lines of other lengths.	**8**
II	**TRANSMISSION LINE APPLICATIONS:** Smith chart and its application. Transmission line applications, Impedance matching Network. Single & double Stub matching. Measurement of parameters of transmission line, measurement of attenuation, insertion loss, reflection coefficient and standing wave ratio	**8**
III	**ATTENUATORS & FILTERS:** Elements of telephone transmission networks, symmetrical and Asymmetrical two port networks. Different Attenuators, p-section & T-section attenuators, stub matching, Transmission equalizers Filters, constant K-section, Ladder type, p-section, T-section filter, m-derived filter sections, Lattics filter section.	**8**
IV	**TELEPHONY:** Voice transmission, Two wire/ Four wire transmission, Multi-channel systems: Frequency division & time division multiplexing, Echo suppressors & cancellers, cross talk. Telephone set, Touch tone dial types, Numbering Concept for Telephony, Essentials of Traffic Engineering, Telephone Traffic Measurements, Subscriber loop Design	**8**
V	**Switching and Signaling for Analog and Digital Telephone Networks**: Introduction to switching Concepts, De-generation, Availability and Grading, Principle of Electronic Exchange, EPABX and SPC Digital telephone Exchange, Fascimile services. Approaches to PCM Switching: Multistage switches, Time Switch, Space Switch, STS and TST Switches, Concept of Supervisory and AC signaling.	**8**

Text Books:	
• W. Fraser-Telecommunications (BPB Publication) • I. Vishvanathan- Telecommunication switching systems & Networks. Prentice Hall of India.	• Cole- Introduction to Telecommunication. Pearson Educatinon. • Floyd-Telecommunication Switching Traffic and Networks, Pearson Education.

ECE504 ANALOG COMMUNICATION

UNIT	CONTENTS	CONTACT HOURS
I	**NOISE EFFECTS IN COMMUNICATION SYSTEMS:** Resistor noise, Networks with reactive elements, Noise temperature, Noise bandwidth, effective input noise temperature, Noise figure. Noise figure & equivalent noise temperature in cascaded circuits.	**8**
II	**AMPLITUDE MODULATION:** Frequency translation, Recovery of base band signal, Spectrum & power relations in AM systems. Methods of generation & demodulation of AM-DSB, AM-DSB/SC and AM-SSB signals. Modulation & detector circuits for AM systems. AM transmitters & receivers.	**8**
III	**FREQUENCY MODULATION:** Phase & freq. modulation & their relationship, Spectrum & band width of a sinusoidally modulated FM signal, phasor diagram, Narrow band & wide band FM. Generation & demodulation of FM signals. FM transmitters & receivers.. Comparison of AM, FM & PM. Pre emphasis & deemphasis. Threshold in FM, PLL demodulator.	**8**
IV	**NOISE IN AM AND FM:** Calculation of signal-to-noise ratio in SSB-SC, DSB-SC, DSB with carrier, Noise calculation of square law demodulator & envelope detector. Calculation of S/N ratio in FM demodulators, Super heterodyne receivers.	**8**
V	**PULSE ANALOG MODULATION:** Practical aspects of sampling: Natural and flat top sampling. PAM, PWM, PPM modulation and demodulation methods, PAM-TDM.	**8**

Text Books:	
• H.Taub & D.L. Schilling-"Principles of Communication Systems", Tata Mc-Graw Hill. • G.Kennedy-"Electronic Communication Systems:, John Wiely & Sons.	• Simon Haykin-"communication Systems". John Wiely & Sons. • B.P. Lathi-"Communication Systems:, John Wiley. • Modern Digital Analog communication Systems. • Louch-Digital & analog Communication, Pearson Education. • Tomasi-Electronic Communication. Pearson Education.

ECE504-P ANALOG COMMUNICATION

1	Harmonic analysis of a square wave of a modulated wave form.
2	Observe the Amplitude modulated wave form & measure modulation index. Demodulation of AM signal.
3	Generation & Demodulation of DSB – SC signal..
4	Modulate a sinusoidal signal with high frequency carrier to obtain FM signal. Demodulation of the FM signal.
5	To observe the following in a transmission line demonstrator kit : (a) The propagation of pulse in non reflecting transmission line. (b) The effect of losses in transmission line. (c) Transmission with standing waves on a Transmission line. (d) The resonance characteristics of a half-wave length long X-mission line.
6	a) To observe the operation of sampling and sample & hold circuits. (b) To study the effect of sampling time (sampling pulse width). (c) To study the effects of changing the sampling frequency & observing aliasing phenomena.
7	To study & observe the operation of a super heterodyne receiver.
8	To study & observe the amplitude response of automatic gain controller (AGC).
9	PAM, PWM & PPM: Modulation and demodulation.

ECE505 MICROWAVE ENGINEERING-I

UNIT	CONTENTS	CONTACT HOURS
I	**WAVE GUIDES:** Introduction of Microwaves and their applications. Rectangular Waveguides, Solution of Wave equation in TE and TM modes. Power transmission and Power losses. Excitation of modes in Rectangular waveguides, circular waveguides. Basic idea of TE and TM modes, field patterns, TEM mode of propagation.	**8**
II	**WAVEGUIDE COMPONENTS:** Scattering matrix representation of networks. Rectangular cavity and circular cavity resonators. Waveguide Tees, Magic Tees. Hybrid rings. Waveguide corners, Bends and twists. Directional couplers, Circulators and isolators.	**8**
III	**KLYSTRONS:** Limitation of conventional vacuum tubes, Construction and operation of two cavity & multicavity klystrons. Velocity modulation and electron bunching (analytical treatment), Applegate diagram and applications of two cavity klystrons. Construction, working and operation of Reflex klystron. Applications and practical considerations. Velocity modulation, power output and frequency characteristics of a Reflex klystron. Electron admittance.	**8**
IV	**TRAVELLING WAVE TUBES (TWT):** Construction, operation and practical consideration of helix type TWT. Introduction to CW power pulsed dual mode TWT. Coupled cavity TWT. Applications of TWT.	**8**
V	**MAGNETRON:** Types of Magnetron. Construction, operation, analysis and practical consideration of cavity or travelling wave magnetron. Introduction to coaxial, frequency angle and voltage tuneable magnetrons. Backward cross field oscillator, Forward wave cross field amplifier.	**8**

Text Books:	
• S. Y. Lio -'Microwave devices and Circuits', Prentice-Hall of India. • H.J. Reich-'Microwave Principles', East-West Press.	• R.E. Collin-'Foundations for microwave Engineering', Mc-Graw Hill. • Sisodia V.L. Gupta-'Microwave Engineering', New Age. •

ECE505-P MICROWAVE ENGINEERING-I

1	Study of various microwave components and instruments like frequency meter, attenuator, detector & VSWR meter.
2	Draw V-I characteristics of microwave source like Gunn diode/ Reflex Klystron.
3	Measurement of frequency and wavelength in a rectangular waveguide.
4	Measurement of VSWR (small as well as large values) & reflection coefficient.
5	Measure unknown impedance with smith chart.
6	Draw the following characteristics of Gunn Diode : (i) Output power and frequency as a function of voltage (ii) Square wave modulation by PIN diode.
7	Drawing polar pattern of Horn antenna.
8	To observe the action of directional coupler and its use in separating incident & reflected wave.
9	Study of Magic Tee, Circulator, isolator.
10	Study of spectrum analyzer & its use in observing the response of (i) High frequency amplifier (ii) Low pass, high pass, band pass, band reject filters.

ECE506-I BIOMEDICAL INSTRUMENTATION

UNIT	CONTENTS	CONTACT HOURS
I	**HUMAN BODY SUBSYSTEMS**: Brief description of neural, muscular, cardiovascular and respiratory systems; their electrical, mechanical and chemical activities. **TRANSDUCERS AND ELECTRODES**: Principles and classification of transducers for Bio-medical applications, Electrode theory, different types of electrodes, Selection criteria for transducers and electrodes.	**7**
II	**BIOPOTENTIALS:** Electrical activity of excitable cells, ENG, EMG, ECG, ERG, EEG. Neuron potential. **CARDIOVASCULAR SYSTEM MEASUREMENTS** : Measurement of blood pressure, blood flow, cardiac output, cardiac rate, heart sounds, Electrocardiograph, phonocardiograph, Plethysmograph, Echocardiograph	**7**
III	**INSTRUMENTATION FOR CLINICAL LABORATORY**: Measurement of pH valve of blood, ESR measurement, haemoglobin measurement, O and CO concentration in blood, GSR measurement. Instrumentation for clinical laboratory: Spectrophotometer, chromatography, Haematology, Measurement of pH value, concentration in blood. **MEDICAL IMAGING**: Diagnostic X-rays, CAT, MRI, thermography, Ultrasonography, medical use of isotopes, endoscopy.	**7**
IV	**PATIENT CARE, MONITORING AND SAFETY MEASURES** : Elements of Intensive care monitoring basic hospital systems and components, physiological effect of electric current shock hazards from electrical equipment, safety measures, Standards & practices. **COMPUTER APPLICATIONS AND BIOTELEMETRY** : Real time computer applications, data acquisition and processing, remote data recording and management.	**7**
V	**THERAPEUTIC AND PROSTHETIC DEVICES**: Introduction to cardiac pacemakers, defibrillators, ventilators, muscle stimulators, diathermy, heart lung machine, Hemodialysis, Applications of Laser.	**7**

Text Books:	
• Webster, J.G.-Medical Instrumentation, Application and Design, John Wiley and sons. • Jacobson, B.Webster, J.G.-Medical and clinical Engineering, Prentice Hall of India.	• Cromwell-Blomedical Instrumentation and Measurment, Prentice Hallof India. • R.S. Khandpur-Handbook of Biomedical Instrumentation, Tata Mc-Graw Hill. • Carr-Introduction to Biomedical Equipment Technology, Pearson Education.

ECE506-II ADVANCED DATA STRUCTURES

UNIT	CONTENTS	CONTACT HOURS
I	**ADVANCED TREES:** Definitions and operations on weight balanced trees (Huffman trees), 2-3 trees and Red-Black trees. Augmenting Red-Black trees to dynamic order statistics and interval tree applications. Operations on disjoint sets and its Union-Find problem. Implementing sets, discitionerics, priority queues and concatenable queues using 2-3 trees.	7
II	**MERGEABLE HEAPS:** Mergeable Heap operations, binomial trees, implementing binomial heaps and its operations. 2-3-4- trees and 2-3-4 heaps. Structure and potential function of Fibonacci heap. Implementing Fibonacci Heap.	7
III	**GRAPH THEORY DEFINITIONS:** Definitions of Isomorphism, Components, Circuits, Fundamental Circuits, Cut-sets, Cut-Vertices, Planer and dual graphs, Spanning trees, Kuratovski's two graphs.	7
IV	**GRAPH THEORETIC ALGORETHMS:** Algorithms for connectedness, finding all spanning trees in a weighted graph and planarity testing. Breadth first and depth first search, topological sort, strongly connected components and, articulation point.	7
V	**APPLICATION OF GRAPHS:** Single source shortest path and all pair shortest path algorithms. Min-Cut Max-Flow theorem of network flows, Ford-Fulkerson Max Flow algorithms.	7

Text Books:	
• Narsingh Deo- Graph Theory with Applications to Engineering and Computer Sicience, Prentice Hall of India. • Cormen- Introduction to Algorithms, Prentice Hall of India.	• Aho A.V., Hopcrpft J.E. and Ullman J.D.-The Design and Analysis of Computer Algorithms, Addition-Wesley. • Horwitz and Sawhni-fundamentals of Data Structures, Galgotia Book source. • Wilson-Introduction to Graph Theory, Pearson Education.

ECE506-III COMPUTER ORIENTED NUMERICAL & STATISTICAL METHODS

UNIT	CONTENTS	CONTACT HOURS
I	**MATRIX COMPUTATION:** Algebra of matrix, Inverse of a matrix, Rank of a matrix, Matrix inversion by Gauss elimination, Computer programs for matrix inversion.	7
II	**SOLUTION OF LINEAR EQUATIONS:** Cramer's rule, Gauss elimination, Gauss Jordan elimination and Gauss Seidal iterative method and their implementation in C.	7
III	**SOLUTION OF NON-LINEAR EQUATIONS:** Interval bisection method, Secant method, Regula-Falsi method, Curve fitting, Method of least squares and their implementation in C.	7
IV	**SOLUTION OF DIFFERENTIAL EQUATIONS:** Euler's method, Modified Euler's method, Runge Kutta method of fourth order, Solution of partial differential equation with special reference to heat equation, Laplace equation and wave equation Milne's and their implementation in C.	7
V	**STATISTICAL METHODS:** Curve fitting methods – method of least squares, fitting a straight line, parabola. Correlation and Linear regression.	7

Text Books:	
• V.Rajaraman-Computer Oriented Numerical Methods, Prentice Hall of India. • B.S. Grewal-Higher Engineering Mathematics.	• J.L. Bansal-Numerical Analysis. • Balasubramanyam-Numerical Methods. • E.V. Krishnamurthy-Numerical Methods. • Gaur and Kaul-Higher Engineering Mathematics.

ECE601-MICROWAVE ENGINEERING-II

UNIT	CONTENTS	CONTACT HOURS
I	**MICROWAVE MEASUREMENTS :** Detection of microwaves , Microwave power measurement, Impedance measurement, Measurement of scattering parameters, Frequency measurement, VSWR measurements	**8**
II	**INTRODUCTION TO STRIPLINES:** Parallel striplines, Coplanar striplines, Shielded striplines, Slot Lines, Integrated Fin line, Non-radiative guide, Transitions, Bends and Discontinuities.	**8**
III	**MICROWAVE NETWORK ANALYSIS:** Impedance and Admittance matrices, Scattering matrix, Reciprocal networks and Loss less networks parameters, ABCD Matrix, Equivalent circuits for Two port Network, Conversions between two port network Signal flow graphs, Discontinuities in waveguides and micro strip.	**8**
IV	**MICROWAVE SEMICONDUCTOR DEVICES**: Construction, Operation and Practical applications of PIN diode, varactor and Tunnel diode, Gunn diode, IMPATT, TRAPTT diodes, BJT, JFET, MESFET, CCD, MASER and LASER.	**8**
V	**MONOLITHIC MICOWAVE INTEGRATED CIRCUITS**: Introduction, Materials, MMIC Growth, MOSFET fabrication, Thin film formation, Hybrid integrated circuit fabrication, Advantages & Difficulties of MICs.	**8**

Text Books:	
• S.Y.Liao-'Microwave Devices and ckts', Prentice Hall of India • K.C. Gupta-'Microwaves', New Age International	• R.E. Collin-'Foundations for Mocrowave Engg', Mc-Graw Hill • T.C. Edwards-'Foundation for Micostrip circuit Design', John Wiley & Sons • B.Bhat & S.K. Koul-'Stripline like Transmision Lines for Microwave Integrated Circuits, Wiley Eastern Limited

ECE602 MICROPROCESSOR AND MICROCONTROLLER

UNIT	CONTENTS	CONTACT HOURS
I	**INTRODUCTION**: CPU, address bus, data bus and control bus. Input/ Output devices, buffers, encoders, latches and memories	**8**
II	**8085 MICROPROCESSOR ARCHITECTURE**: Internal data operations and registers, pins and signals, peripheral devices and memory organization, interrupts. CISC and RISC architecture overview.	**8**
III	**8085 MICROPROCESSOR INSTRUCTIONS**: Classification, format and timing. Instruction set. Programming and debugging, 8 bit and 16 bit instructions.	**8**
IV	**(8085 MICROPROCESSOR INTERFACING**: 8259, 8257, 8255, 8253, 8155 chips and their applications. A/D conversion, memory, keyboard and display interface (8279).	**8**
V	**INTRODUCTION TO 8051 MICROCONTROLLER**: General features & architecture of 8051. Memory, timers and interrupts. Pin details. Interfacing and applications	**8**

Text Books:	
• R. Gaonkar- Microprocessor Architecture, Programming and Applications, Wiely • NTEL- Microcontroller Handbook	• Ayle- 8051 Microcontrollers, Penram Press • the 8051 Microcontrollers & Embeded System, Pearson Education • PIC Microcontrollers, Pearson Education

ECE602-P MICROPROCESSOR AND MICROCONTROLLER

1	Study the hardware, functions, memory structure and operation of 8085 microprocessor kit.
2	Program to perform integer division: (i) 8-bit by 8-bit (ii) 16-bit by 8-bit.
3	Transfer of a block of data in memory to another place in memory in the direct and reverse order
4	Searching a number in an array and finding its parity.
5	Sorting of array in: (i) Ascending (ii) Descending order.
6	Programme to perform following conversion: (i) BCD to ASCII (ii) BCD to Hexadecimal.
7	Programme to multiply two 8-bit numbers.
8	Programme to generate and sum 15 fibanocci numbers.
9	Programme for rolling display of message “INDIAN.
10	To insert a number at correct place in a sorted array.
11	Serial and Parallel data transfer on output port 8155 & 8255 & designing of disco light, running light, and sequential lights on off by above hardware.
12	Generation of different waveform on 8253/ 8254 programmable timer.

ECE603 INDUSTRIAL ELECTRONICS

UNIT	CONTENTS	CONTACT HOURS
I	**SEMICONDUCTOR POWER DEVICES:** Basic characteristics & working of Power Diodes, Diac, SCR, Triac, Power Transistor, MOSFETs, IGBT, and GTO	**8**
II	**RECTIFIERS & INVERTERS:** Working principles of single and three phase bridge rectifiers, Voltage and current source inverters	**8**
III	**POWER SUPPLIES:** Principle of operation of choppers. Step up, Step down and reversible choppers. High frequency electronic ballast, Switch Mode Power Supply: Fly back converter, forward/buck converter, Boost converter and buck-boost converter. Uninterruptible Power Supply	**8**
IV	**MOTOR CONTROL:** Introduction to speed control of DC motors using phase controlled converters and choppers, Basic idea of speed control of three phase induction motors using voltage and frequency control methods	**8**
V	Stepper Motors: Variable reluctance, Permanent magnet and hybrid stepper motors. Induction and dielectric heating control.	**8**

Text Books:	
• Biswanath Paul, Industrial Electronics and Control, Prentice Hall of India • S.N. Biswas, Insustrial Electronics, Dhanpat Rai & Co	• Zbar, Insustrial Electronics: A text Lab Manual, Tata Mc-Graw Hill • Morris, Industiral Electronics, Tata Mc-Graw Hill • P.S Bhimbhra

ECE603-P INDUSTRIAL ELECTRONICS

1	Study the characteristics of SCR. Observe the terminal configuration. Measure the breakdown voltage. Measure latching and holding current. V-I characteristics.
2	Perform experiment on triggering circuits for SCR. R-triggering circuit. R-C triggering circuit. UJT triggering circuit.
3	Study and obtain the characteristics of Diac.
4	Study and obtain the waveforms for single-phase half-wave controlled converter.
5	Study and obtain the waveforms for single-phase half controlled symmetrical and asymmetrical bridge Converters.
6	Study and obtain the waveforms for single-phase fully controlled bridge converter.
7	Study and obtain the waveforms for voltage-commutated chopper.
8	Study and obtain the waveforms for current-commutated chopper.
9	Perform experiment on single phase PWM inverter.
10	Perform experiment on buck, boost and buck-boost regulators.
11	Perform experiment on Motor control – open loop & closed loop.

ECE604 DIGITAL COMMUNICATION

UNIT	CONTENTS	CONTACT HOURS
I	**PCM & DELTA MODULATION SYSTEMS:** Uniform and Non-uniform quantization. PCM and deltamodulation, Signal to quantization noise ratio in PCM and delta modulation. DPCM, ADM, T1 Carrier System, Matched filter detection. Error probability in PCM system.	**8**
II	**BASE BAND TRANSMISSION:** Line coding (RZ, NRZ): Polar, Bipolar, Mancheste, AMI. Inter symbol interference, Pulse shaping, Nyquist criterion, Raised cosine spectrum	**8**
III	**DIGITAL MODULATION TECHNIQUES:** Geometric interpretation of signals, Orthogonalization, ASK, BPSK, BFSK, QPSK, MSK modulation techniques and Coherent detection of these techniques. Calculation of error probabilities.	**8**
IV	**INFORMATION THEORY:** Amount of Information, Average Information, Entropy, Information rate, Increase in Average information per bit by coding, Shannon's Theorem and Shannon's bound, Capacity of a Gaussian Channel, BW-S/N trade off.	**8**
V	**CODING:** Coding and decoding of Information, Hamming code, Single Parity-Bit Code, Linear Block code, cyclic code & convolutional code.	**8**

Text Books:	
• H.Taub & D.L. schilling-"Principles of communication System", Tata Mc-Graw Hill • Simon Haykin-"Communication Systems", John Wiley & Sons	• B.P. Lathi-"Communication Systems", Tata Mc-Graw Hill • Proakis-"Digital Communication" Tata Mc-Graw Hill • Sklar-"Digital Communication" Pearson Education

ECE604-P DIGITAL COMMUNICATION

1	a) To observe sampling of analog signal. Identify & solve the aliasing problem. (b) To observe the Transmission of two signals over a single channel using sampling methods.
2	TDM-PAM: Modulation & demodulation.
3	Operation of a PCM encoder & decoder.
4	TDM-PCM: Modulation & demodulation.
5	Observe the performance of a Delta modulation system & to derive from it a delta sigma modulation system.
6	To generate and study the various data formatting schemes (Unipola, Bi-polar, Manchester, AMI etc.).
7	Generate ASK signals, with and without carrier suppression. Demodulation of these two types of modulated signal.
8	Generate the FSK wave forms & demodulate the FSK signals based on the properties of (a) Tuned circuits (b) PLL.
9	Generate the PSK signals and demodulate it.
10	**Simulation using any virtual Instrumentation Software:** To carry out convolution in both continuous time and discrete time systems To carry out convolution in both continuous time and discrete time systems Perform various keying Techniques: PSK, ASK, FSK & MSK.

ECE605 CONTROL SYSTEMS

UNIT	CONTENTS	CONTACT HOURS
I	**CONTROL SYSTEMS ANALYSIS AND COMPONENTS:** Examples and application of open loop and close loop systems. Brief idea of multivariable control system, Brief idea of Z-transform and digital control systems. Differential equations. Determination of transfer function by block diagram reduction technique & signal flow graph method.	**8**
II	**TIME RESPONSE ANALYSIS OF FIRST ORDER & SECOND ORDER SYSTEMS:** Transient response analysis. Steady state error & error constants. Dynamic error and dynamic error coefficient, Performance Indices	**8**
III	**FREQUENCY DOMAIN METHODS:** Bode plot, Design specification in frequency domain and their co-relation with time domain.	**8**
IV	**STABILITY OF THE SYSTEM:** Absolute stability and relative stability. Routh's stability criterion, Hurwitz criterion. Root locus method of analysis. Polar plots, Nyquist stability criterion. M and N loci, Nicholas charts	**8**
V	**STATE VARIABLE ANALYSIS:** Concepts of state, state variable and state model. State models for linear continuous time systems. Brief idea of state variable analysis in discrete time domain. Transfer functions, Solution of state equation. Concepts of controllability & observability.	**8**

Text Books:	
• I J Nagrath and M Gopal: Control Systems Engineering, New Age Publication • K Atsuhiko Ogata: Modern Control Engineering, Prentice Hall of India • M. gopal: Control Systems, Tata Mc-Graw Hill	• B.C.Kuo: Automatic Control Systems, Prentice Hall of India • Bekn: Digital contorl mpten • R.T. stef: Design of F.B. conrol myoter

ECE606-I NEURAL NETWORKS

UNIT	CONTENTS	CONTACT HOURS
I	**INTRODUCTION:** Introduction to Neural Networks, Biological basis for NN, Human brain, Models of a Neuron, Directed Graphs, Feedback, Network architectures, Knowledge representation, Artificial intelligence & Neural Networks.	7
II	**LEARNING PROCESSES:** Introduction, Error –Correction learning, Memory –based learning, Hebbian learning, Competitive learning, Boltzmann learning, Learning with a Teacher & without a teacher, learning tasks, Memory, Adaptation.	7
III	**SINGLE LAYER PERCEPTRONS:** Introduction, Least-mean-square algorithm, Learning Curves, Learning rate Annealing Techniques, Perceptron, Perceptron Convergence Theorem	7
IV	**MULTI LAYER PERCEPTRONS** : Introduction, Back-Propagation Algorithm, XOR Problem, Output representation and Decision rule, Feature Detection, Back-Propagation and Differentiation, Hessian Matrix, Generalization.	7
V	**RADIAL-BASIS FUNCTION NETWORKS & SELF-ORGANISING MAPS:** Introduction to Radial basis function networks, Cover's Theorem on the Separability of Patterns, Interpolation Problem, Generalized Radial-Basis function networks, XOR Problem. Self-Organizing map, Summary of SOM Algorithm, Properties of the feature map.	7

Text Books:	
• freeman/Skapura-Networks, Pearson Education • Artificial Neural Network,Robert Schalloff,TMH • Neural Network,Satish kumar,TMH	• freeman/Skapura-Networks, Pearson Education • Neural Network Design w/CD, Hagan, Cengage Learning • Fuzzy Logic and Neural Networks: Basic Concept And Application,A Lavala, Chemakesava R.,New Age

ECE606-II PARALLEL COMPUTATION & ARCHITECTURE

UNIT	CONTENTS	CONTACT HOURS
I	**INTRODUCTION:** Synchronous and asynchronous paradigms of parallel computing	7
II	**HARDWARE TAXONOMY:** Flynn's classification, Handler's classification, Software taxonomy, Kung's taxonomy, SPMD.	7
III	**HARDWARE TAXONOMY:** Flynn's classification, Handler's classification, Software taxonomy, Kung's taxonomy, SPMD.	7
IV	**PARALLEL PROGRAMMING LANGUAGES:** Performances Matrices – Laws governing performance measurements, metrics-speed up, efficiency utilization, communication, overheads, single/multiple programme performances, benchmarks.	7
V	**PROCESSOR ARRAYS:** Basic Algorithms – Fast Fourier Transform, Linear System Solution, Sorting etc.	7

Text Books:	
• Quinn- M.Parallel Computing Theory and Practice, Mc_graw Hill • Hwang K. Briggs, F.A.-Computer Architecture & Parallel Processing, Mc-Graw Hill	• Kumar, V., Grama, A.Gupta A. and Karypis, G-An Introduction to Parallel Computing, Addison Wesley.

ECE606-III OPTIMIZATION TECHNIQUES

UNIT	CONTENTS	CONTACT HOURS
I	**INTRODUCTION:** Historical development, engineering application of optimization, Formulation of design problems as a mathematical programming problem, Classification of optimization problems	7
II	**LINEAR PROGRAMMING:** Simplex methods, Revised simplex method, Duality in linear programming, post optimality analysis.	7
III	Applications of Linear programming, Transportation and assignment problems.	7
IV	**NON-LINEAR PROGRAMMING:** Unconstrained optimization techniques, Direct search methods, Descent methods, Constrained optimization, Direct and Indirect methods.	7
V	Dynamic Programming: Introduction, multi-decision processes, computational procedure.	7

Text Books:	
• Hiller and Lieberman, Introduction to Operation Research (Seventh Edition),TMH • Anderson – An introduction to management science, quantitative approaches to decision making, Cengage learning	• Prasad – Operations Research, Cengage learning • Ravindren Philips and Solberg, Operation Research Principles and Practice (Second Edition), Wiley

ECE 607-P ENTREPRENEURSHIP DEVELOPMENT

1	Definition of entrepreneur, qualities of a successful entrepreneur, Charms of being an entrepreneur, achievement-motivation, leadership and entrepreneurial competencies.
2	Decision-making, procedures and formalities for starting own business, financial support system.
3	Identification and selection of business opportunities and market survey, business plan. Implementation and customer satisfaction.
4	Business crises, problem-solving attitude, communication skill. Government policies for entrepreneurs.
5	Knowledge based enterprises, Scope of entrepreneur in present context, area of future entrepreneurship.
6	Marketing & Sales Promotion, Techno-Economic Feasibility Assessment by Preparation of Preliminary & Detailed project report.

ECE701- ANTENNA & WAVE PROPAGATION

UNIT	CONTENTS	CONTACT HOURS
I	**ANTENNA FUNDAMENTALS:** Antenna parameters, Radiation from a current element in free space. Quarter & half wave antenna. Reciprocity theorem. Resonant and non-resonant antenna. Effective length and aperature, gain, beamwidth, directivity, radiation resistance, efficiency, polarization, impedance and directional characteristics of antenna, antenna temperature.	**8**
II	**ANTENNAS:** V and Rhombic antennas, Folded dipole, Yagi-Uda antenna, Frequency independent antennas, Log-periodic antennas, UHF and Microwave antennas- Antenna with parabolic reflectors, Horn and Lens antennas, Helical antennas, Square and Circular loop antennas, Fundamentals of Slot and Microstrip antennas.	**8**
III	**ANTENNA ARRAYS:** Two element array, N-element linear arrays, Broadside, End fire, collinear and combination arrays, Multiplication of patterns, Binomial arrays. Effect of ground on antennas, Antenna loading. **Antenna Measurements:** Antenna impedance, radiation pattern, gain, directivity, polarization and phase measurements.	**8**
IV	**RADIO WAVE PROPAGATION:** Mechanism of radio wave propagation, Reflection, Refraction interference and diffraction of radio waves. Theory of ground wave, space wave and sky wave propagation. Plane earth reflection, Reflection factors for horizontal and vertical polarizations. Duct propagation and tropospheric scattering.	**8**
V	Various Ionospheric layers. Characteristics of ionosphere and its effects on wave propagation. Critical frequency, Virtual height, skipzone & maximum usable frequency. Multiple hop transmission. Oblique & vertical incidence transmission. Effect of earth's magnetic field, solar activity and meteorological conditions on wave propagation.	**8**

Text Books:	
• J.D. Kraus, 'Antennas', Mc-Graw Hill. • C.A. Balanis, 'Antenna Theory', Harper & Row. • K.D. Prasad, 'Antenna and Wave Propagation', SATYA Prakashan, New Delhi.	• E.C. Jordan and K.g. Balmain, 'Electromagnetic waves and Radiating Systems', Prentice hall of India. • R.E. Collin, 'Antennas & Radio Wave Propagation', Mc-Graw Hill.

ECE701-P ANTENNA & WAVE PROPAGATION LAB

1	To study the characteristic of the following: (a) End-fed vertical antennas. (b) Altering the effective length of an antenna. (c) Practical top loaded antennas. (d) Directional antenna with driven elements. (e) Parastic arrays. (f) Folded antenna elements
2	Study the importnat characteristics of antenna land experimental measure the Radiation resistance, Radiation Pattern on polar plots and calculate the Beam width and gain of main lobe and band width for the following types of antenna. (a) Half wave dipole (b) Folded dipole (c) Yagi UDA multiple element folded dipole (d) Hertz Antenna (e) End fire and broad side antenna (f) Phase array antenna (g) combined collinear array (h) Loop antenna (i) Ground plane antenna (j) Log periodic antenna (k) Rhombus antenna (l) Slot antenna
3	Demonstration of modeling of wire antenna using appropriate design software
4	Simulation of antenna arrays using appropriate software
5	Design and testing of microstrip rectangular patch antenna lusing appropriate software
6	(a) to construct a basic transmitter, receiver and line of sigth microwave radio link using micostrip components. (b) To investigate the transmission characteristics of the link and to measure the gain of the microstrip patch antennas using in the above setup. Draw the antenna radiation digram

ECE702 DIGITAL SIGNAL PROCESSING

UNIT	CONTENTS	CONTACT HOURS
I	**SAMPLING:** Discrete time processing of Continuous-time signals, continuous-time processing of discrete-time signals, changing the sampling rate using discrete-time processing.	**8**
II	**TRANSFORM ANALYSIS OF LTI SYSTEMS:** Introduction, The frequency response of LTI systems, System functions for systems characterized by LCCD (Linear Constant Coefficient Difference) equations, All-pass system, Minimum-Phase systems, and Linear systems with linear phase.	**8**
III	**STRUCTURES FOR DISCRETE-TIME SYSTEMS:** Block diagram and signal flow graph representation of LCCD (LCCD – Linear Constant Coefficient Difference) equations, Basic structures for IIR and FIR systems, Transposed forms.	**8**
IV	**FILTER DESIGN TECHNIQUES:** Introduction, Analog filter Design: Butterworth & Chebyshev.IIR filter design by impulse invariance & Bilinear transformation. Design of FIR filters by Windowing: Rectangular, Hanning, Hamming & Kaiser.	**8**
V	The Discrete Fourier transform (DFT), Properties of the DFT, Linear Convolution using DFT. Efficient computation of the DFT: Decimation–in-Time and Decimation-in frequency FFT Algorithms. Processing of speech signals: Vocoders, linear predictive coders.	**8**

Text Books:	
• Schafer, Buck-Discrete Time signal Processing, Pearson Education Asia. • Prokis & Monolakis-Digital Signal Processing: Principles, Algorithms & Application, Prentice hall of India.	• S.K. Mitra-Digital Signal Processing. Tata Mc-Graw Hill. • Rabiner & Gold-Theory & Applications of Digital Signal Processing, Prentice Hall of India. • Lathi-Signal Processing & Linear System, Oxford Univ Press.

ECE702-P DIGITAL SIGNAL PROCESSING LAB

1	**Modeling and simulation using MAT LAB** (a) Realising a given block diagram having multiplier, adder/subtractor and system (Discrete/Continuous) with given Impulse response. Calculating output for given input (b) To simulate the transmitter and receiver for BPSK (c) To design and simulate FIR digital filter (LP/HP) (d) To design and simulate IIR digital filter (LP/HP)
2	**DSP Lab using TMS320C6XXX DSP Kits** (a) To study the architecture of TMS320C6XXX DSP kits using Bloom with DSP (b) To generate wave form (SINE, COSINE, SQUARE & TRIANGULAR) (c) Verification of Sampling Theorem (d) Verification of linear/circular convolution (e) To design FIR and FIR digital filter (LP/HP)

ECE703 WIRELESS COMMUNICATION

UNIT	CONTENTS	CONTACT HOURS
I	**PROPAGATION PHENOMENA:** Fundamentals of fading, Multipath channels, Spread Spectrum signals: Direct-sequence spread spectrum signals, p-n sequences, Frequency-hopped spread spectrum signals, Code-division multiplexing.	8
II	**LINE OF SIGHT MICOWAVE COMMUNICATION:** Link Engineering, Frequency planning, Free space loss, Fresnel zone clearance bending of radio beam, Effective earth radius, Building blocks of Transmitter & Receiver.	8
III	**MULTIPLE ACCESS TECHNIQUES:** FDMA, TDMA and CDMA with reference to mobile radio and satellite systems. TDMA based networks. CDMA based networks.	8
IV	**CELLULAR WIRELESS NETWORKS:** GSM: Introduction, overview of the GSM systems, GSM codec, channel coding and interleaving, radio like control. Cordless systems and WLL, Mobile IP, Wireless access protocol. Wireless LAN's: Technology, IEEE 802.11 standards and Blue tooth. Broadband Wireless 802.16.	8
V	**SATELLITE COMMUNICATION:** Elements of satellite communication: Frequency bands, Transmission and multiplexing. Modulation, Multiple access. Satellite orbit and description- orbital period and velocity, effects of orbital inclination, Azimuth and elevation, Coverage angle and slant range, Geostationary orbit, Satellite description. Earth Station antenna, high-power amplifier, low-noise amplifier, up converter, down converter, monitoring and control, reliability. Satellite Link: basic link analysis.	8

Text Books:	
• Reppaport-Wireless Communication, Pearson Education. • William Stallings- Wireless communication & Networks, LPE, Pearson Education, Asia. • Tri. T. Ha.- Digital Satellite Communications, Mc-Graw Hill International.	• Dr.Kamilo Feher-Digital Wireless Communication, Prentice Hall of India. • William C.Y. Le-Mobile Cellular Telecommunications, Mc-Graw Hill Interational Edition. • Richharia M-Satellite Communication System, Mac Millan.

ECE703-P WIRELESS COMMUNICATION LAB

1	Measurement of antenna characteristics: Radiation Pattern on polar plots, Beam width and Gain of main lobe for the following types of antennas: (a) Half wave and quarter wave dipole (b) Folded dipole (c) Yagi UDA multiple element folded dipole (d) Hertz Antenna (e) End fire array and broad side array (f) Helix antenna (g) Paraboloid reflector antenna (h) Loop antenna (i) Ground plane antenna (j) Log periodic antenna (k) Rhombus antenna (l) Slot antenna.
2	Demonstration of modeling of wire antenna using appropriate design software
3	Simulation of antenna arrays using appropriate software
4	Design and testing of microstrip rectangular patch antenna using appropriate software
5	Investigate the transmission characteristics of the link and measure the gain of the microstrip antennas. Draw the antenna radiation diagram
6	Radar Trainer: Working of Doppler radar, velocity of moving object, time and frequency measurement and other applications
7	To perform Modulation, Demodulation and BER measurement using CDMA – DSSS Trainer
8	To establish analog/digital communication link and transmit & receive three signals (audio, video,tone) simultaneously using Satellite Communication Trainer
9	To study GPS Receiver, establishing link between GPS satellite & GPS trainer and measure of latitude & longitude

ECE704 IC TECHNOLOGY

UNIT	CONTENTS	CONTACT HOURS
I	**INTRODUCTION TO TECHNOLOGIES:** Semiconductor Substrate-Crystal defects, Electronic Grade Silicon, Czochralski Growth, Float Zone Growth, Characterization & evaluation of Crystals; Wafer Preparation-Silicon Shaping, Etching and Polishing, Chemical cleaning.	**7**
II	**DIFFUSION & ION IMPLANTATION:** Ficks diffusion Equation in One Dimension, Atomic model, Analytic Solution of Ficks Law, correction to simple theory , Diffusion in SiO, Ion Implantation and Ion Implantation Systems Oxidation. Growth mechanism and Deal-Grove Model of oxidation, Linear and Parabolic Rate co-efficient, Structure of SiO , Oxidation techniques and system, Oxide properties.	**7**
III	**CHEMICAL VAPOUR DEPOSITION AND LAYER GROWTH:** CVD for deposition of dielectric and polysilicon – a simple CVD system, Chemical equilibrium and the law of mass action, Introduction to atmospheric CVD of dielectric, low pressure CVD of dielectric and semiconductor. Epitaxy-Vapour Phase Expitaxy, Defects in Epitaxial growth, Metal Organic Chemical Vapor Deposition, Molecular beam epitaxy.	**7**
IV	**PATTERN TRANSFER:** Introduction to photo/optical lithography, Contact/ proximity printers, Projection printers, Mask generation, photoresists. Wet etching, Plasma etching, Reaction ion etching.	**7**
V	**VLSI PROCESS INTEGRATION:** Junction and Oxide Isolation, LOCOS methods, Trench Isolation, SOI; Metallization, Planarization. Fundamental consideration for IC Processing, NMOS IC Technology, CMOS IC Technology, Bipolar IC Technology.	**7**

Text Books:	
• S.M. Sze-VLSI Technology, Tata Mc-Graw Hill. • D. Nagchoudhary-principles of Microelectronic Technology, Wheeler Publishing. • Stephen A Campbell-The Science and Engineering of Microelectronic Fabrication, Oxford University Press.	• Hong Xiao-Introduction to Semiconductor Manufacturing, Prentice Hall India. • Kang- CMOS circuit design, Tata Mc-Graw Hill. • Razoni-Design of CMOS Analog Integrated Circuit.

ECE705 VLSI DESIGN

UNIT	CONTENTS	CONTACT HOURS
I	**INTRODUCTION TO MOS TECHNOLOGY:** Basic MOS transistors , Enhancement Mode transistor action, Depletion Mode transistor action, NMOS and CMOS fabrication	**8**
II	**BASIC ELECTRICAL PROPERTIES OF MOS CIRCUITS:** I versus V relationship, Aspects of threshold voltage, Transistor Transconductance g . The nMOS inverter, Pull up to Pull-down ratio for a NMOS Inverter and CMOS Inverter (B /B), MOS transistor circuit Model, Noise Margin.	**8**
III	**CMOS LOGIC CIRCUITS:** The inverter, Combinational Logic, NAND Gate NOR gate, Compound Gates, 2 input CMOS Multiplexer, Memory latches and registers, Transmission Gate, Gate delays, CMOS-Gate Transistor sizing, Power dissipation.	**8**
IV	Basic physical design of simple Gates and Layout issues. Layout issues for inverter, Layout for NAND and NOR Gates, Complex Logic gates Layout, Layout optimization for performance.	**8**
V	Introduction to VHDL, Prolog & other design tools. VHDL Code for simple Logic gates, flip-flops, shift registers.	**8**

Text Books:	
• Neil H.E. Weste, Kamran Eshraghian-Principles of CMOS VLSI Design • Douglas A. Pucknell, Kamran Eshraghian-Basic VLSI Design	• Stephen Brown and Zvonlo Veranesic-Fundamentals of Digital Logic with VHDL Design, Tata Mc-Graw Hill • Behzad Razavi-Design of Analog CMOS Integrated Circuits, Mc-Graw Hill • Michael John, Sebastian Smith-Application specific Integrated Circuit

ECE706-I ADVANCED MICROPROCESSORS

UNIT	CONTENTS	CONTACT HOURS
I	**8086 ARCHITECTURE:** Hardware specifications, Pins and signals, Internal data operations and Registers, Minimum and maximum mode, System Bus Timing, Linking and execution of Programs, Assembler Directives and operators.	**7**
II	**SOFTWARE & INSTRUCTION SET:** Assembly language programming: addressing mode and instructions of 8086, MACRO programming, 8086 interrupts.	**7**
III	**ANALOG INTERFACING:** A/D and D/A converter interfacing, keyboard and display interfacing, RS 232 & IEEE 488 communication standards.	**7**
IV	**DIGITAL INTERFACING:** Programmable parallel ports**,** Interfacing microprocessor to keyboard and alphanumeric displays, Memory interfacing and Decoding ,DMA controller.	**7**
V	**MULTIPROCESSOR CONFIGURATIONS:** Multiuser / Multitasking operating system concepts, 8086 based Multiprocessor systems. Introduction and basic features of 286, 386, 486 & Pentium processors.	**7**

Text Books:	
• Dougtas V.Hall- Microprocessors & Interfacing: Programming and Hardware, Tata Mc-Graw Hill • Yu-Cheng Liu, Glenn A.Gibson- Microprocessor systems: The 8086/8088", Prentice Hall of India	• A.K. ray, K.H. Bhurchand- Advanced Microprocessor and Peripherals, Tata Mc-Graw Hill • Barry B. Brey- The Intel Microprocessors: Architecture, Programming & Interfacing, Pearson Education Asia

ECE706-II ARTIFICIAL INTELLIGENCE & EXPERT SYSTEMS

UNIT	CONTENTS	CONTACT HOURS
I	**INTRODUCTION TO AI KNOWLEDGE:** Importance of AI,Knowledge Base System Knowledge organization & manipulation, Conceptual Introduction to LISP and other AI programming Languages	7
II	**KNOWLEDGE REPRESENTATION:** Syntax Semantics, Inference Rules, Non-deductive Inference methods, and representations using rules, forward chaining and backward chaining.Fuzzy Logic & Natural languages computations. Probabilistic Reasoning. Object Oriented Representations	7
III	**KNOWLEDGE ORGANIZATION & MANIPULATION:** Search & control strategies, matching techniques, knowledge organization & management, Genetic Algorithms based search techniques	7
IV	**KNOWLEDGE SYSTEMS ARCHITECTURE:** Rule based, non-production, uncertainty knowledge system building tools	7
V	**KNOWLEDGE ACQUISITION:** General concepts, learning by induction	7

Text Books:	
• Dr. Peter Norvig, Sebastian ThrunArtificial Intelligence: A Modern Approach (3rd Edition) • Kumar Satish, "Neural Networks" Tata Mc Graw Hill	• David Poole, Alan Macworth -Artificial intelligence,Cambridge University Press • James A Anderson, An introduction to Neural Networks. Bradford Books

ECE706-III OPERATING SYSTEMS

UNIT	CONTENTS	CONTACT HOURS
I	**INTRODUCTION:** History, Operating system services, types, responsibilities, generations, LINUX, WINDOWS	7
II	**PROCESS MANAGEMENT:** Operations on process, Process state, Scheduling, Criteria, scheduling algorithms, Evaluation, Synchronization, Semaphores, Monitors	7
III	**MEMORY MANAGEMENT:** Swapping, Continuous memory allocation, Paging, Pure paging, Demand paging, Page-replacement algorithms, thrashing, Example-Pentium, Disk Scheduling	7
IV	**INFORMATION MANAGEMENT:** File and directory concept, Access methods, Protection, Free space management, Efficiency and performance, Access matrix, Capability-based systems, Program-threats, User authentication, Firewall	7
V	**DEAD LOCKS:** System model, Dead lock characterization, Deadlock prevention, Avoidance, Detection, Recovery, Classic problems of synchronization	7

Text Books:	
• Modern Operating Systems, Andrew S Tanenbaum, PHI • Operating Systems:, Pal Chaudhury, PHI	• Operating System Principles, Peter B. Galvin, Greg Gagne, John Wiley & Sons • Operating Systems: Principles, Design and Applications , cengage learning • Understanding Operating System , Flynn, cengage learning

ECE801 COMPUTER NETWORKS

UNIT	CONTENTS	CONTACT HOURS
I	**QUEUING THEORY:** Pure birth, Pure death & Birth-death processes, Mathematical models for M/M/1, M/M/8, M/M/m, M/M/1/K and M/M/m/m queues. Little's formula. M/G/1 Queuing model basics	**8**
II	**DATA LINK LAYER:** Packet & Circuit switching, OSI & TCP/IP Reference Models, Framing, Simplex protocol, Simplex stop & wait protocol, Sliding window protocol, Go back N protocol, selective repeat, HDLC, Data link layer in internet	**8**
III	**MEDIUM LAYER:** Static & dynamic channel allocation, Multiple Access Protocols: ALOHA, slotted ALOHA, CSMA, Token Bus, Token Ring, FDDI, IEEE standards 802.2, 802.3 Hubs, Bridges, Routers & Gateways	**8**
IV	**NETWORK LAYER:** Network layer Design issues.Adaptive & Non-adaptive routing algorithms, Congestion control algorithms for TCP/IP networks, Internetworking, Network layer in the Internet: IPv4 & IPv6 Protocols, OSPF and BGP.TCP Protocol architecture	**8**
V	**ATM NETWORKS:** Connection Oriented Networks: X.25, Frame Relay & ATM. ISDN system architecture. Broadband ISDN. ATM Protocol architecture, Recognition Algorithm in ATM Networks,Congestion control Algorithms	**8**

Text Books:	
• Stallings - Data & computer Communication, Pearson Education Asia • Trivedi-Probability and Statistics with reliability, Queuing and Computer Science Applications, Sc. Application, Prentice hall of India	• Tancnbaum - Computer Networks, Pearson Education of Asia • Gallager - Data Networks, Prentice Hall of India

ECE801-P COMPUTER NETWORKS

1	**PRELIMINARIES:** Study and use of common TCP/IP protocols and term viz. telnet rlogin ftp, ping, finger, Socket, Port etc
2	**DATA STRUCTURES USED IN NETWORK PROGRAMMING:** Representation of unidirectional, Directional weighted and unweighted graphs
3	**ALGORITHMS IN NETWORKS:** computation of shortest path for one source-one destination and one source –all destination
4	**SIMULATION OF NETWORK PROTOCOLS:** (i) Simulation of M/M/1 and M/M/1/N queues. (ii) Simulation of pure and slotted ALOHA. (iii) Simulation of link state routing algorithm.
5	**Case study : on LAN Training kit** (i) Observe the behavior & measure the throughput of reliable data transfer protocols under various Bit error rates for following DLL layer protocols- a. Stop & Wait b. Sliding Window : Go-Back-N and Selective Repeat (ii) Observe the behavior & measure the throughput under various network load conditions for following MAC layer Protocols a. Aloha b. CSMA, CSMA/CD & CSMA/CA c. Token Bus & Token Ring
6	**DEVELOPMENT OF CLIENT SERVER APPLICATION:** (i) Develop 'telnet' client and server which uses port other than 23. (ii) Write a finger application which prints all available information for five users currently logged on and are using the network for longest duration. Print the information in ascending order of time

ECE802-RADAR & TV ENGINEERING

UNIT	CONTENTS	CONTACT HOURS
I	**RADAR:** Radar Block diagram, frequencies and applications. Radar range equation. Continuous wave (CW) & FM radar; Moving target indicator (MTI) : Delay line cancellers, blind velocity Pulse Doppler Radar. Tracking radar sequential lobbing, Conical scan and monopulse radar, Types of display, Radar receivers, Noise figure	**8**
II	**NAVIGATIONAL AIDS:** Principle of operation of Radar direction finder & range system. LORAN system, DME, TACAN, Aircraft landing systems	**8**
III	**TV ENGINEERING:** Theory of scanning standards, Principles of Monochrome and colour T.V. system (PAL, SECAM, NTSC). Composite video signal analysis. T.V Cameras : Image orthicon, plumbicon, vidicon. CCD camera tubes.Types of Monochrome and colour picture tubes, set-up adjustments. LCD and Plasma display	**8**
IV	Picture, colour and sound carriers. Vestigial side band transmission. Encoding picture information. Chrominance modulation. Compatibility of colour and monochrome T.V. systems. Block diagram of T.V. transmitters. TV transmission & reception antennas	**8**
V	**TV RECEIVER:** Functional block diagram of T.V. receiver, R.F. Tuner, I.F. amplifier, Video detector, video amplifier, AGC, Synch. Separation, Sync. Processing and AFC. Deflection oscillators, vertical & horizontal deflection and sound system circuits. EHT generation. Common faults and their diagnosis. Basic idea of HDTV, DBS-TV and 3D-TV	**8**

Text Books:	
• R.R. Gulati - Monochromic and Colour Television, Wiley Eastem • N.S. Nagaraja - 'Elements of Electronic navigation', Tata Mc-Graw hill	• M.I.Skolink - 'Introduction to Radar System', Mc-Graw Hill • Dhake - television Engineering. Tata Mc-Graw Hill

ECE803-OPTICAL COMMUNICATION

UNIT	CONTENTS	CONTACT HOURS
I	**OPTICAL FIBERS:** Basic optical laws and definitions, Principles of light propagation in fibers, Ray theory, Optical fiber modes and configurations, Step index and graded index fibers, Monomode and multimode fibers, Fiber materials, fiber fabrication, Fiber optic cables. Attenuation, signal distortion in optical fibers, Dispersion-intra modal & inter modal, Dispersion shifted and flattened fiber.	**8**
II	**OPTICAL SOURCES:** LED's- Structure, Materials, Characteristics, Modulation, Power & efficiency, Laser Diodes - Basic concept, Hetro Structure, properties and modulation.	**8**
III	**OPTICAL DETECTORS:** PIN and Avalanche photo diodes, photo detector noise, detector response time, Avalanche multiplication noise. Photo diode materials. Fundamental of Optical Receiver Operation.	**8**
IV	**OPTICAL FIBER COMMUNICATION SYSTEMS:** Source to fiber coupling, fiber to fiber joints, fiber splicing, fiber connectors. Principal components. Link design calculation, Applications, Wavelength division multiplexing.	**8**
V	**OPTICAL FIBER MEASUREMENTS:** Measurements of Fiber attenuation, Dispersion, refractive index profile, Numerical aperture & diameter.	**8**

Text Books:	
• Gerd Keiser-Optical Fiber Communications, Tata Mc-Graw lHill • J.N. Senior-Optical Fiber Communications, Prentice Hall of India	• J.Gowar-Optical Communications system, Prentice hall of India • J.Wilson & Hawkes-Opto Electronics-An Introduction, Prentice Hall of India • Joseph C. Palais-Fiber Optic Communications, LPE, Pearson Education Asia

ECE803-P OPTICAL COMMUNICATION LAB

1	**PART-I** Schematic design and make Device Level Layout of following circuits (a) BJT/FET Amplifier in various configuration (b) Counters, Shift Registers & Sequence Decoders (c) Various circuits with Op-Amp.
2	**PART-II** Design of following ckt using appropriate software like VHDL/ FPGA 3-input NAND gate Half adder D-Latch Serial in-serial out shift register.
3	**PART-III** To perform following experiments based on Fiber Optic Trainer To set up Fiber Optic Analog link. To set up fiber Optic Digital link. Measurement of Propagation loss and numerical aperture. Characterization of laser diode and light emitting diode.

ECE804-I IMAGE PROCESSING AND PATTERN RECOGNITION

UNIT	CONTENTS	CONTACT HOURS
I	**INTRODUCTION:** Imaging in ultraviolet and visible band. Fundamental steps in image processing. Components in image processing. Image perception in eye, light and electromagnetic spectrum, Image sensing and acquisition using sensor array	**7**
II	**DIGITAL IMAGE FUNDAMENTALS:** Image sampling and quantization, Representing digital images, Spatial and gray-level resolution, Aliasing and Moiré patterns, Zooming and Shrinking digital images	**7**
III	**IMAGE RESTORATION:** Image restoration model, Noise Models, Spatial and frequency properties of noise, noise probability density functions, Noise - only spatial filter, Mean filter Statistic filter and adaptive filter, Frequency domain filters - Band reject filter, Band pass filter and Notch filter	**7**
IV	**IMAGE COMPRESSION:** Compression Fundamentals - Coding Redundancy, Interpixel redundancy, Psycho visual redundancy and Fidelity criteria. Image Compression models, Source encoder and decoder, Channel encoder and decoder, Lossy compression and compression standards. color space formats, scaling methodologies (like horizontal, vertical up/down scaling). Display format (VGA, NTSC, PAL)	**7**
V	**EXPERT SYSTEM AND PATTERN RECOGNITION:** Use of computers in problem solving, information representation, searching, theorem proving, and pattern matching with substitution. Methods for knowledge representation, searching, spatial, temporal and common sense reasoning, and logic and probabilistic inferencing. Applications in expert systems and robotics	**7**

Text Books:	
• Rafael C. Gonzalez-Digital Image Processing, Pearson Edcation Asia • Nick Effard-Digital Image Processing, Pearson Education Asia • Kenneth R. Castleman-Digital Image Processing, Pearson Education Asia	• Jain A.K.-Digital Image Processing, Prentice hall of India • Sonka, Hlavac & Boyle-Image Processing. analysis and machine Vision, Thomas Learning

ECE804-II VHDL

UNIT	CONTENTS	CONTACT HOURS
I	**INTRODUCTION:** Fundamental & history of various hardware description language, Design flow of ASICs and and standard logic circuits using software	7
II	**COMBINATIONAL CIRCUIT BUILDING BLOCKS:** Multiplexer, Decoders, encoders, Code Converters, VHDL Code for Combinational Circuits	7
III	**SEQUENCIAL CIRCUITS:** VHDL code for Flip-Flops, shift registers , Counters	7
IV	**SYNCHRONOUS/ ASYNCHRONOUS SEQUENCIAL CIRCUITS:** Mealy & Moore type FSMs, VHDL Code for Mealy & Moore Machines, VHDL Codes for Serial Adder, Vending Machine	7
V	**DIGITAL SYSTEM DESIGN:** Building Block circuits, Memory organization, SRAM, Design examples of divider, Multiplier, Shifting & Sorting Operations, Clock Synchronization, CPU organization and design concepts	7

Text Books:	
• Stephen Brown and Zvonki Vranesic-Fundamentals of Digital Logic circuit VHDL Design, Tata Mc-Graw Hill • Morris Mano-Digital Logic & Computer Design, Prentice Hall of India	• Z.Navabi-Analysis and Modeling of Digital Systems, Tata Mc-Graw Hill • D.L.Perry-VHDL 3rd cd., Tata Mc-Graw Hill

ECE804-III MICROCONTROLLER AND EMBEDED SYSTEMS

UNIT	CONTENTS	CONTACT HOURS
I	**THE 8051 MICROCONTROLLER:** Introduction, The 8051 microcontroller hardware, I/O pins, Port, External memory, Counters and Timers, Serial data. Interrupts	**7**
II	**8051 ASSEMBLY LANGUAGE PROGRAMMING:** Addressing modes, External data moves, push and pop opcodes, Logical operations, Byte level and bit level logical operations. Arithmetic operations, Jump and call instructions, Interrupts & returns	**7**
III	**REAL TIME CONTROL:** Interrupts, Multiple sources of interrupts, Non maskable sources of interrupts, Interrupt structure in 8051,Timers,Free running counter & Real Time control	**7**
IV	**SYSTEM DESIGN** : Serial I/O interface, Parallel I/O ports interface, Digital and Analog interfacing methods, LED array, keyboard, Printer, Flash memory interfacing	**7**
V	**INTRODUCTION TO EMBEDED SYSTEM:** Application of Microcontrollers in interfacing, Robotics, MCU based measuring instruments. Real Time Operating System for System Design, Multitasking System, Task Definition in a Multitasking System, Round Robin Scheduling, Full Pre-emptive Scheduling, Basic study and Features of Commercial RTOS : WINCE and Embedded Linux	**7**

Text Books:	
• K.N. Ayala-The 8051 Microcontroller. Penram International • M.A. Mazidi and J.G. Mazidi-The 8051 Microcontroller and Embedded Systems, Pearson Education Asia	• David simon-An Embedded software Primer. Pearson Education Asia

ECE 805-P INDUSTRIAL ECONOMICS & MANAGEMENT

1	Organizational forms, Profit maximization and other objectives of industrial firms, Theory of profitability, Economies of scale. Financing of Industries- Need and sources of finance, Role of special financial institutions, Investment criteria-NPV, IRR
2	Approaches to industrial location analysis, Productivity analysis, Input-Output analysis, Concentration of economic power. New Industrial Policy – Critical analysis, Role of technology and entrepreneurship in industrial development
3	Management – Principles of management, functions-planning, Organization staffing, Directing, Controlling, Coordination, Decision making.
4	Production Management – Total quality management, JIT, Quality circle, Quality-ISO9000, ISO14000, KANBAN, Bench marking, Effective communication.
5	Labour Legislations.