UNIVERSITY OF KERALA

B.TECH DEGREE COURSE
(2008 SCHEME)

REGULATIONS, SCHEME AND SYLLABUS

FOR

ELECTRONICS AND COMMUNICATION ENGINEERING

UNIVERSITY OF KERALA

B.Tech Degree Course – 2008 Scheme

REGULATIONS

1. Conditions for Admission

Candidates for admission to the B.Tech degree course shall be required to have passed the Higher Secondary Examination, Kerala or 12th Standard V.H.S.E., C.B.S.E., I.S.C. or any examination accepted by the university as equivalent thereto obtaining not less than 50% in Mathematics and 50% in Mathematics, Physics and Chemistry/ Bio- technology/ Computer Science/ Biology put together, or a diploma in Engineering awarded by the Board of Technical Education, Kerala or an examination recognized as equivalent thereto after undergoing an institutional course of at least three years securing a minimum of 50 % marks in the final diploma examination subject to the usual concessions allowed for backward classes and other communities as specified from time to time.

2. Duration of the course

i) The course for the B.Tech Degree shall extend over a period of four academic years comprising of eight semesters. The first and second semester shall be combined and each semester from third semester onwards shall cover the groups of subjects as given in the curriculum and scheme of examination
ii) Each semester shall ordinarily comprise of not less than 400 working periods each of 60 minutes duration
iii) A candidate who could not complete the programme and pass all examinations within Ten (10) years since his first admission to the B.Tech programme will not be allowed to continue and he has to quit the Programme. However he can be readmitted to the first year of the programme if he/she satisfies the eligibility norms applicable to the regular candidates prevailing at the time of readmission.

3. Eligibility for the Degree

Candidates for admission to the degree of bachelor of technology shall be required to have undergone the prescribed course of study in an institution maintained by or affiliated to the University of Kerala for a period of not less than four academic years and to have passed all the examinations specified in the scheme of study

4. Subjects of Study

The subjects of study shall be in accordance with the scheme and syllabi prescribed

5. Evaluation

Candidates in each semester will be evaluated both by continuous assessment and end semester University examination. The individual maximum marks allotted for continuous assessment and University examination for each subject is as prescribed by the scheme of study.

5.1 Continuous Assessment (C.A)

The marks awarded for the continuous assessment will be on the basis of the day-to-day work, periodic tests (minimum two in a semester) and assignments (minimum of three – one each from each module). The faculty member concerned will do the continuous assessment for each semester. The C.A. marks for the individual subjects shall be computed by giving weight age to the following parameters.

Subject	Attendance	Tests	Assignments/ Class Work
Theory Subjects	20%	50%	30%
Drawing	20%	40%	40%
Practical	20%	40%	40%
Project Work	Work Assessed by Guide – 50% Assessed by a three member committee out of which one member is the guide – 50%		

The C.A. marks for the attendance (20%) for each theory, practical and drawing shall be awarded in full only if the candidate has secured 90% attendance or above in the subject. Proportionate reduction shall be made in the case of subjects in which he/she gets below 90% of the attendance for a subject. The CA marks obtained by the student for all subjects in a semester is to be published at least 5 days before the commencement of the University examinations. Anomalies if any may be scrutinized by the department committee and the final CA marks are forwarded to the university within the stipulated time.

5.2. End Semester University Examinations

i) There will be University examinations at the end of the first academic year and at the end of every semester from third semester onwards in subjects as prescribed under the respective scheme of examinations. Semester classes shall be completed at least 10 working days before the commencement of the University examination.

ii) The examination will be held twice in an year – April/May session (for even semester) and October/November session (for odd semester). The combined 1st and 2nd semester is reckoned as equivalent to an even semester for the purpose of conduct of examination and the University examination will be held during April/May. However VII and VIII Semester examination will be conducted in both the sessions. This schedule will not be changed

iii) A student will be permitted to appear for the university examination only if he/she satisfies the following requirements

a. He/she must secure not less than 75% attendance in the total number of working periods during the first year and in each semester thereafter and shall be physically present for a minimum of 60% of the total working periods. In addition, he/she also shall be physically present in at least 50% of total working periods for each subject
b. He must earn a progress certificate from the head of the institution of having satisfactorily completed the course of study in the semester as prescribed by these regulations
c. It shall be open to the Vice-Chancellor to grant condonation of shortage of attendance on the recommendation of the head of the institution in accordance with the following norms
d. The attendance shall not be less than 60% of the total working periods
e. He/she shall be physically present for a minimum of 50% of the total working periods
f. The shortage shall not be condoned more than twice during the entire course
g. The condonation shall be granted subject to the rules and procedures prescribed by the university from time to time.
h. The condonation for combined 1st and 2nd semesters will be reckoned as a single condonation for attendance purposes.

iv) A student who is not permitted to appear for the University examinations for a particular semester due to the shortage of attendance and not permitted by the authorities for condonation of shortage of attendance shall repeat the semester when it is offered again. This provision is allowed only once for a semester.

v) The university will conduct examinations for all subjects (Theory, Drawing & Practical)
vi) The scheme of valuation will be decided by the chief examiner for theory / drawing subjects
vii) For practical examinations, the examiners together will decide the marks to be awarded. The student shall produce the certified record of the work done in the laboratory during the examination. The evaluation of the candidate should be as per the guidelines given in the syllabus for the practical subject.

6. Letter Grades

For each subject in a semester, based on the total marks obtained by the student in the University examination and Continuous assessment put together a letter grade (S,A+, A, B+, B, C+, C, D, E and F) will be awarded. ***All letter grades except 'F' will be awarded if the marks for the University examination is 40 % or above and the total mark (C.A marks + University Exam mark) is 50 % or above***. No absolute mark will be indicated in the grade card. Letter grade corresponding to total marks (C.A marks+ University Exam mark) and the corresponding grade point in a ten-point scale is described below.

% of Total marks ***(C.A marks + University Exam mark)***	**Letter Grade**	**Grade Point (G.P)**	**Remarks**
90 % and above	S	10	Excellent
85 % and above but less than 90%	A+	9	
80 % and above but less than 85%	A	8.5	
75 % and above but less than 80%	B+	8	
70 % and above but less than 75%	B	7.5	
65 % and above but less than 70%	C+	7	
60 % and above but less than 65%	C	6.5	
55 % and above but less than 60%	D	6	
50 % and above but less than 55%	E	5.5	
Below 50% (C.A + U.E) or below 40 % for U.E only	F	0	Failed

7. Grade Point Average (GPA) and Cumulative Grade Point Average (CGPA)
Grade point average is the semester wise average points obtained by each student in a 10-point scale. GPA for a particular semester is calculated as per the calculation shown below.

$$GPA = \frac{\sum Credit \times \text{GP obtained for the subject}}{\sum \text{credit for subject}}$$

Cumulative Grade point Average (CGPA) is the average grade points obtained by the students till the end of any particular semester. CGPA is calculated in a 10-point scale as shown below.

$$\text{CGPA} = \frac{\sum \text{Credits for semester} \times \text{GPA obtained for the semester}}{\sum \text{credits for the semester}}$$

GPA and CGPA shall be rounded to two decimal points. The Grade card issued to the students shall contain subject number and subject name, credits for the subject, letter grades obtained, GPA for the semester and CGPA up to that particular semester. In addition to the grade cards for each semester all successful candidate shall also be issued a consolidated statement grades. On specific request from a candidate and after remitting the prescribed fees the University shall issue detailed mark to the individual candidate.

8. Minimum for a pass

a) A candidate shall be declared to have passed a semester examination in full in the first appearance if he/she secures not less than 5.5 GPA with a minimum of 'E' grade for the all individual subject in that semester.

b) A candidate shall be declared to have passed in an individual subject of a semester examination if he/she secures grade 'E' or above.

c) A candidate who does not secure a full pass in a semester examination as per clause (a) above will have to pass in all the subjects of the semester examination as per clause (b) above before he is declared to have passed in that semester examination in full.

9. Improvement of Grades

i) A candidate shall be allowed to re-appear for a maximum of two subjects of a semester examination in order to improve the marks and hence the grades already obtained subject to the following conditions

   a) The candidate shall be permitted to improve the examination only along with next available chance.
   b) The candidate shall not be allowed to appear for an improvement examination for the subjects of the VII & VIII semesters
   c) The grades obtained by the candidate for each subject in the improvement chance he has appeared for or the already existing grades – whichever is better will be reckoned as the grades secured.
   d) First & Second semester will be counted as a single chance and they can improve a maximum of three subjects

ii) A candidate shall be allowed to repeat the course work in one or more semesters in order to better the C.A. marks already obtained, subject to the following conditions

   a) He/she shall repeat the course work in a particular semester only once and that too at the earliest opportunity offered to him/her.
   b) He/she shall not combine this course work with his/her regular course work
   c) He/she shall not be allowed to repeat the course work of any semester if he has already passed that semester examination in full
   d) The C.A marks obtained by the repetition of the course work will be considered for all purposes

iii) A candidate shall be allowed to withdraw from the whole examination of a semester in accordance with the rules for cancellation of examination of the University of Kerala.

10. Classification of Successful candidates

i) A candidate who qualifies for the degree passing all the subjects of the eight semesters within five academic years (ten consecutive semesters after the commencement of his/her course of study) and secures not less than 8 CGPA up to and including eighth semester (overall CGPA) shall be declared to have passed the B.Tech degree examination in FIRST CLASS WITH DISTINCTION

ii) A candidate who qualifies for the degree passing all the subjects of the eight semesters within five academic years (ten consecutive semesters after the commencement of his/her course of study)

and secures less than 8 CGPA but not less than 6.5 CGPA up to and including eighth semester shall be declared to have passed the B.Tech degree examination in FIRST CLASS.

iii) All other successful candidates shall be declared to have passed the B.Tech Degree examination in

SECOND CLASS

iv) Successful candidates who complete the examination in four academic years (Eight consecutive semesters after the commencement of the course of study shall be ranked branch-wise on the basis of the CGPA in all eight semesters put together. In the case of a tie in the CGPA the total marks of the students who have got same CGPA shall be considered for finalizing the rank. Students who pass the examination in supplementary examination are also covered under this clause

11. Educational Tour

a) The students may undertake one educational tour preferably after fourth semester of the course and submit a tour report
b) The tour may be conducted during the vacation / holidays taking not more than 5 working days, combined with the vacation / holidays if required. Total number of Tour days shall not exceed 15 days.
c) The tour period shall be considered as part of the working periods of a semester

12. Revision of Regulations

The university may from time to time revise, amend or change the regulations, curriculum, scheme of examinations and syllabi. These changes unless specified otherwise, will have effect from the beginning of the academic year / semester following the notification of the University

SCHEME FOR B.TECH DEGREE FROM 2008
ELECTRONICS AND COMMUNICATION

BRANCH: ELECTRONICS & COMMUNICATION SEMESTER I & II						
Course No.	Name of Subject	Weekly load hrs	Max. Sessional Marks	Exam Duration Hrs	Exam Max. Marks	Credits
		L T D/P				
08.101	Engineering Mathematics I	2 1 -	50	3	100	6
08.102	Engineering Physics	2 1 -	50	3	100	6
08.103	Engineering Chemistry	2 1 -	50	3	100	6
08.104	Engineering Graphics	1 - 2	50	3	100	6
08.105	Engineering Mechanics	2 1 -	50	3	100	6
08.106	Basic Civil Engineering	2 1 -	50	3	100	6
08.107	Basic Mechanical Engineering	2 1 -	50	3	100	6
08.108	Basic Electrical & Electronics Engineering	2 1 -	50	3	100	6
08.109	Basic Communication & Information Engineering	2 1 -	50	3	100	6
08.110	Engineering Workshops	- - 2	50	3	100	4
	TOTAL	17 8 4	500		1000	58
TOTAL MARKS 1500 TOTAL CREDITS 58						

Note: **08.109 Subject shall be handled by the faculty of Electronics & Communication Dept.in the Colleges.**

BRANCH: ELECTRONICS & COMMUNICATION SEMESTER III						
Course No.	Name of Subject	Weekly load hrs	Max. Sessional Marks	Exam Duration Hrs	Exam Max. Marks	Credits
		L T D/P				
08.301	Engineering Mathematics II(CMPUNERFHBTA)	3 1 -	50	3	100	4
08.302	Solid State Devices (TA)	3 1 -	50	3	100	4
08.303	Network Analysis (TA)	3 1 -	50	3	100	4
08.304	Programming in C++ & Data Structures (TA)	2 - 2	50	3	100	4
08.305	Electronics Circuits I (T)	3 1 -	50	3	100	4
08.306	Digital Electronics (T)	2 1 -	50	3	100	3
08.307	Electronics Devices Lab (TA)	- - 3	50	3	100	3
08.308	Digital Integrated Circuits Lab (T)	- - 3	50	3	100	3
	TOTAL	16 5 8	400		800	29
TOTAL MARKS 1200 TOTAL CREDITS 29						

Note: 08.304 shall be handled by faculty of Electronics & Communication Dept.

BRANCH: ELECTRONICS & COMMUNICATION SEMESTER IV						
Course No.	Name of Subject	Weekly load hrs	Max. Sessional Marks	Exam Duration Hrs	Exam Max. Marks	Credits
		L T D/P				
08.401	Engineering Mathematics III - Probability & Random Processes (TA)	3 1 -	50	3	100	4
08.402	Humanities (CTARFHD)	3 - -	50	3	100	3
08.403	Signals & Systems (TA)	3 1 -	50	3	100	4
08.404	Electronics Circuits II (T)	2 1 -	50	3	100	3
08.405	Analog Integrated Circuits (T)	3 1 -	50	3	100	4
08.406	Analog Communication (T)	2 1 -	50	3	100	3
08.407	Electronics Circuits Lab (T)	- - 4	50	3	100	4
08.408	Analog Integrated Circuits Lab (T)	- - 4	50	3	100	4
	TOTAL	16 5 8	400		800	29
TOTAL MARKS 1200 TOTAL CREDITS 29						

Note:08.401 shall be handled by faculty of Mathematics Dept.

ALL ELECTIVES FROM SEMESTER V TO VIII EXCEPT 08.556 SHALL BE HANDLED BY FACULTY OF ELECTRONICS & COMMUNICATION DEPT.

BRANCH: ELECTRONICS & COMMUNICATION SEMESTER V							
Course No.	Name of Subject	Weekly load hrs			Max. Sessional Marks	Exam Duration Hrs	Exam Max. Marks	Credits
		L	T	D/P				
08.501	Engineering Mathematics IV - Complex Analysis & Linear Algebra(TA)	3	1	-	50	3	100	4
08.502	Digital Signal Processing (TA)	3	1	-	50	3	100	4
08.503	Computer Organisation & Architecture (TA)	2	1	-	50	3	100	3
08.504	Electrical Drives & Control (T)	2	1	-	50	3	100	3
08.505	Applied Electromagnetic Theory (T)	3	1	-	50	3	100	4
	Elective I (TA) or (T)	2	1	-	50	3	100	3
08.507	Communication Engineering Lab (T)	-	-	4	50	3	100	4
08.508	Digital Signal Processing Lab (T)	-	-	4	50	3	100	4
	TOTAL	15	6	8	400		800	29
TOTAL MARKS 1200 TOTAL CREDITS 29								

Elective I	
08.506	Logic Synthesis & Verification (TA)
08.516	Fuzzy Systems & Applications (TA)
08.526	System Software (TA)
08.536	Artificial Neural Networks (TA)
08.546	Digital Systems Design with VHDL (TA)
08.556	Professional Communication (TA)
08.566	Electromagnetic Compatibility (T)

Note:08.501 shall be handled by faculty of Mathematics Dept.

BRANCH: ELECTRONICS & COMMUNICATION SEMESTER VI						
Course No.	Name of Subject	Weekly load hrs	Max. Sessional Marks	Exam Duration Hrs	Exam Max. Marks	Credits
		L T D/P				
08.601	Microcontroller Based System Design (TA)	3 1 -	50	3	100	4
08.602	VLSI Design (TA)	3 1 -	50	3	100	4
08.603	Control Systems (T)	2 1 -	50	3	100	3
08.604	Digital Communication (T)	3 1 -	50	3	100	4
08.605	Antenna & Wave Propagation (T)	2 1 -	50	3	100	3
	Elective II (TA) or (T)	2 1 -	50	3	100	3
08.607	Microcontroller Lab(TA)	- - 4	50	3	100	4
08.608	Electronic Product Design & Mini Project (TA)	1 - 3	50	3	100	4
	TOTAL	16 6 7	400		800	29
TOTAL MARKS 1200 TOTAL CREDITS 29						

Elective II	
08.606	Speech Processing (TA)
08.616	Adaptive Signal Processing. (TA)
08.626	Digital Image Processing (TA)
08.636	Wavelets & Applications (TA)
08.646	Digital Signal Processors (TA)
08.656	Optimization Techniques (TA)
08.666	Electronic Instrumentation(T)

BRANCH: ELECTRONICS & COMMUNICATION SEMESTER VII							
Course No.	Name of Subject	Weekly load hrs			Max. Sessional Marks	Exam Duration Hrs	Exam Max. Marks	Credits
		L	T	D/P				
08.701	Industrial Management (TA)	2	1	-	50	3	100	3
08.702	Optical Communication (T)	3	1	-	50	3	100	4
08.703	Microwave Engineering (T)	3	1	-	50	3	100	4
08.704	Information Theory & Coding (T)	3	1	-	50	3	100	4
	Elective III (TA) or (T)	2	1	-	50	3	100	3
	Elective IV (TA) or (T)	2	1	-	50	3	100	3
08.707	Industrial Electronics Lab (T)	-	-	3	50	3	100	3
08.708	Communication Systems Lab (T)	-	-	3	50	3	100	3
08.709	Seminar (TA)	-	-	1	50	-	-	1
08.710	Project Design (TA)	-	1	-	50	-	-	1
	TOTAL	15	7	7	500		800	29
TOTAL MARKS 1300 TOTAL CREDITS 29								

Elective III	
08.705	Real Time Operating Systems (TA)
08.715	Cryptography (TA)
08.725	Pattern Recognition (TA)
08.735	Optoelectronic Devices (TA)
08.745	Computer Vision (TA)
08.755	CDMA Systems (T)

Elective IV	
08.706	Mixed Signal Circuits Design (TA)
08.716	Embedded Systems (TA)
08.726	Intellectual Property Rights (TA)
08.736	MEMS (TA)
08.746	Low Power VLSI Design (TA)
08.756	Antenna Design (T)

BRANCH: ELECTRONICS & COMMUNICATION SEMESTER VIII						
Course No.	Name of Subject	Weekly load hrs	Max. Sessional Marks	Exam Duration Hrs	Exam Max. Marks	Credits
		L T D/P				
08.801	Nanoelectronics (TA)	2 1 -	50	3	100	3
08.802	Radar & Television Engineering (T)	3 1 -	50	3	100	4
08.803	Computer Communication (T)	2 1 -	50	3	100	3
08.804	Satellite & Mobile Communication (T)	3 1 -	50	3	100	4
	Elective V (T)	2 1 -	50	3	100	3
	Elective VI (T)	2 1 -	50	3	100	3
08.807	Microwave & Optical Communication Lab (T)	- - 4	50	3	100	4
08.808	Project (TA)	- - 5	150	-	-	3
08.809	Viva – Voce (TA)	- - -	-	3	100	2
	TOTAL	14 6 9	500		800	29
TOTAL MARKS 1300 TOTAL CREDITS 29						

Elective V	
08.805	Aviation Electronics (T)
08.815	Integrated Optics & Photonic Systems (T)
08.825	Microwave Devices & Circuits(T)
08.835	Discrete Control & Navigation Systems (T)
08.845	Artificial Intelligence and Robotics (T)

Elective VI	
08.806	Modelling & Simulation of Communication Systems (T)
08.816	Biomedical Engineering (T)
08.826	Information Security (T)
08.836	Digital Instrumentation (T)
08.846	Current Topics (T)

Syllabus I & II Semester
(Common To All Branches)

08-101 ENGINEERING MATHEMATICS- 1

L-T-P : 2-1-0 **Credits: 6**

MODULE- 1

Applications of differentiation:– Definition of Hyperbolic functions and their derivatives- Successive differentiation- Leibnitz' Theorem(without proof)- Curvature- Radius of curvature- centre of curvature- Evolute (Cartesian ,polar and parametric forms)

Partial differentiation and applications:- Partial derivatives- Euler's theorem on homogeneous functions- Total derivatives- Jacobians- Errors and approximations- Taylor's series (one and two variables) - Maxima and minima of functions of two variables - Lagrange's method- Leibnitz rule on differentiation under integral sign.

Vector differentiation and applications :- Scalar and vector functions- differentiation of vector functions-Velocity and acceleration- Scalar and vector fields- Operator ∇ - Gradient- Physical interpretation of gradient- Directional derivative- Divergence- Curl- Identities involving ∇ (no proof) - Irrotational and solenoidal fields – Scalar potential.

MODULE-II

Laplace transforms:- Transforms of elementary functions - shifting property- Inverse transforms- Transforms of derivatives and integrals- Transform functions multiplied by t and divided by t - Convolution theorem(without proof)-Transforms of unit step function, unit impulse function and periodic functions-second shifiting theorem- Solution of ordinary differential equations with constant coefficients using Laplace transforms.

Differential Equations and Applications:- Linear differential eqations with constant coefficients- Method of variation of parameters - Cauchy and Legendre equations –Simultaneous linear equations with constant coefficients- Application to orthogonal trajectories (cartisian form only).

MODULE-III

Matrices:-Rank of a matrix- Elementary transformations- Equivalent matrices- Inverse of a matrix by gauss-Jordan method- Echelon form and normal form- Linear dependence and independence of vectors- Consistency- Solution of a system linear equations-Non homogeneous and homogeneous equations- Eigen values and eigen vectors – Properties of eigen values and eigen vectors- Cayley Hamilton theorem(no proof)- Diagonalisation- Quadratic forms- Reduction to canonical forms-Nature of quadratic forms-Definiteness,rank,signature and index.

REFERENCES

1. Kreyszig; *Advanced Engineering Mathematics*, 8th edition, Wiley Eastern.
2. Peter O' Neil ; *Advanced Engineering Mathematics,* Thomson
3. B.S.Grewal ; *Higher Engineering Mathematics,* Khanna Publishers
4. B.V.Ramana*; Higher Engineering Mathematics,* Tata Mc Graw Hill, 2006
5. Michel D Greenberg; *Advanced Engineering Mathematics,*Pearson International
6. Sureshan J, Nazarudeen and Royson; *Engineering Mathematics I*, Zenith Publications

08.102 ENGINEERING PHYSICS

L-T-P: 2-1- 0 **Credits: 6**

MODULE-I

Oscillations and Waves

Basic ideas of harmonic oscillations – Differential equation of a SHM and its solution. Theory of damped harmonic oscillations. Quality factor. Theory of forced harmonic oscillations and resonance. Types of waves. One dimensional waves – Differential Equation. Harmonic waves. Three dimensional waves - Differential Equation and solution. Plane waves and spherical waves. Energy in wave motion. Velocity of transverse waves along a stretched string.

Electromagnetic Theory

Del operator – grad, div, curl and their physical significance. Concept of displacement current. Deduction of Maxwell's equations. Prediction of electromagnetic waves. Transverse nature of electromagnetic waves. **E** and **H** are at right angles. Poynting's theorem (qualitative only)

Physics of Solids

Space lattice. Unit cell and lattice parameters. Crystal systems. Co-ordination number and packing factor with reference to simple cubic, body centered cubic and face centered cubic crystals. Directions and planes. Miller indices. Interplanar spacing in terms of Miller indices. Super conductivity - Meissner effect. Type-I and Type-II superconductors. BCS theory (qualitative). High temperature superconductors. Applications of superconductors. Introduction to new materials (qualitative) - Metallic glasses, Nano materials, Shape memory alloys, Bio materials.

MODULE- II

Interference of Light

Concept of temporal and spatial coherence. Interference in thin films and wedge shaped films. Newton's rings. Michelson's interferometer. Determination of wave length and thickness. Interference filters. Antireflection coating.

Diffraction of Light

Fresnel and Fraunhofer diffraction. Fraunhofer diffraction at a single slit. Fraunhofer diffraction at a circular aperture (qualitative). Rayleigh's criterion for resolution. Resolving power of telescope and microscope. Plane transmission grating. Resolving power of grating. Grating equation. X-ray diffraction. Bragg's law.

Polarization of Light

Types of polarized light. Double refraction. Nicol Prism. Retardation plates. Theory of plane, circular and elliptically polarized light. Production and analysis of circularly and elliptically polarized light. Polaroids. Induced birefringence. Photo elasticity – isoclinic and isochromatic fringes – photo elastic bench

Special Theory of Relativity

Michelson-Morley experiment. Einstein's postulates. Lorentz transformation equations (no derivation). Simultaneity. Length contraction. Time dilation. Velocity addition. Relativistic mass. Mass energy relation. Mass less particle.

MODULE – III

Quantum Mechanics

Dual nature of matter. Wave function. Uncertainty principle. Energy and momentum operators. Eigen values and functions. Expectation values. Time Dependent and Time Independent Schrodinger equations. Particle in one dimensional box. Tunnelling (qualitative).

Statistical Mechanics

Macrostates and Microstates. Phase space. Basic postulates of Maxwell-Boltzmann, Bose-Einstein and Fermi-Dirac statistics. Distribution equations in the three cases (no derivation). Bosons and Fermions. Density of states. Derivation of Planck's formula. Free electrons in a metal as a Fermi gas. Fermi energy.

Laser

Einstein's coefficients. Population inversion and stimulated emission. Optical resonant cavity. Ruby Laser, Helium-Neon Laser, Carbon dioxide Laser (qualitative). Semiconductor Laser (qualitative). Holography. Fiber Optics - Numerical Aperture and acceptance angle. Types of optical fibers. Applications.

REFERENCE:

1. Sears & Zemansky ; University Physics. XI Edn.,; Pearson
2. Frank & Leno; Introduction to Optics. III Edn., , Pearson
3. J.C. Upadhyaya; Mechanics., Ram Prasad & Sons
4. David J Griffiths; Introduction to Electrodynamics, III Edn, , Pearson
5. M Ali Omar; Elementary Solid State Physics., Pearson
6. S O Pillai; Solid State Physics., New Age International Publishers
7. John R Taylor, Chris D Zafiratos & Michael A Dubson; Modern Physics for Scientists and Engineers. II Edn, Prentice Hall of India
8. Eugene Hecht; Optics. IV Edn, Pearson
9. Robert Resnick ; Introduction to Special Relativity., John Willey and Sons
10. Richard L Libboff; Introduction to Quantum Mechanics. IV Edn, Pearson
11. Donald A Mcquarrie; Statistical Mechanics., Vivo Books
12. Mark Ratner& Daniel Ratner; Nanotechnology.
13. T.A. Hassan et al; A Text Book of Engineering Physics., Aswathy Publishers, Trivandrum
14. B. Premlet; Advanced Engineering Physics , Phasor Books, Kollam.

LIST OF DEMONSTRATION EXPERIMENTS

1. Newton's Rings – Determination of wave length.
2. Air Wedge – Diameter of a thin wire
3. Spectrometer – Plane transmission grating – wavelength of light.
4. Spectrometer – Refractive indices of calcite for the ordinary and extraordinary rays.
5. Laser – Diffraction at a narrow slit.
6. Laser – Diffraction at a straight wire or circular aperture.
7. Michelson's interferometer – Wavelength of light.
8. Michelson's interferometer – Thickness of thin transparent film.
9. Polarization by reflection – Brewster's law.
10. Computer stimulation – superposition of waves.
11. Computer stimulation – study of **E** & **H**. (Gauss' law & Ampere's law)

Pattern of Question Paper

University examination is for a maximum of **100 marks**, in **3 hour** duration. The syllabus is spread in 3 modules. The question paper will consist of two parts (A and B).

Part A contains short answer questions for **40 marks**. This part contains 10 questions without any choice, **each of 4 marks** (uniformly taken from all modules).

Part B contains long answer questions for **60 marks**. From each module, this part contains 3 questions out of which 2 are to be answered, **each of 10 marks.** Long answer questions from all the 3 modules will form 60 marks.

08.103 ENGINEERING CHEMISTRY

L-T-P: 2-1-0 **Credits: 6**

MODULE-1

Electrochemistry - Electrodes- Electrode potential- Origin of electrode potential- Helmotz double layer- Nernst equation and application- Reference electrodes- Standared hydrogen electrode- Saturated calomel electrode- Quinhydron electrode-Determination of P^H using these electrodes- Concentration cells- Fuel cells- Secondary cells- Lead acid cell- Nickel cadmium cell- Lithium-ion cell. - Coductometric and Potentiometric titrations (acid base, oxidation reduction and precipitation titrations). **(12hrs)**

Corrosion and its control- Theories of corrosion (chemical corrosion and electrochemical corrosion)- Galvanic series- Types of corrosion (Concentration cell corrosion, Stress corrosion, Galvanic corrosion) - Factors affecting corrosion (nature of metal and nature of environment) and different methods of corrosion control (corrosion inhibitors, cathodic protection). **(5hrs)**

Protective coatings- Metallic coatings- Chemical conversion coatings- paint **(4hrs)**

Nano materials- Introduction-Classification-preparation (laser abrasion technique and sputtering technique)- Chemical method (reduction)-Properties and Applications of nano materials-Nano tubes-Nano wires. **(4hrs)**

MODULE-2

Water treatment- Types of hardness- Degree of hardness- Related problems- Estimation of hardness- by EDTA method- Sludge and scales in boilers- Priming and foaming- Boiler corrosion-Water softening methods, Lime-soda process, Ion exchange methods-Internal treatments (colloidal, carbonate, phosphate and calgon conditioning)- Domestic water treatment- Methods of disinfection of water-Desalination process (Reverse osmosis, electro dialysis- Distillation). **(12hrs)**

Envirnmental damages and prevention- Air pollution- CFCs and ozone depletion- Alternative refrigerents-Green house effect-Water pollution- BOD and COD- Waste water treatment- Aerobic - Anaerobic and USAB processes. **(3hrs)**

Thermal methods of analysis-Basic principles involved in Thermo gravimetry, Differential thermal analysis and applications. **(2hrs)**

Spectroscopy- Molecular energy levels-Types of molecular spectra- Electronic spectra (Classification of electronic transitions- Beer Lamberts law, Vibrational spectra (mechanism of interaction and application), Rotational spectra (Determination of bond length and application). NMR spectra (Basic principle, chemical shift, spin-spin splitting) **(6hrs)**

Chromatography- General principles- High performance liquid chromatography- Gas chromatography. **(2hrs)**

MODULE-3

Polymers- Classifications- Mechanism of polymarisation (Addition, free radical, cationic, anionic and coordination polymarisation)- Thermoplastics and thermosetting plastics-Compounding of plastics-Moulding techniques of plastics (Compression, Injection, Transfer and Extrusion moulding)-Preparation, properties and uses of PVC, PVA, PMMA, Nylon, PET, Bakelite, Urea formaldehyde resin- Silicon polymers- Biodegradable plastics. Elastomers- structure of natural rubber-vulcanisation- synthetic rubbers (Buna-S, Butyl rubber and Neoprene) **(12hrs)**

Organo electronic compounds -Super conducting and conducting organic materials like Polyaniline, polyacetylene and [polypyrrol and its applications. **(2hrs)**

Fuels- Calorific value- HCV and LCV-Experimental determination of calorific value-Theoretical calculation of calorific value by Dulongs formula - Bio fuels -Bio hydrogen and Bio-diesel **(5hrs)**

Lubricants- Introduction-Mechanism of lubrication- solid and liquid lubricant- Properties of lubricants-Viscosity index- flash and fire point- cloud and pour point- aniline value. **(4hrs)**

Cement- Manufacture of Portland cement- Theory of setting and hardening of cement **(2hrs)**

LAB-EXPERIMENTS (DEMONSTRATION ONLY)

1. Estimation of total hardness in water using EDTA.
2. Estimation of chloride ions in domestic water.
3. Estimation of dissolved oxygen.
4. Estimation of COD in sewage water.
5. Estimation of available chlorine in bleaching powder.
6. Estimation of copper in brass.
7. Estimation of iron in a sample of heamatite.
8. Determination of flash and fire point of a lubricating oil by Pensky Marten's apparatus.
9. Potentiometric titrations.
10. Preparation of buffers and standardisation of P^H meter.
11. Determination of molarity of HCl solution P^H-metrically.
12. Determinations of PH using glass electrode and quinhydron electrode.

REFERENCES

1. H.A. Willard, L.L. Merrit and J.A. Dean ; *Instrumental methods of analysis*
2. A.K. De ; *Environmental Chemistry*
3. K.J.Klauhunde; *Nanoscale materials in chemistry*
4. B.R. Gowariker ; *Polymer science*
5. B.W.Gonser ; *Modern materials*
6. V.Raghavan; *Material Science and engineering. A first course*
7. L.H. Van Vlack ; *Elements of Material science and Engineering*
8. J.W.Goodby ; *Chemistry of liquid crystals*
9. S.Glasstone ; *A text book of physical chemistry*
10. P.C. Jain; *Engineering Chemistry*
11. Juhaina Ahad ; *Engineering Chemistry*
12. Shashi Chawla ; *A text book of Engineering Chemistry*
13. R. Gopalan, D.Venkappayya & S. Nagarajan ; *Engineering Chemistry*
14. J.C. Kuriakose and J. Rajaram ; *Chemistry of Engineering and Technology volume I & II*
15. R.N Goyal and Harmendra Goeal; *Engineering Chemistry*, Ane Students Edition, Thiruvananthapur

08.104 ENGINEERING GRAPHICS

L- T-D: 1-0-2 **CREDITS: 6**

INTRODUCTION: Introduction to technical drawing and its language. Lines, lettering, dimensioning, scaling of figures, symbols and drawing instruments. (1 sheet practice**)**

MODULE 1

PLAIN CURVES: Conic sections by eccentricity method. Construction of ellipse: (i) Arc of circles method (ii) Rectangle method (ii) Concentric circles method. Construction of parabola (i) Rectangle method (ii) Tangent method. Construction of hyperbola (i) Arc of circles method (ii) given ordinate, abscissa and the transverse axis (iii) given the asymptotes and a point on the curve. Construction of Tangent and Normal at any point on these curves

MISCELLANEOUS CURVES: Construction of Cycloid, Epicycloid and Hypocycloid, Involute of a circle. Archimedian spiral, Logarithmic spiral and Helix. Construction of Tangent and Normal at any point on these curves

PROJECTION OF POINTS AND LINES: Types of projections, Principles of Orthographic projection. Projections of points and lines. Determination of true length, inclination with planes of projection and traces of lines.

MODULE II

PROJECTION OF SOLIDS: Projection of simple solids such as prisms, pyramids, cone, cylinder, tetrahedron, octahedron, sphere and their auxiliary projections.

SECTIONS OF SOLIDS: Types of cutting planes, section of simple solids cut by parallel, perpendicular and inclined cutting planes. Their projections and true shape of cut sections.

DEVELOPMENT OF SURFACES: Development of surfaces of (i) simple solids like prisms, pyramids, cylinder and cone (ii) Cut regular solids.

MODULE III

ISOMETRIC PROJECTION: Isometric scale, Isometric view and projections of simple solids like prisms, pyramids, cylinder, cone sphere, frustum of solids and also their combinations.

INTERSECTION OF SURFACES: Intersection of surfaces of two solids as given below.

(i) Cylinder and cylinder
(ii)Prism and prism.
(iii) Cone and Cylinder

(Only cases where the axes are perpendicular to each other and intersecting with or without offset.)

PERSPECTIVE PROJECTION: Principles of perspective projection, definition of perspective terminology. Perspective projection of simple solids like prisms and pyramids in simple positions.

CAD: Introduction to CAD systems, Benefits of CAD, Various Soft wares for CAD, Demonstration of any one CAD software.

General Note:

(i) First angle projection to be followed
(ii) Question paper shall contain 3 questions from each module, except from CAD. Students are required to answer any two questions from each module.

(iii) Distribution of marks

Module -I 2 x 16 = 32
Module -II 2 x 17 = 34
Module III 2 x 17 = 34

100

REFERENCES

1. Luzadder and Duff ; *Fundamentals of Engineering Drawing*
2. N. D. Bhatt ; *Engineering Drawing*
3. K. Venugopal *; Engineering Drawing and Graphics*
4. P.S. Gill; *Engineering Graphics*
5. P.I. Varghese; *Engineering Graphics*
6. K.R. Gopalakrishnan*; Engineering Drawing*
7. Thamaraselvi; *Engineering Drawing*
8. K.C. John; *Engineering Graphics*
9. K.N. Anil Kumar; *Engineering Graphics*

08.105 ENGINEERING MECHANICS

L-T-P: 2 - 1 – 0 **Credits: 6**

MODULE I (20 HRS)

Idealizations of Mechanics- Elements of vector algebra

Statics of rigid bodies-Classification of force systems- principle of transmissibility of a force-composition and resolution- Resultant and Equilibrant of coplanar concurrent force systems-various analytical methods- - Lami's theorem, method of resolution- Conditions of equilibrium-

Moment of a force, couple, properties of couple- Varignon's theorem- Resultant and equilibrant of coplanar non-concurrent force systems- Conditions of equilibrium. Equilibrium of rigid bodies-free body diagrams.(simple problems)

Types of supports - types of beams - types of loading- Support reactions of simply supported and overhanging beams under different types of loading.

Forces in space, equations of equilibrium, Vector approach.

Friction-Laws of friction-angle of friction- cone of friction- ladder friction- wedge friction.

MODULE II (20 HRS)

Properties of surfaces- centroid of composite areas- Theorems of Pappus-Gouldinus- Moment of inertia of areas, Parallel and perpendicular axes theorems- Radius of Gyration- moment of inertia of composite areas.

Dynamics: Kinematics-Combined motion of translation and rotation-instantaneous centre, motion of link, motion of connecting rod and piston, wheel rolling without slipping.

Relative velocity - basic concepts-analysis of different types of problems

Kinetics- Newton's laws of translatory motion- D'Alembert's principle- Motion of lift- Motion of connected bodies.

MODULE III (20 HRS)

Work, Power and Energy - Work-Energy principle-Impulse, Momentum.

Collision of elastic bodies-Law of conservation of momentum-Direct and oblique impact between elastic bodies and impact with fixed plane.

Curvilinear motion- D'Alembert's principle in curvilinear motion- Mass moment of inertia of rings, solid discs and solid spheres (no derivations required)Angular momentum-Angular impulse.

Kinetics of rigid bodies under combined translatory and rotational motion – work – energy principle for rigid bodies.

Centrifugal and centripetal forces – motion of vehicles on curved paths in horizontal and vertical planes – super elevation – stability of vehicles moving in curved paths (qualitative ideas only).

Simple harmonic motion – vibration of mechanical systems - basic elements of a vibrating system – spring mass model – undamped free vibrations – angular free vibration – simple pendulum.

REFERENCES:

1. Beer & Johnston, "Vector Mechanics for Engineers – Statics and Dynamics", Tata Mc-Graw Hill Publishing Company Limited, New Delhi, 2005.
2. Irving. H. Shames, "Engineering Mechanics", Prentice Hall Book Company, 1966.
3. Timoshenko S. & Young D. H., "Engineering Mechanics", Mc-Graw Hill –International Edition
4. Popov, "Mechanics of Solids", Pearson Education,2007
5. Kumar K.L., "Engineering Mechanics", Tata Mc-Graw Hill Publishing Company Limited, New Delhi, 1998.
6. Rajasekaran S. & Sankarasubramanian G., "Engineering Mechanics", Vikas Publishing House Private Limited, New Delhi, 2003.
7. Tayal A K, "Engineering Mechanics- Statics and Dynamics" , Umesh Publications, Delhi,2004

8. Benjamin J., “Engineering Mechanics”, Pentex Book Publishers and Distributors, Kollam, 2008

Note

Question For University Examination:- Part A – 8 compulsory questions covering entire syllabus, 5 marks each. (5 x 8 = 40) Part B – Three questions of 10 marks from each module, out of which two should be answered (10 x 2 x 3 = 60).

08.106 BASIC CIVIL ENGINEERING

L-T-P: 2- 1 - 0 **Credits: 6**

MODULE I

Surveying: Object and Principles of Surveying.
Linear Measurements: Direct measurements - Tape & chain only - Ranging out survey lines-Taking measurements of sloping ground - Errors - Tape correction (problems).
Levelling: Levelling instruments - Level (Dumpy Level, Tilting Level) Levelling Staff. Measurements in levelling - Temporary adjustments of a level, holding the staff, reading the staff - Principles of leveling - recording measurements in the field book - reduction of level - height of collimation method only (simple examples).
Contour maps (Brief description only). Computation of areas - Mid ordinate rule, average ordinate rule, Trapezoidal rule, Simpson's rule (examples)- Introduction to Distomat, Total Station & GPS (Brief description only)

MODULE II

Building construction*:* Selection of site for buildings - types of buildings - Components of buildings.
Foundation: Different types - Spread footing, Isolated footing, Combined footing, Mat foundation, Pile foundation (description only).
Safe Bearing Capacity of Soil: Importance of determination of the Safe Bearing Capacity of Soil (brief description only).

Super structure: Masonry - stone masonry, brick masonry –Types- desirable qualities of stone and brick.
Partition: Materials used for making partition - plywood, particle boards & glass.
Doors, windows & ventilators : Types - materials used for the construction of doors and windows - wood, steel & Aluminium.
Plastering: Mortar – properties - Preparation of Cement mortar
Painting: Preparation of surfaces for painting - plastered, wood and steel surfaces- Types of paint - enamel, emulsion & distemper. Flooring: Types - mosaic tiles, ceramic tiles, marble, granite and synthetic materials. Roofing: Selection of type of roof -flat roof, sloping roof -Concrete roof, tiled roof. Selection of roof covering materials. GI Sheet , AC Sheet, PVC Sheet

MODULE III

Concrete: Ingredients- cement, aggregate, and water. Qualities of ingredients (brief description only).
Tests on Cement - consistency, initial and final setting times. Compressive strength -IS Specifications.
Aggregates – desirable qualities of fine and coarse aggregates
Plain Cement Concrete (PCC): preparation-proportioning-mixing of concrete.
Steel-common types used in construction- Mild Steel, HYSD Steel and their properties.
Reinforced Cement Concrete (RCC)-advantages of RCC over Plain Cement Concrete.
Elementary ideas on pre-cast and pre-stressed concrete constructions.
Building services – vertical transportation – stairs – types, escalators and elevators, ramps (brief description only). Plumbing services- brief description of water supply and sewage disposal arrangements for residential buildings.

REFERENCE:

1. Adler R., Vertical Transportation for Buildings, American Elsevier Publishing Company, New York.1970
2. B.C Punmia, "Surveying & Leveling" Vol. – I, Laxmi publications(P) Ltd,N.Delhi, 2004
3. Rangwala., Building Materials,Charotar publishing house, 2001
4. Rangwala, "Building Construction" , Charotar Publishing House., 2004
5. S.K. Roy, "Fundamentals of Surveying" Prentice-Hall of India, New Delhi.2004

6. Rangwala.,"Water Supply and Sanitary Engineering", Charotar Publishing House. 1990
7. Moorthy, "Building Construction", Modern Publishing House distributor., 1957
8. Jha and Sinha, "Construction and Technology"
9. Narayanan and Lalu Mangal ,"Introduction to Civil Engineering"Phasor Books,Kollam.
10. Santha Minu, "Basic Civil Engineering" Karunya Publications,Trivandrum

Note: The question paper will consists of two parts. Part I and part II..

Part I is Compulsory covering the entire syllabus, for 40 marks. It contains 8 questions of 5 marks each.

Part II is to cover 3 modules. There will be two questions (20 marks each) from each module out of which one from each module is to be answered. (20 X 3 = 60)

08.107 BASIC MECHANICAL ENGINEERING

L-T-P/D: 2-1-0 **Credits: 6**

MODULE I

Thermodynamics : Basic concepts and definitions of Zeroth law, First law, Second law of thermodynamics-concept of reversibility and entropy. p-v and T-s diagrams

Air cycles: Carnot, Otto and Diesel cycles-Air standard efficiency (simple problems)

IC Engines: Working and comparison of two stroke and four stroke petrol and diesel engines - general description of various systems using block diagrams – air system, fuel system, ignition system and governing system. A brief description of CRDI, MPFI, GDI and Hybrid Vehicles

Steam boilers: Classification – Cochran boiler, Babcock and Wilcox boiler, Benson boiler- fluidized bed combustion,

MODULE II

Principles and fields of application of - compressors - reciprocating and centrifugal, blower, pumps-reciprocating, centrifugal and jet pumps, steam and hydraulic turbines- impulse and reaction, gas turbine cycles- open and closed

Elementary ideas of hydro electric, thermal and nuclear power plants

Refrigeration & Air Conditioning: Refrigerants, CFC free refrigerants. Vapor compression refrigeration system, Comfort and Industrial air conditioning-typical window air conditioning unit (general description only).

MODULE III

Mechanical Power transmission systems: Belt, rope and gear drives-types, comparison and fields of application-velocity ratio-slip (simple problems) friction disc, single plate clutch, gear trains (no derivations).

Manufacturing processes: Elementary ideas of casting, forging, rolling, welding, soldering and brazing

Machining processes- turning, taper turning, thread cutting, shaping, drilling, grinding, milling (simple sketches and short notes).

Non conventional machining - Electro discharge machining (EDM) and Electro chemical machining (ECM)

Principle, application and advantages of C N C machine

REFERENCES

1. Spalding and Cole, “Engineering Thermodynamics”
2. Gill, Smith and Zuirys, “Fundamentals of IC Engines”
3. Amstead, Ostwald and Begeman, “Manufacturing processes”
4. Crouse, “Automobile Engineering”
5. Roy and Choudhary, “Elements of Mechanical Engineering”
6. Hajra Choudhary, “Workshop Technology”
7. R K Bensal, “Fluid mechanics and machines”
8. J Benjamin, “Basic Mechanical Engineering”

Note: Lectures are to be supplemented by demonstration in laboratories.

Note: The question paper will consist of two parts. Part I is to be compulsory for 40 marks. This may contain 10 questions of 4 marks each. Part II is to cover 3 modules. There can be 3 questions from each module (10 marks each) out of which 2 are to be answered.

08.108 BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

L-T-P:2–1-0 **Credits 6**

MODULE – I

Elementary concepts - Kirchoffs laws - Magnetic Circuits - MMF, field strength, flux density, reluctance – problems in series magnetic circuits. Review of electromagnetic induction - Faradays laws, Lenz's law - statically induced and dynamically induced emf - self and mutual induction - inductance.

Alternating current fundamentals - generation of alternating currents – waveforms - frequency - period - average and rms values - form factor. Phasor representation of alternating quantities - rectangular polar and exponential forms.

Analysis of simple ac circuits – concept of impedance and admittance - phasor representation - j notation - power and power factor in ac circuits - active and reactive components. Solution of RL, RC and RLC series circuits.

Three phase systems - generation of three phase voltage - star and delta connection - relation between phase and line values of voltage and current - phasor representation - three wire and four wire systems.

Measurement of power in three phase circuits (two wattmeter method). Measurement of energy – working of 1-phase energy meter.

MODULE – II

Transformers - Principle of operation - EMF equation - constructional details of single phase and three phase transformers

Methods of bulk generation of electric power. Block schematic of layout of generating stations - hydroelectric, thermal and nuclear power plants. Renewable energy sources - solar, wind, tidal, wave and geothermal energy.

Bulk transmission of electric power - typical electrical power transmission scheme - need for high transmission voltage - substations - substation equipments. Primary and secondary transmission and distribution systems

Different methods of wiring for LT installations. Schematic layout of LT switchboards. Earthing of installations - necessity of earthing - plate and pipe earthing. Protective fuses, MCBs, ELCBs and switches.

Working of incandescent lamps, -fluorescent lamps, energy efficient lamps

MODULE – III

Diodes - PN junction diodes,. V-I characteristics, dynamic & static resistance, principle of working and V-I characteristics of Zener diode, principle of Photo diode, Solar cell, & LED.

Rectifiers & power supplies - block diagram description of a dc power supply, circuit diagram & working of half-wave & full wave rectifier, final equations of Vrms, Vdc, ripple factor and peak inverse voltage in each case, principle of working of series inductor and shunt capacitor filters. Working of simple zener voltage regulator.

Power devices – V – I characteristics and applications of SCR and Triac Working principle of UPS and SMPS

Transducers – Resistance strain guage, thermistor, LVDT

REFERENCES

1. V.N. Mitlle, “Basic Electrical Engineering”, Tata McGraw Hill, 1990.
2. DP Kothari, LJ Nagrath, “Theory and Problems of Basic Electrical Engineering”, Prentice Hall of India, 2000.
3. B.L. Thereja, “A Text Book of Electrical Technology”, Volume I, S Chand & Co, New Delhi, 1992.
4. Francis M Fernandez, “A Basic Course in Electrical Engineering”, Rajath Publishers, Ernakulam.

5. TP Imthias Ahmed, B. Premlet, “Introduction to Electrical Engineering”, Phaser Books, Kollam
6. Gopakumar, “Introduction To Electronics and Communications”, .Phasor Books, Kollam
7. Millman and Halkias, "Integrated Electronics: Analog and digital circuits and systems", McGraw-Hill Book Co
8. Edward Hughes, “Electrical and Electronic Technology”, Pearson Education, 2002.
9. ML Soni, PU Guptha, US Bhatnagar and A Chakrabarthy, “A Text Book on Power System Engineering”, Dhanpath Rai & Sons, New Delhi 1997
10. N.N.Bhargava, “Basic Electronics and Linear Circuits”, Tata McGraw Hill
11. Rangan C.S., Sarma G.R., and Mani V.S.V., "Instrumentation Devices and Systems", Tata McGraw Hill, 1992.
12. Muhammad H. Rashid, “Power Electronic Circuits, Devices and Applications”, Pearson education, Asia 2003.

Note : The question paper will consist of two parts. Part – A is to be compulsory for 40 marks (10 questions of 4 marks each). Part-B is to cover 3 modules for 60 marks. (50% choice- One out of two or two out of four from each module).

08.109 BASIC COMMUNICATION AND INFORMATION ENGINEERING

L-T-P: 2-1-0 **Credits: 6**

MODULE 1(Qualitative Treatment)

(a) Bipolar junction transistors: NPN & PNP transistors, structure, typical doping, working of NPN transistor, concepts of common base, common emitter & common collector configurations, current gain of each, input & output characteristics of common emitter configuration, comparison of three configurations with reference to voltage & current gain, input & output resistances and applications. (6 hrs)

(b) Field effect Transistors: basic principles of JFET, MESFET and MOSFET, comparison with BJT. (3 hrs)

(c) Amplifiers & Oscillators: circuit diagram & working of common emitter amplifier, function of each component in the circuit, need of proper biasing, frequency response, voltage gain and 3dB bandwidth, concepts of class A, B, AB and Class C power amplifiers, circuit diagram & working of push pull amplifiers, concepts of feedback, working principles of oscillators, circuit diagram & working of RC phase shift oscillator (7 hrs)

(d) Integrated circuits: advantages of ICs, analog and digital ICs, functional block diagram of operational amplifier, ideal operational amplifier, use as inverting amplifier, non inverting amplifier, summing amplifier, integrator and comparator. (4 hrs)

(e) Digital ICs: logic gates, realization of logic functions, principle of combinational and sequential logic circuits, flip flop (JK), logic families: TTL and CMOS Logic (No internal diagram) (4 hrs)

(f) IC fabrication: purification of silicon, crystal growth, wafer preparation. unit process: oxidation, diffusion, ion implantation, epitaxy, deposition, photolithography. (4 hrs)

MODULE 2 (Qualitative Treatment)

(a) Measurements: principle and block diagram of analog and digital multimeter, working principle of CRT, block diagram of CRO, measurements using CRO, principle of digital storage oscilloscope, principle and block diagram of function generator. (5hrs)

(b) Radio communication: principle of AM & FM, wave forms, bandwidths, block diagrams of AM & FM transmitters, principle of AM &FM demodulation, comparison of AM & FM,principle &block diagram of super heterodyne receiver. (4 hrs)

(c) Color television: TV Standards interlaced scanning, block diagram of PAL TV transmitter & receiver, basic principles of cable TV, CCTV system, basic principles of HDTV, basic principles of LCD & Plasma displays. (5 hrs)

(d) Radar and navigation: principle of radar and radar equation, block schematics of pulsed radar, factors affecting range, applications of radar in measurements and navigation. (4 hrs)

(e) Satellite communication: microwave frequency bands, concept of geo-stationary satellite, frequency bands used, satellite transponder, block diagram of earth station transmitter & receiver, advantages of satellite communication, principle of Global Positioning System(GPS). (3 hrs)

(f) Optical communication: block diagram of the optical communication system, principle of light transmission through fiber, concepts of Single Mode and Multi Mode optical fiber, working principle of source (semiconductor Laser) & detector (PIN,APD), advantages of optical communication. (5 hrs)

MODULE 3 (Qualitative Treatment)

(a) Computer Architecture: functional units: basic concept of ALU- data path and control, memory hierarchy, caches, main memory, virtual memory, operating systems, microprocessors - functional block diagram of 8085 (9 hrs)

(b) Data communication: overview, analog and digital data transmission, transmission media, digitization of wave forms, PCM , digital modulation techniques- ASK, PSK, FSK, basic concepts of error detection , parity checking. (6hrs)
(c) Mobile communication: basic principles of cellular communications, concepts of cells, frequency reuse, principle and block diagram of GSM, principle of CDMA, WLL & GPRS technologies.(4hrs)
(d) Internet Technology: concepts of networking: client - server computing, IP addresses, domain names, network interface unit - modem, switching technologies- circuit switching and packet switching, LAN,MAN,WAN &World wide web, network topologies, communication protocols- TCP/IP, Introduction to web languages-HTML ,XML, internetworking concepts, network devices- basic principles of router, bridge, switch, network security- Firewall. (7 hrs)

REFERENCES

1. Santiram Kal, *Basic Electronics – Devices, Circuits and IT fundamentals*, PHI
2. Louis.E.Frenzel, *Principles of Electronic Communication Systems*, TMH
3. William Stallings, *Wireless Communications and Networks*, Pearson Education.
4. M.Moris Mano, Computer Architecture, PHI
5. Neil H E Weste,Kamran Eshraghian, *Principles of CMOS VLSI design – A system perspective*, Pearson Education [Module 1(f)]
6. David A. Bell, *Electronic Instrumentation and Measurements*, PHI .[Module 2(a)]
7. N N Bhargava,D C Kulshreshtha,S C Gupta, *Basic Electronics & Linear Circuits*, TMH
8. ITL Education Solution Ltd., *Introduction to Information Technology*, Pearson Education, 5th edition, 2008
9. R.R. Gulati, *Monochrome and Colour Television*, New Age International [Module 2 (c)]
10. K Gopakumar, *Introduction to Electronics & Communication* , 3rd edition, 2008,Phasor Publisher's,Kollam

This subject shall be handled by faculty of Dept.of Electronics and Communication.

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

08.110 ENGINEERING WORKSHOPS

L-T-P: 0-0-2 **CREDITS: 4**

A. Carpentry:

Study of tools and joints. Practice in planning, chiseling, marking and sawing. Joints – Cross joint, T joint, Dove tail joint.

B. Fitting:

Study of tools, Practice in filing, cutting, drilling and tapping. Male and female joints, Stepped joints.

C: Sheet Metal Work:

Study of tools. Selection of different gauge GI sheets for jobs. Practice on riveted joints. Preparing tube joints, frustums, trays and containers.

D. Plumbing:

Study of tools. Details of plumbing work in domestic and industrial applications. Study of pipe joints, cutting, threading and laying of pipes with different fittings using PVC pipes. Use of special tools in plumbing work.

E: Foundry:

Study of tools. Preparation of sand, moulding practice and demonstration of casting.

F. Welding:

Study of welding machines. Straight line practices, Making of Butt joint, T joint and Lap joint.

G: Smithy:

Study of tools. Demonstration on forging of square prism, hexagonal bolt, T bolt and Eye bolt.

H: Machine Tools:

Study and demonstration on working of machine tools. Lathe and Drilling machine.

NOTE: For the university examination the student shall be examined in sections A, B, C, D and E only.

Syllabus III Semester

08.301 ENGINEERING MATHEMATICS II (CMPUNERFHBTA)

L-T-P : 3-1-0 **Credits: 4**

Module I

Multiple Integrals: Double Integrals (Cartisian only). Change of order of integration. Area enclosed by plane curves. Triple integrals. Volume of solids.

Vector integration: Line and surface and volume integrals. Greens theorem in the plane. Stokes theorem and Gauss divergence theorem (no proof).

Module II

Fourier series: Fourier series of periodic functions of period $2\prod$ and $2l$. Dirichlet's condition for convergence. Odd and even functions. Half range expansions.

Fourier Transforms: Fourier integral theorem (no proof)- Fourier transforms – Fourier sine and cosine transforms, inverse Fourier transforms, properties

Module III

Partial differential equations: Formation of PDE. Solution of Lagranges linear equation. First order nonlinear equations – standard forms- Homogeneous PDE with constant coefficients.

Application of PDE: Derivation of one dimensional Wave and Heat equations. Solution by separation of variables. Boundary value problems in one dimensional Wave and Heat equations.

References:

1. Kreyszig, *Advanced Engineering Mathematics*, 8th Wiley Eastern.
2. Peter O Neil, *Advanced Engineering Mathematics*.
3. B.S. Grewal, *Higher Engineering Mathematics*, Khanna Publications.
4. B.V. Ramana, *Higher Engineering Mathematics*, Tata Mc Graw Hill.
5. Michel D Greenberg, *Advanced Engineering Mathematics*, Pearson

Question Paper

The question paper shall consist of two parts. Part A (40 marks) Ten compulsory questions of 4 marks each. Part B (60 marks) Students must answer one out of two from each module. Each question carries 20 marks.

08.302 SOLID STATE DEVICES (TA)

L-T-P: 3-1-0 **Credits: 4**

Module I

Crystal Structures-Planes and Directions. Elemental and compound semiconductors. Energy bands in solids, intrinsic and extrinsic semiconductors, Energy momentum relation for electrons in solids, effective mass. Fermi-dirac distribution. Equilibrium and steady state conditions, Equilibrium concentration of electrons and holes (graphical and analytical representation), Temperature dependence of carrier concentration.

Carrier transport in semiconductors – drift, conductivity and mobility, variation of mobility with temperature and doping, High Field Effects, Hall effect.

Excess carriers in semiconductors – Generation and recombination mechanisms of excess carriers, quasi Fermi levels, diffusion, Einstein relations. Continuity equations.

PN junctions - Contact potential, Electrical Field, Potential and Charge Density at the junction, Energy band diagram, Minority Carrier Distribution, Ideal diode equation, Electron and hole component of current in forward biased p-n junction, effect of Temperature on I-V characteristics. Real diodes. High level injection effects. Diode capacitances, switching transients.

Module II

Electrical Breakdown in PN junctions - Zener and avalanche break down (abrupt PN junctions only), Linearly graded junction - electric field, built in potential, junction capacitance.

Metal Semiconductor contacts, Energy band diagram of Ohmic and Rectifying Contacts, Current Equation, Comparison with PN Junction Diode.

Hetero Junctions – Energy band diagram, Applications.

Bipolar junction transistor - current components, Minority Carrier Distributions basic parameters, Evaluation of terminal currents and dc parameters (based on physical dimensions), Switching, Base width modulation, Avalanche multiplication in collector-base junction, Punch Through, Base resistance, Static I-V characteristics of CB and CE configurations.

Module III

Field Effect Transistors: JFET - principle of operation, current equation, static I-V characteristics, and device parameters.

MOS Capacitor - Ideal MOS Capacitor, Energy Band Diagram, Carrier Concentrations in the Space Charge Region, C-V characteristics, threshold voltage, effect of real surfaces.

MOSFET- Basic structure and principle of operation, I-V characteristics, Derivation of Drain Current (Square Law Model Only) and device parameters, Channel length modulation, Velocity saturation, Body effect, DIBL, Hot Electron Effect, Sub threshold Conduction.

UJT, PNPN diode, SCR, DIAC, TRIAC and IGBT – Principles of operation and static characteristics (no derivation)

Text Book:

Ben G. Streetman: Solid State Electronic Devices, **5/e**, Pearson Education.

References:

1. M.S.Tyagi: *Introduction to Semiconductor Materials and Devices*, John Wiley &Sons,2000.
2. Warner and Grung: *Semiconductor Device Electronics*, Holt Rinhalt & Winston 1991.
3. S.M.Sze: *Physics of Semiconductor Devices*, **3/e**, Wiley Eastern.
4. Y.P.Tsividis: *Operation and Modeling of the MOS Transistor*, Mc Graw Hill, 1986.
5. V.Suresh Babu: *Solid State Devices & Technology*, Sanguine, Bangalore, 2005.

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

(70% Numerical Problems and derivations)

08.303 NETWORK ANALYSIS (TA)

L-T-P: 3-1-0 **Credits: 4**

Module I

Elements of Network Analysis- Mesh and node analysis.

Network theorems: Thevenin's theorem, Norton's theorem, Super position theorem, Reciprocity theorem, Millman theorem, Maximum Power Transfer theorem.

Signal representation - Impulse, step, pulse and ramp function, waveform synthesis.

Laplace Transform in the Network Analysis: Initial and Final conditions, Transformed impedance and circuits, Transform of signal waveform. Transient analysis of RL, RC, and RLC networks with impulse, step, exponential, pulse and sinusoidal inputs, use of initial and final value theorems. Networks with transformed impedance and dependent sources.

Module II

The concept of complex frequency - Network functions for the one port and two port - driving point and transfer functions - Poles and Zeros of network functions and their locations and effects on the time and frequency domain. Restriction of poles and zeros in the driving point and transfer function. Time domain behavior from the pole - zero plot.

Frequency response plots - Magnitude and phase plots, Plots from s-plane phasors, Bode plots - phase margin and gain margin.

Parameters of two-port network – impedance, admittance, transmission and hybrid - Conversion formulae.

Attenuators – propagation constant, types of attenuators – T, π and Balanced.

Module III

Resonance in series and parallel circuits- resonant frequency- bandwidth - Q factor, Selectivity. Coupled circuits, single tuned and double tuned circuits, coefficient of coupling, Image Impedance, Characteristic impedance and propagation constant.

Introduction to filters- Filter approximations - poles of the Butterworth, Chebyshev and inverse Chebyshev functions, expression for transfer function of Butterworth Low pass filter, design for 2nd order and 3rd order low pass Butterworth filters, Bessel-Thomson response. Frequency transformations - transformations to high pass, band pass and band elimination.

Text Book:

1. Van Valkenburg: *Network Analysis,* **3/e**,Pearson Education.
2. Roy Choudhary: *Networks and Systems,* New Age International,2005.
3. Wai-Kai Chen: *Passive and Active Filters-- Theory and Implementations*, John Wiley&Sons,1986.

Reference:

1. Franklin F. Kuo: *Network Analysis and Synthesis,* **2/e**, Wiley India.
2. M.E. Van Valkenburg: *Analog Filter Design*, Saunder's College Publishing,1982.
3. V. K. Aatre: *Network Theory and Filter Design*, Wiley Eastern.
4. Smarajit Ghosh, *Network Theory – Analysis & Synthesis*, PHI, 2008
5. Sudhakar and S. P. Shyam Mohan: *Circuits and Network Analysis*,3/e, TMH.

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

(Minimum 75% Problems)

08.304 PROGRAMMING IN C++ & DATA STRUCTURES (TA)

L-T-P: 2--0 -2 **Credits: 4**

Module I

Basic stricture of a C++ program, Types and Declarations: Types - Boolean, character, integer, Floating point, void, enumerated. Conditional statements and loops. Declarations- structure, multiple names, scope, initialization. Function declaration, argument passing, value return. Recursive functions. Macros. Classes - objects, private, public and protected variables. Arrays (one and two dimensional). Pointers, new operator and delete operator for dynamic memory management. Pointer to arrays, constants, reference, pointer to void, pointer to function.

Module II

Function overloading, operator overloading, friend function, derived class (inheritance), polymorphism, virtual function, templates, Files and streams.
Library functions for File and String operations. Introduction to Standard Template Library.
Programming tools- make files, debuggers, revision control systems, exception handling.

Module III

Data Structures: Linked (single and double) lists -basic operations. Linked list implementation of: Stack -basic operations, Queues - basic operations. Binary Tree- basic operations. Binary Search Tree, Binary tree traversal (inorder, preorder, postorder).
Sorting Algorithms- bubble sort, shell sort, merge sort, quick sort, heap sort. Comparison of Sorting Algorithms by Speed and Space. Order(big-O), Average, Best, Worst case running time of Algorithms.

Text Book:

1. B Stroustrup, *The C++ Programming Language*, **3/e**, Edition, Addison Wiley.
2. AV Aho and JD Ullman, *Data Structures and Algorithms*, Pearson Education, 2005.
3. D Samenta, *Classic Data Structures*, PHI, 2005.

Reference:

1. E Balaguruswamy, *Object Oriented Programming with C++*,**3/e**, TMH.
2. Richard F Gilbert, Behrouz A Forouz, *Data Structures A pseudocode Approach with C++*, Thomson, 2001.
3. Langsam, *Data Structures Using C and C++*, **2/e**, Pearson Education.
4. Brain W Kernighan, *The Practice of Programming*, Pearson Education, 2007.
5. Bruce Eckel, *Thinking in C++*, volumeI and volumeII, Pearson Education, 2001.

This subject shall be handled by faculty of Dept.of Electronics and Communication in the Colleges.

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

(Minimum 50% Programs)

08.305 ELECTRONIC CIRCUITS - I (TA)

L-T-P: 3-1-0 **Credits: 4**

Module I

RC Circuits: Response of high pass and low pass RC circuits to sine wave, step, pulse and square wave inputs, Tilt, Rise time. Differentiator, Integrator.

Small signal diode model for low and high frequencies, clipping and clamping circuits.

Analysis of Half wave, full wave and bridge rectifiers. Analysis of L, C, LC & π Filters. Zener voltage regulator, transistor series (with feedback) and shunt voltage regulators, Short circuit and fold back protection.

Module II

DC analysis of BJTs - BJT as amplifier. Small signal equivalent circuits (Low frequency π and h models only).Transistor Biasing circuits, Stability factors, Thermal runaway. BJT as switch.

Small signal analysis of CE, CB, CC configurations using approximate hybrid π model (gain, input and output impedance)

MOSFET I-V relation, load lines, small signal parameters, small signal equivalent circuits. Body effect. Biasing of MOSFETs amplifiers.

Analysis of Single stage discrete MOSFET amplifiers – small signal voltage and current gain, input and output impedance of Basic Common Source amplifier, Common Source amplifier with and without source bypass capacitor, Source follower amplifier, Common Gate amplifier.

Module III

High frequency equivalent circuits of BJTs, MOSFETs, Miller effect, short circuit current gain, s-domain analysis, amplifier transfer function. Analysis of high frequency response of CE, CB, CC and CS, CG, CD amplifiers.

Power amplifiers: Class A, B, AB and C circuits - efficiency and distortion. Biasing of class AB circuits. Transformer less power amplifiers.

Text Books:

1. Sedra and Smith: *Microelectronic Circuits*, **4/e**, Oxford University Press 1998.
2. Donald A Neamen. : *Electronic Circuit Analysis and Design*, **3/e**, TMH.

References:

1. Millman and Halkias: *Integrated Electronics*, TMH, 2004.
2. Spencer & Ghausi: *Introduction to Electronic Circuit Design*, Pearson Education, 2003.
3. Roger T. Howe, Charles G. Sodini**:** *Microelectronics: An Integrated Approach*, Pearson Education, 1997.
4. R E Boylstad and L Nashelsky: *Electronic Devices and Circuit Theory*, **9/e**, Pearson Education
5. Gopakumar: *Design and Analysis of Electronic Circuits*, Phasor books.

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

(Minimum 60% Problems and Analysis)

08.306 DIGITAL ELECTRONICS (T)

L-T-P: 2-1-0 **Credits: 3**

Module I

Binary codes, BCD, Switching algebra, Boolean rules, laws and theorems.

Sum of product and product of sum simplification, Canonical forms, Karnaugh map (up to 4 variables), completely and incompletely specified functions.Quine McCluskey method (up to 5 variables).

Combinational logic circuits – general approach to combinational logic design. Decoders, encoders, multiplexers, demultiplexers. Adders, subtractors, ripple carry and look ahead carry adders, BCD adders, and binary comparators.

Introduction to VHDL – Logic gates, Half adder and Full adder using VHDL.

Memories – ROM, PROMs, RAMs – Basic structure, Static and dynamic RAMs.

Module II

Integrated Circuit technologies – Characteristics and Parameters. TTL Circuits – NOT, NAND, NOR, Open collector, tristate gates, positive and negative logic, ECL OR-NOR, CMOS- NOR, NOT, NAND, comparison.

Differences between combinational and sequential circuits – sequential circuit models, flip flops – SR, JK, D, T, Master slave, characteristic equations, Flip flop timing specifications.

Binary counters – Synchronous and Asynchronous design, Counters for random sequence- design. Registers, Universal shift registers, Ring and Johnson counter.

Multivibrators – astable and monostable multivibrators using gates, 74121 and 74123.

Module III

Mealy and Moore models, state machine notation, state diagram, state table, transition table, excitation table and equations, synchronous sequential analysis – principles, examples.

Construction of state diagrams, sequential circuit design – state equivalence, state reduction, state assignment techniques, Analysis of synchronous sequential circuits – examples.

Asynchronous sequential circuit – basic structure, Analysis of asynchronous sequential machines, Flaw tables, State assignment- races and cycles, shared and multiple row state assignment.

Hazards – causes of hazards, Logic hazards, essential hazards, design of hazard free combinational networks.

Text Book:

1. Yarbrough, John M: *Digital logic- Application and Design,* Thomson Learning, New Delhi,2002.
2. John F Wakerly: *Digital Design Principles and Practice,* **4/e**,Pearson Education.

Reference:

1. Thomas A.DeMessa, Zack Ciecone: *Digital Integrated Ciruits*, Wiley India,2007
2. Raj Kamal: *Digital Systems principles and Design*, Pearson Education,2008.
3. C.H. Roth,Jr.: *Fundamentals of Logic Design*, **5/e**, Thomson Learning.
4. Thomas L Floyd, R.P Jain: *Digital Fundamentals*, **8/e**, Pearson Education.
5. B.Somanathan Nair: *Digital Electronics and Logic Design*,PHI,2008.

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

(Minimum 60% Design and Problems)

08.307 ELECTRONIC DEVICES LAB (TA)

L-T-P : 0-0-3 **Credits: 3**

1. Characteristics of Diodes & Zener diodes
2. Characteristics of Transistors (CE & CB)
3. Characteristics of JFET and MOSFET
4. Characteristics of SCR
5. Frequency responses of RC Low pass and high pass filters. RC Integrating and Differentiating circuits.
6. Zener Regulator with & without emitter follower.
7. RC Coupled CE amplifier - frequency response characteristics.
8. MOSFET amplifier (CS) - frequency response characteristics.
9. Clipping and clamping circuits.
10. Rectifiers-half wave, full wave, Bridge with and without filter- ripple factor and regulation.

Internal Marks: 50

1. Attendance	- 10
2. Class work	- 20
3. Practical internal Test	- 20

Note: For University examination, the following guidelines should be followed regarding award of marks

(a) Circuit and design	- 20%
(b) Performance (Wiring, usage of equipments and trouble shooting)	- 15%
(c) Result	- 35%
(d) Viva voce	- 25%
(e) Record	- 05%

Practical examination to be conducted covering entire syllabus given above.
Students shall be allowed for the University examination only on submitting the duly certified record. The external examiner shall endorse the record.

08.308 DIGITAL INTEGRATED CIRCUITS LAB (T)

L-T-P : 0-0-3 **Credits: 3**

1. Characteristics of TTL and CMOS gates.
2. Realization of logic circuits using TTL / CMOS (NAND / NOR) gates.
3. Arithmetic circuits - Half adder, Full adder, 4 bit adder/ subtractor, BCD adder-7483 circuits.
4. Astable and Monostable multivibrators using TTL/CMOS gates
5. Realization of RS, T, D, JK and Master Slave flip-flops using gates.
6. Shift Registers, Ring counter and Johnson counter (using gates and 7495)
7. Counters, up/down counters (asynchronous & synchronous) using flip flops.
8. Counter ICs, Sequence generator (7490,7493,7495).
9. BCD to Decimal and BCD to 7 segment decoder & display
10. Multiplexers, Demultiplexers using gates and ICs. (74150,74154)
11. Realisation of combinational circuits using MUX & DEMUX.
12. Astable & Monostable using 74123.
13. Simulation of Half adder, Full adder using VHDL.

Internal Marks: 50

1. Attendance	- 10
2. Class work	- 20
3. Practical internal test	- 20

Note: For University examination, the following guidelines should be followed regarding award of marks

(a) Circuit and design	- 20%
(b) Performance (Wiring, usage of equipments and trouble shooting)	- 15%
(c) Result	- 35%
(d) Viva voce	- 25%
(e) Record	- 05%

Practical examination to be conducted covering entire syllabus given above.
Students shall be allowed for the University examination only on submitting the duly certified record. The external examiner shall endorse the record.

Syllabus IV Semester

ENGINEERING MATHEMATICS - III

08.401 PROBABILITY & RANDOM PROCESSES (TA)

L-T-P : 3-1-0 **Credits: 4**

Module I

Random Variables - Discrete and continuous random variables - Probability density functions and distribution functions - Mathematical Expectations - Properties - Binomial distribution, Poisson distribution, Uniform distribution (Mean and Variance - Problems) - Normal distribution, Rayleigh distribution (Problems) - Chebychev's inequality (without proof) - Problems - Markov inequality (without proof) - Two dimensional random variables - Joint probability distribution - Marginal and conditional probability function - Independent random variables - Problems - Correlation and Covariance - Problems - Central limit theorem - Problems.

Module II

Random processes - Classification of random processes and examples - Continuous random process - Discrete random process - Continuous random sequence - Discrete random sequence - Stationary process and evolutionary process - Strict sense stationary process - Wide sense stationary process - Auto correlation, auto covariance and cross correlation - Their relation, properties and problems - Poisson process - Mean, variance, autocorrelation of the Poisson process - Properties (no proof) - Problems -

Module III

Markov process - Classification of Markov process - Markov chain - Transition probability matrix. Ergodic process - Time average of random process - Power spectral density and its properties - Spectral representation of real WSS process - Wiener-Khinchin Theorem (no proof) - Calculation of spectral density given the autocorrelation function - Linear time invariant systems - WSS process as input - Autocorrelation and spectral density as output (mention only) - Binomial, Wiener and Gaussian process (statements only)

References:

1. Papoulis and S.U. Pillai, *Probability, random variable and stochastic processes*, **4/e**, TMH
2. Veerarajan, *Probability and Random Processes*, **2/e**, TMH
3. Probability and Statistics, *Schaum Series*
4. Stark and Woods, *Probability and Random processes with Application to Signal Processing*,**3/e**,Pearson Education.
5. Gubner, *Probability and Random Processes for Electrical and ComputerEngineers*, Cambridge University Press,2006.

Question Paper:

The question paper shall consist of two parts. PartA (40 marks) shall contain 10 compulsory questions of 4 marks each. PartB (60 marks) will have 3 modules . There shall be 2 questions from each module (20 marks each) out of which one is to be answered.

Note: This subject shall be handled by the faculty of Mathematics Department

08.402 HUMANITIES (CTAFRHB)

L-T-P : 3-0-0 **Credits: 3**

PART I

ECONOMICS (2 Periods per week)

Module I

Definition of Economics – Basic Concepts Goods – Choice of techniques – Production possibility curve National Income concepts – GNP – GDP – NNP – Per Capita Income – Three Sectors of the Economy – Primary – Secondary, Tertiary Sector – Significance of Money.

Meaning of Demand and Supply – Types of demand – Determinants of Demand – Demand forecasting

Production function – Law of Variable proportion – Returns to scale – Least cost combination of inputs – Cost concepts – Cost output relationship

Module II

Inflation – causes of inflation – measures to control inflation – Demand – Pull inflation – Cost push inflation – effects of Inflation – effects of inflations comparison between inflation and deflation.

India's Economic crisis in 1991 – New economic policy – Global Financial meltdown in 2008 – Applicability of Keynesian Theory to UDC's.

Stock Market and present scenario – Industrial sector past and present – Industry Analysis – Electronics – Chemical – Automobile – FMCG Industry.

Environment and Development – Basic Issues – Sustainable Development and Environmental Accounting – Population – Resources and the Environment – Poverty and the Environment – Growth versus the Environment – The Global Environment .

PART II

ACCOUNTANCY (1 Period per week)

Module III

Book-Keeping and Accountancy – Elements of Double Entry-Book-Keeping – rules for journalizing – Ledger accounts – Cash book – Banking transactions – Trial Balance – Method of Balancing accounts – the journal proper (simple problems).

Final accounts: preparation of trading and profit and loss Account – Balance sheet (with simple problems) – Introduction to Accounting packages (Description only)

References:

1. K.K. Dewett, *Modern Economic theory*
2. Michael – Todaro, *Economic Development* Addison Wesley Longman Ltd.
3. Mohinder Kumar Sharma – *Business Environment in India*
4. D.M. Mithani – *Money, Banking, International Trade and Public Finance*, Himalaya publishing House, New Delhi.
5. Rudder Dutt and K.P.M Sundaran – *Indian Economy*
6. Hal R. Varian – *Intermediate Micro Economics*
7. Koutsiannis (second Edition) *Micro Economics*
8. *Double Entry book Keeping* – Batliboi
9. *A Systematic approach to Accounting* : Dr. K.G. Chandrasekharan Nair

Question Paper

Note: Part I and Part II to be answers in separate answer books.

Part – I Economics

Part A – 30 Marks (short answers) covering entire syllabus (3x10=30)

Part B – 40 marks (50% choice one out of two or two out of four from each module)

Part – II Accountancy

Three questions covering entire syllabus out of which two questions has to be answered (2x15=30)

08.403 SIGNALS & SYSTEMS (TA)

L-T-P : 3-1-0 **Credits: 4**

Module I

Classification and Representation of Continuous time and Discrete time signals. Signal operations.
Continuous Time and Discrete Time Systems- Classification, Properties. Representation - Differential Equation representation of Continuous Time Systems. Difference Equation Representation of Discrete Systems.
Continuous Time LTI systems and Convolution Integral, Discrete Time LTI systems and linear convolution.

Module II

Frequency Domain Representation of Continuous Time Signals- Continuous Time Fourier Series: Convergence. Continuous Time Fourier Transform: Properties.
Frequency Domain Representation of Discrete Time Signals- Discrete Time Fourier Transform: Properties, Sampling Theorem, aliasing, reconstruction filter, sampling of band pass signals, Relation between Digital Frequency and Analog Frequency of sampled signals.
Fourier Series Representation of Discrete Time Periodic Signals.

Module III

Laplace Transform – ROC – Inverse transform – properties – Analysis of Continuous LTI systems using Laplace Transform – unilateral Laplace Transform. Relation between Fourier and Laplace Transforms.
Z transform – ROC – Inverse transform – properties – Analysis of Discrete Time LTI systems using Z transforms – unilateral Z transform. Relation between DTFT and Z-Transform.
Random process - Stationarity, Ergodicity, Correlation, Power spectral density – properties. Wiener - Khinchin Theorem. Transmission of Random process through a linear Filter. Gaussian process – properties.

Text Books:

1. Simon Haykin: *Signals & Systems*, John- Wiley, 2003.
2. Simon Haykin: *Communication Systems*,**4/e**,John -Wiley.

Reference:

1. Alan V. Oppenheim, Alan S.Willsky: *Signals and Systems,* **2/e**, PHI.
2. Rodger E. Ziemer: *Signals & Systems - Continuous and Discrete*, **4/e**,Pearson Education.
3. B P. Lathi: *Signal Processing & Linear systems*, Oxford Publication,2000.
4. Hwei P.Hsu: *Signals and Systems*, McGraw Hill,1995.
5. M.J.Roberts: *Signals and Systems*, TMH,2003.

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

(Minimum 75% Problems, derivations and proofs)

08.404 ELECTRONIC CIRCUITS – II (T)

L-T-P : 2-1-0 **Credits: 3**

Module I

Differential Amplifiers - BJT differential pair, large signal and small signal analysis of differential amplifiers, Input resistance, voltage gain, CMRR, non ideal characteristics of differential amplifier. Frequency response of differential amplifiers.

MOS differential amplifiers, Current sources, Active load, cascode load, current mirror circuits, Wilson current mirror circuits. Small signal equivalent circuits, multistage differential amplifiers.

Analysis of BJT tuned amplifiers, synchronous and stagger tuning.

Module II

Feed back amplifiers - Properties of negative feed back. The four basic feed back topologies-Series-shunt, series-series, shunt-shunt, shunt-series.

Analysis and design of discrete circuits in each feedback topologies (BJT only) - Voltage, Current, Transconductance and Transresistance amplifiers, its loop gain, input and output impedance., Stability of feedback circuits. effect of feedback on amplifier poles, frequency compensation-Dominant pole and Pole-zero.

Multistage amplifiers – cascade and cascode amplifiers and its dc analysis.

Frequency response of cascade and cascode amplifiers. Bode plot of multistage Amplifier, Phase and gain margin,

Module III

Low frequency Oscillators: Barkhausen criterion, RC phase shift and Wien bridge oscillators - analysis. Analysis of High frequency oscillators- Hartley, Colpitts, Clapp, Crystal oscillators and UJT Oscillators.

Transistor switching circuits: Transistor as switch, biasing, Transistor switching times. (Delay, rise, storage and fall time). Analysis of collector coupled Astable, Monostable and Bistable multivibrators, Schmitt trigger – analysis.

Sweep circuits- Bootstrap sweep and current sweep circuits - analysis.

Text Book:

1. Sedra and Smith : *Microelectronic Circuits*, **4/e**, Oxford University Press 1998.
2. Donald A Neamen. : *Electronic Circuit Analysis and Design*,**3/e**, TMH

Reference:

1. Spencer & Ghausi : *Introduction to ElectronicCircuit Design,* Pearson Education, 2003.
2. RogerT.Howe,Charles G. Sodini : *Microelectronics: An Integrated Approach*, Pearson Education,1997.
3. R E Boylstad and L Nashelsky : *Electronic Devices and Circuit Theory*, **9/e**, Pearson Education.
4. Millmann and Taub : *Pulse Digital and Switching Waveforms,* **2/e**,TMH.
5. Gopakumar : *Design and Analysis of Electronic Circuits*, Phasor books.

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

(Minimum 60% Problems and Analysis)

08.405 ANALOG INTEGRATED CIRCUITS (T)

L-T-P : 3-1-0 **Credits: 4**

Module I

Simplified internal circuit of 741 op-amp. DC analysis, Gain and frequency response.

MOS Operational Amplifiers, single stage- cascode and folded cascode, two stage op-amp, op-amp with output buffer, frequency compensation and slew rate in two stage Op-amps.

Ideal op-amp parameters, Non ideal op-amp. Effect of finite open loop gain, bandwidth and slew rate on circuit performance.

Inverting and non-inverting amplifier, summing amplifier, integrator, differentiator, Differential amplifiers, Instrumentation amplifiers, V to I and I to V converters, Comparators, precision rectifiers, oscillators -Phase-shift, Wein-Bridge, multivibrators - Astable, Monostable, Schmitt Trigger, Square and triangular waveform generator.

Module II

Filters: Butterworth Ist order Low pass, high pass, bandpass and band elimination. Biquadratic filter (single op-amp with finite gain non inverting-Sallen and key) of Low pass, High pass, Band pass and Band elimination filters. Tow-Thomas filters. Filters using Antoniou gyrator.

Switched capacitor Resistor, switched capacitor Integrator, Ist order SC filter, IInd order SC filter based on Tow-Thomas. Sample and hold circuits.

D/A converters: DAC characteristics- resolution, output input equations, Weighted resistor, R-2R network, DAC 08.

A/D converter: ADC characteristics, Types - Dual slope, Counter ramp, Successive approximation, flash ADC - AD670.

Module III

Analog multipliers – emitter coupled pair as simple multiplier, Gilbert multiplier cell, four quadrant multiplier, Gilbert multiplier as a balanced modulator and phase detector, AD532.

Monolithic Waveform generators – grounded capacitor VCO and emitter coupled VCO, IC8038.

Basic PLL topology and principle, transient response of PLL, Linear model of PLL, Major building blocks of PLL – analog and digital phase detector, VCO, filter.

Applications of PLL. Monolithic PLL - IC LM565 and CD4046 CMOS PLL.

Monolithic Voltage Regulators – IC 723 and its Applications, Current boosting, short circuit and fold back protection. 555 Timer and its application.

Text Book:

1. Sergio Franco: *Design with Operational Amplifiers and Analog Integrated Circuits*, **3/e**,TMH.
2. Gayakwad : *Op-Amps and Linear Integrated Circuits* , **4/e**, Pearson Education.
3. K. R. Botkar : *Integrated Circuits*, **9/e**, Khanna Publishers.

Reference:

1. Behzad Razavi : *Design of Analog CMOS IC*, TMH, 2003.
2. Sidney Soclof: *Design & Applicatications of Analog Integrated Circuits*. PHI, 2008
3. David A.Johns, Ken Martin: *Analog Integrated Circuit Design*, Wiley India, 2008
4. Roy Chowdhary: *Linear Integrated Circuits*,**2/e**, New Age International.
5. Somanathan Nair,*Linear Integrated Circuits*,John Wiley.2009

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

(Minimum 50% Design, Analysis and Problems)

08.406 ANALOG COMMUNICATION (T)

L-T-P: 2-1-0 **Credits: 3**

Module I

Amplitude modulation - Modulation Index, Modulation Index for Sinusoidal AM, Average power for sinusoidal AM, Effective Voltage and Current for Sinusoidal AM, Nonsinusoidal Modulation, DSBSC Modulation, Amplitude Modulator Circuits, Amplitude Demodulator Circuits, Diagonal Peak Clipping, AM Transmitters – Broadcast Transmitters.

Receivers - Superhetrodyne Receivers, Tuning Range, Tracking, Sensitivity and Gain, Image Rejection, Adjacent Channel Selectivity, Automatic Gain Control, Double Conversion.

Single Sideband Modulation - Principles, Balanced Modulators – Singly & Doubly Balanced Modulators, SSB Generation – Filter Method, Phasing Method & Third Method, SSB Reception, Modified SSB Systems – Pilot Carrier SSB & ISB, Companded SSB.

Pulse Modulation - PAM - TDM, PPM, PWM.

Module II

Angle Modulation - Frequency modulation, Sinusoidal FM, Frequency spectrum for sinusoidal FM, Average power in sinusoidal FM, Non-sinusoidal modulation-deviation ratio, Measurement of modulation index for sinusoidal FM.

Phase modulation- Equivalence between PM and FM, Sinusoidal Phase Modulation, Digital Phase Modulation.

Angle modulator Circuits – Varactor Diode Modulators, Transistors Modulators, FM Transmitters – Direct & Indirect Methods, FM Broadcast,

Angle modulation detectors – Foster-Seeley discriminator, Ratio Detector, Quadrature Detector, PLL Demodulator, Automatic Frequency Control, Amplitude Limiters, Pre-emphasis and De-emphasis, FM Broadcast Receivers, FM Stereo Receivers.

Module III

Noise - Thermal noise, Shot noise, Partition Noise, Flicker noise, Burst Noise, Avalanche noise, Bipolar & field Effect transistor noise. Noise factor, Noise factor of amplifiers in Cascade, Noise Temperature.

Effect of noise in Analog Communication Systems- Effect of noise on AM Systems- Effect of noise on a Base band System, Effect of noise on DSBSC AM, Effect of noise on SSB AM. Effect of noise on Angle modulation- Threshold Effect in Angle modulation.

Telephone Systems – Standard Telephone Set, Basic Call Procedures, Call progress Tones & Signals – DTMF, Cordless Telephones, Electronic Telephones, Paging systems. The telephone circuit - Local subscriber loop, Channel noise and Noise weighting, Power measurement, Private-line circuits, Voice-frequency circuit arrangements. The public telephone network - Instruments, Local loops, Trunk circuits and exchanges, Local central office Exchanges, Automated central office switches and Exchanges.

Text Books:

1. Dennis Roody & John Coolen: *Electronic Communication*, **4/e**. PHI.
2. Wayne Tomasi, *Advanced Electronic Communications Systems*, **6/e**,PHI.

References:

1. Simon Haykin: *Communication Systems*,**4/e**,John Wiley.
2. John G. Proakis& Masoud Salehi: *Communication Systems Engineering*,**6/e**,Pearson Education.
3. George Kennedy: *Communication Systems*, **3/e**, TMH.
4. Leon W.Couch II : *Digital and Analog Communication Systems*, **6/e**, Pearson Education.
5. K.C.Raveendranathan: *Analog Communications Systems-Principles and Practice*, Universities Press,2008.

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

(Minimum 25% Problems)

08.407 ELECTRONIC CIRCUITS LAB (T)

L-T-P : 0-0-4 **Credits: 4**

1. Feed back amplifiers (current series, voltage series) - Gain and frequency response
2. Power amplifiers (transformer less), Class B and Class AB.
3. Differential amplifiers (using BJT and MOSFETs) - Measurement of CMRR
4. Cascade amplifiers - Frequency response.
5. Cascode amplifiers (using BJT and MOSFETs) - Frequency response.
6. Phase shift, Wien bridge, Hartley and Colpitts Oscillators.
7. Astable, Monostable and Bistable multivibrator circuits.
8. Schmitt trigger circuits.
9. Tuned amplifiers - frequency response.
10. Series voltage regulator circuits – short circuit and fold back protection.
11. Bootstrap sweep circuit.
12. Introduction to SPICE and simulation of experiments 4, 5, 6 and 7 listed above using SPICE

Internal Marks: 50

1. Attendance	- 10
2. Class work	- 20
3. Practical internal test	- 20

Note: For University examination, the following guidelines should be followed regarding award of marks

(a) Circuit and design	- 20%
(b) Performance (Wiring, usage of equipments and trouble shooting)	- 15%
(c) Result	- 35%
(d) Viva voce	- 25%
(e) Record	- 05%

Practical examinations to be conducted covering the experiments (1 – 11) only.

Students shall be allowed for the University examination only on submitting the duly certified record. The external examiner shall endorse the record.

08.408 ANALOG INTEGRATED CIRCUITS LAB (T)

L-T-P : 0-0-4 **Credits: 4**

1. Familiarization of Operational amplifiers- Inverting and Non inverting amplifiers, frequency response, Adder, Integrator, comparator and voltage level detector.
2. Measurement of Op-Amp. parameters.
3. Difference Amplifier and Instrumentation amplifier.
4. Astable, Monostable and Schmitt trigger circuit using Op -Amps.
5. Triangular and square wave generators using Op- Amplifier.
6. Wien bridge oscillator using op-amplifier with amplitude stabilization and amplitude control, RC Phase shift Oscillator.
7. Voltage comparator ICs LM311, Window Comparator using LM311.
8. IC voltage regulators (723), low & high voltage regulation Short circuit and Fold back protection.
9. Astable, Monostable multivibrator using 555.
10. Precision rectifiers using Op-Amp.
11. Active second order filters using Op-Amp (LPF, HPF, BPF and BSF)
12. Filters using gyrator circuits.
13. A/D converters- counter ramp and flash type.
14. D/A Converters- ladder circuit.

Internal Marks: 50

1. Attendance	- 10
2. Class work	- 20
3. Practical internal test	- 20

Note: For University examination, the following guidelines should be followed regarding award of marks

(a) Circuit and design	- 20%
(b) Performance (Wiring, usage of equipments and trouble shooting)	- 15%
(c) Result	- 35%
(d) Viva voce	- 25%
(e) Record	- 05%

Practical examination to be conducted covering entire syllabus given above.
Students shall be allowed for the University examination only on submitting the duly certified record. The external examiner shall endorse the record.

Syllabus V Semester

ENGINEERING MATHEMATICS – IV

08.501 COMPLEX ANALYSIS AND LINEAR ALGEBRA (TA)

L-T-P : 3-1-0 **Credits: 4**

Module I

Complex Differentiation - Limits, Continuity and differentiation of complex functions. - Analytic functions – Cauchy Riemann equations in Cartesian form (proof of necessary part only) - Properties of analytic functions - Harmonic functions - Determination of harmonic conjugates - Milne-Thomson method.

Conformal mapping - The transformations $w = 1/z$, $w = z^2$, $w = z + 1/z$, $w = \sin z$, $w = \cos z$, bilinear transformations

Module II

Complex Integration – Line integral - Cauchy's integral theorem - Cauchy's integral formula - Power series - Taylor's and Laurent's series - Zeroes, Poles and singularities - Residues and Residue theorem -Evaluation of real definite integrals - $\int_0^{2\pi} f(\sin\theta, \cos\theta)\, d\theta$, $\int_{-\infty}^{\infty} f(x)\, dx$ (with no poles on the real axis)- (proof of theorems not required)

Module III

Partitioned matrices and matrix factorization - LU decompositions - Vector space and subspace - Null space and Column spaces - Bases - Co-ordinate systems - Dimension of vector space - Rank - Change of basis - Inner product space - Length and orthogonality - Orthogonal sets - Orthogonal projection - Gram-Schmidt process - Least square problem - Quadratic form - Constrained optimization of quadratic forms - Singular value decomposition (proof of the theorem are not included)

References:

1. Peter O'neil, *Advanced Engineering Mathematics*, Thomson Learning.
2. Erwin Kreizig ,*Advanced Engineering Mathematics*, Wiley Eastern.
3. BS Grewal, *Higher Engineering Mathematics*, Khanna Publishers.
4. David C Lay, *Linear Algebra with Applications,* Pearson Education
5. Schaum Series, *Linear Algebra*.
6. Kenneth Hoffmann and Ray Kunze, *Linear Algebra*, PHI.
7. Gareth Williams, *Linear Algebra with Applications*, Jones and Bartlett publications
8. Gilbert Strang, *Linear Algebra with Applications*, Thomson Learning

Question Paper:

The question paper shall consist of two parts. PartA (40 marks) shall contain 10 compulsory questions of 4 marks each. PartB (60 marks) will have 3 modules . There shall be 2 questions from each module (20 marks each) out of which one is to be answered.

Note: This subject shall be handled by the faculty of Mathematics Department.

08.502 DIGITAL SIGNAL PROCESSING (TA)

L-T-P : 3-1-0 **Credits: 4**

Module I

The Discrete Fourier Transform –Frequency Domain Sampling, Properties of DFT, Linear Filtering Methods Based on the DFT, Frequency Analysis of Signals using DFT.

Computation of DFT - FFT Algorithms (Radix 2 only), Efficient computation of DFT of Two Real Sequences and a 2N-Point Real Sequence, Linear Filtering and Correlation using DFT. Introduction to DCT and properties.

Module II

Design of FIR Filters- Symmetric and Antisymmetric FIR Filters, FIR Filters using Window method and Frequency Sampling Method, Design of Optimum Equiripple Linear-Phase FIR Filters.

Design of IIR Digital Filters from Analog Filters- IIR Filter Design by Impulse Invariance, IIR Filter Design by Bilinear Transformation, Frequency Transformations in the Analog and Digital Domain.

Filter structures: FIR Systems- Direct Form, Cascade Form and Lattice Structure. IIR Systems- Direct Form, Transposed Form, Cascade Form and Parallel Form.

Module III

Analysis of finite word length effects- Quantization noise, round off errors, input and output quantization error, limit cycles in IIR filters, round off errors in FFT algorithm.

Multi-rate Digital Signal Processing- Decimation and Interpolation (Time domain and Frequency Domain Interpretation), Sampling Rate Conversion, Multistage Implementation of Sampling-Rate Conversion, Applications of Multi-rate Signal Processing- Sub band Coding, Trans-multiplexers.

Computer architecture for signal processing - Architecture of TMS320C6713 processor.

Programming Tools for DSP Processors.

Text Books

1. A.V. Oppenheim & Ronald W Schafer*: Discrete Time Signal Processing*, **2/e**, PHI.
2. Sanjith K Mitra *: Digital Signal Processing*, **2/e**, Tata Mc Graw Hill.
3. Rulph Chassaing, *Digital Signal Processing and Applications with the C6713 and C6416 DSK*, Wiley Interscience.
4. Apte, *Digital Signal Processing*. 2/eWiley India 2009.

Reference:

1. John G Proakis, Dimitris G Monolakis-*Digital Signal Processing*, **4/e**, PHI.
2. Emmanuel C Ifeachor, Barrie W Jervis: *Digital Signal Processing*, **2/e**, Pearson Education /PHI.
3. P.P. Vaidyanathan, *Multirate Systems and Filter Banks*, PHI, 2004.
4. Uwe Mayer-BAeses, *Digital Signal Processing with FPGAs*, **2/e**, Springer.
5. Vinay K. Ingle and John Proakis,*Digital Signal Processing A MATLAB based Approach*, Books-cole publishing company,2000.

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

(Minimum 75% Problems, derivations and proofs)

08.503 COMPUTER ORGANISATION & ARCHITECTURE (TA)

L-T-P 2-1-0 **Credits: 3**

Module I

Functional units of a Computer – Von Neuman Architecture -Steps involved in Execution of an instruction – Harvard Architecture - Performance measurement and benchmarking.
Instruction formats – Survey of addressing modes - CISC and RISC.
Computer Arithmetic – Implementing addition, subtraction, multiplication and division – Floating point representation – Floating point operations & their implementation.
MIPS – architecture, addressing modes , instruction format and instruction set.
Translating a C program into MIPS assembly language and machine codes.

Module II

Design of Data path and Control (based on MIPS instruction set) - Design of data path to cover the basic memory reference (lw & sw), arithmetic/logical (add, sub, and, or) and branch instructions – Control of the single clock cycle implementation – Multi cycle implementation – Fetch, Decode, Execute and Memory access cycles – Design of control unit – Hardwired and Microprogrammed control.
Enhancing Performance – Pipelining – overview of pipelining – pipelined datapath – pipelined control – data hazards and forwarding – data stalls – control hazards – branch hazards.

Module III

Memory system hierarchy – Caches – Mapping techniques – Replacement algorithm – Cache performance – interleaved memory – Virtual memory – Address translation.
Interfacing I/O to Processor. Interrupts and Direct Memory Access.
CISC microprocessors. Architecture of Intel 8086 - CPU, pin functions, instruction cycle time, addressing. Modes. VLIW architecture.

Text Book:

1. David A Patterson, John L Hennessy, *Computer Organisation and Design – The Hardware / Software Interface*, **3/e**, Elsevier Publications.
2. David A Patterson, John L Hennessy,*Computer Architecture – A Quantitative Approach*, **4 /e**, Elsevier Publications.
3. Douglas V Hall, *Microprcessors and Interfacing; Programming and Hardware*, 2/e, TMH.

References:

1. Hayes, *Computer Architecture and Organisation*, **3/e**, Mc Graw Hill.
2. Kai Hwang, *Advanced Computer Architecture: Parallelism, Scalability and Programmability*, 1993, Mc Graw Hill.
3. Carl Hamacher, Zvonko Vranesic, Safwat Zaky, *Computer Organisation*, **5 /e**, Mc Graw Hill.

This subject shall be handled by faculty of Dept.of Electronics and Communication.

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

(Minimum 40% Problems and design)

08.504 ELECTRICAL DRIVES & CONTROL (T)

L-T-P : 2-1-0 **Credits: 3**

Module 1

DC machines- Principle of operation of dc generator, constructional details, emf equation, types of generators. Principle of operation of dc motors. Electrical and mechanical characteristics of dc series, shunt and compound motors, applications.

AC motors- Principle of operation, rotating magnetic field, single phase and three phase induction motors.

Module 2

Power devices- power BJT, power MOSFET and IGBT - steady state and switching characteristics. Drive requirements. Design of simple drive circuits for power BJT, power MOSFET and IGBT. Principle of DC motor control. Principle of PWM switching control. Two quadrant, four quadrant converter circuit.

Controlled rectifiers. Principle of phase controlled converter operation. Single phase half wave and full wave controlled rectifiers with R, RL and battery loads.

Module 3

Basic configurations of switched mode inverter-principle of PWM switching schemes for square wave and sine wave output. Single phase inverters-half bridge, full bridge and push pull inverter, voltage source inverter. Block diagram of UPS

Induction motor drives Speed control by varying stator frequency and voltage. Principle of vector control. Comparison of vector control and scalar control. Voltage source inverter driven induction motor, application of PWM for induction motor drive.

Text Book

1. JB Gupta. *Theory and performance of electrical machines*, Vol 2, SK Kataria and sons
2. L.Umanand , *Power electronics. Essentials and Applications*. First edition by Wiley India Pvt. Ltd.
3. Ned mohan , Tore M .Undeland ,William P Robbins ,*Power electronics Converters Application and Design*, II edition , John wiley and sons.

References

1. B.L Theraja and A.K Theraja. *A textbook of Electrical Technology. AC and DC machines,* Volume 11, S Chand and Company LTD
2. Mohammad H Rashid ,, Second edition Prentice Hall of India
3. R.Krishnan, *Electric Motor Drives, Modeling Analysis and Control*, PHI

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

(Minimum 40% Problems and design)

08.505 APPLIED ELECTROMAGNETIC THEORY (T)

L-T-P : 3-1-0 **Credits: 4**

Module I

Review of vector calculus, spherical and cylindrical coordinate system, coordinate conversion, elemental displacement, area and volume for spherical and cylindrical coordinate system. curl, divergence, gradient in general coordinate system, spherical and cylindrical coordinate system., Vector potential , Energy stored in Electric field, Poisson and Laplace equations, Determination of E and V using Laplace equation. Derivation of capacitance and inductance of two wire transmission line and coaxial cable. Boundary condition of electric field and magnetic field. Equation for continuity, dielectric relaxation time, vector magnetic potential A. Maxwell's equation from fundamental laws. Relation between E , V and A.

Module II

Solution of wave equation, Propagation of plane EM wave in partially conducting media, in perfect dielectric, in good conductors, attenuation, phase velocity, group velocity, skin depth, Reflection and refraction of plane electromagnetic waves at boundaries for normal & oblique incidence – Snell's law of refraction, Brewster angle, Poynting vector, Poynting vector theorem, Complex Poynting vector. Polarization of electromagnetic wave and derivation of polarization angle.

Uniform transmission line, transmission line parameters. Loading of transmission lines. transmsission line equations. Voltage and Current distribution.

Module III

Derivation of input impedance of transmission line. VSWR and reflection coefficient. Relation between VSWR, Zo and Zr. Transmission line as circuit elements (L and C). Half wave and quarter wave transformer. Impedance matching using stubs,. Lines with losses – DC line, low frequency line, high frequency line.

Development of Smith chart-calculation of voltage minima and maxima, impedance, single stub matching, double stub matching using smith chart.

The hollow rectangular wave guide – modes of propagation of wave, dominant mode, calculation of attenuation in wave guides, guide wavelength and impedance.

Text Books :

1. Umran S. Inan & Aziz S. Inan: *Engineering Electromagnetics*,Pearson Education,1999.
2. Joseph A Edminister : *Electromagnetics,* **2/e,** Schaum's Outline Series.
3. Nannapaneni Narayana Rao: *Elements of Engineering Electromagnetics*,**5/e**, Pearson Education.

References:

1. John D. Kraus: *Electromagnetics*,**4/e**, Mc Graw Hill.
2. Martin A Plonus : *Applied Electromagnetics,* McGraw Hill,1978.
3. David K. Cheng: Field and Wave Electromagnetics, **2/e**, Pearson Education
4. Hayt: *Engineering Electromagnetics*, **7/e**, TMH.
5. Edward C Jordan : Electromagnetic waves and Radiating Systems, **2/e**,PHI.

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered. (Smith chart should be provided if needed.)

(Minimum 75 % problems , derivations and proof.)

08.506 LOGIC SYNTHESIS AND VERIFICATION (TA)

L-T-P : 2-1-0 **Credits: 3**

Module I

Graph theory - Directed and undirected graphs- Strongly Connected Components (SCC), Graph Traversal (BFS, DFS). General purpose methods for Combinatorial Optimization problems. Graph Optimization problems and Algorithms - Shortest Path - Critical Path- Graph Coloring - Graph Covering, Heuristic and Exact Algorithms.

Boolean Algebra - Partial Order Sets, Boolean Functions - Hasse Diagram – Lattice, Satisfiability Don't Care (SDC)- Observability Don't Care(ODC). Cube Representation of Boolean functions. Cofactors-Shannon cofactors, Boolean Dierence, Smoothing, Consensus. Boolean Satisfiability (SAT) and Cover. Synthesis of Two Level Circuits:- Prime Implicants (PI)- Recursive Computation of PI, Unate Covering Problem-Binate Covering Problem- Branch and Bound Algorithms.

Module II

Data structures for graphs, Binary Decision Diagrams(BDD), OBDD, ROBDD- Representation of Logic Functions in BDD - Algorithms for BDD operations.

Heuristic Minimization of Two level circuits- local search - Equivalence and Tautology- Recursive Complementation-Essential Primes -Multiple Valued Logic. Espresso Algorithm- Expand, Reduce, Irredundant, Essentials.

Sequential Systems - models -FSM-: Minimization of FSM, FSM Traversal, FST, FSM Equivalence Checking. FSM Traversal using BDD. Minimization of Completely and Incompletely specified State Machines- State Encoding Algorithms- Decomposition and Encoding.

Module III

Finite Automata-Deterministic Multiple Level Combinational Logic Optimization: Introduction, Models and Transformation for Combinational Networks. Optimization of Logical Networks. Representation of Functions in Factored form - Division- Kernels and Co-Kernels. Rectangle Covering, Heuristic Factoring Algorithms - Decomposition and Restructuring.

Finite Automata(DFA), DFA Synthesis, w-regular automata, Formal Verification with L-Automata.

Reference:

1. Gray D Hatchtel, Fabio Somenzi, *Logic Synthesis and Verification Algorithms*, Kluwer Academic Publications, 2002.
2. Sabih H Gerez, *Algorithms for VLSI Design Automation*, John Wiley and Sons, 2004.

Reading:

1. Giovanni De Micheli, *Synthesis and Optimization of Digital Circuits*, McGraw-Hill.
2. Soha Hassova, Tsutomu Sasao, *Logic Synthesis and Veri_cation*, Kluwer Academic Pub.
3. Jakko T. Astola, Radomir S Stankovi*: Fundamentals of Switching Theory and Logic Design, A Hands on Approach*, Springer.
4. Rudiger Ebendt, Gorschwin Fey, *Advanced BDD Optimization*, Springer.
5. Frederick J Hill, GR Peterson, *Computer Aided Logical Design with Emphasis on VLSI*, **4/e**,John Wiley and sons.

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

(Minimum 50% logical/numerical problems, derivation and Proof)

08.516 FUZZY SYSTEMS & APPLICATIONS (TA)

L-T-P: 2-1-0 **Credits: 3**

Module I

Introduction to fuzzy sets and systems-crispness, vagueness, uncertainty and fuzziness. Basics of fuzzy sets, membership functions, support of a fuzzy set height, normalized fuzzy set, α cuts. Properties of Fuzzy set .Operation on fuzzy set-complement, intersection, union, equality & subset hood. Law of excluded middle, law of contradiction, concentration, dialation, contrast intensification. Type- 2 fuzzy sets.

M**odule II**

Extension Principle and its application. Fuzzy relation, operations on fuzzy relation, projection, max-mini composition, cylindrical extension.Reflexivity,symmetry and transcitivity.Fuzzy prepositions, fuzzy connectives, linguistic variables, linguistic hedges, Fuzzy quantifiers. Approximate reasoning or fuzzy inference, generalized modus ponens (GMP), generalized modus Tollens (GMT) Fuzzy rule based system. Fuzzification and defuzzifiction,centroid,centre of sums.

Module III

Applications-Fuzzy logic controllers, Types of FLC- Types of Fuzzy rule formats. Block diagram of fuzzy logic controller.multi input multi output control system. Fuzzy control of a cement kiln, Automatic train operating system, Fuzzy pattern recognition. Inverted pendulum, aircraft landing control, air conditioner control.

Reference:

1.Timothy J. Ross, *Fuzzy Logic with Engineering Applications*, 2/e, McGraw Hill
2. Zimmerman, H.J., *Fuzzy Set Theory and its Applications*, **4/e**,Springer.2001.
3. Ganesh, M., *Introduction to Fuzzy Sets and Fuzzy Logic*, PHI,2006.
4. Driankov, D., Hellendoorn, H., Reinfrank, M.,*An Introduction to Fuzzy Control*, Narosa,1996.

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

(Minimum 75% logical/numerical problems, derivation and Proof)

08.526 SYSTEM SOFTWARE (TA)

L-T-P : 2-1-0 **Credits: 3**

Module I

System Software - Language processors: Introduction , Language processing activities, fundamentals of Language processing , fundamentals of Language specifications ,Language processor development tools. Data structures for Language processing : Search data structures, Allocation data structures

Scanning and Parsing : Scanning , Parsing. Assemblers : Elements of assembly language programming, A simple assembly scheme, Pass structure of assemblers. Macros and Macroprocessors : Macro definition and call ,Macro expansion , Nested macrocalls

Module II

Compilers and Interpreters :Aspects of compilation, Memory allocation ,Interpreters.

Linkers: Relocation and linking concepts. Software tools: Software tools for program development

Operating systems - Evolution of OS systems. Processes :Process definition ,Process control , Interacting Processes ,Implementation of interacting Processes ,Threads. Scheduling :Scheduling policies ,Job Scheduling ,Process Scheduling . Deadlocks: Definitions, Handling Deadlocks, Deadlock detection and resolution, Deadlock avoidance.

Module III

Process synchronization: Implementing control ,synchronization , Semaphores.

Memory management : Memory allocation preliminaries, Contiguous Memory allocation, noncontiguous Memory allocation ,Virtual memory using paging, Virtual memory using segmentation.

Protection and security :Encryption of data, Protection and security mechanisms.

Distributed operating systems : Definition and examples , Design issues of Distributed operating systems , Networking issues ,Communication protocols.

Text book

1. D M Dhamdhere, *System programming and Operating systems* 2nd revised edition, TMH.

References

1. Milan Milenkovic, *Operating Systems*, 2nd edition, TMH.
2. John J Donovan, *System Programming*,2/e, McGraHill.
3. Leland L Beck, *System Software: An Introduction to System Programming*, 3rd edition, Pearson Education.

This subject shall be handled by faculty of Dept.of Electronics and Communication .

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

08.536 ARTIFICIAL NEURAL NETWORKS (TA)

L-T-P : 2-1-0 **Credits: 3**

Module I

Introduction to Neural Networks - Applications - Biological Neurons and Neural Networks - Typical architecture of Artificial Neural Networks - Common activation functions - Mc. Culloh Pitts Neuron - Single Layer Perceptrons – linear Separability - Learning Algorithms - Hebbian Learning, Gradient Descent Learning, Widrow Hoff Learning , The Generalized Delta Rule, learning rates, Practical Considerations.

ANN models for Pattern Classification – Hebb Net,Perceptrons, ADALINE networks (Architecture, Algorithm and simple Applications)

Module II

Pattern Association :- training algorithm for pattern association - Hetro Associative Network, Auto Associative Network, Hopfield Network, BAM Network - Architecture, Algorithm and simple Applications.

Network based on competition:- Fixed weight competitive Network-Maxnet, Mexican Hat and Hamming Net - Self Organizing Maps - Kohonen Network- Learning Vector Quantization, Counter Propagation Network (Architecture, Algorithm and simple Applications) Optimization problems solving using neural networks.

Module III

Adaptive Resonance Theory:- ART 1 and ART 2 – Back Propagation Networks, Learning with Momentum, - Radial Basis Function Networks - Conjugate Gradient Learning, Bias and Variance, Under-Fitting and Over-Fitting – Bolzmann machine (Architecture, Algorithms and Applications)

Text Books:

1. Simon Haykin, *Neural Networks,* **2/e**, Prentice Hall.
2. Laurene Fausett, *Fundamentals of Neural Networks,* Pearson Education 2004.
3. Christopher M. Bishop, *Neural Networks for Pattern Recognition* by Oxford University Press, 1995.

Reference:

1. James A Freeman, David M. Skapura, *Neural Networks- Algorithms, Applications and Programming Techniques* , Pearson Education.
2. Bose & Liang, *Neural Network Fundamentals,* Mc Graw Hill.
3. Martin T. Hagan, Howard B. Demuth, Mark Beale, *Neural Network Design,* Vikas Thomson learning.
4. S N Sivanandham, S Sumathi, S N Deepa, *Introduction to Neural Networks using Matlab 6.0,* Tata Mc.Graw Hill 2005

Question Paper:

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

(Minimum 50% Problem and Algorithm)

08.546 DIGITAL SYSTEMS DESIGN WITH VHDL (TA)

L-T-P : 2-1-0 **Credits: 3**

Module I

Concepts of Digital System Design Process, Design automation, Hardware Description Language, Hardware Simulation, Oblivious Simulation, Event-driven simulation, Hardware synthesis, Level of abstraction.

VHDL Language - Design methodology based on VHDL, Elements of VHDL, Describing components, Packages, Top down design, verification, Top-down design with VHDL, Subprograms, VHDL operators, Conventions & Syntax. Basic concept in VHDL - Characterizing Hardware Language, Timing, Concurrency, Hardware modeling, Objects & Classes, Signal assignment, Inertial delay, Mechanism, Transport delay mechanism, Comparing Inertial and Transport. Concurrent and Sequential Assignment: concurrent assignment, Event and Transaction, Delta delay, Sequential placement of transaction.

Module II

Type declaration and usage, Enumeration type for multi value logic, Array declaration, VHDL Operators, subprogram parameters, Types and overloading, Array attributes, Type attributes, Signal attributes, Entity attributes. Sequential processing - Process statement, Signal assignment versus Variable assignment, Sequential statements – IF, CASE, LOOP, ASSERT, WAIT etc., Concurrent assignment problem, Passive processes. Structural Specification of Hardware - Inverter model, NAND gate model, Modeling Flip- Flops using VHDL Processes, Logic Design of Comparator, VHDL description of comparator, VHDL Models for a Multiplexer, VHDL description of a simple test-bench, simulation, Logic design of Latch, Flip-flop, VHDL model for Counter and Registers,. Subprograms and Packages - Subprograms, Functions, Conversion functions, Resolution functions, Procedures. Packages, Package declaration, Deferred constants, Subprogram declarations, Package body. Aliases, Qualified expressions, User-defined attributes, Generate statements, Text I/O.

Module III

Data flow Description in VHDL - Multiplexing and data selection. Design of a serial adder with accumulator, design of binary multiplier using VHDL, Multiplication of signed binary numbers, deign of binary dividers. State machine description – Derivation and realization of SM charts, A sequence detector, Allowing multiple active states, Mealy and Moore machine, Generic State Machine, General data flow circuits, Linked state machines. Design configurations - Default configurations, Component configurations, Mapping library entities, Generics in configurations, Architecture configurations. Synthesis - RTL description, Constraints, Attributes, Technology libraries, Translation, Optimization, Flattening, Factoring, Mapping to Gates. Designing with FPGA and CPLD, Xilinx 4000 Series FPGAs and Altera Flex 10K series CPLDs.

Text Books:

1. Wakerly J. F., *Digital Design – Principles and Practices*, **4/e**,Pearson Education,2008.
2. Roth C. H., *Digital System Design Using VHDL*, Cengage Learning,2008.
3. J.Bhasker, V*HDL Primer*, 3/e, Pearson Education, India.

References:

1. Mano M. M. and Ciletti M. D., *Digital Design*, **4/e**, Pearson Education,2008.
2. Perry D. L., *VHDL Programming by Example*, **4/e**, TMH,2008.
3. Brown S. and Vranesic Z., *Fundamentals of Digital Logic with VHDL Design*, **2/e**,TMH.2008.
4. Pedroni V. A., *Circuit design with VHDL*, PHI,2008.

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

(Minimum 60% Problem, Design and Programs)

08.556 PROFESSIONAL COMMUNICATION(TA)

L-T-P : 2-1-0 **Credits: 3**

Module I

Written Communication: Fundamental Principles of clear writing – Style and tone in formal writing with Exercises. Grammar in context- focus areas – Tenses- Prepositions- Modals- Adjectives. Transformation of sentences. Reading comprehension. Précis-writing to express ideas through various kinds of essays.

Module II

Technical Writing – Definition- Description- Instructions and Writing Technical Papers.
Transcoding - Interpreting Graphics and Writing coherent paragraphs-Writing for focus.
Mind Map- Organisation of Coherent Paragraphs and Essays.

Module III

Business Administrative and E-Correspondence - Business Reports- Technical Documentation - Project Proposal Writing and CVs/ Resumes- Application letters- Notices- Agenda- Minutes & Memos. Case Analysis.
Organization Communication**:** Objectives - Channels of communication- Barriers in Communication- Non-verbal & Cross-cultural communication- Meetings- Conferences- Press Conference and Press release.

PRACTICALS: (No University Examination)

Practice in Speech Making Process – Developing Communicative Ability – Techniques for speaking fluently-Using body language- Developing fluency and confidence. Short Speeches. Group Discussions and Role-plays. Listening Activities. Effective Presentation Strategies.
Writing User Manuals of Electronic Equipment.

REFERENCES:

1. Rodney Huddleston and Geoffrey K Pullam, *A Student's Introduction to English Grammar*, Cambridge University Press, U K, 2005.
2. Sankaranarayanan V, Sureshkumar S and Palanisamy, *Technical English for Engineering Students*, PHI, 2008
3. Bert Decker, *The Art of Communicating*, Decker Communications, Inc, USA, 2004.
4. Meenakshi Raman and Sangeeta Sharma, *Technical Communication: Principles and Practice*, Oxford University Press, U K, 2004.
5. Paul V Anderson, *Technical Communication: A Reader – Centered Approach*, Asia Pvt. Ltd, Singapore, 2003.

Internal Marks:

50 Marks is to be awarded for the continuous evaluation in the practical done in a language lab with the syllabus given above.(one hour per week)

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

08.566 ELECTROMAGNETIC COMPATIBILITY (T)

L-T-P : 2-1-0 **Credits: 3**

Module I

EMI Environment – Sources of EMI, conducted and radiated EMI, Transient EMI, EMI-EMC definitions, units, parameters. EMI coupling principles-Conducted, Radiated and Transient Coupling, Common Impedance Ground Coupling, Radiated Common Mode and Ground Loop Coupling, Radiated Differential Mode Coupling, Near field cable to cable coupling. Power mains and power supply coupling.

Module II

EMI specifications, standards, limits - units of specifications, Civilian and Military standards.
EMI measurements – EMI test instruments, systems, EMI test, EMI shielded chamber, Open area test site, TEM cell Antennas, conductors, sensors, injectors, couplers, Military test methods and procedures, calibration procedures.
Crosstalk -Three-conductor transmission lines, shielded wires, twisted wires, shielding.

Module III

EMI control techniques – shielding, filtering, grounding, bonding, Transient suppressors, Isolation transformer, Cable routing, signal control, component selection and mounting.
EMC design of PCB – PCB traces cross talk, impedance control, power distribution decoupling, zoning, motherboard designs.

Reference:

1. Bernhard Keiser, *Principles of Electromagnetic Compatibility,* Artech house, **3/e,**1986.
2. Henry W. Ott, *Noise reduction Techniques in Electronics Systems*, John Wiley & Sons, 1988.
3. Paul, C.R., *Introduction to Electromagnetic Compatibility*,Wiley Interscience.2006
4. Kaiser, K.L., *Electromagnetic Compatibility Handbook*, CRC Press.2004
5. Kodali, V.P., *Engineering Electromagnetic Compatibility: Principles, Measurement and Technologies*, IEEE Press.2001

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

(Minimum 40% Problem, derivation and Proof)

08.507 COMMUNICATION ENGINEERING LAB (T)

L-T-P : 0-0-4 **Credits: 4**

1. AM generation using discrete components.
2. AM using multiplier IC AD534 or AD633.
3. AM detection using envelope detector.
4. IF tuned amplifier.
5. FM using 555 IC.
6. Study of 4046- Measurement of lock and capture range.
7. FM generation and demodulation using 4046.
8. Frequency multiplier using 4046.
9. PAM modulator and demodulator
10. PWM Modulation & Demodulation using 555 timer
11. PPM Modulation & Demodulation using 555 timer
12. Pseudo Random Binary Sequence Generator.

Internal Marks: 50

1. Attendance	- 10
2. Class work	- 20
3. Practical internal test	- 20

Note: For University examination, the following guidelines should be followed regarding award of marks

(a) Circuit and design	- 20%
(b) Performance (Wiring, usage of equipments and trouble shooting)	- 15%
(c) Result	- 35%
(d) Viva voce	- 25%
(e) Record	- 05%

Practical examination to be conducted covering entire syllabus given above.
Students shall be allowed for the University examination only on submitting the duly certified record. The external examiner shall endorse the record.

08.508 DIGITAL SIGNAL PROCESSING LAB (T)

L-T-P : 0-0-4 **Credits: 4**

PART A: Experiments on Digital Signal Processors.

1. Sine wave generation.
2. Real Time FIR Filter implementation (Low-pass, High-pass and Band-pass)
3. Real Time IIR Filter Implementation (Low-pass, High-pass and Band-pass)
4. Pseudo Random Sequence Generator.
5. Real time DFT of sine wave.
6. Sampling a given Analog signal and study of aliasing.

PART B: Experiments on MATLAB or LABWIEW

1. Convolution: Linear Convolution, Circular Convolution, Linear Convolution using Circular Convolution.
2. Random Sequence Generation: Uniform, Rayleigh and Normal Distributions.
3. Discrete Fourier Transform: (Unfolding the spectrum, Frequency Unwrapping).
4. Linear convolution using DFT (Overlap-add and Overlap-Save methods).
5. Design & implementation of IIR filters. (Butterworth and Chebyshev Filters).
6. Design & implementation of FIR filters. (Window method and Frequency sampling Method).
7. Optimal Equiripple Design of FIR filters.
8. Generation of AM, FM & PWM waveforms.
9. Study of sampling rate conversion by a rational factor.
10. Z – Transform.

Internal Marks: 50

1. Attendance	- 10
2. Class work	- 20
3. Practical internal test	- 20

Note: For University examination, the following guidelines should be followed regarding award of marks:

(Questions for each batch should be selected equally from part A and B)

(a) Circuit and design	- 20% (Logical design and flow diagram for software experiments.)
(b) Implementation (Usage of Kits and trouble shooting)	- 15% (Coding for Software experiments.)
(c) Result	- 35% (Including debugging of Program for software experiments.)
(d) Viva voce	- 25%
(e) Record	- 05%

Practical examination to be conducted covering entire syllabus given above.
Students shall be allowed for the University examination only on submitting the duly certified record. The external examiner shall endorse the record.

Syllabus VI Semester

08.601 MICROCONTROLLER BASED SYSTEM DESIGN (TA)

L-T-P : 3-1-0 **Credits: 4**

Module I

Introduction to microcontrollers, general architecture of microcontrollers and microprocessors, types of microcontrollers, embedded processors. Overview of the 8051 family. 8051 architecture- memory organization, registers and I/O ports. Addressing modes , instruction sets, and assembly language programming. Introduction to C programming in 8051, Watchdog timer, Power down mode: idle/sleep mode.

Module II

Programming timer/counter. Interrupts- handling and programming. Serial communication using 8051- Interfacing with RS232.

8051 interfacing - keyboard, stepper motor, ADC , DAC, and LCD module interface. Applications - square wave and rectangular wave generation, frequency counter and temperature measurement.

PIC microcontrollers - introduction, architecture (block diagram explanation only) , and pin details of PIC 16F877 . Memory organization, ports and timers in PIC 16F877.

Module III

Microcontroller RISC family-ARM processor fundamentals: Register Organisation ,pipeline, core. ARM instruction sets: data processing, branch ,load-store, interrupts & program status register instructions. Exceptions & interrupts: handling & priorities. Development & Debugging tools for microcontroller based system design: software and hardware tools like {cross assembler, compiler, debugger, simulator, in-circuit emulator and logic analyser

Text Book:

1. Muhammad Ali Mazidi, *The 8051 microcontroller and Embedded System*, 2006, Pearson Education.
2. PIC 16F877 data book
3. Andrew N Sloss,Dominic Symes,Chris Wright, *ARM Developer's Guide,* Elsevier

References

1. ARM processor Data book.
2. Kenneth Ayala, *The 8051 Microcontroller*, **3/e**, Thomson Publishing, New Delhi.
3. David Seal, *ARM Architecture Reference Manual*.
4. Wayne Wolf, *Computers as Components: Principles of Embedded Computing system design,* Else Vier,2005.

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

(Minimum 25% Assembly language programs (8051 based) and 25% design)

08.602 VLSI DESIGN (TA)

L-T-P : 3-1-0 **Credits: 4**

Module I

Material Preparation- Purification, Crystal growth (CZ and FZ process), Slicing and Wafer processing**,** Thermal Oxidation**:** Growth mechanisms, Dry and Wet oxidation, Deal Grove model. Diffusion- Fick's Laws, Pre deposition and drive in processes, diffusion system. Ion implantation- Range Theory, channeling, annealing. Epitaxy-VPE and MBE, CVD and MBE systems. Deposition - Dielectric and poly silicon film deposition. Isolation- PN junction isolation and dielectric isolation. Multilevel Interconnects and Metallization. Lithography- Photo lithographic sequence, Electron Beam Lithography, X-ray Lithography. CMOS IC Fabrication Sequence- n well, p well, and twin tub process. SOI -Fully depleted and partially depleted SOI devices. Fabrication Sequence. Resistors and capacitors Fabrication.

Module II

VLSI Design Flow- Design specifications, Behavioral level, RTL, logic Design and Physical Level Design (Basic concepts only)**.**
Review of MOS transistor theory- Saturation and Linear regions of Operation of NMOS and PMOS. Review of Short channel and secondary effects of MOSFET.
MOSFET Capacitances- Oxide related capacitances, Junction Capacitances.
MOSFET Scaling -Constant field, Constant voltage and generalized scaling.
Stick diagram and Lay out - Design rules (λ and μ rules)**.**
CMOS inverter - DC characteristics, Noise margin, Static load inverters, pseudo NMOS, Saturated load inverters. Propagation delay, Static and Dynamic Power dissipation. CMOS logic design - Static logic and Dynamic logic, Domino logic, np- CMOS, Pass transistor logic, Transmission gates.

Module III

CMOS system design- Adders, Static adder, Dynamic adder, Carry bypass adder, Linear Carry select adder, Square root carry select adder, Carry look ahead adder, Register based multipliers, Array multipliers. Memory elements- Timing matrix of Sequential circuits, Static and Dynamic Memory Latches and Registers, Multiplexer based latches, SRAM, DRAM, ROM. Sense amplifiers – Differential, Single ended. Reliability and testing of VLSI circuits – General concept, CMOS testing, Test generation methods. Introduction to VLSI design tools. Introduction to PLDs-PLA Design, folding of PLAs and familiarization of FPGAs.

Text Books:

1. M.S.Tyagi: *Introduction to Semiconductor Materials*, Wiley India,
2. Jan M Rabaey: *Digital Integrated Circuits* PHI 2008
3. John P Uyemura: *Introduction to VLSI Circuits and Systems*, Wiley India, 2008

References:

1. Neil H E Weste & Kamram Eshrahian: *Principles of CMOS VLSI Design*,**2/e**, Pearson Education.
2. Yuan Taur, Tak Hning: *Fundamentals of Modern VLSI Devices*, Cambridge Uni. Press, 2000.
3. S K Gandhi: *VLSI Fabrication Principles*, **2/e**, Prentice Hall.
4. Wayne Wolf: *Modern VLSI Design Systems on Chip*, **3/e,** Pearson Education.

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

(Minimum 25 % problems)

08.603 CONTROL SYSTEMS (T)

L-T-P : 2-1-0 **Credits: 3**

Module I

Components of control system – Open loop and closed loop control systems - Modeling in frequency domain - Mechanical and electromechanical systems. State – space representation – Converting transfer function to state space and state space to transfer function.

Design process - Signal flow graphs - Mason's rule formula. Standard test signals, natural frequency and damping ratio, time response specifications.

Time response of first and second order systems - Steady state and dynamic error coefficients.

Module II

Routh's stability criterion - Root locus techniques. Frequency response techniques: Nyquist criterion – Stability with the Nyquist diagram – gain margin and phase margin - stability with Bode plots – Steady state error characteristics from frequency response.

Module III

Design specification – controller configuration – design fundamentals. Phase – Lead, Phase – Lag and Lead – Lag controllers .Design of phase lag controllers(frequency domain approach).
State space analysis –Solving discrete time state space equations – pulse transfer function– Discretisation of continuous time state space equations – Jury's test - Lyapunov stability analysis. Pole placement and observer design – Introduction – controllability – observability. Introduction to digital control.

Text Book :

1. Benjamin C. Kuo: *Automatic Control Systems*, **8/e**,Wiley India.
2. Ogata K., *Discrete-time Control Systems*, **2/e**, Pearson Education.

References:

1. Norman S Nise : *Control System Engineering*,**5/e**, Wiley India
2. K.Ogata: *Modern Control Engineering*, Prentice Hall of India, **4/e**, Pearson Education, 2002.
3. Richard C Dorf and Robert H Bishop : *Modern Control Systems,* **9/e**, Pearson Education, 2001.
4. Dean Frederick & Joe Chow: *Feedback Control Problems using MATLAB,* Addison Wesley,2000.

This subject shall be handled by faculty of Dept.of Electronics and Communication .

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.
(Minimum 75 % problems, derivations and proof.)

Assignment for Sessional marks may be problems based on MATLAB /LABVIEW or any other software packages covering the syllabus above.

08.604 DIGITAL COMMUNICATION (T)

L-T-P : 3-1-0 **Credits: 4**

Module I

Pulse Modulation- Sampling process, Aliasing, Reconstruction, PAM, Quantization, PCM, Noise in PCM system, Modifications of PCM – Delta modulation, DPCM, ADPCM, ADM, Processing Gain.

Base band Pulse Transmission – Matched filter, properties, Error rate due to noise, ISI – Nyquist criterion for distortion less transmission, Ideal solution, Raised cosine spectrum, Correlative level coding - Duobinary coding, precoding, Modified duobinary coding, Generalized Partial response signaling, Base band M-ary PAM transmission, eye pattern, optimum linear receiver. Adaptive Equalization.

Module II

Signal space Analysis – Geometric representation of signals, analyzer and synthesizer, distance, norm, inner product and orthogonality, Gram Schmidt orthogonization procedure.

Conversion of the continuous AWGN channel into a vector channel –Statistical Characterization of correlator outputs, Likelihood function – Coherent detection of signals in noise –Maximum aposteriori probability Rule, Maximum likelihood Detection, correlation receiver – probability of error.

Pass band Digital Transmission – Transmission model, Error rate analysis, Coherent phase shift keying , Hybrid amplitude and phase modulation schemes, coherent frequency shift keying, Detection of signals with unknown phase, Non coherent orthogonal modulation, Differential phase shift keying, Comparison of digital modulation schemes.

Module III

Spread spectrum communication - Pseudo–noise sequences, Properties of PN sequences. Generation of PN Sequences, generator polynomials, Maximal length codes and Gold Codes. Spread spectrum communication– Notion of spread spectrum, Direct sequence spread spectrum with coherent binary phase shift keying, Signal space dimensionality and processing gain, Probability of error, Anti-jam Characteristics, Frequency Hop spread spectrum with MFSK, Slow and Fast frequency hoping.

Multiple Access Techniques, multipath channels, classification, Coherence time, Coherence bandwidth, Statistical characterization of multi path channels, Binary signaling over a Rayleigh fading channel, Diversity techniques - Diversity in time, frequency and space. TDMA and CDMA – RAKE receiver. Source coding of speech.

Text book:

1. Simon Haykin: *Communication systems*, **4/e**, John-Wiley & sons.

References:

1. Bernard Sklar: *Digital Communication*, **2/e**, Pearson Education, **2001.**
2. Harold Kolimbris: *Digital Communication Systems,* **1/e**, Pearson Education, **2000.**
3. Sam Shanmugham – *Digital and Analog Communication systems*, Wiley India.
4. Leon W.Couch II: *Digital and Analog Communication Systems*, **6/e**, Pearson Education.
5. John G. Proakis, Masoud Salehi: *communication Systems Engineering*, **3/e**, Pearson Education

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

(Minimum 60% Problems, derivations and proofs)

08.605 ANTENNA & WAVE PROPAGATION (T)

L-T-P : 2-1-0 **Credits: 3**

Module I

Basic antenna parameters - gain, directivity, beam solid angle, beam width and effective aperture calculations. Effective height - wave polarization - antenna temperature - radiation resistance - radiation efficiency - antenna field zones - principles of reciprocity. Duality of antennas. Concept of retarded potential. Field, directivity and radiation resistance of a short dipole and half wave dipole. Measurement of radiation pattern, gain, directivity and impedance.

Module II

Arrays of point sources - field of two isotropic point sources - principle of pattern multiplication - linear arrays of 'n' isotropic point sources. Grating lobes. Properties and Design of Broadside, Endfire, Binomial and Dolph chebyshev arrays. . Basic principle of beam steering. Traveling wave antennas. Principle and applications of V and rhombic antennas. Principles of Horn, Parabolic dish and rectangular Patch antennas (expression for E, H, and Gain – no derivation). Principle of Log periodic antenna array and Helical antenna.

Antennas for mobile base station and handsets.

Module III

Radio wave propagation – Modes – structure of atmosphere – characteristics of ionized regions – sky wave propagation – effect of earth's magnetic field – MUF – skip distance – virtual height – skip distance - Ionospheric abnormalities and absorption – space wave propagation – LOS distance – Effective earth's radius – Field strength of space wave - duct propagation – VHF and UHF Mobile radio propagation – Tropospheric Scatter Propagation – VLF and ELF propagation in sea water.

Text Books :

1. John D. Krauss: *Antennas for all Applications,* **3/e**, TMH.
2. Constantine A Balanis: *Antenna Theory and Design,* **2/e** , Wiley Publications.
3. E.C. Jordan & K G Balmain: *Electromagnetic Waves & Radiating Systems,* **2/e**, PHI.

Reference:

1. R.E Collin: *Antennas & Radio Wave Propagation,* Mc Graw Hill. 1985.
2. Terman: *Electronics & Radio Engineering,* **4/e,** McGraw Hill.
3. Thomas A. Milligan: *Modern Antenna Design*, IEEE PRESS, **2/e,**Wiley Interscience.
4. Ganesh Rao,Somanathan Nair,Antennas and Radiowave Propagation,Sanguine 2007

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

(Minimum 60 % problems, derivations and proof.)

08.606 SPEECH PROCESSING (TA)

L-T-P : 2-1-0 **Credits: 3**

Module I

Speech production and perception. Time frequency representation of speech - spectrogram, speech features from spectrogram.

Classification of Speech Sounds - Vowels, Consonants, Diphthongs, nasal consonants, fricatives , Voice and unvoiced speech. Pitch and pitch detection.

STFT analysis of speech, Sinusoidal model of speech, Homomorphic filtering.

Module II

Linear Prediction Modeling of speech - Source filter model, Covariance Method, Autocorrelation method, Levinson Durbin Algorithm, LPC based speech coder: LSF representation, Quantization of LSF coefficients. Introduction to multi-pulse LPC and Code excited linear prediction.

Module III

Speech Recognition - Speech recognition model, Distortion Measures for speech recognition : Log spectral Distance, Cepstral Distance and likelihood distance. Time alignment Normalization : Dynamic Time Warping.

HMM based speech recognizer - Definition of HMM, Formulation of speech recognition process using HMM.

References:

1. Thomas F. Quatieri: *Discrete Time Speech Signal Processing: Principles and Practice*, Pearson Education Asia.
2. L R Rabiner, R W Schafer : *Digital Processing of Speech Signals* , Prentice Hall Signal Processing Series, 1978.
3. J R Deller Jr, et al: *Discrete-Time Processing of Speech Signals*, IEEE Press, 2000.
4. Ben Gold, Nelson Morgan: *Speech and Audio Signal Processing*.
5. Douglas O'Shaughnessy, *Speech Communication : Human and Machine*, Universities Press, 2000.

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

(Minimum 60% problems, derivations and proof)

Assignment for Sessional marks shall be problems based on MATLAB / any other software packages covering the syllabus above.

08.616 ADAPTIVE SIGNAL PROCESSING (TA)

L-T-P : 2-1-0 **Credits: 3**

Module I

Linear optimum filtering and adaptive filtering, linear filter structures, adaptive equalization, noise cancellation and beam forming.

LMS algorithm and its applications, learning characteristics and convergence behavior, misadjustment, Normalized LMS and affine projection adaptive filters, Frequency domain block LMS algorithm.

Module II

Optimum linear combiner and Wiener-Hopf equations, orthogonality principle, minimum mean square error and error performance surface, Steepest – descent algorithm and its stability.

Least squares estimation problem and normal equations, projection operator, exponentially weighted RLS algorithm, convergence properties of RLSalgorithm; Kalman filter as the basis for RLS filter, Square-root adaptive filtering and QR- RLS algorithm, Systolic-array implementation of QR – RLS algorithm.

Module III

Forward and backward linear prediction - Levinson-Durbin algorithm, Lattice predictors, gradient-adaptive lattice filtering, least-squares lattice predictor, QR-decomposition based least-squares lattice filters.

Adaptive coding of speech. Adaptive equalization of wireless channels. Antenna array processing.

Text Books:

1. Haykin, S. *Adaptive Filter Theory*, Pearson Education. 2002.
2. Widrow, B.,Stearns, S.D.,*Adaptive Signal Processing*, Pearson Education
3. Manolakis,D.G,Ingle, V.K.,Kogon,M.S,*Statistical and Adaptive Signal Processing*, Artech House,2005.

Reference:

1. Sayed Ali, H., *Fundamentals of Adaptive Filtering*, John Wiley & Sons. 2003
2. Diniz, P.S.R., *Adaptive Filtering: Algorithms and Practical Implementation*, Kluwer.1997
3. Sayeed, Ali, H., *Adaptive Filters*, Wiley-IEEE Press. 2008.
4. Scharf, L.L., *Statistical Signal Processing: Detection, Estimation, and Time Series Analysis*, Addison- Wesley.1991.

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

(Minimum 60% Problem, derivation and Proof)

08.626 DIGITAL IMAGE PROCESSING (TA)

L-T-P : 2-1-0 **Credits: 3**

Module I

Digital Image Fundamentals: Two dimensional systems and Mathematical preliminaries-Elements of Digital Image Processing System - Structure of the human eye - Image formation and contrast sensitivity – Gray scale and Color Images-Sampling and Quantization - Neighbours of pixel – Distance measures – Image processing applications.

Image Transforms: Introduction to Fourier transform - Discrete Fourier transform - Properties of two dimensional FT – Separability, Translation, Periodicity, Rotation, Average Value – DFT,FFT,DCT, DST, Walsh, Hadamard, KL transforms and their properties.

Module II

Image Enhancement**:** Point Operations - Spatial domain methods - Frequency domain methods - Histogram Equalization technique - Neighbourhood averaging Median filtering - Low pass filtering Averaging of multiple Images - Image sharpening by differentiation - High pass filtering. Homomorphic filtering.

Image Restoration: Degradation model for continuous functions - Discrete formulation - Diagonalization of circulant and Block-circulant matrices - Effects of Diagonalization - Unconstrained and constrained Restorations - Inverse Filtering - Wiener Filter - Constrained least - square Restoration.

Module III

Image Compression: Coding and Interpixel redundancies - Fidelity criteria - Image Compressions models - Elements of Information theory - Variable length coding - Bit plane coding - Lossless Predictive coding - Lossy predictive coding - Transform coding techniques.

Image Segmentation and Representation: The detection of discontinuities - Point, Line and Edge detections - Gradient operators - combined detection - Thresholding - Representation schemes: chain codes - Polygon approximation - Boundary descriptors: Simple descriptors - Shape numbers Fourier descriptor's - Introduction to recognition and Interpretation.

Mathematical morphology - binary morphology, dilation, erosion, opening and closing, duality relations, gray scale morphology.

Text books:

1. Rafael C Gonzalez and Richard E.woods, "*Digital Image Processing*",**3/e**,Addition – Wesley.
2. Anil K Jain, "*Fundamentals of Digital Image Processing*", PHI, New Delhi, 1995
3. S Jayaraman,S Esakkirajan,T Veerakumar,"*Digital Image Processing*",TMH,2009

References:

1. Kenneth R Castleman, "*Digital Image Processing*", PHI, 1995.
2. William K Pratt, "*Digital Image Processing*", Wiley India 2/e.
3. Sid Ahmed M A, "*Image Processing Theory, Algorithm and Architectures*", McGraw-Hill, 1995.
4. Rafael C Gonzalez and Richard E.woods, "*Digital Image Processing Using MATLAB*", Addition - Wesley, 2004.
5. R.M. Haralick, and L.G. Shapiro, *Computer and Robot Vision*, Vol-1, Addison - Wesley, 1992.

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

(Minimum 60% Problems, derivations and proofs)

08.636 WAVELETS & APPLICATIONS (TA)

L-T-P : 2-1-0 **Credits: 3**

Module I

Fourier and Sampling Theory - Generalized Fourier theory, Fourier transform, Short-time(windowed) Fourier transform, Time-frequency analysis, Fundamental notions of the theory of sampling.

Theory of Frames - Bases, Resolution of unity, Definition of frames, Geometrical considerations and the general notion of a frame, Frame projector, Example – windowed Fourier frames.

Wavelets - The basic functions, Specifications, Admissibility conditions, Continuous wavelet transform (CWT), Discrete wavelet transform (DWT).

Module II

The multiresolution analysis (MRA) of L2(R) - The MRA axioms, Construction of an MRA from scaling functions - The dilation equation and the wavelet equation, Compactly supported orthonormal wavelet bases - Necessary and sufficient conditions for orthonormality.

Wavelet transform - Wavelet decomposition and reconstruction of functions in L2(R). Fast wavelet transform algorithms - Relation to filter banks, Wavelet packets.

Module III

Wavelet Transform Applications:
Image processing - Compression, Denoising, Edge detection and Object detection.
Audio - Perceptual coding of digital audio.
Wavelet applications in Channel coding.

References :

1.P. P. Vaidyanathan: *Multirate Systems & Filter Banks* , PTR, PH, 1993
2.Gilbert Strang : *Linear Algebra and its Applications*.
3.Reghuveer M Rao, Ajit S Bopardikar: *Wavelet Transforms – Introduction to Theory and Applications*, Pearson Education Asia, 1998.
4.Strang G S, T Q Nguyen: *Wavelets and Filter Banks*, Wellesley – Cambridge Press 1996.
5.Burrus C S, R A Gopinath and H. Gao: *Introduction to Wavelets and Wavelet Transforms: A Primer*, Prentice Hall, 1998.

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

(Minimum 60% problems, derivations and proof)

Assignment for Sessional marks shall be problems based on MATLAB / any other software packages covering the syllabus above.

08.646 DIGITAL SIGNAL PROCESSORS (TA)

L-T-P : 2-1-0 **Credits: 3**

Module I

Introduction to programmable digital signal processors: Multiplier and multiplier accumulator, Bus structure, multiple access memories, VLIW architecture , enhancing computational throughput - parallelism and pipelining, special addressing modes, on chip peripherals. Architecture of TMS320C5x: Bus structure, CALU, ARAU, registers, parallel logic unit, program controllers, flags, on chip memory, and peripherals.

Module II

Assembly language instructions: Assembly language syntax, addressing modes, load/store instructions, add, subtract, multiply, NORM and program control instructions. Instruction pipelining in C5x: pipeline structure, pipeline operation, program for familiarization of arithmetic instructions, programs for processing real time signals. Systolic architecture introduction-systolic array design- FIR systolic arrays- selection of scheduling vector- matrix multiplication and 2D systolic array design- systolic design for space representations containing delays.

Module III

Fast Convolution- cook toom algorithm and winogard algorithm. iterated convolution, cyclic convolution. Computer arithmetic- Signed Digit Numbers(SD) - Multiplier Adder Graph - Logarithmic and Residue Number System(LNS, RNS) - Index Multiplier -Architecture for Pipelined Adder, Modulo Adder & Distributed Arithmetic(DA), CORDIC Algorithm and Architecture. Square rooting-: digit recurrence algorithm.

References:

1. B.Venkataraman and M.Bhaskar, *Digital signal Processors, Architecture, programming and Applications*, TMH, New-Delhi.
2. Keshab K. Parhi, *VLSI Digital signal processing Systems: Design and Implementation*, John Wiley & Sons, 1999.
3. Digital Signal processing with FPGAs, U Mayer Baese, 2e, Springer
4. Synthesis of Arithmetic Circuit: FPGA ASIC and Embedded Systems, Jean Pierre Deschamps, etc, Wiley InterScience, 2006.
5. Texas Instruments TMSC5x ,*Users Manuals*.

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered. **(Minimum 25% Problems and algorithms)**

08.656 OPTIMIZATION TECHNIQUES (TA)

L-T-P : 2-1-0 **Credits: 3**

Module I

Unconstrained optimization - Necessary and sufficient conditions for local minima, One dimensional search methods, Gradient methods - Steepest descent, Inverse Hessian, Newton's method, Conjugate direction method, Conjugate gradient algorithm, Quasi Newton methods.

Module II

Linear Programming **: -** Convex polyhedra, Standard form of linear programming, Basic solutions, Simplex algorithm, Matrix form of the simplex algorithm, Duality, Non simplex methods : Khachiyan method, Karmarkar's method.

Module III

Nonlinear Constrained Optimization: - Equality constraints – Lagrange multipliers, Inequality constraints – Kuhn-Tucker conditions, Convex optimization, Geometric programming, Projected gradient methods, Penalty methods.

Genetic Algorithms - basics,design issues,convergence rate,Genetic Algorithm methods.

Text Books:

1. EDWIN K. P. CHONG, STANISLAW H. ZAK **,** *An Introduction to Optimization,***2/e**, John Wiley & Sons.
2. Stephen Boyd, Lieven Vandenberghe, *Convex Optimization*, CUP, 2004.
3. R. Fletcher, *Practical methods of Optimization*, **2/e**,Wiley, ,2003.

References:

1. Belegundu, *Optimization Concepts and Applications in Engineering*, Pearson Education, 2005.

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

(Minimum 60% Problems, derivations and proofs)

08.666 ELECTRONIC INSTRUMENTATION (T)

L-T-P : 2-1-0 **Credits: 3**

Module I

Errors in measurements, accuracy, precision, sensitivity, resolution of instruments

Transducers - classification – general input output configuration – static and dynamic characteristics. Resistance Transducers-Principles of operation, characteristics of resistance transducers, resistance potentiometer. Inductive Transducers-induction potentiometer, variable reluctance transducers, LVDT, eddy current transducers, synchros and resolver. Capacitive Transducers-variable air gap type, variable area type, variable permittivity type, capacitor micro phone.

Module II

Measurement of Displacement and Strain- Resistive, inductive and capacitive transducers for displacement. Wire, metal film and semiconductor strain gauges. Measurement of Force and Pressure-Column, ring and cantilever-beam type load cells. Elastic elements for pressure sensing - using displacement sensors and strain gauges with elastic elements. Measurement of Vibrations- Importance of vibration measurement, frequency range of vibrations. Absolute displacement, velocity and acceleration pick-ups; Mass-spring-damper system as absolute acceleration to relative displacement converter; Strain gauge and piezoelectric type acceleration pickups. Measurement of Speed and Torque- Electro-magnetic and photoelectric tachometers; Torque shaft, strain-gauge, electromagnetic and radio type torque meters.

Module III

Measurement of resistance, inductance and capacitance using bridges - Wheatstone, Kelvin and Maxwell bridges. Megger and Q meter. Electronic multimeter, Audio Power Meter, RF power meter, True RMS Meter.

The Cathode Ray Tube, Deflection amplifier, Resolution, Wave form display, Oscilloscope time - base, Dual trace oscilloscope, Dual beam and split beam. , Z axis modulation, oscilloscope probes.

Special oscilloscopes – Operation, controls and application of Analog storage, Sampling and Digital storage oscilloscopes. Power Scopes – working and its application. Principles of operation of TEM and SEM instruments. Spectrum analyser

Text Books:

1. Murthy D. V. S, "*Transducers and Instrumentation*", PHI, 1995.
2. Ernest Doebelin, *Measurement Systems*, **5/e**, McGraw Hill
3. Helfrick & Cooper, *Modern Electronic Instrumentation and Measurement Techniques*, PHI,2008.
4. D.A.Bell, *Electronic Instrumentation and Measurements*, PHI, 2003.

Reference:

1. D. Patranabis, *Principles of Electronic Instrumentation*, PHI, 2008.
2. Clyde F Coombs, Jr., *Electronic Instrument Hand book*, **3/e**, 1999, Mc Graw Hill.
3. Joseph J. Carr, *Elements of Electronic Instrumentation and Measurements*, **3/e**, Pearson Education.
4. Anand M. M. S.,*Electronic Instruments and Instrumentation Technology*,PHI.2008.
5. Johnson C. D., *Process Control Instrumentation Technology*, **8/e**, PHI,2008

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

08.607 MICROCONTROLLER LAB (TA)

L-T- : 0-0-4 **Credits: 4**

A. **Programming experiments using 8051 Trainer Kit**.

1. Addition and Subtraction of 16 bit numbers.
2. Multiplication and division of 8 bit numbers.
3. Sorting, Factorial of a number.
4. Multiplication by shift and add method.
5. LCM and HCF of two 8 bit numbers
6. Matrix addition
7. Square, Square root, Fibonacci series.

B. Interfacing experiments

1. DAC interface.
2. Stepper motor interface.
3. Display interface.
4. Realization of Boolean expression using port.
5. Frequency measurement by counting the number of pulses in a fixed amount of time.
6. Frequency measurement by measuring the time period between two consecutive pulses.
7. Waveform generation using lookup tables.
8. PWM generation.
9. Interfacing with 8-bit ADC.

Note: For University examination, the following guidelines should be followed regarding award of marks:
(Questions for each batch should be selected equally from part A and B)

(a) Circuit and design - 20%
(b) Implementation(Usage of Kits and trouble shooting) - 15%
(c) Result - 35%
(d) Viva voce - 25%
(e) Record - 05%

Practical examination to be conducted covering entire syllabus given above.
Students shall be allowed for the University examination only on submitting the duly certified record. The external examiner shall endorse the record.

08.608 ELECTRONIC PRODUCT DESIGN & MINI PROJECT (TA)

L-T-P : 1-0-3 **Credits: 4**

This course includes both theory and practical works

I.THEORY

Theory classes are to be conducted 1 hour/week, based on the following syllabus:

DESIGN (Theory only)

Definition of a product, Product Classification, New Product development process. Product design methodology, Product planning, data collection. Creativity techniques. Elements of aesthetics. Ergonomics. Control panel organization. Electronic systems and needs. Physical integration of circuits, packages, boards and full electronic systems. Introduction to reliability, Reliability considerations in electronic products, Effect of reliability on product design and pricing. EMI and RFI studies. Restriction of Hazardous Substances (RoHS) compliance.

Text Books:

1. Kevin Otto and Kristin Wood, "*Product Design*", Pearson Education, 2003.
2. Flurschiem CH: *Industrial Design and Engg.*, Design Council, London and Springer Verlag, 1983
3. Web based Current literature, IEEE Press 1999.
4. Ernest J Mccormick: *Human Factors in Engg. And Design*, McGraw Hill Co. Ed.

II. PRACTICAL

A) COMPUTER AIDED PCB DESIGN & ASSEMBLING

One hour per week is allotted for Computer Aided PCB Design & Assembling.

Following Circuits are to be used for the above purpose (Minimum one circuit from each category should be done)

1. Discrete component circuits.
2. Timer ICs based circuits.
3. Op-Amp ICs based circuits.
4. Digital ICs based circuits.
5. Microcontroller based circuits.
6. Combination of the above**.**

B) MINIPROJECT

For Miniproject, 2 hours/week is allotted.

Each student should conceive, design develop and realize an electronic product. The basic elements of product design - the function ergonomics and aesthetics - should be considered while conceiving and designing the product. The electronic part of the product should be an application of the analog & digital systems covered up to the 6^{th} semester. The realization of the product should include design and fabrication of PCB. The student should submit a soft bound report at the end of the semester. The product should be demonstrated at the time of examination.

Internal Evaluation & Marks

Total internal marks is 50**.**

An end semester written examination is to be conducted based on the Theory part (Design), with two hour duration for 25 Marks. Remaining 25 marks is to be awarded for the Mini project, after evaluation at the end of the semester**.**

University Examination & Marks

Total external marks are 100**.**

Practical examination will be conducted for Computer Aided PCB Design (1 1/2 hour) & PCB Assembling (1 1/2 hour). The miniproject will also be evaluated during the practical examination.

One of the following custom made PCB may be used for the University examination.

1. Water Level Controller.
2. Water Level Indicator.
3. Musical Burglar Alarm.
4. Light Dimmer.
5. Heat Sensor.
6. FM Transmitter.
7. Dancing Light.
8. Audio Level Indicator.
9. Clap Switch/Sound Operated Switch.
10. Touch Sensitive Switch.
11. Audio Power Amplifier.
12. Regulated Power Supply (Rectifier-Filter-Regulator)
13. Count Down Timer.
14. Digital Clock.
15. Musical Door Bell.

Note: For University examination, the following guidelines should be followed regarding award of marks

(a) PCB Design (any given circuit using CAD software)	- 20%
(b) PCB assembling of the given circuit on a single sided given PCB	- 10%
(c) Result/working of the assembled circuit	- 15%
(d) Evaluation of the finished Mini project done by the student	- 20%
(e) Viva voce (Based only on the Mini Project done by the student)	- 25%
(f) Record & Report	- (5+5)%

Students shall be allowed for the University examination only on submitting the duly certified record and the mini project report (Soft bounded). The external examiner shall endorse them.

Syllabus VII Semester

08.701 Industrial Management (TA)

L-T-P : 2-1-0 **Credits: 3**

Module I

Evolution of Scientific Management and industrial Engineering. Functions of Management- Brief description of each function . System concept. Types of organization structures - Types of companies and their formation. Personal Management – Objectives and functions – Recruitment, Selection, Training and Induction concepts and Techniques.

Cost concept - Break even analysis (simple problems). Depreciation - Methods of calculating depreciation. Introduction to reliability. Reliability of electronic components

Module II

Facilities Planning- Factors to be considered in site selection, plant layout- types of layout, layout planning- systematic layout planning, computerized planning techniques.

Introduction to Material Handling Principles, equipments and their selection

Work study – methods study and Time measurement, Steps in method improvement – use of charts and diagrams. Performance rating and Methods- Types of allowances, computation of basic time and standard time. Wages and incentives -system of wage incentive plans. Job evaluation and Merit rating.

Module III

Fatigue and methods of eliminating fatigue- industrial relations - Industrial disputes- collective bargaining – Trade unions- workers participation in management in Indian context.

Labour welfare and social security- Industrial safety – Methods and Techniques.

Production Planning and Control - functions and Objectives- job, batch, mass and continuous production – Inventory control- Determination of EOQ-selective inventory control techniques.

Quality Engineering :– Quality Control- Quality Vs Cost concept, Control chart for variables and attributes- Introduction to Six Sigma- Introduction to ISO, Total Quality Management, Quality information system, Bench marking and Quality circles

Introduction to Marketing and its Environment- different concepts- marketing mix-Product Life Cycle.

References:

1 M.A.Shahaf,*Management Accounting Principles & Practices* ,Vikas publications Pvt.
2. Grant and levenworth ,*Statistical Quality Control*, TMH.
3. Krafewsk, *Operations Management* , Pearson Education 6th Edn.
4. *Introduction to Work Study*- ILO
5. Besterfield, *Total Quality management* , Peaarson Education
6. Richard L. Francis & John .A. White, *Facility Layout & Location* , Prentice Hall
7. Kotler,*Marketing Management* ,Pearson Education
8. Roger G. Schroedu, *Operations Management* , McGraw Hill
9. Monappa , *Industrial Relations*, TMH
10. Stephen P Robbins, David A. Deceyo, *Fundamentals of Management* ,Pearson Education

University Examination

Question Paper consists of two parts. Part A-10 compulsory short answer questions for 4 marks each, covering the entire syllabus (10 x 4=40). Part B-2 questions of 20 marks each, from each module and student has to answer one from each module (3 x 20=60)

Note: 08.701 shall be handled by faculty of Mechanical Dept.

08.702 OPTICAL COMMUNICATION (T)

L-T-P : 3-1-0 **Credits: 4**

Module I

Classification of Light wave systems. Fibers- types and refractive index profiles, Mode theory of fibers- modes in SI and GI fibers. Impairments in fibers. Dispersion- Group Velocity Dispersion, modal, wave guide and Polarization Mode Dispersion. Attenuation- absorption, bending and scattering losses. Fabrication of fibers, fiber cables.

Optical sources: LEDs and LDs, Structures, Characteristics, Modulators using LEDs and LDs. Coupling with fibers. Noise in Laser diodes, Relative Intensity Noise (RIN), Phase noise and Amplified Spontaneous Emission (ASE) noise. Effects of Laser diode nonlinearity and noise in fiber communications.

Optical detectors:- types and characteristics- structure and working of PIN and APD. Noise in detectors and comparison of performance.

Module II

Optical receivers- Ideal photo receiver and quantum limit of detection. The effects of noise. Types of pre-amplifiers.

Digital transmission systems- Design of IMDD links- power and rise time budgets, effects of noise.

Optical Amplifiers- comparison of different types- doped fiber amplifiers- EDFA- basic theory, structure and working. Noise in EDFA.

Coherent Systems: Sensitivity of a coherent receiver – ASK, FSK and PSK systems- comparison with IMDD systems. Optical Time Domain Reflectometer – fault detection, length and refractive index measurements.

Module III

Multi-Giga bit systems—The WDM concept and components, Couplers, Add/ Drop Multiplexers, gratings, wavelength tunable sources, the challenges in DWDM.

Soliton based systems: Introduction to soliton theory – soliton lasers- soilton links using lumped EDFA repeaters. GH effect and dispersive radiations- Soliton-soliton interaction-amplifier gain fluctuations- gain stabilization methods- design of soliton based links – Bit Error Rate performance.

Introduction to Light Wave Networks.

Text Books:

Gerd Keiser: *Optical Fiber Communications*,**4/e**,TMH, 2008.

Govind P Agarwal:*Fiber Optic Communication systems 3 ed*- WileyIndia, 2008.

References:

1. Joseph C. Palais – *Fiber Optic Communications*,5/e Pearson Education, 2008.
2. John M Senior- *Optical communications*, **2/e**, PHI.
3. Harold Kolimbiris- *Fiber Optics Communications* – Pearson Education.

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

(Minimum 25% Problem, derivation and Proof)

08.703 MICROWAVE ENGINEERING (T)

L-T-P : 3-1-0 **Credits: 4**

Module I

Cavity Resonators - Rectangular and Circular wave guide resonators- Derivation of resonance frequency of Rectangular cavity. Klystrons - Re-entrant cavities, Velocity modulation, Bunching (including analysis), Output power and beam loading, Reflex Klystron, Derivation of Power output, efficiency and admittance. Traveling wave tubes – Slow wave structures, Helix TWT, Amplification process, Derivation of convection current, axial electric field, wave modes and gain.

Module II

Magnetron oscillators – Cylindrical magnetron, Cyclotron angular frequency, Power output and efficiency.

Solid state microwave devices – Microwave bipolar transistors – Physical structures, Power-frequency limitations. Physical structure of Hetrojunction bipolar transistors and high frequency equivalent circuit. Principle of Tunnel diodes and tunnel diode oscillators. Gunn diodes – Different modes. Principle of operation Gunn Diode Oscillators and Amplifiers. MESFET – VI Characteristics and high frequency equivalent circuit. Common source amplifier using MESFET. PIN diode characteristics, and applications.

Module III

Microwave hybrid circuits – Waveguide tees, Magic tees, Hybrid rings, Corners, Bends, Twists. Formulation of S-matrix. Directional couplers – Two hole directional couplers, S-matrix of a directional coupler. Circulators and isolators. Measurement of Microwave power, Frequency and Impedance.

Microwave Communication – Advantages – Analog and digital microwave – FM microwave radio system, Repeaters, Diversity reception, Protection Switching arrangements, FM microwave radio stations, Path characteristics, System gain.

Text Books:

1. Samuel Y. Liao: *Microwave Devices and Circuits,* **3/e**, Pearson Education.
2. Robert E. Collin: *Foundation of Microwave Engineering,* 2/e,Wiley India.
3. Wayne Tomasi: *Advanced Electronic Communication Systems,* **6/e.**PHI.

References:

1. David M Pozar : *Microwave Engineering*,**3/e**, Wiley India
2. Ludwig, Reinhold, *RF circuit design Theory and Application*, Prentice Hall, 2000.

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered. **(Minimum 50% Problems, derivations and proofs)**

08. 704 INFORMATION THEORY AND CODING (T)

L-T-P : 3-1-0 **Credits: 4**

Module I

Introduction to Information Theory. Concept of amount of information, units – entropy, marginal, conditional and joint entropies – relation among entropies – mutual information, information rate. Source coding: Instantaneous codes – construction of instantaneous codes – Kraft's inequality, coding efficiency and redundancy, Noiseless coding theorem – construction of basic source codes – Shannon – Fano Algorithm, Huffman coding, Channel capacity – redundancy and efficiency of a channel, binary symmetric channel (BSC), Binary erasure channel (BEC) – capacity of band limited Gaussian channels, Shannon – Hartley theorem – bandwidth – SNR trade off – capacity of a channel of infinite bandwidth, Shannon's limit

Module II

Introduction to rings , fields, and Galois fields. Codes for error detection and correction – parity check coding – linear block codes – error detecting and correcting capabilities – generator and parity check matrices – Standard array and syndrome decoding – perfect codes, Hamming codes – encoding and decoding, cyclic codes – polynomial and matrix descriptions – generation of cyclic codes, decoding of cyclic codes, BCH codes – description and decoding, Reed – Solomon Codes, Burst error correction.

Module III

Convolutional Codes – encoding – time and frequency domain approaches, State Tree & Trellis diagrams – transfer function and minimum free distance – Maximum likelihood decoding of convolutional codes – The Viterbi Algorithm. Sequential decoding,. Cryptography : Secret key cryptography, block and stream ciphers. DES, Public key cryptography.

Text Books:

1. P.S.Sathya Narayana: *Concepts of Information Theory & Coding* , Dynaram Publications,2005
2. Ranjan Bose: *Information Theory, Coding and Cryptography*, **2/e**,TMH, New Delhi
3. Shu Lin & Daniel J. Costello.Jr., *Error Control Coding : Fundamentals and Applications*, **2/e**,Prentice Hall Inc.,Englewood Cliffs, NJ.

References:

1. D.E.R. Denning, *Cryptography and Data Security*, Addison Wesley, 1983.
2. David J.C Mackay, *Information Theory, Inference and Learning Algorithms*, Cambridge,2005.
3. Paul Garrett, *The mathematics of Coding Theory*, Prentice Hall, 2004.
4. Das Mullick Chatterjee, *Principles of Digital communication* , Wiley Eastern Ltd.
5. Simon Haykin, *Communication Systems*,**4/e**, John Wiley & Sons Pvt. Ltd

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

(Minimum 50% Problems, derivations and proofs)

08.705 REAL TIME OPERATING SYSTEMS (TA)

L-T-P : 2-1-0 **Credits: 3**

MODULE I

Introduction to Operating system-:Kernel, Process- states and transition- manipulation of process and address space, creation and termination, signals, process scheduling. memory management

Interrupts: interrupt sources and handlers- saving and restoring the content, disabling interrupt, the shared data problem- shared data bug- atomic and critical section- interrupt latency.

Structure of real time systems: task classes, time systems and classes, performance measures.

MODULE II

RTOS: tasks, threads and process- reentrancy- reentrancy rules- RTOS semaphores-semaphore initialization-semaphore reentrancy, multiple semaphore

RTOS services: message queue- mailboxes and pipes - time function -events -memory management - interrupt routine in RTOS.

Design using RTOs: design principles- short interrupt routines- RTOS tasks- tasks for priority- tasks for encapsulation - creating and destroying of tasks.

Scheduling- Rate monitoring Scheduling- Deadline monitoring scheduling. Aperiodic Task Scheduling: Non-preemptive methods (EDD, LDF), Preemptive methods (EDF, EDF). Periodic Task Scheduling: Static priority assignments (RM, DM), Dynamic priority assignments (EDF, EDF*)

MODULE III

Real time kernels- issues in real time kernel-Structure of a real-time kernel-Process states -Data structures-Kernel primitives -Inter-task communication mechanisms -System overhead.

Case study of(Kernel design, threads and task scheduling) RTOS: QNX Nutrino2 and MicroC/OS-II real time operating systems.

Text Books:

1. Abraham Silberschatz, "Operating System Concepts", John wiley Pub, 7e
2. Giorgio C. Buttazzo, "HARD REAL-TIME COMPUTING SYSTEMS Predictable Scheduling Algorithms and Applications", Kluwer Academic Publishers.
3. Jean J Labrosse, "MicroC/OS-II, The Real-Time Kernel", 1998, CMP Books.

Reference:

1. Robert Krten, "Getting started with QNX Neutrino" ,1999, Parse Software Devices.
2. Krishna CM, Kang Singh G, "Real time systems", Tata McGrawHill, 2003.

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

08.715 CRYPTOGRAPHY(TA)

L-T-P: 2-1-0 **Credits: 3**

Module I

Introduction to cryptology- stream and block ciphers- secret and public key cryptography.

Mathematical Proof Methods: direct, indirect, by cases, contrapositive, contradiction, induction, existence.

Introduction to Complexity of Algorithm- P, NP, NP-Complete classes.

Number theory- primes, divisibility, liner diaphantine equations, congruences, system of linear congruences, Wilson theorem, Fermat's little theorem, Euler's theorem. Multiplicative functions, Primitive roots, Quadratic congruences- quadratic residues, Legrende symbol.

Review of algebraic structures -groups, rings, finite fields, polynomial rings over finite field.

Module II

Affine cipher, Hill cipher, Enciphering matrices.

Public key cryptography- One way functions- RSA - Discrete Log- Deffie-Helman Key Exchange system, Digital signature standards. Knapsack Crypto system - Zero-knowledge protocols.

Module III

Primality testing- pseudo primes- the rho method. Elliptic curves and elliptic curve cryptosystems. Data Encryption standard(DES), Advanced Encryption standard (AES).

Cryptanalysis methods- linear, differential, higher order differential, quadratic. Factoring Algorithms- Trial Division, Dixon's Algorithm, Quadratic Sieve.

Reference:

1. Neal Koblitz: *A Course in Number Theory and Cryptography*, **2/e**, Springer.
2. Thomas Koshy: *Elementary Number Theory with Applications*, Elsevier India, 2e.
3. Menezes A, et.al.: *Handbook of Applied Cryptography*, CRC Press, 1996.

Reading:

1. MR Schroeder: *Number Theory in Science and Communication*, **4/e**, Springer.
2. Niven, Zuckerman: *An Introduction to Theory of Numbers*, Wiley InterScience.
3. Mark Stamp, Richard M Low: *Applied Cryptanalysis- Breaking Ciphers in the Real World*, Wiley InterScience.
4. Mao*: Modern Cryptography*, Pearson Education.
5. Victor Shoup: *A Computational Introduction to Number Theory and Algebra*, Cambridge University Press.

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

(Minimum 60% Problem, derivation, algorithms and Proof)

08.725 PATTERN RECOGNITION (TA)

L-T-P : 2-1-0 **Credits: 3**

Module I

Basics of pattern recognition. Bayesian decision theory- Classifiers, Discriminant functions, Decision surfaces, Normal density and discriminant functions, Discrete features. Parameter estimation methods - Maximum-Likelihood estimation, Gaussian mixture models, Expectation-maximization method, Bayesian estimation.

Module II

Hidden Markov models for sequential pattern classification - Discrete hidden Markov models, Continuous density hidden Markov models. Dimension reduction methods, Fisher discriminant analysis,

Principal component analysis.

Non-parametric techniques for density estimation - Parzen-window method, K-Nearest Neighbour method.

Module III

Linear discriminant function based classifiers – Perceptron, Support vector machines.

Non-metric methods for pattern classification - Non-numeric data or nominal data, Decision trees, Cluster validation.

Unsupervised learning and clustering - Criterion functions for clustering, Algorithms for clustering: K-means, Hierarchical and other methods.

Text Books:

1. R.O.Duda, P.E.Hart and D.G.Stork, *Pattern Classification*, John Wiley, 2001
2. S.Theodoridis and K.Koutroumbas, *Pattern Recognition*, **4/e**, Academic Press, 2009
3. C.M.Bishop, *Pattern Recognition and Machine Learning*, Springer, 2006

References:

1. K. R. Castleman, *Digital Image Processing* , Prentice Hall of India, 1996.
2. W.Chou B.H. Juang (Eds.),*Pattern Recognition in Speech and Language Processing* , CRC Press, 2003.
3. J.I.Tou & R.C.Gonzalez, *Pattern Recognition Priciples*, Addition –Wesley.
4. R.Schalkoff, *Pattern Recognition –Statistical, Structural and Neural Approaches*, John Wiley, 1992.

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

(Minimum 60% Problem, derivation, Proof and algorithms)

08.735 OPTOELECTRONIC DEVICES (TA)

L-T-P : 2-1-0 **Credits: 3**

Module I

Optical processes in semiconductors, EHP formation and recombination, absorption and radiation in semiconductor, deep level transitions, Auger recombination, luminescence and time resolved photoluminescence, optical properties of photonic band-gap materials. Measurement of optical properties

Junction photodiode: PIN, heterojunction and avalanche photodiode. Comparisons of various photo detectors, High speed measurements. Beam optics-Gaussian beam, properties, beam quality. Transmission through optical components

Module II

Photovoltaic effect, V-I characteristics and spectral response of solar cells, heterojunction and cascaded solar cells, Schottky barrier and thin film solar cells, design of solar cell.

Modulated barrier, MS and MSM photodiodes; Wavelength selective detection, coherent detection; Micro cavity photodiode.

Electroluminescent process, choice of light emitting diode (LED) material, device configuration and efficiency; LED: Principle of operation, LED structure, frequency response, defects, and reliability. Principle of Optoelectronic modulators, electro optic modulator,acousto-optic modulators. Application area

Module III

LASER – Emission and absorption of radiation in a two-level system, Einstein's Relations and Population Inversion, Gain in a two-level Lasing medium, Lasing condition and gain in a semiconductor, Selective Amplification and Coherence, Line-shape function and line-broadening mechanism, Lasing threshold condition in a two level system, Axial and Transverse Laser modes.

Junction Laser - Operating principle, threshold current, heterojunction lasers, DFB laser, Cleaved Coupled Cavity laser, Quantum Well lasers, Surface emitting lasers, Rare-earth doped lasers, Alternate Pumping techniques. Mode Locking of semiconductor lasers, Tunneling Based lasers , FP lasers

References

1.Pallab Bhattacharya: *Semiconductor Optoelctronic devices* ,**2/e**, PHI.

2,John.M.Senior: *Optical Fiber Communications – Principles and Practice*, **2/e**, PHI.

3.S.C Gupta: *Optoelectronic Devices and Systems*, PHI,2008

4.Khare, *Fiber optics and Optoelectronics*,Oxford University press,2006

5.Saleh and Teich, *Fundamentals Of Photonics*,Wiley interscience,2007

6.Simmon and Potter, *Optical materials*, Elsevier,2006

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

(Minimum 50% problems, derivations and proof)

08.745 COMPUTER VISION (TA)

L-T-P : 2-1-0 **Credits: 3**

Module I

Introduction- The Marr paradigm and scene reconstruction, Other paradigms for image analysis.
Image Formation- Monocular imaging system, Orthographic & Perspective Projection, Camera model and Camera calibration, Binocular imaging systems, Image Digitization.
Binary Image Analysis and Segmentation- Properties, Digital geometry, Segmentation.

Module II

Image Processing for Feature Detection and Image Synthesis- Image representations in continuous and discrete form, Edge detection, corner detection, Line and curve detection, SIFT operator, Image-based modeling and rendering, Mosaics, snakes, Fourier and wavelet descriptors, Multiresolution analysis.
Shape from X - Shape from shading, Photometric stereo, Texture, Occluding contour detection.

Module III

Motion Analysis- Regularization theory, Optical computation, Stereo Vision, Motion estimation, Structure from motion.
Object Recognition- Hough transforms and other simple object recognition methods, Shape correspondence and shape matching, Principal component analysis, Shape priors for recognition.

Text Book:

David. A. Forsyth and J. Ponce, *Computer Vision: A Modern Approach* , Prentice Hall, 2003.

References:

1. B. K. P. Horn, *Robot Vision*, MIT Press, 1986.
2. Linda Shapiro and George Stockman, *Computer Vision*, Prentice Hall, 2001
3. R. Jain, R. Kasturi and B. Schunk, *Machine Vision*, McGraw Hill, 1995
4. E. Trucco and A. Verri, *Introductory Techniques for 3D Computer Vision*, Prentice Hall.
5. Adrian Low, *Introductory Computer Vision, Imaging Techniques and Solutions*,**2/e**,BSP,India.

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.
(Minimum 60% Problem, derivation and Proof)

08.755 CDMA SYSTEMS (T)

L-T-P : 2-1-0 **Credits: 3**

MODULE I

Introduction to CDMA, Direct Sequence(DS)- Frequency Hopped(FH)- Pulse Position Hopped(PH) Spread Spectrum(SS) Communication. Modulation Schemes for SS, Generation of -DS SS and FH SS Signals. Orthogonal and Quasi-Orthogonal expansion of SS signals.

Reception of SS signals in AWGN channel-. Coherent Reception of DS CDMA (uplink and downlink) and FH SS signals.

MODULE II

Forward Error Control Coding in SS systems. Non coherent Reception of encoded DS CDMA Systems. convolutional coding in DS CDMA, orthogonal convolutional coding. Coding in FH CDMA Systems

Pseudo Signal Generation- Pseudorandom sequences- ML Linear shift register- Randomness property. Generation of pseudorandom signals from pseudorandom sequences.

Synchronisation of Pseudorandom signals, acquisition process. Shannon Capacity of DS CDMA , FH CDMA Systems.

MODULE III

CDMA Networks- hand off strategy, Power control, erlang capacity of CDMA Sysetm.Interference Cancellation -SIC and PIC

Multiuser Detection: Single user matched filter- hypothesis testing- optimal receiver- matched filter in CDMA Channel, Coherent single user matched filter in Rayleigh fading channel. Optimum detector for synchronous channels- (Two-user and K-user) and asynchronous channel. Decorrelating Detector (DD)- DD in synchronous and asynchronous channels. . Non Decorrelating linear multiuser detection- optimum linear multiuser detection. MMSE Linear multiuser detection.

Text Books:

1 . Kamil Sh Zigangirov,*Theory of Code Division Multiple Access Communication*, IEEE Press, Wiley InterScience , 2004

2. Sergio Verdu, *Multiuser Detection*, Cambridge Universty Press, 1998.

Reference:

1. Samuel C Yang, *CDMA RF Syetsm Engineering*, 1998, Arect house Inc,

2. Don Torrieri, *Principles of Spread Spectrum Communication Systems*, Springer 2005

3. Andrew J Viterbi, *CDMA: Priciples of spread Sprectrum Communication*, Addisson Wisley, 1996

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

(Minimum 40% Problem, derivation and Proof)

08.706 MIXED SIGNAL CIRCUIT DESIGN (TA)

L-T-P : 2-1-0 **Credits: 3**

Module I

Analog and digital MOSFET models. CMOS inverter – DC characteristics – switching characteristics, Static logic gates- NAND and NOR gates- DC and Switching characteristics-pass transistor and transmission gate logic.

Module II

Differential Amplifiers-CMRR-Cascode differential amplifier- Two stage CMOS Op- Amps-Frequency compensation of opamps-miller compensation. Two stage open loop comparator-propagation delay, High speed comparators- Analog multiplier.

Module III

Dynamic analog circuits – charge injection and capacitive feed through in MOS switch – sample and hold circuits- Design of Switched capacitor circuits – First order switched capacitor circuits, capacitor filters- Design of PLL, Sense amplifiers, DAC, ADC – High speed ADC, Over sampling ADC

Text Book:

1. Baker, Li, Boyce, *CMOS: Circuits Design, Layout and Simulation*, Prentice Hall India, 2000
2. Phillip E. Allen, Douglas R. Holbery, *CMOS Analog Circuit Design* , Oxford, 2004

Reference:

1. Razavi B., *Design of Analog CMOS Integrated Circuits*, Mc G Hill, 2001.

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

(Minimum 75% Design, Analysis and Problems)

08- 716 EMBEDDED SYSTEMS (TA)

L-T-P : 2-1-0 **Credits: 3**

Module I

Introduction to Embedded Systems

Definition and Classification – Overview of Processors and hardware units in an embedded system – Software embedded into the system – Exemplary Embedded Systems – Embedded Systems on a Chip (SoC) and the use of VLSI designed circuits

I/O Devices - Device I/O Types and Examples – Synchronous - Iso-synchronous and Asynchronous Communications from Serial Devices - Examples of Internal Serial-Communication Devices - UART and HDLC - Parallel Port Devices - Sophisticated interfacing features in Devices/Ports- Timer and Counting

Devices - '12C', 'USB', 'CAN' and advanced I/O Serial high speed buses- ISA, PCI, PCI-X.

Module 2

Programming concepts of Embedded programming in C Program Elements, Macros and functions - Use of Pointers - NULL Pointers - Use of Function Calls – Multiple function calls in a Cyclic Order in the Main Function Pointers – Function Queues and Interrupt Service Routines Queues Pointers – Concepts of embedded programming in C++ – Cross compiler – Optimization of memory codes.

Real time operating systems Definitions of process, tasks and threads – Clear cut distinction between functions – ISRs and tasks by their characteristics – Operating System Services- Goals – Structures- Kernel - Process Management – Memory Management – Device Management – File System Organisation and Implementation

Module 3

I/O Subsystems – Interrupt Routines Handling in RTOS, RTOS Task scheduling models - Handling of task scheduling and latency and deadlines as performance metrics – Co-operative Round Robin Scheduling – Cyclic Scheduling with Time Slicing (Rate Monotonics Co-operative Scheduling) – Preemptive Scheduling Model strategy by a Scheduler - Inter Process Communication and Synchronisation – Shared data problem – Use of Semaphore(s) – Priority Inversion Problem and Deadlock Situations – Inter Process Communications using Signals – Semaphore Flag or mutex as Resource key – Message Queues – Mailboxes – Pipes – Virtual (Logical) Sockets – Remote Procedure Calls (RPCs).

Study of Micro C/OS-II or Vx Works or Any other popular RTOS – RTOS System Level Functions – Task Service Functions – Time Delay Functions – Memory Allocation Related Functions – Semaphore Related Functions .

REFERENCES

1. Rajkamal, *Embedded Systems Architecture, Programming and Design*, TATA McGraw-Hill, First reprint Oct. 2003

2.Steve Heath, *Embedded Systems Design*, Second Edition-2003, Newnes,

3.David E.Simon, An *Embedded Software Primer*, Pearson Education Asia, First Indian Reprint 2000.

4.Wayne Wolf, *Computers as Components: Principles of Embedded Computing System Design – Harcourt India*, Morgan Kaufman Publishers, First Indian Reprint 2001

5.Frank Vahid and Tony Givargis, *Embedded Systems Design – A unified Hardware / Software Introduction*, John Wiley, 2002.

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

08.726 INTELLECTUAL PROPERTY RIGHTS (TA)

L-T-P : 2-1-0 **Credits: 3**

Module 1

Intellectual property rights-Introduction, importance, need of IPR, forms of IPR-Trade mark, Patent, Copyright, Design, Semiconductor IC layout design, geographical indication of goods.
Trademarks-Introduction, condition and procedure for registration, rights and limitations of registration ,infringement of trade mark, remedies against infringement, offences and penalties.

Module 2

Patents- Meaning and purpose of patent , advantage of patent to inventor, invention not patentable, application for patent, provision for secrecy of certain inventions , grant of Patent ,rights of patent holder, infringement of patent, offences and penalties, international arrangements.
Copyrights- introduction, meaning of copyrights ownership, rights of owner, subject matter of copyrights, international copyrights, infringement, offences and penalties.
Industrial design- Introduction, registration of design, copyrights in registered design
Industrial and international exhibitions.

Module 3

Semiconductor IC layout design- Introduction, condition and procedure for registration,
Effects of registration, offences and penalties.
IT related IPR-Computer software and IPR, database and protection, domain name protection.
International treaties- Introduction, TRIPS, PCT, WIPO, EPO, WTO, introduction to dispute settlement procedure, Indian position in global IPR structure.

References

1.N.K.Acharya, *Text book on Intellectual property rights* ,Asia Law House,Hyderabad
2 Ganguli, *Intellectual property rights*, TMH,Delhi
3 Bare acts of (i)The Trade marks act1999 (ii) The patents acts 1970 (iii)The copyright act 1957 (iv) Design act 2000(v)The semiconductor IC layout design act 2000

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

08.736 MEMS (TA)

L-T-P : 2-1-0 **Credits: 3**

Module I

MEMS and Microsystems – Applications – Multidisciplinary nature of MEMS – principles and examples of Micro sensors and micro actuators – micro accelerometer - meters Micro grippers – micro motors - micro valves – micro pumps – Shape Memory Alloys.

Scaling laws in miniaturization - scaling in geometry, scaling in rigid body dynamics, the trimmer force scaling vector, scaling in electrostatic and electromagnetic forces, scaling in electricity and fluidic dynamics, scaling in heat conducting and heat convection.

Module II

Micro System fabrication – photo lithography – Ion implantation- Diffusion – Oxidation – Chemical vapour deposition – Etching- Overview of Micro manufacturing – Bulk micro manufacturing – Surface micro machining – LIGA process – Materials for MEMS – silicon – silicon compounds – silicon piezo resistors – GaAs – polymers.

Module III

Microsystem Design - Design considerations – Selection of signal transduction – Process design – Design of a silicon die for a micro pressure sensor – Microsystem packaging - three levels of micro system packaging – interfaces in micro system packaging – Signal mapping and transduction – RF MEMS and optical MEMS components.

Text book:

1. Tai-Ran Hsu, *MEMS and Microsystems Design and Manufacture*, TMH, 2002.

References:

1. Mark Madou, *"Fundamentals of Micro fabrication"*, CRC Press, New York, 1997.
2. Julian W Gardner, *"Microsensors: Principles and Applications"*, John Wiley & Sons, 1994
3. Sze S M, *"Semiconductor Sensors"*, McGraw-Hill, New Delhi, 1994.
4. Chang C Y and Sze S M, *"VLSI Technology"*, McGraw-Hill, New York, 2000.

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

08.746 LOW POWER VLSI DESIGN (TA)

L-T-P : 2-1-0 **Credits: 3**

Module I

Introduction- Need for low power VLSI chips, Sources of power dissipation, Dynamic power dissipation, Charging and discharging of capacitance, Short circuit current in CMOS circuits, CMOS leakage current, Static current.

Power analysis - Gate-Level, Architecture level and Data correlation analysis. Monte Carlo Simulation. Probabilistic power analysis.

Low voltage CMOS VLSI technology - BiCMOS and SOI CMOS technology.

Module II

Power reduction at the circuit level -Transistor and gate sizing, Equivalent pin ordering, Network restructuring and reorganization, Special latches and Flip Flops, Low power digital cell library, Adjustable device threshold voltage-Low voltage circuits-voltage scaling-sub threshold operation of MOSFETs.

Power reduction at the logic level - Gate reorganization, Signal gating, Logic encoding, State machine encoding, Precomputation logic.

Module III

Power reduction at the architecture and system level - Power and performance management, Switching activity reduction, Parallel architecture with voltage reduction, Flow graph transformation. Low power SRAM architectures. Software design for low power architecture. Recent trends in low-power design for mobile and embedded application.

Text books:

1. Gary K Yeap, Practical Low Power Digital VLSI Design, Kluwer academic publishers,1998.
2. Kaushik Roy, Sharat Prasad, *Low-Power CMOS VLSI design*, John Wiley & Sons, 2000.

References:

1. Anantha P Chandrakasan, Robert W Brodersen,*Low Power Digital CMOS Design*, Kluwer Academic Publications,1995.
2. Kuo J B and Lou J H, "*Low Voltage CMOS VLSI Circuits*", John Wiley & Sons,1999.

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

(Minimum 40% Problem, derivation and Proof)

08.756 ANTENNA DESIGN (T)

L-T-P : 2-1-0 **Credits: 3**

Module I

Review of Antenna Fundamentals - Principles of radiation and basic definitions, Antenna characteristics. Friis transmission equation. Radiation integrals and auxiliary potential functions. Circular loop antenna – analysis.

Helical antenna – normal mode and axial mode helical antennas – design considerations.

Planar Antennas - Micro strip rectangular and circular patch antennas- Analysis and design, Feeding methods.

Module II

Array Theory – Linear array:- grating lobe considerations, Broadside , end fire and Chebyshev arrays; . Electronic beam steering. Array design based on Fourier series. Planar array- Array factor, beam width, directivity. Example of micro strip patch arrays .

Broadband Antennas- Folded dipole, Sleeve dipole and Biconical antenna- Analysis, Antenna matching techniques.

Module III

Self and mutual impedance of between linear elements . Analysis of Yagi - Uda antenna.. Frequency Independent Antennas- Planar spiral antenna, Log periodic dipole array.

Aperture Antennas- Field equivalence principle, Babinet's principle. Rectangular waveguide, pyramidal horn antenna, and Parabolic reflector antenna. Lens antennas.

Antennas for mobile communication - Handset antennas, Base station antennas.

Text Books:

1. Consrantive A Balanis, *Antenna Theory - Analysis and Design*, **2/e** John Wiley & Sons.
2. John D. Krans, Ronald J. Marhefka, *Antennas for all Applications* ,**3/e**, TMH.
3. R.A. Sainati, *CAD of Microstrip Antennas for Wireless Applications,* Artech House, 1996.

Reference:

1. Sopholes J.Orfanidis, *Electromagnetic waves and Antennas*,at: www.ece.rutgers.edu/~orfanidi/ewa

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 should be answered. (Smith chart should be provided if needed.)

(Minimum 60 % problems , derivations and proof.)

08.707 INDUSTRIAL ELECTRONICS LAB (T)

L-T-P : 0-0-3 **Credits: 3**

1. Inductor and transformer design and testing.
2. MOSFET gate drive circuits.
3. Power BJT Drive circuits.
4. Temperature Controlled ON/OFF Relay Circuit.
5. Light Controlled ON/OFF Relay Circuit.
6. Linear Ramp Firing Circuit.
7. Sine Triangle PWM generation.
8. Step-Down DC-DC Converter.
9. Step- Up DC-DC Converter.
10. Push- Pull Inverter.
11. Electronic Dimmer Circuit for lighting.
12. Battery Charger circuit with over voltage protection.

Note: For University examination, the following guidelines should be followed regarding award of marks

(a) Circuit and design - 20%
(b) Implementation - 10%
(c) Result - 40%
(d) Viva voce - 25%
(e) Record - 05%

Practical examination to be conducted covering entire syllabus given above.
Students shall be allowed for the University examination only on submitting the duly certified record. The external examiner shall endorse the record.

08.708 COMMUNICATION SYSTEMS LAB (T)

L-T-P : 0-0-3 **Credits: 3**

Part A: Hardware Experiments:

1. Delta Modulation & Demodulation.
2. Sigma delta modulation.
3. PCM (using Op-amp and DAC).
4. BASK (using analog switch) and demodulator.
5. BPSK (using analog switch).
6. BFSK (using analog switch).
7. Error checking and correcting codes.
8. 4 Channel digital multiplexing (using PRBS signal and digital multiplexer).

Part B: Matlab or Labview Experiments:

1. Mean Square Error estimation of a signals.
2. Huffman coding and decoding.
3. Implementation of LMS algorithm.
4. Time delay estimation using correlation function.
5. Comparison of effect in a dispersive channel for BPSK, QPSK and MSK.
6. Study of eye diagram of PAM transmission system.
7. Generation of QAM signal and constellation graph.
8. DTMF encoder/decoder using simulink.
9. Phase shift method of SSB generation using Simulink.
10. Post Detection SNR estimation in Additive white Gaussian environment using Simulink.

Note: For University examination, the following guidelines should be followed regarding award of marks:
(Questions for each batch shall be selected equally from part A and B)

(a) Circuit and design	- 20%	(Logical design and flow diagram in case of software Expts.)
(b) Implementation	- 10%	(Coding in case of Software Expts.)
(c) Result	- 40%	(Including debugging of Program in case of Software Expts.)
(d) Viva voce	- 25%	
(e) Record	- 05%	

Practical examination to be conducted covering entire syllabus given above.
Students shall be allowed for the University examination only on submitting the duly certified record. The external examiner shall endorse the record.

08.709 SEMINAR (TA)

L-T-P : 0-0-1 **Credits: 1**

Internal Evaluation (50 Marks)

The student is expected to present a seminar in one of the current topics in Electronics, Communication, Electronic Instrumentation and related areas based on current publications.

The student will undertake a detailed study on the chosen subject and submit a seminar report in a soft bound form at the end of the semester. This report shall be submitted for evaluation for the viva-voce in 8^{th} semester.

The report shall be endorsed by the Guide, Seminar coordinator and the Professor/HOD. Evaluation of presentation will be conducted by a committee of the **Seminar coordinator, Guide and a Senior faculty.**

Internal Marks shall be awarded as follows:

1. Evaluation of Presentation : **30 marks**
2. Evaluation of Report : **20 marks**

08.710 PROJECT DESIGN (TA)

L-T-P : 0-1-0 **Credits: 1**

Internal Evaluation (50 Marks)

The student is expected to select a project in one of the current topics in Electronics, Communication, Electronic Instrumentation and related areas based on current publications.

He/She shall complete the design of the project work and submit the design phase report. This shall be in soft bound form.

This report shall be submitted for evaluation in 7^{th} semester as well as for the viva-voce in 8^{th} semester.

The report shall be endorsed by the Guide, Project co-ordinator and the Professor/HOD.

Evaluation of report and viva will be conducted by a committee consisting of the **Project co-ordinator, Guide and a Senior faculty.**

The number of students in a project batch shall be limited to a **maximum of four**.
(The project shall be done in the Institute where the student is doing the course)

Internal Marks shall be awarded as follows:

1. Evaluation of the report : **25 marks**
2. Viva : **25 marks**

Syllabus VIII Semester

08.801 NANOELECTRONICS (TA)

L-T-P : 2-1-0 **Credits: 3**

Module I

Introduction to nanotechnology and nanoelectronics, Impacts, Limitations of conventional microelectronics. Introduction to methods of fabrication of nanonaterials-different approaches.

fabrication of nano-layers -Physical Vapor Deposition, Chemical Vapor Deposition, Epitaxy, Molecular Beam Epitaxy, Ion Implantation, Formation of Silicon Dioxide. Fabrication of nanoparticle- grinding with iron balls, laser ablation, reduction methods, sol gel, self assembly, precipitation of quantum dots.

Introduction to characterization tools of nano materials- -principle of operation of STM, AFM, SEM, TEM, XRD, PL & UV instruments.

Module II

Mesoscopic Physics and Nanotechnologies - trends in Microelectronics and Optoelectronics, characteristic lengths in mesoscopic systems, Quantum mechanical coherence, Quantum wells ,wires and dots, Density of states and dimensionality

The physics of low dimensional structures - basic properties of two dimensional semiconductor nanostructures, square quantum wells of finite depth, parabolic and triangular quantum wells, quantum wires and quantum dots

Semiconductor quantum nanostructures and super lattices – MOSFET structures, Heterojunctions, Quantum wells, modulation doped quantum wells, multiple quantum wells

The concept of super lattices Kronig - Penney model of super lattice.

Transport of charge in Nanostructures under Electric field - parallel transport, perpendicular transport, quantum transport in nanostructures

Transport of charge in magnetic field and quantum Hall effect - Effect of magnetic field on a crystal, the Aharonov-Bohm effect, the Shubnikov-de Hass effect, the quantum Hall effect.

Module III

Nanoelectonic devices and systems - MODFETS, heterojunction bipolar transistors, resonant tunnel effect, RTD, RTT,hot electron transistors, Coulomb blockade effect and single electron transistor, CNT transistors, heterostructure semiconductor laser, quantum well laser, quantum dot LED, quantum dot laser, vertical cavity surface emitting laser, quantum well optical modulator, quantum well sub band photo detectors, Infrared detector,nanoswitches,principle of NEMS.

Text Books

1. J.M. Martinez-Duart,R.J. Martin Palma,F. Agulle Rueda *Nanotechnology for Microelectronics and optoelectronics* , Elsevier,2006.
2. W.R. Fahrner, *Nanotechnology and Nanoelctronics*, Springer, 2005

References

1. K. Goser, P. Glosekotter, J. Dienstuhl, *Nanoelectronics and nanosystems*, Springer 2004.
2. 2. Supriyo Dutta, *Quantum Transport- Atom to transistor*, Cambridge University Press, 2005.
3. T. Pradeep, *Nano the Essentials*, TMH, 2007.
4. Poole, *Introduction to Nanotechnology* ,John Wiley 2006
5. Chattopadhyay,Banerjee, *Introduction to Nanoscience & Technology*,PHI 2009
6. Diwanand and Bharadwaj,*Nanoelectronics*,Pentagon Press Delhi 2006

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

(Minimum 25% Problems)

08.802 RADAR & TELEVISION ENGINEERING (T)

L-T-P : 3-1-0 **Credits: 4**

Module I

Radar : The Radar equation-Pulse Radar-CW Radar-CW Radar with non zero IF, equation for Doppler frequency- FM-CW Radar using sideband superhetrodyne receiver, MTI Radar-Delay line canceller, MTI Radar with power amplifier & power oscillator, Non coherent MTI Radar, Pulse Doppler Radar, Radar Transmitters. Radar Modulator-Block diagram. Radar receivers- noise figure, low noise front ends, Mixers – Different types of Displays – Duplexers- Branch type and balanced type.

Navigation- Loop Antenna, Radio compass. Hyperbolic Systems of Navigation, LORAN – A. Distance Measuring Equipment . Instrument Landing System – Localizer, Glide Slope, Marker beacons.

Module II

Television: Scanning, Blanking and synchronisation, Picture signal - composite video signal-Vestigial sideband transmission-Principle of CCD Camera - Monochrome picture tube- Monochrome TV receivers- RF tuner ,VHF tuner- Video amplifier, IF section, Vestigial sideband correction- Video detectors, Sound signal separation, AGC, sync separation, horizontal and vertical deflection circuits, EHT generation.

Colour TV system: Principle of colour signal transmission and reception, PAL, NTSC, SECAM (block schematic description), Picture tube – delta gun.

Module III

Digital TV: Digitized Video, Source coding of Digitized Video – Compression of Frames – DCT based – (JPED), Compression of Moving Pictures (MPEG). Basic blocks of MPEG2 and MPE4. Digital Video Broadcasting (DVB) – Modulation: QAM – (DVB-S, DVB-C), OFDM for Terrestrial Digital TV (DVB –T). Reception of Digital TV Signals (Cable, Satellite and terrestrial). Digital TV over IP, Digital terrestrial TV for mobile. Display Technologies – basic working of Plasma, LCD and LED Displays.

Text Books:

1. Merrill I. Skolnik: *Introduction to Radar Systems*,**3/e**, Tata McGraw Hill,
2. N.S.Nagaraja: Elements of Electronic Navigation, **2/e**, Tata McGraw Hill
3. R.R. Gulati: *Monochroeme and Colour Television.* New Age international, 2008.
4. Herve Benoit, *Digital Television Satellite, Cable, Terrestrial, IPTV, Mobile TV in the DVB Framework*, **3/e**, Focal Press, Elsevier, 2008

Reference :

1. Shlomo Ovadia: *Broadband Cable TV Access Networks*, PH-PTR, 2001
2. Byron Edde: *Radar Principles, Technology & Applications*, Pearson Education.
3. Mark E Long: "*The Digital Satlitte TV Hand Book*", Butterworth-Heinemann.
4. K.R.Rao, J.O.Hwang, *Techniques and standards for Image,Video and Audio coding*,Prentice Hall,1996
5. John Arnold, Michael Frater, Mark Pickering,*Digital Television Technology and Standards*, John Wiley & Sons, Inc, 2007
6. Robert L. Hartwig,*Basic TV Technology: Digital and Analog*, **4/e,** Focal Press, Elsevier, 2005

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

(Minimum 20% Problems, derivations and proofs)

08.803 COMPUTER COMMUNICATION (T)

L-T-P : 2-1-0 **Credits: 3**

Module I

Network Architecture, Packet and Circuit switching, Layering and Protocols, OSI Layering, TCP/IP Layering.

Physical layer: Cables for Networking Coaxial cables, UTP, Fiber Optic cables.

Data link Layer: Framing, Frame length design, SONET and HDLC. Error Detection, Internet Checksum.

Reliable Transmission, Stop and wait protocol, Sliding window protocols. Ethernet, MAC Layer design, CSMA/CD. Logical Link Control. WLAN, CSMA/CA. Switching and Forwarding, Bridges and LAN Switches- Learning Bridges, Spanning Tree algorithm, Broadcast and Multicast, Virtual LAN (VLAN).

Module II

Network Layer: Network as graph. Routing Algorithms- Shortest Path Routing, Distance Vector Routing, Link State Routing, Hierarchical Routing. Multi Protocol Label Switching (MPLS).

Internet Working: Simple IP Addressing, Packet Forwarding, Address Translation, Address Resolution Protocols (ARP), Error Reply (ICMP), Global Internet, Sub netting, Routing in the internet - Intra Autonomous system routing (OSPF), Routing. Information protocol, Inter Autonomous System Routing (BGP), Classless Routing (CIDR). IP Version6, UDP, TCP, Congestion Control- TCP Congestion Control, TCP Congestion Avoidance, TCP Flow Control.

Module III

Network Security Issues, Multilevel Security models. Authentication Protocols, Message Integrity Proto cols, Message Digest5 (MD5), Access control: Firewalls and Packet filtering. Types of Attacks. Network Intrusion Detection System.

Security in Layers - Application Layer: SSH, Transport Layer: TLS, SSL. Network Layer: IP Security (IPSec). Virtual Private Networks.

Introduction to Ethernet Passive Optical Networks (EPONs)

Text Book :

Larry Peterson and Bruce S Davie*: Computer Network- A System Approach,* **4/e**, Elsevier India.

Reference:

1. J FKurose, *Computer Network A Topdown Approach Featuring the Internet*,**3/e**,Pearson Education.
2. S.Keshav: *An Engineering Approach to Computer Networking*, Pearson Education,2005.
3. John R Vacca: *Cabling Hand book*,Pearson Education
4. Glen Kramer: *Ethernet Passive Optical Networks*,Mc.Graw Hill,Professional,2005.
5. Charlie Kaufman et al: *Network Security Private Communication In A Public World,* **2/e**, Pearson Education.
6. Naganand Doraswamy, Dan Harkins: *IPSec The New Security Standard for the Internet, Intranets and Virtual Private Networks*, Prentice Hall PTR,2003.

This subject shall be handled by faculty of Dept.of Electronics and Communication.

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

(Minimum 40% logical/numerical problems, derivation and Proof)

08.804 SATELLITE & MOBILE COMMUNICATION (T)

L-T-P : 3-1-0 **Credits: 4**

Module I

Communication Satellite- Orbits & launching methods-Kepler's law-Inclined Orbits-Geostationary orbits, Effect of Orbital Inclination, Azimuth and Elevation, Coverage Angle and Slant Range, Eclipse, Satellite Placement. Space segment subsystems & description, Earth Station- Antenna, High Power Amplifiers, Up converter, Down converters, Monitoring and Control. Satellite link- Basic Link and Interference analysis, Rain Induced Attenuation and Cross Polarization Interference-Link Design. Mobile Satellite Networks.

Module II

Cellular concept:-hand off strategies, Interference and system capacity-: Cell splitting, Sectoring, Repeaters, Microcells. Link budget based on path loss models. Propagation models(outdoor):- Longely-Rice Model, Okumura Model. Mobile Propagation:- Fading and doppler shift, impulse response model of multipath channel, parameters of multipath channel. Fading effect due to multipath time delay spread and doppler shift. Statistical models for multipath flat fading:- Clarks model, Two-ray Rayleigh Model. Multiple Access- TDMA overlaid on FDMA,SDMA, FHMA. GSM:- Architecture, Radio subsystem, Channel types, Frame Structure. Introduction to Ultra Wideband Communication System.

Module III

Direct sequence modulation, spreading codes, the advantage of CDMA for wireless, code synchronization, channel estimation, power control- the near-far problem, FEC coding and CDMA, multiuser detection, CDMA in cellular environment. Space diversity on receiver techniques, multiple input multiple output antenna systems, MIMO capacity for channel known at the receiver -ergodic capacity, space division multiple access and smart antennas.

Text books:

1. Dennis Roody, *Satellite communication*,**2/e**, McGraw Hill.
2. Theodore S. Rappaport: *Wireless communication principles and practice*,**2/e**, Pearson Education
3. Simon Haykin, Michael Mohar, *Modern wireless communication*, Pearson Education,2008

References:

1. Tri. T. Ha, *Digital satellite communication*,**2/e**, Mc graw Hill.
2. M. Ghavami, L. D. michael, k Rohino, Ultra-wide band signals in communication engineering, Wiley Inc.
3. William stallings: *Wireless communication and networks*, Pearson Education, 2006
4. William C Y Lee: *Mobile cellular Telecommunications*,**2/e**, Mc Graw Hill.
5. Madhavendar Richharia: *Mobile satellite communications: principles and trends*, Pearson Education,2004.

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

(Minimum 40% Problem, derivation and Proof)

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08.805 AVIATION ELECTRONICS (T)

L-T-P : 2-1-0 **Credits: 3**

Module I

Atmospheric flight mechanics,Aerostatics,Bernoulli's equation, Air data instruments-Pitot and static systems, Altimeter and its types, Airspeed indicator, Mach meter, Vertical speed indicator. Gyroscopic instruments and compasses. Static stability and control - Longitudinal control, Stick forces, Directional stability and control, Roll stability and control.

Module II

Aircraft equations of motion –Rigid body equations of motion, Orientation and position of the Airplane, Gravitational and thrust forces, small disturbance theory, Aerodynamic force and moment representation. Longitudinal motion-Pure pitching motion, Stick fixed longitudinal motion and approximations, Flying qualities, Flight simulation. Lateral motion-Pure rolling and yawing motion, Lateral directional equations of motion, Lateral flying qualities, Inertial coupling.

Module III

Aircraft response to control-Equation of motion in a nonuniform atmosphere, Pure vertical motion, Atmospheric turbulence and models, Wind shear. Application of classical control theory to aircraft autopilot design-Aircraft transfer functions, Control surface actuator, Displacement autopilot, Stability augmentation, Instrument landing. Application of modern control theory to aircraft autopilot design-Stability augmentation, Autopilot design, State observer, Optimal control.

Text Books:

1. Robert C Nelson,*Flight Stability and Automatic Control*,2/e,TMH.
2. David Harris,*Flight Instruments & Automatic flight control systems*,6/e,Wiley India.

References:

1. Myron Kayton, Walker R. Fried, *Avionics_Navigation_Systems*, John Wiley and Sons Inc, 1997.
2. R.B.Underdown & Tony Palmer,*Ground studies for pilots Navigation*,6/e,Wiley India.
3. Albert Helfrick: *Principles of Avionics*, Avionics publication,2002.
4. R. P. G. Collinson, "*Introduction to Avionics*", Kluwer Academic puplications.

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

(Minimum 40% Problem, derivation and Proof)

08.815 INTEGRATED OPTICS AND PHOTONIC SYSTEMS (T)

L-T-P : 2-1-0 **Credits: 3**

Module I

Introduction , advantages, comparison of optical IC with electrical IC, applications of integrated optics, substrate materials for optical IC. Optical wave guide mode, modes in a planar wave guide, ray optic approach to optical mode theory, basic three layer waveguide, symmetric and asymmetric wave guide, rectangular channel and strip loaded wave guides. Wave guide fabrication technique, deposited thin film, substitution dopant atoms, carrier concentration reduction wave guide, epitaxial growth, electro optic wave guide.

Module II

Polymer and fiber integrated optics, polymer processing, applications, polymer wave guide devices, optical fiber wave guide devices, fiber sensor, types, applications. Losses in optical wave guide, measurement of losses. Wave guide input and output couplers, types of couplers, coupling between wave guides, coupled mode theory, wave guide modulator, electro optic modulator, single and dual channel electro optic modulator acousto optic modulator. Integrated semiconductor laser, integrated semiconductor optical amplifier, monolithical integrated direct modulator, direct modulation of QD laser, integrated optical detectors, structures, factors affecting the performance, principle of micro optical devices.

Module III

Optical amplifiers, semiconductor laser amplifier, doped fiber amplifiers, Fiber Raman amplifier, fiber Brillouin amplifier, noise characteristics ,crosstalk, system applications. Direct detection light wave system, digital optical receiver, direct detection with optical amplifiers, performance. Coherent detection light wave system, system configurations, performance. Soliton light wave system,soliton wave propagation, soliton amplification, system design.

Reference:

1 Robert Hunsperger, *Integrated optics :Theory and technology* 6/e Springer, 2009
2. Keico Iizuka, *Elements of photonics*, John Wiley, 2002
3. Pappannareddy, *Introduction to light wave systems*,Artech House,1995
4. Lifante, *Integrated Photonics: Fundamentals* ,John Wiley 2003

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

(Minimum 20% problems, derivations and proof)

08.825 MICROWAVE DEVICES AND CIRCUITS (T)

L-T-P : 2-1-0 **Credits: 3**

Module I

Microwave Network Analysis – Equivalent voltages and currents, Impedance and Admittance matrices, Scattering matrix, The transmission matrix. Signal flow graphs. Impedance matching and tuning – Matching with lumped elements, Single stub tuning, Double stub tuning. Quarter wave transformer, Theory of small reflections.

Bipolar transistors – biasing, FET – biasing, MESFET – Structure, Operation.

Module II

Gunn – effect diodes – Gunn effect, Ridley – Watkins-Hilsum theory, Modes of operation, Limited space – Charge accumulation (LSA) mode of Gunn diode.

Microwave generation and amplification. Structure, Operation, Power output and efficiency of IMPATT and TRAPATT diodes.

Microwave amplifiers and oscillators – Amplifiers – Gain and stability, Single stage transistor amplifier design. Oscillator design – One port negative resistance oscillators.

Module III

Microwave Integrated Circuits -Planar Transmission line – methods of analysis. Micro strip line, coupled strip lines, micro strip coupled lines, Distributed and lumped elements of integrated circuits – capacitors, inductors, resistors, terminations, attenuators, resonators and discontinuities.

Filters – LPF, BPF. Diode control devices – switches, attenuators, limiters. Diode phase shifter. Circulators and isolators.

Text Books:

1. David M. Pozar, *Microwave Engineering* , **2/e**, John Wiley & Sons.
2. Liao, *Microwave Devices and Circuits*, **3/e**, Pearson Education.
3. Leo Maloratsky, *Passive RF and Microwave Integrated Circuits,* Elsevier,2006.

Reference:

1. Robert E Collin: *Foundations of Microwave Engineering,* Mc Graw Hill.
2. Bharathi Bhat and Shiban K. Koul: *Stripline-like Transmission Lines for MIC,* New Age International (P) Ltd, 1989.
3. I.Kneppo,J.Fabian,etc.,*Micrwave Integrated Circuits*,BSP,India,2006.

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

(Minimum 25% Problem, derivation and Proof)

08.835 DISCRETE CONTROL & NAVIGATION SYSTEMS (T)

L-T-P : 2-1-0 **Credits: 3**

Module I

Introduction to Digital control system. Z plane analysis of discrete control systems – Impulse sampling and data hold - pulse transfer function - Realization of digital controllers. Design of discrete time control systems by conventional methods - Mapping between the S plane and the Z plane. Stability analysis in the Z plane. Transient and steady state response analysis. Design based on the root locus and frequency response methods.

Module II

State space analysis – State space representations – Solving discrete time state space equations – pulse transfer function matrix – Discretization of continuous time state space equations – Liapunov stability analysis. Pole placement and observer design – Introduction – controllability – observability – Transformations in state space analysis and design – design via pole placement – state observers – servo systems

Module III

Electronic Navigation: Principle of depth measurement, principle of echo sounding, digitized and micro computer echo sounder. Principle of speed measurement using water pressure, electromagnetic induction, acoustics correlation technique, Doppler principle, Doppler speed logging system. Introduction to Loran-C, Loran charts, position fixing using Loran-C, Loran receiver. Introduction to satellite navigation, GPS, dilution of precision, satellite pass predictions, DGPS, GPS antenna, GPS receiver architecture. Principle of radio finding system, RDF receiver. Introduction to automatic steering, basic autopilot system, and manual operation controls.

Text Books:

1. Ogata K., *Discrete-time Control Systems*, **2/e**, Pearson Education.
2. Kuo B. C , *Digital Control Systems* , **2/e**, Oxford University press,2003.
3. Tetley, Electronic navigation system, **3**/**e**, Elsevier 2008

References:

1. Gopal M., *Digital Control and State Variable Methods*, TMH, NewDelhi, 2006.
2. Walter R Fried, Myron Kayton : *Avionic Navigation Systems* , Wiley-IEEE.
3. N.S Nagaraja, *Elements of Electronic Navigation*, TMH.

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

(Minimum 50% Problem, derivation and Proof)

08.845 ARTIFICIAL INTELLIGENCE & ROBOTICS (T)

L-T-P : 2-1-0 **Credits: 3**

Module I

Fundamental Concepts - Agents, environments, general model; Problem solving techniques. Search Techniques - Uninformed search, heuristic search, adversarial search and game trees; Solution of constraint satisfaction problems using search.

Knowledge Representation - Propositional and predicate calculus, semantics for predicate calculus, inference rules, unification, semantic networks, conceptual graphs, structured representation, frames, scripts.

Module II

Prolog - Basic constructs, answer extraction. Bayesian Reasoning - Bayesian networks, dynamic Bayesian networks. Planning - State-space search, planning graphs. Learning -Inductive learning, decision tree learning.

Robotics - Basic concepts, definition and origin of robotics, different types of robots, robot classification, applications, robot specifications. Introduction to automation - Components and subsystems, basic building block of automation, manipulator arms, wrists and end-effectors.

Module III

Transmission elements - Hydraulic, pneumatic and electric drives. Gears, sensors, materials, user interface, machine vision, implications for robot design, controllers.

Kinematics, dynamics and control - Object location, three dimensional transformation matrices, inverse transformation, kinematics and path planning, Jacobian work envelope, manipulator dynamics, dynamic stabilization, position control and force control, present industrial robot control schemes.

Text Books:

1. Russell, S., Norvig, P, *Artificial Intelligence: A Modern Approach*, Pearson Education, 2006.
2. Spong and Vidyasagar, *Robot Dynamics and Control*, John Wiley & Sons, 1990.
3. Rich, E., Knight, K., *Artificial Intelligence*, TMH, 2006.
4. Asfahl C.R, *Robots and Manufacturing Automation*, John Wiley & Sons, 1992.

Reference:

1. Nilsson, N. J., *Artificial Intelligence: A New Synthesis*, Morgan Kaufmann.1998
2. Bratko, I., *Prolog Programming for Artificial Intelligence*, **3/e**,Pearson Education.2001.
3. Klafter, R.D., Chmielewski, T.A, Negin, M.,*Robotic Engineering An Integrated Approach*, PHI,2007
4. Schilling, R. J., *Fundamental of Robotics: Analysis and Control*,PHI,2007.
5. Fu, K.S,Gonzalez,R.C,Lee, C.S.G.,*Robotics, Control, Sensing, Vision and Intelligence*, McGraw-Hill,1987.

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

(Minimum 50% Problem, derivation and Proof)

08.806 MODELLING & SIMULATION OF COMMUNICATION SYSTEMS (T)

L-T-P : 2-1-0 **Credits: 3**

Module I

Simulation and Modeling Methodology, Review of Random Process: Univariate and multivariate models, Transformation of random variables, Bounds and approximation, Random process models - Markov and ARMA Sequences, Sampling rate for simulation.

Random Number Generation, Testing Random Number Generators.

Modeling of Transmitter and Receiver subsystems: Information sources, Radio frequency and optical modulation. Demodulation and detection, Multiplexing.

Module II

Communication channels and models: Fading and multipath channels, The Almost Free space channel, Conducting and Guided wave media, Finite state channel models.

Estimation of parameters in simulation: Quality of an estimator, Estimating the average level of waveform, Estimating the power spectral density of a process.

Estimation of performance measures from simulation : Estimation of SNR, Estimating Performance measures for digital systems :The Monte Carlo Method , Importance sampling method.

Module III

Review of Queuing models, Burke's theorem, Queuing Networks, Operational Laws, Mean value analysis , Hierarchical decomposition of Large Queuing networks: Queuing network model with a load dependent server.

Analysis of simulation Results: Model Verification Techniques, Model Validation Techniques, Transient Removal, Terminating Simulations , Stopping Criteria, Variance Reduction.

References:

1. M.C.Jeruchim, Philip Balaban and K.Sam Shanmugam, "Simulation of communication systems", Plenum Press, New York,1992
2. Raj Jain, *The Art of Computer Systems Performance Analysis,* John Wiley and Sons 1991
3. Jerry Banks and John S.Carson, *"Discrete-event system Simulation*", Prentice Hall, Inc., New Jersey,1984
4. A.M.Law and W.David Kelton, *"Simulation Modeling and analysis",* Mc Graw Hill Inc., New York, 1991

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

(Minimum 60% Problem, derivation and Proof)

08.816 BIOMEDICAL ENGINEERING (T)

L-T-P : 2-1-0 **Credits: 3**

Module I

The Human Body – Overview. Principle of generation and propagation of bioelectric potentials. ECG, EEG, EMG. The heart and circulatory system. Electrical activity of heart. ECG machine, Biopotential Electrodes, Theory of Electrode skin interface, Transducers, Leads and Electrodes, Pacemaker, Defibrillator,

Blood pressure measurements- Oscillometric and Ultrasonic Non-invasive pressure measurements.

Blood flow meters – Electromagnetic Blood Flow meter, Ultrasonic Blood flow meter

Bio electric Amplifiers – Introduction – Isolation and chopper stabilized Amplifiers – Input guarding.

Module II

Human respiratory system and its measurement. Respiratory therapy equipment- Ventilator. The human nervous system. Neuron, Propagation of action potential through nerves, EEG Machine, Instrumentation for measuring brain function – Intensive and coronary care units. Medical laboratory instruments-Hemodialysis Machine, Heart-Lung Machine, Electromagnetic Interference to medical electronic equipments. Electrical Safety, Micro and Macro shock hazards.

Introduction to Bioinformatics – Overview.

Module III

Medical Imaging systems: X-ray Imaging, Application of X-rays in medicine, Computed Tomography. Ultrasonic Imaging-A-Scan, B-Scan, M-Scan, Magnetic Resonance Imaging. Benefits, Risks and Limitations of MRI. Positron Emission Tomography. PET Instrumentation System. Advantages of PET scan.

Biomedical Telemetry system- Components of Biotelemetry system, Application of telemetry in Patient care.

Text Books:

1. Joseph J Carr & John M Brown : *Introduction to Biomedical Equipment Technology*, 4th edn., Pearson Education
2. R.S.Khandpur: *Handbook of Biomedical Instrumentation* , TMH, New Delhi.
3. T. K. Attuwood & D J Pary Smith: *Introduction to Bioinformatics*, 1999, Pearson Education

References:

1. John G.Webster: *Medical Instrumentation - Application and Design,* Houghton Mifflin Company, Boston.
2. Leslie Cromwell, Fred J.Weibell and Erich A.Pferffer: *Biomedical Instrumentation and Measurements*, PHI, New Delhi.
3. B.D.Ratner and Hoffman: *An Introduction to Materials in Medicine*, Academic Press.
4. John Enderele, Susan Blanchard, Joseph Bronzino "Introduction to Biomedical Engineering"2nd Edition, Academic Press , Elselvier

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

08.826 INFORMATION SECURITY (T)

L-T-P : 2-1-0 **Credits: 3**

MODULE I

Introduction to information security issues (confidentiality, integrity and availability) and definitions. review and role of cryptography in information security. Information hiding - steganagraphy and water marking. Access control- Authentication methods, passwords and biometrics, two factor authentication, single sign on and web security. Authorization- Access control matrix, Multilevel Security models, Multilateral Security, Covert Channel, Inference Control, CAPTCHA, Firewalls-packet filters, Intrusion detection systems.

MODULE II

Security Protocols- Authorization Protocol, Zero Knowledge proofs, Kerberos and GSM Security Architecture. Software Flaws and Malware- types and software based attacks, security issues in software, Digital Right Management (DRM). Operating Systems and Security- OS Security Functions, trusted OS.

MODULE III

Computer Forensics: Fundamental Definitions- Types of cyber forensic systems. Computer Forensic Evidence and Capture:- data recovery, evidence collection, duplication and preservation of digital evidence. Computer image verification and authentication. Computer Forensic Analysis:- Display of electronic evidence, verification of data, Reconstruction of past events. Network forensic scenario. Counter measures and information warfare.

Text books:

1. Mark Stamp, Information Security Principles and Practice, John Wiley & Sons, 2006.
2. John R. Vacca, Computer Forensics, *Computer Crime Scene Investigation*, **2/e,**Charles River Media, Inc.Boston, 2005
3. Thomas R. Peltier, Justin Peltier, John Blackley, *Information Security Fundamentals*, CRC Press, 2004.

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

08.836 DIGITAL INSTRUMENTATION (T)

L-T-P : 2-1-0 **Credits: 3**

Module I

Digital instruments - the basics of digital instruments, digital measurement of time interval, phase, frequency, Digital LCR meter, voltmeter and multimeter. Working principle and applications of Wave form analyzer, harmonic distortion meter, harmonic analyser and Spectrum analyzer. Logic state analyser and its application. IEEE - 488 General Purpose Interface Bus (GPIB) Instruments with application. Telemetry- Basic scheme of telemetry, Sources of error, line or transmission error, DC voltage and current telemetry schemes, Radio telemetry, PWM and digital telemetry schemes.

Module II

Virtual Instrumentation - Historical perspective, advantages, block diagram and architecture of a virtual instrument, data-flow techniques, graphical programming in data flow, comparison with conventional programming. Development of Virtual Instrument using GUI, Real-time systems, Embedded Controller, OPC, HMI / SCADA software, Active X programming.

VI programming techniques - VIs and sub-VIs, loops and charts, arrays, clusters and graphs, case and sequence structures, formula nodes, local and global variables, string and file I/O, Instrument Drivers, Publishing measurement data in the web.

Module III

Data acquisition basics - Introduction to data acquisition on PC, Sampling fundamentals, Input/Output techniques and buses. ADC, DAC, Digital I/O, counters and timers, DMA, Software and hardware installation, Calibration, Resolution, Data acquisition interface requirements. VI Chassis requirements.

Common Instrument Interfaces - Current loop, RS 232C/ RS485, GPIB.

Bus Interfaces - USB, PCMCIA, VXI, SCSI, PCI, PXI, Firewire. PXI system controllers, Ethernet control of PXI.

Text Books:

1. D.A.Bell, *Electronic Instrumentation and Measurements*, PHI, 2003.
2. Helfrick & Cooper, *Modern Electronic Instrumentation and Measurement Techniques*, PHI,2008.
3. Gary Johnson, *LabVIEW Graphical Programming*, **2/e**, McGraw Hill.
4. Kevin James, *PC Interfacing and Data Acquisition: Techniques for Measurement, Instrumentation and Control*, Newnes, 2000.

Reference:

1. S.Gupta and J.P.Gupta,*PC Interfacing for data acquisition and Process control*, Instrument Society of America.
2. National Instruments Inc.& Bishop,*Lab View 8 Student Edition*, Prentice Hall,2007.
3. Rangan C.S.,Sarma G.R. and Mani V.S.V., *Instrumentation Devices and Systems*, 2/e,TMH,2008.
4. Sanjay Gupta Joseph John,Virtual Instrumentation Using LabVIEW, TMH, 2006.
5. *LabVIEW Basics-I Manual*, National Instruments, 2005.

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered

08.846 CURRENT TOPICS (T)

L-T-P : 2-1-0 **Credits: 3**

The syllabus shall contain current area of research in Electronics &communication (45hrs.) which shall meet the pattern of the elective subjects given in the eighth semester.
It shall not be a repetition of any subject or contents of a subject in the syllabus given.
The syllabus shall be approved by the Board of Studies of the University before the commencement of semester.

08.807 MICROWAVE & OPTICAL COMMUNICATION LAB (T)

L-T-P : 0-0-4 **Credits: 4**

Microwave Experiments:

1. GUNN diode characteristics.
2. Reflex Klystron Mode Characteristics
3. VSWR and Frequency measurement.
4. Verify the relation between Guide wave length, free space wave length and cut off wave length for rectangular wave guide.
5. Measurement of E-plane and H-plane characteristics.
6. Directional Coupler Characteristics.
7. Unknown load impedance measurement using smith chart and verification using transmission line equation.
8. Measurement of dielectric constant for given solid dielectric cell.
9. Magic-Tee characteristics.
10. Antenna Pattern Measurement.
11. Calibration of attenuator.

Optical Experiments:

1. Measurement of Numerical Aperture of a fiber, after preparing the fiber ends.
2. Measurement of attenuation per unit length of a fiber using the cutback method.
3. Preparation of a Splice joint and measurement of the splice loss.
4. Power Vs Current (P-I) characteristics and measure slope efficiency of Laser Diode.
5. Voltage Vs Current (V-I) characteristics of Laser Diode.
6. Power Vs Current (P-I) characteristics and measure slope efficiency of LED.
7. Voltage Vs Current (V-I) characteristics of LED.
8. Characteristics of Photodiode and measure the responsivity.
9. Characteristics of Avalanche Photo Diode (APD) and measure the responsivity.
10. Measurement of fiber characteristics, fiber damage and splice loss/connector loss by Optical Time Domain Reflectometer (OTDR) technique.

Note: For University examination, the following guidelines should be followed regarding award of marks

(a) Design and Implementation	- 20%
(b) Result	- 50%
(c) Viva voce	- 25%
(d) Record	- 05%

Practical examination to be conducted covering entire syllabus given above.

Students shall be allowed for the University examination only on submitting the duly certified record. The external examiner shall endorse the record.

08.808 PROJECT (TA)

L-T-P : 0-0-5 **Credits: 3**

Internal Evaluation only (150 marks)

Each student shall complete the project work assigned to him/her and submit the project report by the end of the semester.

This report (consisting of problem statement, design, implementation, results and analysis) shall be of a hard bound type.

The report shall be endorsed by the Guide, Project co-ordinator and the Professor/HOD.

Evaluation of report, results, presentation and viva will be conducted by a committee consisting of the **Project co-ordinator, Guide and a senior faculty.**

The number of students in a project batch shall be limited to a **maximum of four**.

(The project shall be done in the Institute where the student is doing the course)

Marks shall be awarded as follows:

1. Mid semester evaluation by the committee - 50 Marks.
2. End semester evaluation & Viva by the committee - 50 Marks.
3. Evaluation of the report and results by Guide - 50 Marks.

08.809 VIVA - VOCE (TA)

L-T-P : 0-0-0 **Credits: 2**

University Examination only (100 Marks)
Minimum pass mark is 40.

(Examiners shall be faculty members having minimum of five years teaching experience)

Viva-Voce examination shall be based only on the subjects studied in the course.
Students shall submit the following while attending the viva-voce

1. Seminar Report (Certified during 7th Semester)
2. Project Design Report (Certified during 7th Semester)
3. Project Report (Certified during 8th Semester)

External Examiner shall endorse all the Reports.

Marks shall be awarded as follows:

1. Questions based on subjects in the course	: 70 Marks
2. Questions based on Project	: 20 Marks
3. Questions based on Seminar	: 10 Marks

Note:
Students shall not be permitted to attend the Viva-Voce examination if he/she does not submit the certified Project reports and Seminar report to the External Examiner for endorsing.