UNIVERSITY OF KERALA

B.TECH DEGREE COURSE
(2008 SCHEME)

REGULATIONS, SCHEME AND SYLLABUS

FOR

APPLIED ELECTRONICS AND INSTRUMENTATION 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
APPLIED ELECTRONICS AND INSTRUMENTATION

BRANCH: APPLIED ELECTRONICS AND INSTRUMENTATION 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: APPLIED ELECTRONICS AND INSTRUMENTATION 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	Functional Electronics (A)	3 1 -	50	3	100	4
08.306	Electrical Machines & Drives (A)	2 1 -	50	3	100	3
08.307	Electronics Devices Lab (TA)	- - 3	50	3	100	3
08.308	Electronics Circuits & Simulation Lab (A)	- - 3	50	3	100	3
	TOTAL	16 5 8	400		800	29
TOTAL MARKS 1200 TOTAL CREDITS 29						

Note: 08.306 shall be handled by faculty of Electrical & Electronics Dept.

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

BRANCH: APPLIED ELECTRONICS AND INSTRUMENTATION 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) (TA)	3 - -	50	3	100	3
08.403	Signals & Systems (TA)	3 1 -	50	3	100	4
08.404	Linear Integrated Circuits (A)	3 1 -	50	3	100	4
08.405	Digital Circuit Design (A)	2 1 -	50	3	100	3
08.406	Basic Instrumentation (A)	2 1 -	50	3	100	3
08.407	Digital Integrated Circuits & HDL Lab (A)	- - 4	50	3	100	4
08.408	Measurements & Instrumentation Lab (A)	- - 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.

BRANCH: APPLIED ELECTRONICS AND INSTRUMENTATION 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	Control System Theory (A)	2 1 -	50	3	100	3
08.505	Power Electronics (A)	3 1 -	50	3	100	4
	Elective I (TA) or (A)	2 1 -	50	3	100	3
08.507	Power Electronics Lab (A)	- - 4	50	3	100	4
08.508	Electrical Machines & Drives Lab (A)	- - 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	CMOS Circuits Design (A)

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

08.508 shall be handled by faculty of Electrical & Electronics Dept.

BRANCH: APPLIED ELECTRONICS AND INSTRUMENTATION 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	Optical Instrumentation (A)	2	1	-	50	3	100	3
08.604	Biomedical Instrumentation (A)	2	1	-	50	3	100	3
08.605	Communication Engineering (A)	3	1	-	50	3	100	4
	Elective II (TA) or (A)	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	Electromagnetics (A)

BRANCH: APPLIED ELECTRONICS AND INSTRUMENTATION 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	Robotics & Industrial Automation (A)	3	1	-	50	3	100	4
08.703	Discrete-Time Control Systems (A)	3	1	-	50	3	100	4
08.704	Process Dynamics & Control (A)	3	1	-	50	3	100	4
	Elective III (TA) or (A)	2	1	-	50	3	100	3
	Elective IV (TA) or (A)	2	1	-	50	3	100	3
08.707	Biomedical Signal Processing Lab (A)	-	-	3	50	3	100	3
08.708	Control system Lab (A)	-	-	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								

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

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	Biomedical Imaging Techniques (A)

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	Mechatronics (A)

BRANCH: APPLIED ELECTRONICS AND INSTRUMENTATION 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	Nano Electronics (TA)	2 1 -	50	3	100	3
08.802	Non Linear Control Theory (A)	3 1 -	50	3	100	4
08.803	Smart Sensors & Networks (A)	2 1 -	50	3	100	3
08.804	Industrial Instrumentation (A)	3 1 -	50	3	100	4
	Elective V (A)	2 1 -	50	3	100	3
	Elective VI (A)	2 1 -	50	3	100	3
08.807	Process Control Lab (A)	- - 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	Distributed Control Systems (A)
08.815	Adaptive Control Systems (A)
08.825	Robust Control (A)
08.835	VLSI Structures for Signal Processing (A)
08.845	VLSI Device & Process Simulation (A)

Elective VI	
08.806	Modelling & Simulation of Dyanamic Systems (A)
08.816	Reversible Logic Design (A)
08.826	Control of Power Convertors (A)
08.836	Virtual Instrumentation (A)
08.846	Current Topics (A)

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:

Sears & Zemansky ; University Physics. XI Edn.,; Pearson

Frank & Leno; Introduction to Optics. III Edn., , Pearson

J.C. Upadhyaya; Mechanics., Ram Prasad & Sons

David J Griffiths; Introduction to Electrodynamics, III Edn, , Pearson

M Ali Omar; Elementary Solid State Physics., Pearson

S O Pillai; Solid State Physics., New Age International Publishers

John R Taylor, Chris D Zafiratos & Michael A Dubson; Modern Physics for Scientists and Engineers. II Edn, Prentice Hall of India

Eugene Hecht; Optics. IV Edn, Pearson

Robert Resnick ; Introduction to Special Relativity., John Willey and Sons

Richard L Libboff; Introduction to Quantum Mechanics. IV Edn, Pearson

Donald A Mcquarrie; Statistical Mechanics., Vivo Books

Mark Ratner& Daniel Ratner; Nanotechnology.

T.A. Hassan et al; A Text Book of Engineering Physics., Aswathy Publishers, Trivandrum

B. Premlet; Advanced Engineering Physics , Phasor Books, Kollam.

LIST OF DEMONSTRATION EXPERIMENTS

Newton's Rings – Determination of wave length.

Air Wedge – Diameter of a thin wire

Spectrometer – Plane transmission grating – wavelength of light.

Spectrometer – Refractive indices of calcite for the ordinary and extraordinary rays.

Laser – Diffraction at a narrow slit.

Laser – Diffraction at a straight wire or circular aperture.

Michelson's interferometer – Wavelength of light.

Michelson's interferometer – Thickness of thin transparent film.

Polarization by reflection – Brewster's law.

Computer stimulation – superposition of waves.

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-I

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-II

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-III

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

H.A. Willard, L.L. Merrit and J.A. Dean ; *Instrumental methods of analysis*

A.K. De ; *Environmental Chemistry*

K.J.Klauhunde; *Nanoscale materials in chemistry*

B.R. Gowariker ; *Polymer science*

B.W.Gonser ; *Modern materials*

V.Raghavan; *Material Science and engineering. A first course*

L.H. Van Vlack ; *Elements of Material science and Engineering*

J.W.Goodby ; *Chemistry of liquid crystals*

S.Glasstone ; *A text book of physical chemistry*

P.C. Jain; *Engineering Chemistry*

Juhaina Ahad ; *Engineering Chemistry*

Shashi Chawla ; *A text book of Engineering Chemistry*

R. Gopalan, D.Venkappayya & S. Nagarajan ; *Engineering Chemistry*

J.C. Kuriakose and J. Rajaram ; *Chemistry of Engineering and Technology volume I & II*

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

Luzadder and Duff ; *Fundamentals of Engineering Drawing*

N. D. Bhatt ; *Engineering Drawing*

K. Venugopal *; Engineering Drawing and Graphics*

P.S. Gill; *Engineering Graphics*

P.I. Varghese; *Engineering Graphics*

K.R. Gopalakrishnan*; Engineering Drawing*

Thamaraselvi; *Engineering Drawing*

K.C. John; *Engineering Graphics*

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:

Beer & Johnston, "Vector Mechanics for Engineers – Statics and Dynamics", Tata Mc-Graw Hill Publishing Company Limited, New Delhi, 2005.

Irving. H. Shames, "Engineering Mechanics", Prentice Hall Book Company, 1966.

Timoshenko S. & Young D. H., "Engineering Mechanics", Mc-Graw Hill –International Edition

Popov, "Mechanics of Solids", Pearson Education,2007

Kumar K.L., "Engineering Mechanics", Tata Mc-Graw Hill Publishing Company Limited, New Delhi, 1998.

Rajasekaran S. & Sankarasubramanian G., "Engineering Mechanics", Vikas Publishing House Private Limited, New Delhi, 2003.

Tayal A K, "Engineering Mechanics- Statics and Dynamics" , Umesh Publications, Delhi,2004

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:

Adler R., Vertical Transportation for Buildings, American Elsevier Publishing Company, New York.1970

B.C Punmia, "Surveying & Leveling" Vol. – I, Laxmi publications(P) Ltd,N.Delhi, 2004

Rangwala., Building Materials,Charotar publishing house, 2001

Rangwala, "Building Construction" , Charotar Publishing House., 2004

S.K. Roy, "Fundamentals of Surveying" Prentice-Hall of India, New Delhi.2004

Rangwala.,"Water Supply and Sanitary Engineering", Charotar Publishing House. 1990

Moorthy, “Building Construction”, Modern Publishing House distributor., 1957
Jha and Sinha, “Construction and Technology”
Narayanan and Lalu Mangal ,”Introduction to Civil Engineering”Phasor Books,Kollam.
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

Spalding and Cole, “Engineering Thermodynamics”

Gill, Smith and Zuirys, “Fundamentals of IC Engines”

Amstead, Ostwald and Begeman, “Manufacturing processes”

Crouse, “Automobile Engineering”

Roy and Choudhary, “Elements of Mechanical Engineering”

Hajra Choudhary, “Workshop Technology”

R K Bensal, “Fluid mechanics and machines”

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

V.N. Mitlle, “Basic Electrical Engineering”, Tata McGraw Hill, 1990.

DP Kothari, LJ Nagrath, “Theory and Problems of Basic Electrical Engineering”, Prentice Hall of India, 2000.

B.L. Thereja, “A Text Book of Electrical Technology”, Volume I, S Chand & Co, New Delhi, 1992.

Francis M Fernandez, “A Basic Course in Electrical Engineering”, Rajath Publishers, Ernakulam.

TP Imthias Ahmed, B. Premlet, “Introduction to Electrical Engineering”, Phaser Books, Kollam

Gopakumar, “Introduction To Electronics and Communications”, .Phasor Books, Kollam

Millman and Halkias, "Integrated Electronics: Analog and digital circuits and systems", McGraw-Hill Book Co

Edward Hughes, “Electrical and Electronic Technology”, Pearson Education, 2002.

ML Soni, PU Guptha, US Bhatnagar and A Chakrabarthy, “A Text Book on Power System Engineering”, Dhanpath Rai & Sons, New Delhi 1997

N.N.Bhargava, “Basic Electronics and Linear Circuits”, Tata McGraw Hill

Rangan C.S., Sarma G.R., and Mani V.S.V., "Instrumentation Devices and Systems", Tata McGraw Hill, 1992.

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 I(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 II (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 III (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

Santiram Kal, *Basic Electronics – Devices, Circuits and IT fundamentals*, PHI

Louis.E.Frenzel, *Principles of Electronic Communication Systems*, TMH

William Stallings, *Wireless Communications and Networks*, Pearson Education.

M.Moris Mano, Computer Architecture, PHI

Neil H E Weste,Kamran Eshraghian, *Principles of CMOS VLSI design – A system perspective*, Pearson Education [Module 1(f)]

David A. Bell, *Electronic Instrumentation and Measurements*, PHI .[Module 2(a)]

N N Bhargava,D C Kulshreshtha,S C Gupta, *Basic Electronics & Linear Circuits*, TMH

ITL Education Solution Ltd., *Introduction to Information Technology*, Pearson Education, 5th edition, 2008

R.R. Gulati, *Monochrome and Colour Television*, New Age International [Module 2 (c)]

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**

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.

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:

Kreyszig, *Advanced Engineering Mathematics*, 8th Wiley Eastern.

Peter O Neil, *Advanced Engineering Mathematics*.

B.S. Grewal, *Higher Engineering Mathematics*, Khanna Publications.

B.V. Ramana, *Higher Engineering Mathematics*, Tata Mc Graw Hill.

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 FUNCTIONAL ELECTRONICS (A)

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

Module I

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

Small signal analysis of CE, CB, CC configurations (gain, input and output impedance).

BJT as switch. – switching circuits – astable, monostable, bistable multivibrators and schmitt trigger circuits.

MOSFET I-V relation, graphical analysis, load lines, small signal parameters, small signal equivalent circuits, body effect, biasing of MOSFETs amplifiers.

Module II

Analysis of Single stage discrete MOSFET amplifiers – small signal voltage and current gain, input and output impedance of Basic CS amplifier, CS amplifier with source resistor, CS amplifier with source by pass capacitor, source follower amplifier, CG amplifier.

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

Multistage MOSFET amplifiers – cascade and cascode amplifiers and its dc analysis, small signal analysis. Frequency response of cascade and cascode amplifiers.

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Module III

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 (MOSFET based) - Voltage, Current, Transconductance and Transresistance amplifiers, loop gain, input and output impedance. Stability of feedback circuits.

Power amplifiers: Class A, B, AB, C circuits - efficiency and distortion. Biasing of class AB circuits. Transformerless 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. Spencer & Ghausi : *Introduction to ElectronicCircuit Design,* Pearson Education, 2003.
2. Roger T. 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. Balbir Kumar,Shail B Kumar: *Electronic Devices & Circuits*, 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 50% Problems)**

08.306 ELECTRICAL MACHINES & DRIVES (A)

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

Module I

D.C. MACHINES: Principle and theory of operation of D.C. generator - generator action- Constructional features of D.C. Machines- Armature reaction- Commutation- Characteristics of shunt, series and compound generators- Principle of operation of D.C. motor- Back E.M.F- Torque equation- characteristics of shunt, series and compound motors- Losses and efficiency calculations- Applications of D.C. Motors- Motor starters- speed control of D.C. motors.

TRANSFORMERS: Principle, constructional details of shell and core type transformer- EMF equation- No-load and on load operation. Test on Transformer- Equivalent circuit - regulation and efficiency calculations- Auto transformer- Principle of operation – phasor diagram - three phase transformer connections.

Module II

SYNCHRONOUS MACHINES: Construction and principle of operation of alternators - EMF equation- determination of regulation by synchronous impedance method - Theory of operation of synchronous motor - Phasor Diagram- Methods of starting.

INDUCTION MACHINES: Construction and principle of operation – classification of induction motor- Torque equation – Torque slip characteristics - Maximum toque - Effect of rotor resistances - starting and speed control.

Module III

SPECIAL MACHINES**:** Types of single phase motor – Double field revolving theory – Capacitor start capacitor run motors – Shaded pole motor – Repulsion type motor – Universal motor – Stepper motor.

DRIVES: DC Motor Drives - Introduction to Motor drives, Criteria for selecting drive component. Equivalent circuit of DC Motor, Block diagram and transfer function.

Text books:

1. Nagrath I J and Kothari D P, " *Electrical Machines*", **2/e**,Tata McGraw-Hill.
2. Sen P C, "*Principles of Electrical Machines and Power Electronics*",**2/e**, John Wiley & Sons.
3. R.Krishnan, *Electric Motor drives – Modeling, Analysis and Control,* PHI, 2008.

Reference:

1 Bimbhra P S, "*Electrical Machinery*", Khanna Publishers, 2004.
2. Gupta B R, and Vandana Singhal, "*Fundamentals of Electrical Machines*", New Age International Publishers, 2001.
3. Say M G, "*Alternating Current Machines*", **5/e**, Pitman.
4. Theodore Wildi, *Electrical Machines, Drives and Power Systems,* **6/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)

08.307 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 ELECTRONICS CIRCUITS & SIMULATION LAB (A)

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

PART –A

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 MOSFETs). Measurement of CMRR.
4. Cascode amplifiers (using MOSFETs). Frequency response.
5. Astable, Monostable and Bistable multivibrator circuits.
6. Schmitt trigger circuits.
7. Series voltage regulator circuits – short circuit and fold back protection.
8. Bootstrap sweep circuit.

PART-B

Introduction to SPICE

Models of resistor, capacitor, inductor, energy sources (VCVS, CCVS, Sinusoidal source, pulse, etc) and transformer.

Models of DIODE, BJT, FET, MOSFET, etc. sub circuits.

Simulation of following circuits using spice (Schematic entry of circuits using standard packages).

Analysis- (transient, AC, DC, etc.):

1. Potential divider.
2. Integrator & Differentiator (I/P PULSE) – Frequency response of RC circuits.
3. Diode Characteristics.
4. BJT Characteristics.
5. FET Characteristics.
6. MOS characteristics.
7. Full wave rectifiers (Transient analysis) including filter circuits.
8. Voltage Regulators.
9. Sweep Circuits.
10. RC Coupled amplifiers - Transient analysis and Frequency response.
11. FET & MOSFET amplifiers.
12. Multivibrators.

Internal Marks: 50

1. Attendance	- 10	
2. Class work	- 20	(For Part A only)
3. Practical internal Test	- 20	(For Part B only)

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 (Including Part-B also)	- 25%
(e) Record	- 05%

Practical examination (university) to be conducted covering entire syllabus given above in part-A.

Students shall be allowed for the University examination only on submitting the duly certified record (Including Part-A and Part-B).

The external examiner shall endorse the record.

Syllabus IV Semester

08.401 ENGINEERING MATHEMATICS - III 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 Computer Engineers*, 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:

K.K. Dewett, *Modern Economic theory*

Michael – Todaro, *Economic Development* Addison Wesley Longman Ltd.

Mohinder Kumar Sharma – *Business Environment in India*

D.M. Mithani – *Money, Banking, International Trade and Public Finance*, Himalaya publishing House, New Delhi.

Rudder Dutt and K.P.M Sundaran – *Indian Economy*

Hal R. Varian – *Intermediate Micro Economics*

Koutsiannis (second Edition) *Micro Economics*

Double Entry book Keeping – Batliboi

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 LINEAR INTEGRATED CIRCUITS (A)

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

Module I

MOS differential amplifiers, 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.

Current sources, Active load, cascode load, current mirror circuits, multistage differential amplifiers.

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

Active Filters : Transfer function, First order Active Filters, Standard second order responses, KRC filters, Multiple-Feedback filters, State variable and biquad filters, Filter approximation, Cascade design, Generalized Impedance Converter.

Switched capacitor, Switched capacitor Integrator, Switched capacitor filter, IInd order SC filter based on Tow-Thomas.

Data converters: Sample and hold characteristics, DAC and ADC specification,

DAC architecture - Weighted resistor, R-2R ladder network, Current steering, Charge Scaling DACs, Cyclic DAC, Pipeline DAC

ADC architecture: Dual slope, Counter ramp, Successive approximation, Flash ADC, Pipeline ADC, Oversampling ADC.

Module III

Operational Transconductance amplifier. Emitter coupled pair as simple multiplier, Variable-Transconductance Multiplier, Multiplier applications,

Voltage Controlled Oscillator: Features of 566 VCO, Applications of VCO.

Phse-Locked Loop : 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. Analysis of lock range and capture range. Applications of PLL. Monolithic PLL - IC LM565 and 4046 CMOS PLL.

Monolithic Voltage Regulators – IC 723 and its Applications, Current boosting, short circuit and fold back protection, Three pin fixed and variable voltage regulators.

Power Amplifier: LM380 power audio amplifier.

Text Books:

1. Sergio Franco: *Design with Operational Amplifiers and Analog Integrated Circuits*, **3/e**,TMH.
2. Behzad Razavi : *Design of Analog CMOS IC,* TMH,2003.

References:

1. Gayakwad : *Op-Amps and Linear Integrated Circuits* , **4/e**, PHI /Pearson Education.
2. K. R. Botkar : *Integrated Circuits*, **9/e**, Khanna Publishers.
3. Baker R Jacob: *CMOS Circuit Design, Layout and Simulation*, PHI,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% Problems and Analysis)

08.405 DIGITAL CIRCUIT DESIGN (A)

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

Module I

Binary codes, BCD, Review of Boolean algebra and Binary arithmetic.

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

Decoders, encoders, multiplexers, demultiplexers. Adders, subtractors, ripple carry and look ahead carry adders, BCD adders, binary comparators.

Description of Logic gates, decoders, encoders, adders using VHDL.

Integrated circuit technologies – Characteristics and Parameters.TTL circuits –NAND,Open collector, tristate gates. CMOS logic circuits - NOR, NOT, NAND. Comparison.

Module II

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.

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

Description of flip flops, registers and counters using VHDL.

Module III

Mealy and Moore models, state machine notation, state diagram, state table, transition table, exciting 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, equivalence and minimization, minimization of completely specified machines, State simplification of redundant states, Incompletely specified machines.

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. C.H. Roth,Jr., *Fundamentals of Logic Design*, **5/e**, Thomson Learning.
2. Thomas L Floyd, R.P Jain: *Digital Fundamentals,* **8/e**, Pearson Education.
3. M.Moris Mano, Michael D.Ciletti, *Digital Design*, **3/e**, Pearson Education.
4. 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% Problems and design)

08.406 BASIC INSTRUMENTATION (A)

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

Module I

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. Transducers-variable air gap type, variable area type, variable permittivity type, capacitor micro phone.

Module II

Generalized configurations of Instruments – Functional element, Analog and Digital modes, Null and deflection methods, I/O configuration, Methods of correction. Generalised performance characteristics of Instruments – Static characteristics - Calibration, Accuracy, Precision and bias. System accuracy calculation. Sensitivity, linearity, threshold, resolution, hysterisis and dead space. Generalised static stiffners and Input impedance.

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

Module III

Digital instruments - the basics of digital instruments, digital measurement of time interval, phase, frequency, Digital LCR meter and digital voltmeter.

The cathode ray tube, Deflection amplifier, Resolution, Wave form display, Oscilloscope time - base, Dual trace oscilloscope, Dual beam and split beam. Oscilloscope controls-measurements of voltage, frequency and phase, pulse measurements, Lissajous figures, 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.

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*,**5/e**, PHI.
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. Patranabis, "*Sensors and Transducers*", **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.

(Minimum25% Problems and design)

08.407 DIGITAL INTEGRATED CIRCUITS & HDL LAB (A)

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

1. Characteristics of TTL and CMOS gates.
2. Arithmetic circuits - Half adder, Full adder, 4 bit adder/subtractor, BCD adder-7483 circuits.
3. Astable and Monostable multivibrators using CMOS gates
4. Realization of RS, T, D, JK and Master Slave flip-flops using gates.
5. Shift Registers, Ring counter and Johnson counter (using gates and 7495)
6. Counters, up/down counters (asynchronous & synchronous) using flip flops.
7. Counter ICs (7490,7493,7495).
8. Sequence generator.
9. BCD to Decimal and BCD to 7 segment decoder & display
10. Multiplexers, Demultiplexers using gates and ICs. (74150,74154)
11. Realization of combinational circuits using MUX & DEMUX.
12. Astable & Monostable using 74123 & 555.
13. Waveform and pattern generation using Multiplexers.
14. Simulation using VHDL **(Internal Evaluation Only) :**
    Logic gates, Decoders, Encoders, Half adder and Full adder, Flip-flops, counters etc. in 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 (without 14th expt). Students shall be allowed for the University examination only on submitting the duly certified record. The external examiner shall endorse the record.

08.408 MEASUREMENTS & INSTRUMENTATION LAB (A)

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

1. Op amp measurements : input offset voltage, input offset current, open loop gain, common mode input resistance, slew rate, CMRR, full power band width comparison of different classes of opamps (2 expts)
2. Op Amp basic circuits – Inverting and Non-inverting Amplifier, Integrator , Comparator.
3. OPAmp Circuits : Astable and Monostable multivibrators, Schmitt trigger, Triangular waveform generator, Wein bridge Oscillators.
4. Universal active filters using Op-Amps (741/747/ 324)
5. ADC & DAC using ICs.
6. Instrumentation amplifier & differential amplifiers using Op-Amps (measurement of CMRR)
7. Transducer measurements.
    a. Diode thermometer
    b. LVDT
    c. Strain gauge.
    d. Pressure transducer.
    e. Thermocouple & RTDS
    f. Photocells
8. Voltage regulator - LM 723 based circuit with fold back and short circuit protection.
9. Phase locked loops, frequency to voltage converter, voltage to frequency converter
10. Programmable logic controllers – ladder diagrams
11. Design of temperature transmitter using RTD.
11. Design of cold junction compensation circuit.
12. Design of IC temperature transmitter.
13. Design of Linearization circuit for thermistor.
14. Design of pressure transmitter.
15. Performance evaluation of pressure gauges using Dead weight tester.
16. Measurement of level using capacitance probe, differential pressure transmitter.

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

08.501 ENGINEERING MATHEMATICS – IV
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:

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

A.V. Oppenheim & Ronald W Schafer*: Discrete Time Signal Processing*, **2/e**, PHI.

Sanjith K Mitra *: Digital Signal Processing*, **2/e**, Tata Mc Graw Hill.

Rulph Chassaing, *Digital Signal Processing and Applications with the C6713 and C6416 DSK,* Wiley Interscience.

Apte, *Digital Signal Processing*. 2/e,Wiley India.

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 CONTROL SYSTEM THEORY (A)

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

Module I

Modeling of dynamic systems – Control Systems – Mechanical, Electrical and Electronic Systems – Signal flow graphs – Linearization of nonlinear models. Mathematical modeling of Fluid systems and Thermal systems. Transient and steady state response analysis of first and second order systems. Root locus analysis – Plots – Rules for construction – Positive feedback and conditionally stable systems.

Module II

Routh's stability criterion. Frequency response analysis – Bode diagrams – Polar plots – Nyquist stability – Stability analysis – Relative stability – Unity feed back systems.

Module III

Control system design by frequency response – Lead, Lag and Leg-lead compensation. PID controls – Tuning rules of PID controllers – optimal sets of parameter values – Modifications of PID control schemes. Two degree of freedom control. Zero placement approach and design.

Text Book:

1. Katsuhiko Ogata, *Modern Control Engineering*, **4/e**, Pearson Education.

References:

1. Benjamin .C Kuo, *Automatic Control Systems*, **8/e**, PHI.
2. Norman S Nise, *Control System Engineering*, **4/e**, John Wiley.
3. Richard C Dorf and Robert H Bishop, *Modern Control System.* **9/e**, Pearson Education.
4. Dean Fredrick & Joe Chow, *Feedback Control Problems using MATLAB,* Addison Wesley/PWS,1995.

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)

08.505 POWER ELECTRONICS (A)

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

Module I

Power electronics versus Linear electronics, Classification of power processors and converters. Power semiconductor switches: Power diodes- structure, static and dynamic characteristics, power diode types. Power transistors- Power BJT, Power MOSFET, GTO and IGBT – structure and V/I characteristics, Steady state and switching characteristics of BJT and Power MOSFET. Drive circuits - requirements and design of simple drive circuits for power BJT, MOSFET and IGBT. Snubber circuits. Single phase and Three phase Rectifiers – Uncontrolled and Controlled rectifiers.

Module II

Switched mode regulators – Buck, Boost, Buck-Boost and Cuk dc-dc converters- analysis of waveforms and derivation of expression for output voltage, voltage and current ripple under continuous conduction mode, Selection of power switches. Overview of SMPS – Isolated converters – Flyback, Forward, Push-pull, Half Bridge and Full bridge converters – waveforms and governing equations. Control of dc-dc converters, Power supply protection, Soft switching, Study of PWM controller IC (TL494 and UC1524).

Module III

Switched mode inverters – principles of PWM switching schemes for square wave and sine wave output. Single phase inverters – half bridge, full bridge and push pull. Three phase inverters – Six step and Current controlled inverters. PWM and space vector modulation in three phase inverters. UPS – working principle and design (On-line and off-line), Battery charging circuits. Motor drives –v/f control for induction motors, adjustable speed control of induction motor.

Text Books:

1. L Umanand, *Power Electronics Essentials and Applications,* Wiley India, 2009.
2.Ned Mohan et. al. ,*Power Electronics :Converters, Applications and Design*, John Wiley & Sons.
3. Jamil Asghar, *Power Electronics*, 7 th print, PHI,2009.

References:

1. Md. H. Rashid*, Power Electronics: Circuits, Devices and Applications,**2/e***, PHI.
2. Michael Jacob, *Power Electronics Principle and Application,* Thomson Delmar Series.
3. Jai P. Agrawal, *Power electronic Systems: Theory and Design,* 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% questions shall be problems, design and analysis)

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.

Module 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*, **2/e**, TMH.
2. John J Donovan, *System Programming*,**2/e**, McGraHill.
3. Leland L Beck, *System Software: An Introduction to System Programming*, **3/e**, 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:

Simon Haykin, *Neural Networks,* **2/e**, Prentice Hall.

Laurene Fausett, *Fundamentals of Neural Networks,* Pearson Education 2004.

Christopher M. Bishop, *Neural Networks for Pattern Recognition* by Oxford University Press, 1995.

Reference:

James A Freeman, David M. Skapura, *Neural Networks- Algorithms, Applications and Programming Techniques ,* Pearson Education.

Bose & Liang, *Neural Network Fundamentals,* Mc Graw Hill.

Martin T. Hagan, Howard B. Demuth, Mark Beale*, Neural Network Design,* Vikas Thomson learning.

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.
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.
2. Perry D. L., *VHDL Programming by Example*, **4/e**, TMH.
3. Brown S. and Vranesic Z., *Fundamentals of Digital Logic with VHDL Design*, **2/e**,TMH.
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:

Rodney Huddleston and Geoffrey K Pullam, *A Student's Introduction to English Grammar*, Cambridge University Press, U K, 2005.
Sankaranarayanan V, Sureshkumar S and Palanisamy, *Technical English for Engineering Students*, PHI, 2008
Bert Decker, *The Art of Communicating*, Decker Communications, Inc, USA, 2004.
Meenakshi Raman and Sangeeta Sharma, *Technical Communication: Principles and Practice*, Oxford University Press, U K, 2004.
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 CMOS CIRCUITS DESIGN (A)

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

Module I

Basic CMOS device physics, CMOS I/V characteristics. CMOS processing, CMOS device layout and design rules, device capacitance. MOS amplifiers –CS,CD,CG and cascode amplifiers ,gain and frequency response. MOS Differential Amplifiers, MOS load, Current source, Current mirror , cascode load.
Noise in CS, CG, CD and Differential amplifiers.

Module II

MOS Sample-and-Hold Circuits, Current and Voltage reference, Bandgap Voltage reference, Propotional-to-absolute-temperature (PTAT) current generation and constant Gm biasing. Translinear gain cell, Translinear multiplier. MOS Operational Amplifiers, single stage- cascode and folded cascode CMOS op-amp. Advanced current mirrors – Wide swing current mirror, wide swing constant transconductance bias circuit, enhanced output impedance current mirror.

Module III

CMOS oscillators – ring oscillators, LC oscillators, CMOS VCO, CMOS PLL, non-ideal effects in PLL, delay locked loops and application. CMOS data converters -Medium and High-speed CMOS data converters- Over sampling converters. CMOS comparators, multipliers and wave shaping circuits. CMOS inverters – static and dynamic characteristics. Domino and NORA logic, combinational and sequential circuits.

Text Books:

1. David A. Johns, Ken Martin : Analog Integrated Circuit Design, Wiley India, 2008.
2. Phillip E. Allen, Douglas R. Holberg, CMOS Analog Circuit Design,Oxford University Press 2004.

Reference:

1. Behzad Razavi: Design of Analog CMOS Integrated Circuits, TMH, 2002.
2. R Jacob Baker, Harry W. Li , David E Boyce: CMOS Circuit Design, Lay out and Simulation - IEEE press, 2002.
3. Paul R.Gray, Paul J. Hurst etc.: Analysis and Design of Analog Integrated Circuits, Wiley India 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 50% marks for problems and design.)

08.507 POWER ELECTRONICS LAB (A)

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

LIST OF EXPERIMENTS

1. Sine triangle PWM generation
2. Study of PWM IC TL 494
3. Power BJT and MOSFET drive circuits
4. Battery charger circuit
5. Buck DC-DC Converters
6. Step up DC-DC converter
7. Push pull DC- DC Converter
8. Application of opto-coupler IC MCT2E
9. AC phase control circuit
10. Linear ramp firing circuits
11. Simple SMPS
12. Half bridge and full bridge converters
13. Study of DC Drive
14. Regulation Characteristics of DC Drive
15. Basic Inverter Circuits

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 ELECTRICAL MACHINES & DRIVES LAB (A)

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

1. No-load and Load Characteristics of DC Shunt and Compound Generator.
2. Load Characteristics of DC Series Motor.
3. Load Characteristics of DC Shunt and Compound Motor.
4. Transformation Ratio and load test on single phase transformer.
5. Open Circuit and Short Circuit Tests on 1-phase Transformer.
6. Load Test on 3-phase Induction Motor.
7. V/f control of 3ϕ induction motor.
8. Load Test on 1-phase Induction Motor.
9. Load Test on 3-phase Alternator.
10. Electrical Braking of DC motor.
11. Speed control of DC Shunt motor.
12. Speed control of DC motor using Power Converters.
13. Study of speed control of stepper motor.

Internal Marks: 50

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

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:

Neil H E Weste & Kamram Eshrahian: *Principles of CMOS VLSI Design*,**2/e**, Pearson Education.
Yuan Taur, Tak Hning: *Fundamentals of Modern VLSI Devices*, Cambridge Uni. Press, 2000.
S K Gandhi: *VLSI Fabrication Principles*, **2/e**, Prentice Hall.
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 OPTICAL INSTRUMENTATION (A)

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

Module I

Optical fibers and their properties - principles of light propagation through a fiber,different types of fibers and their properties, transmission characteristics of optical fiber, absorption losses, scattering losses, dispersion, optical sources and detectors – LED-PIN and APD.

Optical fiber sensors - Intensity modulated optical fiber sensors, Reflective Evanescent wave and microbend fiber optic sensors, Fiber optic refractometers & thermometers,distributed sensing with fiber optic sensors,interferometric optical fiber sensors,moiré fringes, measurement of -current, pressure, temperature,liquid level,strain,current and voltage using optical fiber sensors.

Module II

Laser fundamentals - fundamental characteristics of Lasers, three level and four level lasers, properties of laser, laser modes, resonator configuration, Q-switching and mode locking, cavity dumping, types of lasers - gas, solid, liquid and semi conductor lasers.

Industrial application of Lasers - Laser for measurement of - distance, length, velocity, acceleration, current, voltage and atmospheric effect. Laser for material processing – laser heating, welding melting and trimming of materials, removal and vaporization.

Module III

Medical applications of lasers - laser and tissue interaction, Laser instruments for - surgery, removal of tumors of vocal cords, brain surgery, plastic surgery, gynecology and oncology.

Holography & Interferometry - principles of Holography, Gabor's hologram, Leith's and Upatneik's techniques in holography, point holograms, fourier transform holograms, acoustic holography, holographic interferometry and applications, Applications of holography in non-destructive testing and instrumentation.

Text books:

1. Senior J M., *Optical Fiber Communication- Principles and Practice*, Prentice Hall, 1993.
2. John and Harry, *Industrial lasers and their applications*, McGraw Hill, 1974.

References:

1. John F Read, *Industrial Applications of Lasers*, Academic Press, 1997.
2. Gerd Keiser,*Optical Fiber Communication*, McGraw Hill,2000.
3. Jasprit Singh, *Semiconductor Optoelectronics*, McGraw Hill,1995.
4. B P Pal, *Fundamentals of Fiber Optics in Telecommunication & Sensor Systems*,Wiley Eastern,1991.
5. Govind P Agarwal, *Optical Communications*, John Wiley, 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 40% Problem and derivation)

08.604 BIOMEDICAL INSTRUMENTATION (A)

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

Module I

Electro physiology - Review of physiology and anatomy, resting potential, action potential, bioelectric potentials, cardiovascular dynamics, electrode theory, bipolar and unipolar electrodes, surface electrodes, physiological transducers. Systems approach to biological systems.

Bioelectric potential and cardiovascular measurements - EMG - Evoked potential response, EEG, foetal monitor. ECG phonocardiography, vector cardiograph, BP, blood flow cardiac output, plethysmography, impedance cardiology, cardiac arrhythmia's, pace makers, defibrillators.

Module II

Respirator and pulmonary measurements and rehabilitation - Physiology of respiratory system, respiratory rate measurement, artificial respirator, oximeter, hearing aids, functional neuromuscular simulation, physiotheraphy, diathermy, nerve stimulator, artificial kidney machine.

Patient monitoring systems - Intensive cardiac care, bedside and central monitoring systems, patient monitoring through bio-telemetry, implanted transmitters, telemetering multiple information. Sources of electrical hazards and safety techniques.

Module III

Recent trends- Medical imaging, X-rays, laser applications, ultrasound scanner, echo cardiography, CT Scan MRI/NMR, cine angiogram, colour doppler systems, Holter monitoring, endoscopy.

Bioinformatics – Introduction, protein information resources, genome information resources, DNA sequence analysis, Pairwise alignment techniques.

Text Book:

1. Leslie Cromwell, Fred J. Weibell and Erich A. Pfeiffer, *Biomedical Instrumentation and Measurements*, **2/e**, PHI.
2. Joseph J Carr & John M Brown, *Introduction to Biomedical Equipment Technology*, **4/e**, Pearson Education.
3. T. K. Attuwood & D J Pary Smith, *Introduction to Bioinformatics*, Pearson Education,2006.

References:

1. Geddes L. A. and Baker L. E., "*Principles of Applied Biomedical Instrumentation*", **3/e**, John Wiley.
2. Khandpur R. S, "*Handbook of Biomedical Instrumentation*", **2/e**.TMH.
3. B.D.Ratner and Hoffman, *Biomaterials Science-An Introduction to Materials in Medicine*, **2/e**,Elsevier.

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.

08.605 COMMUNICATION ENGINEERING (A)

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

Module I

Analog Communication Systems- Principles of Amplitude modulation, double and single side band, suppressed carrier principle and system, AM modulation and demodulation circuits, AM Transmitters, Radio receivers, Angle modulation, Frequency modulation and demodulation methods, FM stereo broadcasting.Comparission of AM and FM.

Transmission lines – Types, equivalent circuit, losses, standing waves, impedance matching, bandwidth. Radio wave propagation – Free space, Ground wave, Ionospheric and Line of sight propagation.

Module II

Digital Transmission **-** Pulse modulation techniques - PAM, PWM and PPM concepts, PCM encoder and decoder,Companding,DM,ADM,Differential PCM,Signal power in binary signals. Multiplexing - Time division multiplexing,T1 digital carrier systems. Frequency division multiplexing –AT & T's FDM hierarchy.Wavelength division multiplexing.

Data Communication Techniques **-** Data transmission using analog carriers, FSK, PSK, DPSK, QPSK, and QAM,Carrier and Clock recovery,DPSK, error and bit error rate performance.

Satellite communication –Kepler's laws, Orbits,Geosynchronus and Geostationary satellites,Antenna look angles,Satellite link models and equations,Link budget.

Module III

Virtual circuits and data grams- routing traffic control - X.25. Computer Communication Architecture and protocols - OSI model - TCP/IP protocol - System network architecture. Principles of internetworking - Bridges - Routing with bridges - Connectionless internetworking - Connection oriented internetworking. ISDN - Transmission structure - User access - ISDN protocols -Broad band ISDN.

Text Books:

Module I

Roy Blake, *Electronic Communication Systems*, **2/e**, Thomson Delmar.

Module-II

Wayne Tomasi, *Advanced Electronic Communications Systems*,**6/e**,Pearson Education.

Module-III

William stallings, *Data and Computer Communication*,**4/e**,PHI/Pearson Education.

References:

1. Kennedy, *Electronic Communication System*s, **4/e**, TMH.
2. Larry Haghes, *Introduction to Data Communication,A practical approach*, Jones and Bartiett,1997.
3. Leon W.Couch,II, *Digital and Analog Communication Systems*,**6/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% Problem, derivation 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:

Rafael C Gonzalez and Richard E.woods, "*Digital Image Processing*",**3/e**,Addition – Wesley.

Anil K Jain, "*Fundamentals of Digital Image Processing*", PHI, New Delhi, 1995

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:

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

References:

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 ELECTROMAGNETICS (A)

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

Module I

Review of vector geometry – Spherical and cylindrical co ordinate systems- Maxwell's equations, TEM modes in a linear homogenous isotropic medium, polarization, Pointing vector and power flow, TEM waves incident on a boundary - Snell's laws, wave propagation inside a conductor - skin depth, weakly dispersive TEM modes - phase and group velocity.

Module II

Multi-conductor Transmission Lines - Time-domain analysis of transmission lines,Bounce diagrams, Frequency-domain analysis of transmission lines, Standing waves; Smith chart, Transmission line matching, Single stub matching, quarter-wave transformers.

Waveguides - Electromagnetic fields in parallel-plate, rectangular waveguides, TE and TM modes, wave impedance, wave velocities, attenuation in waveguides.

Module III

Electromagnetic radiation , retarded potentials , power density , beam solid angle, radiation intensity, radiation resistance, radiation pattern, radiation efficiency , gain , directivity , effective aperture and effective length of the antennas. Electric field, magnetic field, radiation resistance and directivity of short dipole and half wave dipole. Folded dipole, Yagi Uda , Parabolic dish antenna. Antenna arrays – broadside and end-fire array.

Wave Propagation – Ground wave , Sky wave and Space wave propagation.

Text Book:

1. Ramo, S., Whinnery J.R., and van Duzer, T, *Fields and Waves in Communication Electronics*, **3/e**, Wiley Eastern.
2. Nannapaneni Narayana Rao: *Elements of Engineering Electromagnetics*,**5/e**, Pearson Education.
3. Jordan, E.C. and Balmain, K.G., *Electromagnetic Waves and Radiating Systems*, **2/e**, PHI.

Reference:

1. Sadiku, M.N.O., *Elements of Electromagnetics*, **3/e**, Oxford University Press.
2. R.E. Collin, *Foundations for Microwave Engineering*, **2/e**, McGraw-Hill, 1993.
3. Hayt, W.H. and Buck, J.A., *Engineering Electromagnetics*, **7/e**, Tata McGraw-Hill.2006
4. John D. Kraus, *Electromagnetics*,**4/e**, Mc Graw Hill.
5. David K. Cheng, *Field and Wave Electromagnetics*, **2/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)

08.607 MICROCONTROLLER LAB (TA)

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

Programming experiments using 8051 Trainer Kit.

Addition and Subtraction of 16 bit numbers.
Multiplication and division of 8 bit numbers.
Sorting, Factorial of a number.
Multiplication by shift and add method.
LCM and HCF of two 8 bit numbers
Matrix addition
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:

Kevin Otto and Kristin Wood, "*Product Design*", Pearson Education, 2003.
Flurschiem CH: *Industrial Design and Engg.*, Design Council, London and Springer Verlag, 1983
Web based Current literature, IEEE Press 1999.
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)

- Discrete component circuits.
- Timer ICs based circuits.
- Op-Amp ICs based circuits.
- Digital ICs based circuits.
- Microcontroller based circuits.
- 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.

Water Level Controller.
Water Level Indicator.
Musical Burglar Alarm.
Light Dimmer.
Heat Sensor.
FM Transmitter.
Dancing Light.
Audio Level Indicator.
Clap Switch/Sound Operated Switch.
Touch Sensitive Switch.
Audio Power Amplifier.
Regulated Power Supply (Rectifier-Filter-Regulator)
Count Down Timer.
Digital Clock.
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 ROBOTICS & INDUSTRIAL AUTOMATION (A)

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

Module I

Introduction - 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. Transmission elements: Hydraulic, pneumatic and electric drives. Gears, sensors, materials, user interface, machine vision, implications for robot design, controllers.

Module II

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.

Robot programming - Robot programming languages and systems, levels of programming robots, problems peculiar to robot programming, control of industrial robots using PLCs.

Module III

Automation and robots - Case studies, multiple robots, machine interface, robots in manufacturing and non-manufacturing applications, robot cell design, selection of a robot.

Factory automation **-** Flexible Manufacturing Systems concept – Automatic feeding lines, ASRS, transfer lines, automatic inspection – Computer Integrated Manufacture – CNC, intelligent automation, Industrial networking, bus standards.

Text Books:

1. Spong and Vidyasagar, *Robot Dynamics and Control*, John Wiley & Sons, 1990.
2. Asfahl C.R, *Robots and Manufacturing Automation*, John Wiley & Sons, 1992.
3. Mikell P Groover,*Automation Production Systems and Computer Integrated Manufacturing*, **3/e**,PHI.

Reference:

1. Klafter, R.D., Chmielewski, T.A, Negin, M.,*Robotic Engineering An Integrated Approach*, PHI,2007
2. Schilling, R. J., *Fundamental of Robotics: Analysis and Control*,PHI,2007.
3. Fu, K.S,Gonzalez,R.C,Lee, C.S.G.,*Robotics, Control, Sensing, Vision and Intelligence*, McGraw-Hill,1987.
4. Bolton W, *Mechatronics*, **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 50% Problem, derivation and Proof)

08.703 DISCRETE - TIME CONTROL SYSTEMS (A)

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

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

Polynomial equation approach to control systems design - Introduction – Diophantine equation – Design – Design of model matching control systems. Optimal control – Introduction – Discrete Euler – Lagrange equation – Time optimum control with energy constraint - Design of optimal linear digital regulator – Principle of optimality and dynamic programming – Solution of the discrete Riccati equation – Sampling period sensitivity. Quadratic optimal control systems – Introduction – Steady state quadratic optimal control.

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.

References:

1. Phillips C. L. and Nagle H. T, *Digital Control System Analysis and Design*, **3/e**,Prentice-Hall.
2. Astrom K. J and Wittenmark, *Computer Controlled Systems Theory and Design*,**2/e**, PHI.
3. Gopal M., *Digital Control and State Variable Methods*, Tata McGraw Hill, 2006.
4. Charles L. Phillips, H. Troy Nagle, *Digital Control System Analysis and Design*, ISA Press,1995.

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)

08.704 PROCESS DYNAMICS AND CONTROL (A)

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

Module I

Process Control System: Terms and objectives, piping and Instrumentation diagram, instrument terms and symbols. Regulator and servo control, classification of variables. Process characteristics: Process equation, degrees of freedom, modeling of simple systems – thermal, gas, liquid systems. Process lag, load disturbance and their effect on processes. Self-regulating processes, interacting and non-interacting processes. Controller modes: Basic control action, two position, multiposition, floating control modes. Continuous controller modes: proportional, integral, derivative. Composite controller modes: P-I, P-D, P-I-D, Integral wind-up and prevention.

Module II

Controller Modes: Auto/Manual transfer, Bumpless transfer. Response of controllers for different test inputs. Selection of control modes for processes like level, pressure, temperature and flow. Controller tuning Methods: Evaluation criteria - IAE, ISE, ITAE. Process reaction curve method, continuous oscillation method, damped oscillation method. Auto tuning. Closed loop response of I & II order systems, with and without valve, measuring element dynamics. Advanced control system: Cascade control, ratio control, feed forward control. Over-ride, split range and selective control. Multivariable process control, interaction of control loops.

Module III

Final control elements: Pneumatic control valves, construction details, types, various plug characteristics. Valve sizing. Selection of control valves. Inherent and installed valve characteristics. Cavitation and flashing in control valves. Valve actuators and positioners. Instrument air supply specifications. Case Studies: Steam boiler – drum level control and combustion. Distillation column – Modelling – Dynamics – Control of top and bottom product compositions – Reflux ratio. Control of chemical reactor – Control of heat exchangers.

Text Books:

1. George Stephenopoulos: *Chemical Process Control,* **2/e**,PHI.
2. D E Seborg etal : *Process Dynamics & Control*, Wiley, 1986.
3. Peter Harriot : *Process Control*,TMH,1985.
4. D R Conghanowr: *Process Systems Analysis and Control*,**2/e**, McGraw Hill.

References:

1. Carlos A Smith etal : *Principles & Practice of Automatic Process Control*, **2/e**,John Wiley & Sons.
2. 1. B. Wayne Bequette: *Process Control – Modeling, Design and Simulation*, PHI,2006.
3. Shinskey: *Process Control Systems*, **4/e**, McGraw Hill.
4. Paul W.Murril: *Fundamentals of Process Control Theory*, **3/e**, ISA press, New York.
5 W Luyben : *Process Modeling, Simulation and Control for chemical Engineers*, **2/e**, McGraw Hill.
6. Patranabis D: *Principles of Process Control*, TMH, 1981.

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)

08.705 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 BIOMEDICAL IMAGING TECHNIQUES (A)

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

Module I

Historical Pespective, Generic Principles-Modality, Contrast, SNR, Resolution, Toxicity.
Mathematical fundamentals- 2D Fourier Transform, Hankel Transform , Radon Transform, k-space.
Physics of Projection Radiography.
Computerized Tomography-Principles of sectional imaging - Scanner configuration - Data acquisition system - Image formation principles - Conversion of x-ray data in to scan image - 2D image reconstruction techniques - Iteration and Fourier methods-Types of CT scanners-Applications.

Module II

Nuclear Medicine – Radio nuclides- Emission Computed Tomography- PET – SPECT imaging - Gamma Camera. Ultra Sound Imaging – Echo equation – Transducers-Capture and display - Principles of A-mode , B-mode and M-mode display – Beam forming- Pulsed Doppler and phased array systems - Applications of diagnostic ultra sound.

Module III

Magnetic Resonance Imaging - Physics of MRI - Pulse sequence- Image acquisition and reconstruction techniques- MRI instrumentation- Magnets-Gradient system- RF coils - Receiver system-Functional MRI -MRI Angiography- Applications of MRI.

Text books:

1. Albert Macovski, *Medical Imaging Systems*, Prentice Hall,1983.
2. S Webb ,*The Physics of Medical Imaging*, CRC press,1988.
3. A C Kak, *Principle of Computed Tomography* ,IEEE Press New York.

References :

1. Joseph Hornak, *The Basics of MRI*, online at http://www.cis.rit.edu/htbooks/mri
2. G A Hay, *Medical Image Formation Perception and Measurement*, Wiley International,1976.

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)

08.706 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:

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

Reference:

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 II

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 III

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 I

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 II

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 III

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:

Gary K Yeap, Practical Low Power Digital VLSI Design, Kluwer academic publishers,1998.

Kaushik Roy, Sharat Prasad*, Low-Power CMOS VLSI design,* John Wiley & Sons, 2000.

References:

Anantha P Chandrakasan, Robert W Brodersen,*Low Power Digital CMOS Design*, Kluwer Academic Publications,1995.

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 MECHATRONICS (A)

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

Module I

Introduction to mechatronics - mechatronics in manufacturing - mechatronics in products - scope of mechatronics - fundamentals of numerical control - advantages of NC systems - classification of NC systems - point to point and contouring systems - NC and CNC - incremental and absolute s ystems - open loop and closed loop systems - features of NC machine tools - fundamentals of machining - design consideration of NC machine tools - methods of improving machine accuracy and productivity - special tool holders.

Module II

System devices - system drives - hydraulic systems - DC motors - stepping motors - AC motors - feedback devices - encoders - pulse digitizers - resolvers - inductosyn - tachometers - counting devices - flip flops - counters - decoders - digital to analog converters - interpolation - linear interpolator - circular interpolators Complete interpolator-Control Loops for CNC-CNC software interpolator - flow of data in NC machines.

Module III

Computer Integrated Manufacturing (CIM) Introduction-Automated Storage and Retrieval Systems - Group Technology-Computer Aided Process Planning-Material Requirement Planning-Computer Aided Inspection- Machine Vision NC part programming - manual programming - concepts - tape formats - tab sequential - fixed block word address and variable block formats - part programming examples - point to point programming and simple contour programming - computer aided programming - concepts - post processor programming languages - APT programming - part programming examples.

Reference:

1. Yoram Koren, *Computer Control of Manufacturing Systems*, McGraw Hill,1983.
2. HMT, Mechatronics, TMH.2000.
3. Michel P. Groover, *Industrial Robots -Technology, Programming and Applications*, McGraw Hill
4. M.P.Groover, and Emory W,Zimmers, *CAD/CAM:Computer Aided Design and Manufacturing*, Prentice Hall,1984.
5. Yoram Koren & Ben Yuri, *Numerical Control of Machine Tools*, Khanna Publishers.1984.

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, derivations and proofs)

Module IV (This Module is only for internal evaluation – 25 Marks as assignment for the subject)

Computer Aided Design (CAD) Design Process-Application of Computers for Design- Benefits of CAD AutoCAD file menu edit menu draw menu modify menu-format menu- tools menu- AutoCAD Dimensioning- 3D representations in CAD- View menu - 3D drawing Entities- Rendering in Auto CAD- solid and surface modelling, comparisons with 2D methods, spline curve and surface representations, parametric methods and data exchange.

08.707 BIOMEDICAL SIGNAL PROCESSING LAB (A)

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

PART A:

1. Measurement of pH, conductivity and turbidity.
2. PC based respiratory analyser.
3. PC based ECG, pulse analyser.
4. Audio tone analyser.
5. Blood pressure calibrator.

Experiments on Digital Signal Processors.

6. Sine wave generation (Display on CRO)
7. Real Time FIR Filter implementation (Low-pass, High-pass and Band-pass)
8. Real Time IIR Filter Implementation (Low-pass, High-pass and Band-pass)
9. Real time DFT of sine wave (Display on CRO)
10. 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. Study of Coefficient Quantization effects on the frequency response of digital filter.

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 Expts.)
(b) Implementation(Wiring, usage of equipments and trouble shooting)	- 15% (Coding for Software Expts.)
(c) Result	- 35% (Including debugging of Program for 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.

08.708 CONTROL SYSTEM LAB (A)

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

PART -A

1. Frequency response characteristics of a second order system
2. Time response characterics of a second order system
3. Root locus analysis & Design.
4. Design of compensation networks (Lead, Lag and Lag –level)
5. Design of state feedback
6. Observer design
7. Implementation of digital PID in a PC using c language and ADC/DAC
8. Data acquisition using LabVIEW
9. PID controller using LabVIEW

PART-B

Experiments based on MATLAB/LABVIEW

1. Microprocessor based servo system.
2. Speed control system (Open loop & closed loop)
3. Real time control of inverted pendulum
4. Real time control of gyroscope.
5. Ball beam system
6. Position control system with velocity feedback
7. Analog PID controller.

Internal Marks: 50

1. Attendance	- 10	
2. Class work	- 20	(For Part A only)
3. Practical internal Test	- 20	(For Part B only)

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 (Including Part-B also)	- 25%
(e) Record	- 05%

Practical examination (university) to be conducted covering entire syllabus given above in part-A.

Students shall be allowed for the University examination only on submitting the duly certified record (Including Part-A and Part-B). 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:
Evaluation of the report : **25 marks**
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

J.M. Martinez-Duart,R.J. Martin Palma,F. Agulle Rueda *Nanotechnology for Microelectronics and optoelectronics* , Elsevier,2006.

W.R. Fahrner, *Nanotechnology and Nanoelctronics*, Springer, 2005

References

K. Goser, P. Glosekotter, J. Dienstuhl, *Nanoelectronics and nanosystems*, Springer 2004.

2. Supriyo Dutta, *Quantum Transport- Atom to transistor*, Cambridge University Press, 2005.

T. Pradeep, *Nano the Essentials*, TMH, 2007.

Poole, *Introduction to Nanotechnology* ,John Wiley 2006

Chattopadhyay,Banerjee, *Introduction to Nanoscience & Technology*,PHI 2009

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 NON-LINEAR CONTROL THEORY (A)

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

Module I

Introduction **-**Features of linear and non-linear systems –State variable representation – Solution of state equations – Conversion of state variable models to transfer functions – Eigen values – Eigen vectors – Concepts of controllability and observability - Common physical non-linearities – Methods of linearising nonlinear systems.

Phase plane analysis - Concept of phase portraits – Singular points – Limit cycles – Construction of phase portraits – Phase plane analysis of linear and non-linear systems – Isocline method.

Module II

Function analysis -Basic concepts, derivation of describing functions for common non-linearities – Describing function analysis of non-linear systems – Conditions for stability – Stability of oscillations.

Stability analysis - Introduction – Liapunov's stability concept – Liapunov's direct method – Lure's transformation – Aizerman's and Kalman's conjecture – Popov's criterion – Circle criterion.

Module III

Adaptive and Feedback Linearization - Matching and triangular conditions, Robust stabilization, self tuning regulator, adaptive feedback Linearization, extension to multi input systems, physical examples.

Controller synthesis -Linear design and non-linear verification – Non-linear internal model control – Parameter optimization – Model predictive controller – Optimal controller – State feedback and observer.

Text books:

1. E. Jean-Jacques, *Slot line, Applied Non-linear Contro*l, Pearson Education,1991.
2. Torkel Glad, Lennart Ljung, *Control Theory – Multi Variable and Non-linear Methods*, Taylor's & Francis Group, 2002.

REFERENCE

1. Peter A. Cook, *Non-linear Dynamical Systems*, **3/e**,Pearson Education.
2. I.J. Nagrath & M. Gopal, *Control System Engineering*, New Age International Publishers, 2003.
3. Ronald R. Mohler, *Non-linear Systems, Vol. – I, Dynamics & Control*, Pearson Education, 1998.
4.Hassan K. Kahalil, *Non-linear Systems*, Pearson Education, 2002.
5. R. Marino and P. Tomei, *Nonlinear control design - Geometric, Adaptive and Robust*, Prentice Hall,1995.

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)

08.803 SMART SENSORS & NETWORKS (A)

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

Module I

Review: Sensor, actuator and transducer- Classification of sensors on the basis of energy source and type of output signals. Signal conditioning. Meaning and types of smart sensors.
MEMS Sensors: Concept and methods of making MEMS devices, Sensors and Actuators, Examples.
Smart Sensor Technologies: Thick-film, thin-film and monolithic IC technologies and their use in making smart sensors. Bulk and surface micromachining technologies, Wafer bonding, LIGA process, Plasma etching, and their use in making smart sensors.

Module II

Intelligent and Network Sensors: Concept and architecture of intelligent sensors, Concept and architecture of network sensors.
Sensor Networking: 7-Layer OSI model of communication system, device-level networks, introduction to protocols and technologies for wired and wireless LANs. Ethernet, RS-485 and Foundation Fieldbus protocols. Wi-Fi. Zigbee and Bluetooth protocols. Concept of adhoc networks. Smart Transducer Interface Standard IEEE 1451.

Module III

Introduction to Sensor network computing: Applications, Constraints/Challenges, Wireless and wired networking issues for sensor nets. Networking for sensor nets- Directed diffusion, Aggregation, Network discovery/initialization, Location/Time service, Routing, Large-scale analysis, Power-aware computing and Communication.

Text Books:

1. Fraden J., Handbook of Modern Sensors: Physics, Design and Applications, AIP press, 2003.
2. Feng Z. and Leonidas G., Wireless Sensor Networks, Elsevier Eastern Limited, 2007.
3. Anna Hac, *Wireless Sensor Network Design***,** John Wiley & Sons, Ltd, 2004.

References:

1. Frank R., *Understanding Smart Sensors*, Artech House publishers. 2000.
2. Yamasaki H., *Intelligent Sensors*, Elsevier Eastern Limited. 1996.
3. Ramon P. A. and Webster J. G., *Sensors and Signal Conditioning*,2/e, John Wiley and Sons.
4. Elena Gaura**,** Robert Newman**,** *Smart MEMS and Sensor systems*, Imperial College Press, 2006.
5. Mohammad Ilyas,*Sensor Network Applications, Architecture and Design*, CRC Publishers, 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.

08.804 INDUSTRIAL INSTRUMENTATION (A)

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

Module I

Measurement of force torque, velocity Electric balance – different types of load cells – magnets – elastics load cell-strain gauge load cell-different methods of torque measurement, strain gauge, relative regular twist-speed measurement-revaluation counter- capacitive tacho-drag up type tacho D.C and A.C tacho generators – stroboscope. Measurement of acceleration, vibration and density Accelerometers – LVDT, piezo- electric, strain gauge and variable reluctance type accelerometers – mechanical type vibration instruments – seismic instrument as an accelerometer and vibrometer – calibration of vibration pick ups – units of density, specific gravity and viscosity used in industries – Baume scale API scale – pressure head type densitometer – float type densitometer – ultrasonic densitometer- bridge type gas densitometer.

Module II

Pressure Measurement: Units of pressure – manometers – different types – elastic type pressure gauges – Bourde type bellows – diaphragms – Electrical methods – elastic elements with LVDT and strain gauges – capacitive type pressure gauge – piezo resistive pressure sensor – resonator pressure sensor – measurement of vacuum – McLeod gauge – thermal conductivity gauges – Ionization gauge cold cathode and hot cathode types – testing and calibration of pressure gauges – dead weight tester. Temperature measurement: Definitions and standards – primary and secondary fixed points – calibration of thermometers different types of filled in system thermometer – sources of errors in filled in systems and their compensation – Bimetallic thermometers – Electrical methods of temperature measurement – Industrial RTDs and their characteristics –3 lead and 4 lead RTDs.

Module III

Measurement of viscosity, humidity and moisture: Viscosity terms – say bolt viscometer – rotameter type viscometer – industrial consistency meters – humidity terms – dry and wet bulb psychrometers – hot wire electrode type hygrometer – dew cell – electrolysis type hygrometer – commercial type dew point meter – moisture terms – different methods of moisture measurement – moisture measurement in granular materials, solid penetrable materials like wood, web type material.
Principle and constructional details of electromagnetic flow meter – different types of excitation – schemes used – different types of ultrasonic flow meters – laser doppler anemometer systems – rortex shedding flow meter – target flow meter – solid flow rate measurement – guidelines for selection of flow meter.

Text books:

1. Ernest O.Doebelin, *Measurement systems Application and Design*, **4/e**, McGraw Hill.
2. D.Patranabis, *Principles of Industrial Instrumentation*,**2/e**, TMH.

References:

1. A.K.Sawhney, *A course in Electrical and Electronic Measurement and Instrumentation* – Dhanpat Raj & Sons,2004.
2. B.C.Nakra and K.K.Chaudary, *Instrumentation Measurement and Analysis*,TMH,1985.
3. Willard, Merritt, Dean and Settle, *Instrumental Methods of Analysis*, **7/e**, CBS Publishers,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 25% Problem, derivation and Proof)

08.805 DISTRIBUTED CONTROL SYSTEMS (A)

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

Module I

Review of computers in process control: Data loggers, Data Acquisition Systems (DAS), Direct Digital Control (DDC). Supervisory Control and Data Acquisition Systems (SCADA), sampling considerations. Functional block diagram of computer control systems.

Programmable logic controller (PLC) basics: Definition, overview of PLC systems, input/output modules, power supplies and isolators. General PLC programming procedures, programming on-off inputs/ outputs. Auxiliary commands and functions, PLC Basic Functions, register basics, timer functions, counter functions. PLC functions: Arithmetic functions, comparison functions, Skip and MCR functions, data move systems. PLC Advanced intermediate functions: Utilizing digital bits, sequencer functions, matrix functions..

Module II

PLC Advanced functions: Alternate programming languages, analog PLC operation, networking of PLC, PLC-PID functions, PLC installation, troubleshooting and maintenance. Design of interlocks and alarms using PLC.

DCS- Basic Packages Introduction, analog control, direct digital control, distributed process control, DCS configuration with associated accessories, control console equipment, control unit (Relay Rack mounted equipments), local control units,attributes of DCS & DCS Flow sheet symbols. DCS System Integration I/O hardware stations, Set-point station control, Supervisory Computer Tasks & configurations, system integration with PLCs and computers.

Module III

Instrumentation Standard Protocols: HART Protocol, frame structure, programming, implementation examples, Benefits, Introduction, Advantages and Limitations of Fieldbus, FDS configuration, Comparison with other fieldbus standards including Device net, Profibus, Controlnet, CAN, Industrial Ethernet, MAP and TOP.

Industrial applications of PLC, SCADA, DCS and open systems for following plants: Cement plant, Thermal power plant, Steel Plant, Glass manufacturing plant, Paper and Pulp plant.

Text Books:

1. Popovic and Bhatkar,*Distributed computer control for Industrial Automation*, Mareeet Dekkar, N.York.
2. Krishna Kant,*Computer based Industrial Control*, Prentice Hall, New Delhi.
3. Lukcas M.P,*Distributed Control Systems*, Van Nostrand Reinhold Co., New York.
4. Curtis D. Johnson, *Process Control Instrumentation Technology*,**7/e**,PHI.

References:

1. John.W.Webb, Ronald A Reis, *Programmable Logic Controllers - Principles and Applications*,4/e, Prentice Hall Inc.
2. Frank D. Petruzella,*Programmable Logic Controllers*, Second edition, McGraw Hill, New York.
3. Deshpande P.B and Ash R.H,*Elements of Process Control Applications*, ISA Press, New York.

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)

08.815 ADAPTIVE CONTROL SYSTEMS (A)

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

Module I

Different adaptive control strategies - Gain scheduling, MRAS, STR, stochastic adaptive control - Lp spaces - Norms, - stability of Dynamic system. Differential equations, stability definitions - Lyapunov stability Theory - Exponential stability theorems – estimating parameters in dynamic systems with least square methods .

Module II

MRAS – adaptation law – adaptation law based on stability criterion – adaptation based on MIT rule – Design of MRAS based on MIT rule – Design of MRAS based on Lyapunov methods – simulation of MRAS systems.

Module III

Self Tuning Regulators – Pole placement design – Indirect STR – continuous time STR –Direct STR- simulation of STR systems - stochastic self tuning regulators- linear quadrant STR – adaptive predictive control .

Reference:

1. Shankar Sastry & Mare Bodson, *Adaptive Control*, IEEE press
2. K.J Astrom & B.Wittenmark, *Adaptive Control,* Pearson Education,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 proofs)

08.825 ROBUST CONTROL (A)

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

Module I

Introduction - Some common robust control problems. Linear system tools - Jordan and Real Jordan canonical forms, structural decomposition.

Structural mapping of Bilinear Transformations - Mapping of continuous time to discrete time and vice a versa, existence condition of H∞ **-** sub optimal controllers, continuous time system and discrete time system.

Module II

Solution to Discrete time Riccati Equations - Solutions to general DARE and H∞-DARE.

Information in continuous time and discrete time H ∞ **-** optimization - Full information feedback case, output feedback case, plants with imaginary axis zeros/unit circle zeros.

Module III

Solutions to continuous time and discrete time H ∞problems - Full state feedback, full order output feedback, reduced order output feedback.

Robust and perfect tracking of continuous time and discrete time systems, solvability conditions and Solutions - solutions to measurement feedback case.

Text Books:

1. Ben M. Chen,*Robust and H∞ Control*, Springer Verlag, 2000.
2. K. Zhon, John C. Doyle,*Essentials of Robust Control*, Prentic Hall, 1998.

Reference:

1. S. P. Bhattacharya, H. Chapellat. *Robust Control - The Parametric Approach*, Prentice Hall,1995.
2. Petros A. Ioannou, Jing Sun, *Robust Adaptive Control*, Prentice Hall.1995.
3. M. Morari and E. Zafiriou, *Robust Process Control*, Prentice Hall, 1989.
4. J. C. Doyle, B. A. Francis and A. R. Tannenbaum, *Feedback Control Theory*, Macmillan,1992.
5. *Optimal Controller, A General Robust Control in Control System Toolbox:- Robust Analysis, Robust Model Reduction:-* MATLAB, Mathwork Inc. 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 and Proof)

08.835 VLSI STRUCTURES FOR SIGNAL PROCESSING(A)

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

Module I

Pipelining of FIR digital filters – parallel processing for FIR systems – combined pipelining and parallel processing of FIR filters for low power – Pipelining in IIR filters – parallel processing for IIR filters – combined pipelining and parallel processing of FIR filters.

Module II

Parallel FIR filters – discrete time cosine transform – implementation of DCT based on algorithm – architecture transformations – parallel architectures for rank order filters.
Scaling and round off noise – round off noise in pipelined IIR filters – round off noise in lattice filters – pipelining of lattice IIR digital filters – low power CMOS lattice IIR filters.

Module III

Evolution of programmable DSP processors – DSP processors for mobile and wireless communications – processors for multimedia signal processing – FPGA implementation of DSP processors -Typical architecture of DSP processor in FPGA.

References:

1. Keshab K. Parhi, *VLSI Digital signal processing Systems: Design and Implementation,* John Wiley & Sons, 1999.
2. Bayoumi,Magdy.A,*VLSI Design Methodologies for Digital Signal Processing Architectures*, BSP, India,2005.
3. Keshab. K. Parhi, Takao Nishitani, *Digital Signal Processing for Multimedia Systems*, Marcel Dekker,Inc,1999
4. Uwe meyer-Baes, *DSP with Field programmable gate arrays,* Springer, 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 50% Problems, derivations and proofs)

08.845 VLSI DEVICE & PROCESS SIMULATION (A)

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

Module I

Introduction to VLSI Design methodologies - Review of Data structures and algorithms , Review of VLSI Design automation tools,Algorithmic Graph Theory and Computational Complexity. Tractable and Intractable problems.General purpose methods for combinatorial optimization.
Layout Compaction - Design rules, problem formulation,algorithms for constraint graph compaction.

Module II

Partition- Kernigham-Lin's algorithm, Fiduccia Mattheyes algorithm, Krishnamurty extension, hMETIS algorithm, multilevel partition techniques.
Floor-Planning- Hierarchical design, wire length estimation, slicing and non-slicing floor plan, polar graph representation, operator concept, Stockmeyer algorithm for floor planning, mixed integer linear program.
Placement- Design types, ASICs, SoC, microprocessor RLM, Placement techniques, Simulated annealing, partition-based, analytical, and Hall's quadratic, Timing and congestion considerations.

Module III

Routing- Detailed, global and specialized routing, channel ordering,channel routing problems and constraint graphs, routing algorithms, Yoshimura and Kuh's method, zone scanning and net merging,boundary terminal problem, minimum density spanning forest problem, topological routing, cluster graph representation.
Sequential Logic Optimization and Cell Binding- State based optimization, state minimization, algorithms- Library binding and its algorithms.

Text Books:

1. Sarrafzadeh, M. and Wong, C.K., *An Introduction to VLSI Physical Design*, **4/e**, McGraw-Hill.
2. N.A. Sherwani,*Algorithms for VLSI Physical Design Automation*, **3/e**, BSP,India.
3. S.H. Gerez, *Algorithms for VLSI Design Automation*, John Wiley & Sons,2002.
4. Lim, S.K., *Practical Problems in VLSI Physical Design Automation*, Springer.2008

Reference:

1. Wolf, W., *Modern VLSI Design System on Silicon*, **2/e**, Pearson Education.2000
2. Sait, S.M. and Youssef, H., *VLSI Physical Design Automation: Theory and Practice*, World Scientific.1999
3. Dreschler, R., *Evolutionary Algorithms for VLSI CAD*, **3/e**,Springer. 2002
4. Hill, D., D. Shugard, J. Fishburn and K. Keutzer, *Algorithms and Techniques forVLSI Layout Synthesis*, Kluwer Academic Publishers,1989.

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% Algorithms and design problems)

08.806 MODELLING & SIMULATION OF DYNAMIC SYSTEMS (A)

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

Module I

Introduction of System Modeling - Mathematical modeling of Systems by transfer function approach and state space approach. Mathematical modeling of Electrical Systems , Mechanical and electromechanical systems, Analogous Systems. Converting transfer function model to state space model and vice versa.

Mathematical Modeling - Liquid level systems, Pneumatic systems, Hydraulic systems, Thermal systems, Chemical systems. Automatic/Industrial Controllers. Robust PID Controllers.

Module II

Introduction to simulation. Motivational examples. Discrete Event Models. Modeling of Uncertainty. Random Number generation and Random Variate Generation. Test of Random number sequences and goodness of fit tests. Simulation languages. GPSS, SIMSCRIPT.

Module III

Selection of Input Probability distribution. Multivariate and time-series input models. Verification of Simulation models. Validation of Simulation models. Variance reduction and output analysis.

Modelling and simulation of - Instrument Servo, Two Car train, Inverted Pendulum, Pendulum on a Cart, Hydraulically actuated gun turret, Two axis Gyroscope, Distillation Columns.

Text Books:

1. B. Friedland,*An introduction to State Space Methods*,Mc.Graw Hill.1986.
2. K. Ogatta,*Systems Dynamics*,**3/e**,Prentice Hall.
3. J. Banks, J. S. Carson, B. L. Nelson and D. M. Nicol, *Discrete Event System Simulation*, **3/e**,Pearson Education.

References:

1. Umez-Eronini, *System Dynamics and Control*, Brooks/Cole – Publishing Company,1999.
2. A. M. Law and W. D. Kelton, *Simulation Modeling And Analysis*, **3/e**, McGraw Hill.
3. W. D. Kelton, R. P. Sadowski and D. A. Sadowski, *Simulation With Arena*, **3/e**,McGraw Hill.
4. Sheldon M. Ross, *Simulation*, **3/e**, Academic 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 50% Problem, derivation and Proof)

08.816 REVERSIBLE LOGIC DESIGN (A)

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

Module I

Reversible Computation - Reversible Turing machine- Entropy of Logic gates - Energy and Information Loss - Reversible Logic Gates- requirements - NOT, k-CNOT, TOFFOLI gates, FRedkin gate. E limination of Garbage in two valued reversible circuits. Combinational reversible circuits. Normal Galois Forms- Invariant valued families of generalized spectral transforms. Shanon/Davio (S/D) Trees- Binary S/D Trees- Ternary S/D Trees . Generalized Inclusive Forms (GIF)- Ternary Inclusive Forms – Quaternary S/D Trees.

Module II

Lattice Structures- Symmetry indices- Two and Three Dimensional Lattice Structures- Shannon Davio Lattice Structures. Reversible Lattice structures. Modified Reconstructability Analysis (MRA)- Two valued and multiple valued. Reversible Decision Diagrams.

Module III

Quantum Computation and quantum logics :-review of linear algebra- qubits- postulates of quantum mechanics- the density operator- quantum computation and measurement. Physical realization of quantum computers.

Text Books:

1. AN Al-Rabadi, *Reversible Logic Synthesis* , Springer, 2004.
2. Michael A Neelsen, Issac L Chauang, *Quantum Computation and Quantum Information*, CUP, 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 50% Problem, derivation and Proof)

08.826 CONTROL OF POWER CONVERTERS (A)

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

Module I

Introduction to Motor Drives: Components of Power Electronic Drives, Criteria for selection of Drive components. DC Motor Drives: Equivalent circuit of DC Motor, Block diagram and transfer function, Principle of DC Motor control, Two quadrant, three phase converter controlled DC Motor drives, Four-quadrant converter circuit.

Module II

Induction Motor Drives: Induction Motor equivalent circuit, Block diagram and transfer function, 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.

Synchronous Motor Drives: Basic principles of synchronous motor operation and its equivalent circuit, Methods of control.

Module III

Application of PWM in control of DC-DC converters and DC-AC, Classification of PWM,Quasi square wave PWM, Frequency spectrum of PWM signals, Sinusoidal PWM, Space vector PWM, Comparison of SPWM and SVPWM , Selective harmonic elimination PWM, Hysterisis controller.

Text Books:

1. R.Krishnan, *Electric Motor drives – Modeling, Analysis and Control,* PHI, 2008.
2. L Umanand, *Power Electronics Essentials and Applications,* Wiley India, 2009.
3. Ned Mohan et. al, *Power Electronics : Converters, Applications and Design*,**2/e**, John Wiley.

Reference:

1. Theodore Wildi, *Electrical Machines, Drives and Power Systems,* **6/e**,Pearson Education.
2. W.Shephered, L N Hulley,*Power Electronics & Control of Motor*, Cambridge University Press.
3. Bubey,*Power Electronics Drives*,Wiley Eastern.

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 and design)

08.836 VIRTUAL INSTRUMENTATION (A)

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

Module I

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 II

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.

Module III

Networking basics for office & Industrial applications. VISA and IVI. VI toolsets.Distributed I/O modules.

Application of Virtual Instrumentation - Instrument Control, Development of process database management system, Simulation of systems using VI, Development of Control system, Industrial Communication, Image acquisition and processing, Motion control.

Text Books:

1. Gary Johnson, *LabVIEW Graphical Programming*, **2/e**, McGraw Hill.
2. Jane W. S. Liu, *Real-time Systems*, Pearson Education, 2001.
3. Jean J. Labrosse, *Embedded Systems Building Blocks:Complete and Ready-to-use Modules in C,***2/e**, CMP Books.

Reference Books:

1. Kevin James, *PC Interfacing and Data Acquisition: Techniques for Measurement, Instrumentation and Control*, Newnes, 2000.
2. Jean J. Labrosse, *"MicroC/OS-II. The Real-time Kernal"*, CMP Books, 2002.
3. S.Gupta and J.P.Gupta,*PC Interfacing for data acquisition and Process control*, Instrument Society of America.
4. National Instruments Inc.& Bishop,*Lab View 8 Student Edition*, Prentice Hall,2007.
5. Peter A Blume, *The Lab View Style Book*, Prentice Hall, 2007.

Web Resources:

1. www.ni.com
2. www.ltrpub.com

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, derivations and proofs)

08.846 CURRENT TOPICS (A)

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

The syllabus shall contain current area of research in Applied Electronics & Instrumentation (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 PROCESS CONTROL LAB (A)

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

1. Experimental study of P,PD,PI and PID controllers on level,flow,temperature and pressure loops.
2. Experimental study of ON-OFF controller and ON- OFF controller with neutral zone on temperature control systems.
3. Controller tuning using continuous cycling method.
4. Controller tuning using process reaction curve method.
5. Control valve characteristics.
6. Experimental study of Ratio,Cascade and Feed forward control systems.
7. PLC based Water level,Bottle filling and Motor speed control systems.
8. Calibration of pressure gauge.
9. Design and testing of RTD based temperature transmitter.
10. Experimental study of Inertial control systems.
11. Experimental study of Binary distillation process.

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.

08.808 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.