Scheme for I to VIII

B.TECH ELECTRONICS & COMMUNICATION ENGINEERING

(2006 Admission onwards)
### Semester I & II

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject Name</th>
<th>Hrs./ week</th>
<th>Marks</th>
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<td>CE/CS/EB/EC/EE/ EI/IT/ME/SE 101</td>
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<td>EC/EI 404</td>
<td>Signals and Systems</td>
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<td>EC/EI 503</td>
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<td>Advanced Microprocessors</td>
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<td>Micro Electronics &amp; Integrated Circuits</td>
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#### ELECTIVE I:

- **EC/EI 705A:** Intelligent Systems
- **EC 705B:** Fundamentals of RF Design
- **EC 705C:** Hardware modeling
- **EB/EC/EI 705D:** Mechatronics

### Semester VIII

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**Grand Total** 8000

#### ELECTIVE II:

- **CS/EC/EE/EI 804 A:** Digital Image Processing
- **CS/EB/EC/IT 804 B:** Bioinformatics
- **EC/EI 804 C:** ASIC Design
- **EC 804 D:** Mixed Signal System Design
MODULE I

**Ordinary differential equations:** First order differential equations-Methods of solution and Simple applications-
Linear differential equations of higher orders with constant co-efficients- Methods of solution of these equations.
Cauchy's linear differential equations. Simultaneous linear differential equations- Simple applications of linear
differential equations in engineering problems –Electrical Circuits, Mechanical Systems

MODULE II

**Infinite series:** Integral test, comparison test, ratio test, Cauchy’s root test, Raabe’s test, series of positive and
negative terms, concept of absolute convergence, alternating series, Leibniz test (No proofs for any of the above
tests)

**Power series:** Internal of convergence of power series, Taylor and Maclaurin series of functions, Leibniz formula for
the nth derivative of the product of two functions (No proof), use of Leibniz formula for the determination of co-
efficients of the power series.

MODULE III

**Partial differentiation:** Partial differentiation-Concept of partial derivative - Chain rule- Total derivative- Euler’s
theorem for homogeneous functions, Differentials and their applications in errors and approximations, Jacobians -
Maxima minima of functions of two variables(Proof of the result not required)-Simple applications.

**Co-ordinate systems:** Rectangular co-ordinates-Polar co-ordinates-In plane and in Space-Cylindrical polar co-
ordinates-Spherical polar co-ordinates.

MODULE IV

**Integral calculus:** Application of definite integrals: Area, Volume, Arc length, Surface area. Improper Integrals-Beta
function-Gamma function

Multiple integrals: Evaluation of double integrals-Change of order of integration. Evaluation of triple integrals-Change
of Variables in integrals. Applications of multiple integrals Plane Area, Surface area &Volumes of solids

**TEXT BOOKS:**
1. Engineering mathematics -Vol1:S.S.Sastry, PHI publishers

**REFERENCES:**
1. Mathematical Techniques: Oxford University Press
Module I:

Module II:

Module III:

Module IV:

Text and Reference Books :

1. Jacob Philip – A text book of Engineering Physics, Educational Publishers and Distributors 2002
2. A.S. Vasudeva – Modern Engineering Physics, S. Chand & Co.
3. M.R. Sreenivasan – Physics for Engineers – New Age International
Module I

Module II


Module III
Chemical Thermodynamics: Fundamentals, Molecular interpretation of internal energy, enthalpy and entropy, Heat of reaction, Kirchhoff's equation, Trouton's rule, Entropy changes accompanying different processes, Nernst heat theorem, Third-law. Free energy: Dependence on pressure and temperature, Gibbs-Helmholtz equation, Free energy changes and equilibrium constant, Chemical potential, Fugacity, Thermodynamics of biochemical reactions.

Module IV

Chemistry of optical fibres, fullerenes and organoelectronical materials (introduction only).

Text Books

1. Peter Atkins and Julio de Paula
   
   Elements of Physical Chemistry, Oxford University Press, 2005

2. Shashi Chawla
   

References

1. Atkins, P.W.,
   
   Physical Chemistry, Oxford University Press, UK, 1998

2. Bhatnagar, M. S.,
   

3. Geoffrey Ozin, Andre Arsenault
   
A) STATICS

MODULE I
Parallel forces in a plane: Two parallel forces. General case of parallel forces in a plane. Centre of parallel forces and centre of gravity, Pappus theorems, centroids of composite plane figures and curves. Distributed forces in a plane.

MODULE II

B) DYNAMICS

MODULE III

MODULE IV

TEXT BOOK & REFERENCES:
MODULE I
Scales- plain scale, vernier scale, diagonal scale.
Conic sections- Construction of ellipse, parabola, hyperbola - construction of cycloid, involute, archimedian spiral and logarithmic spiral- drawing tangents and normals to these curves.

MODULE II
Introduction to orthographic projections- plane of projection- principles of first angle and third angle projections, projection of points in different quadrants.
Orthographic projection of straight lines parallel to one plane and inclined to the other plane- straight lines inclined to both the planes- true length and inclination of lines with reference planes- traces of lines.
Projection of plane laminae of geometrical shapes in oblique positions.

MODULE III
Projection of polyhedra and solids of revolution- frustum, projection of solids with axis parallel to one plane and parallel or perpendicular to other plane- projection of solids with axis inclined to both the planes- projection of solids on auxiliary planes.
Section of solids by planes inclined to horizontal or vertical planes- true shape of sections.

MODULE IV
Development of surface of cubes, prisms, cylinders, pyramids and cones
Intersection of surfaces- methods of determining lines of intersection - intersection of prism in prism and cylinder in cylinder.

MODULE V
Introduction to isometric projection- isometric scales, isometric views- isometric projections of prisms, pyramids, cylinders, cones and spheres.
Introduction to perspective projections : visual ray method and vanishing point method- perspective of circles-perspective views of prisms and pyramids.

TEXT BOOKS & REFERENCES:
2. Elementary engineering drawing N.D.Bhat, Charotar publishing house
(A) CIVIL ENGINEERING

MODULE I


Construction: Foundation - types of foundations - isolated footing, combined footing, raft, pile & well foundations,

MODULE II

Super structure: Brick masonry, English bond and Flemish bond, Stone masonry, Random rubble masonry. Roofing - Steel trusses, roofing for industrial buildings

Surveying: Principles, instruments, ranging and chaining of survey lines, errors in chaining, field work, field book, selection of survey stations, reconnaissance.

Levelling: Levelling instruments, different types, temporary adjustments, mean sea level, reduced level of point, booking of field notes, reduction of levels by height of collimation method.

Text Books & References:
1. Engineering materials : Rangawala
2. Building construction : Punmia
5. A Text book of building construction : Jha & Sinha
6. Surveying & Levelling : T P Kanetkar
7. Surveying & Levelling : Hussain

(B) MECHANICAL ENGINEERING

MODULE III

Thermodynamics: thermodynamic systems - open, closed and isolated systems, equilibrium state of a system, property and state, process, cycle, work, Zeroth law of thermodynamics-concept of temperature, temperature scales. First law - internal energy, enthalpy. Second law - Kelvin-Plank and Clausius statements, Carnot Cycle.

Refrigeration and Air conditioning: Vapour compression and vapour absorption refrigeration systems, summer and winter Air conditioning, Comfort and industrial Air conditioning.

Elementary ideas of simple reaction and impulse turbines, compounding of turbines.

MODULE IV

Internal Combustion Engines: working of two stroke and four stroke Petrol and Diesel engines, simple Carburettor, ignition system, fuel pump, fuel injector, cooling system, lubricating system.

Transmission of Power: Belt drives (open and closed), chain drives.

Metal fabrication: Welding - Arc, gas, resistance welding, Welding defects, Soldering, Brazing.

Text Books & References:
1. Engineering Thermodynamics : P.K.Nag
3. Engineering Thermodynamics : Van Wylon
4. Thermodynamics : J.P.Holman
5. Elements of Internal Combustion Engines : Rogowsky, Tata McGraw Hill
(A) ELECTRICAL ENGINEERING

Module I
Basic principles of Electric circuits: Review of Ohms law - Definition of resistance, current, voltage and power - Series and parallel circuits- constant voltage source and constant current source.

Network Theorems: Kirchoff’s laws- Network analysis by Maxwell’s circulation currents - Thévenin’s theorem - Superposition theorem -Norton’s theorem - Simple illustrative problems on network theorems.

Review of electrostatics - Coulomb’s Law- Electric field strength and Electric flux density-capacitance.

Module II


(B) ELECTRONICS ENGINEERING

Module III


Transistors: - PNP and NPN transistors - theory of operation - Transistor configurations - characteristics - comparison.

Special semiconductor devices - FET - SCR - LED - LCD – V-I characteristics, applications.

Module IV
Fundamentals of Instrumentation: Transducers - Definition - Classification – Active & passive - Transducer for position, pressure, velocity, vibration and temperature measurements.

CRO – principle of operation - measurement of amplitude, frequency and phase.

Fundamentals of Communication: Analog communication - concept of modulation, demodulation. Types: AM - FM -PM- Block diagram of general communication system -Basic concepts of digital communication - Block diagram.

Text Book:

Further References:
1. Electrical Technology : Edward Hughes, Addison Wesley Publication
Module I

Introduction to programming in C: Fundamental data types- integer, floating point, and enumerated data types, Expressions – arithmetic, relational and logic operators, Type conversion – simple and compound statement, Access to standard library, standard I/O-getchar, putchar, Formatted I/O, scanf, printf, error handling, line input and output, control structures, selection statement, IF, SWITCH, WHILE, DO WHILE, FOR, BREAK, CONTINUE, GOTO, RETURN statements.

Module II

Functions: Declarations and functions, parameter passing mechanism, storage classes-scope, visibility, and life time of variables, AUTO, EXTERN, STATIC and REGISTER modifiers, Recursion.

Module III

Arrays: Single and multi-dimensional arrays, sorting, selection sort, search-linear search and binary search, Structures and union.

Module IV

Pointers: Pointers and addresses, pointer arrays,,,,, function returning pointers, pointers to function, pointer arithmetic,, pointers to structures, array of structures, preprocessor directive, command line arguments, typedef.

Text Book & References:

1. Computer Fundamentals & Programming in C : Pradip Dey & Manas Ghosh (OXFORD)
2. Computer Fundamentals : Dr. Varghese Paul (EPD)
3. Programming in C : B.S. Gotfried (Schaum series, TMH)
CE/CS/EB/EC/EE/EI/ME/IT/SE 109 TECHNICAL COMMUNICATION AND SOCIAL SCIENCES

(Module IV Environmental Studies : 1 hour per week
Other modules : 2 hours per week)

PART - A  TECHNICAL COMMUNICATION

Module I

(25 hours)

Oral Communication: starting and ending a conversation; telling and asking people to do things; expressing opinions and ideas, decisions and intentions, offers and invitations, feelings, right and wrong, numbers and money.

Purpose and audience; dealing with customers and clients; face-to-face discussions; meetings and attending meetings; checking understanding; raising questions; giving and receiving feedback; using body language; leading and directing discussions; concluding discussions; using graphics in oral presentations

Reading Comprehension and reference skills: skimming and scanning; factual and inferential comprehension; prediction; guessing meaning of words from context; word reference; comprehending graphics in technical writing.

Reading strategies; reading speed; reading between the lines for hidden meaning; interpreting graphics; using a dictionary; using an index; using a contents list to find information; choosing the right reference source.

Module II

(20 hours)

Written Communication: note making and note taking; summarising; notes and memos; developing notes into text; organisation of ideas: cohesion and coherence; paragraph writing: ordering information in space and time; short essays: description and argument; comparison and contrast; illustration; using graphics in writing: tables and charts; diagrams and flow-charts; maps, plans and graphs.

Spelling rules and tips; writing a rough draft; editing and proof reading; writing the final draft; styling text; filling in complex forms; standard letters; CV; writing a report; writing leaflets and brochures; writing references; essay writing: expository writing; description of processes and products; classification; the instructional process; arguments and presentation of arguments; narrating events chronologically.

PART - B  SOCIAL SCIENCES

Module III

(15 hours)

Science, Technology and Ethics


Responsibilities and Rights of engineers – Collegiality and Loyalty – Respect for authority – Collective bargaining – Confidentiality – Conflicts of interest – Professional rights.

Module IV

Environmental Studies :

(30 hours)

Natural resources – issues related to the use and over exploitation of forest resources, water resources, mineral resources, food resources and energy resources – role of an individual in conservation of natural resources – equitable use of resources for sustainable life styles.

Concept of an ecosystem – structure and function – energy flow in the ecosystem – ecological succession - food chains, food webs and ecological pyramids – structure and functions of a forest ecosystem and an aquatic eco system.
Definition of biodiversity – genetic, species and ecosystem diversity – biogeographical classification of India – Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values.

Causes, effects and control measures of air pollution, water pollution, soil pollution, noise pollution, marine pollution, thermal pollution and nuclear hazards – Causes, effects and control measures of urban and industrial solid wastes – Role of an individual in prevention of pollution - An overview of the various environmental legislations in India – Issues involved in enforcement of environmental legislation.


Text Books:

Meenakshi Raman and Sangeetha Sharma

Technical Communication: Principles and Practice,
Oxford University Press, 2004

Rajagopalan. R

Environmental Studies: From Crisis to Cure, Oxford
University Press, 2005

Jayashree Suresh and B.S. Raghavan

Professional Ethics, S. Chand & Company Ltd, 2005.

WC Dampier

History of Science, Cambridge University Press.

References:

Adrian Doff & Christopher Jones,

Language in Use. Upper intermediate, self-study

Krishna Mohan & Meenakshi Raman,


Edmund D. Seebaur & Robert L. Barry

Fundamentals of Ethics for Scientists and Engineers, Oxford
University Press, 2001

Krishna Mohan & Meera Banerji,

Developing Communication Skills, Mac

Rajendra Pal & JS Korlahalli

Essentials of business communication, S. Chand & Company Ltd

Sarah Freeman,


Meenambal T, Uma R M and K Murali

Principles of Environmental Science and Engineering, S. Chand & Company Ltd, 2005

University Examination pattern

The question paper will have two parts. Part A (Technical Communication) will cover Modules I, II and will have a weightage of 50 marks. Part B (Social Sciences) will cover Module III and Module IV (Environmental Studies) and will have a weightage of 50 marks. Part A and Part B will have to be answered in separate answer books.

Part A

University examination pattern

Q I - 4 short type questions of 5 marks, 2 each from module I and II
Q II - 2 questions A and B of 15 marks from module I with choice to answer any one
Q III - 2 questions A and B of 15 marks from module II with choice to answer any one

Part B

University examination pattern

Q I - 5 short type questions of 4 marks, 2 from module III and 3 from module IV
Q II - 2 questions A and B of 10 marks from module III with choice to answer any one
Q III - 2 questions A and B of 20 marks from module IV with choice to answer any one

**CE/CS/EB/EC/EE/EI/ME/IT/SE 110**

COMPUTER PROGRAMMING LABORATORY

1. Study of OS commands. General introduction to application packages.
3. Searching & sorting
4. Creation and use of databases in a suitable database package
5. Programming exercises in C.

**CE/CS/EB/EC/EE/EI/ME/IT/SE 111**

ELECTRICAL AND MECHANICAL WORKSHOPS

**ELECTRICAL WORKSHOP**

1. One lamp controlled by one switch
2. Series and parallel connections of lamps.
3. Stair case wiring.
4. Hospital Wiring.
5. Godown wiring.
6. Fluorescent lamp.
7. Connection of plug socket.
8. Different kinds of joints.
10. Soldering practice.
11. Familiarisation of CRO.

**MECHANICAL WORK SHOP**

1) Fitting Shop.
2) Sheet Metal Shop
3) Foundry Shop
4) Welding Shop
5) Carpentry Shop
   (Preliminary exercises for beginners in all shops. Specific models may be designed by the teachers.)

Introduction to the use of concrete mix.
Module I
Matrices and Vector spaces: Rank of matrix, Echelon and normal form, Solutions of linear systems of algebraic
equations, Eigen values and Eigen vectors, Cayley- Hamilton theorem (no proof).
Vector Spaces- Subspaces,-Linear Independence of vectors-Linespan-Dimension and Basis. Linear transformations.

Module II
Fourier series and Fourier integrals: Fourier series of Periodic functions-Euler formulae for Fourier coefficients-
functions having period 2π, arbitrary period- even and odd functions-half range expansions, Fourier integral, Fourier
cosine and sine transformations, linearity property, transform of derivatives, convolution theorem (no proof)

Module III
Laplace transforms: Linearity property, transforms of elementary functions, Laplace transforms of derivatives and
integrals, differentiation and integration of transforms, convolution theorem (no proof), use of Laplace transforms in
the solution of initial value problems, unit step function, impulse function - transform of step functions, transforms of
periodic functions.

Module IV
Vector calculus: Scalar and Vector point functions-Gradient and directional derivative of a scalar point functions. -
Divergence and Curl of a vector point functions- their physical meanings. Evaluation of line integrals, surface integral
and volume integrals, Gauss’s divergence theorem, Stoke’s theorem (No Proof of these theorem), conservative force
fields, scalar potential.

Text books:

References :
1. Larry C Andrews,Ronald C Philips, Mathematical Techniques For Engineers & Scientists, Phi Publishers
Module   I

Transformers: working principle and elementary theory of an ideal transformer, Constructional features of single phase transformer, emf equation, turns ratio, vector diagram, equivalent circuit, impedance transformation, transformer losses, flux leakage, efficiency, open circuit and short circuit test, load test. Auto transformer - working principle and saving copper, basic idea of current transformer and potential transformer, distribution and power transformer, applications, standard rating, IS specifications.

Module   II

Basic principles of electrical machines: Concepts of motoring and generating action,
DC machines- Main constructional features, principles of operation, types of generators, emf equation, characteristics, applications, armature reaction and commutation, types of motors, torque, speed, and power, characteristics, applications, starting losses, and efficiency, speed control, testing, load test of dc machines.

Module   III

AC Machines: Alternator- rotating field, speed and frequency, effect of distribution of winding, coil span, characteristics, emf equation, losses and efficiency, regulation (emf method only), applications, synchronous motor-principle of operation, over excited and under excited, starting, applications, synchronous capacitor.
Induction Motor: Three phase induction motor, principles of operation, and constructional features of squirrel cage and slip ring motors, torque-slip characteristics, starting, speed control, losses and efficiency.
Single phase induction motor: Principle of operation, types of single phase induction motors

Module   IV

Generation, transmission & distribution of electrical energy:
Different methods of power generation- thermal, hydro-electric, nuclear, diesel, gas turbine stations (general idea only), electrical equipments in power stations, concept of bus bar, load dispatching, methods of transmission, transmission lines, overhead lines and insulators, corona and skin effect of DC & AC distribution, substation (elementary idea only)

Text Books:


References:

Module I
Review of basic Circuit Concepts and theorems, Passive circuit components, Sources, Standard input signals; Source transformation, Mesh and Node analysis, Network equation for RLC Circuits
Graph of a Network, Trees, Co-trees and loops, Incidence matrix, Cut-set Matrix, Tie-set Matrix and loop currents, Analysis of Networks

Module II
Characterization of two port networks using different parameters; Interconnections of two port Networks, T &  representation; Steady state and transient response, DC and sinusoidal response of RL, RC and RLC circuits, Initial conditions, Rise and decay of current, Time constant, Damping.
Laplace Transforms – Concept, Laplace transform of important Network functions; Transfer function of two port networks, poles and zeros; Application of Laplace Transforms – Solutions of Network Problems.

Module III
Passive filters – Filter fundamentals, Classification of Filters- Low Pass, High Pass, Band Pass & Band Reject Filters. Characteristic impedance, Design of Constant K and m derived filters (all four)- T and  - frequency response, Recursive filters- Butter worth, Chebyshev & Elliptical filters (Concept only)-Frequency response, transfer function.

Module IV

Text Books:
1. D. Roy Choudhury, Networks and systems, New Age International, 1988

References:
1. William B. Stanley, Network Analysis with applications, Pearson Education. 4th ed.
2. C.P. Kuriakose, Circuit theory: Continuous and Discrete-time systems, Elements of network synthesis, PHI, 2005
5. Bruce Carlson, Circuits, Thomson Learning, 2006
8. Schaum’s 3000 solved Problems in Electric Circuits, Book 1,2, McGraw Hill, 1988
EB/EC/EI 304 DIGITAL ELECTRONICS

Module I

**Number system and codes**: Binary, Octal, and Hexadecimal number systems - Binary arithmetic, Binary coded Decimal, Excess - 3 code, Gray Code, Error detection and correction - Boolean algebra - Minimization of Boolean function using Karnaugh Map and Quine - McClusky methods – Formation of switching functions from word statements, realisation using NAND, NOR. Combinational circuits- multiplexer demultiplexer, decoder, encoder

Module II

**Sequential circuits**: Flip-flops - RS, JK & T & D flip-flops, shift registers - counters - Asynchronous and synchronous counters, Up-Down counter, modulo counter, Ring counter, Johnson counter - sequence generators - state tables and diagrams

Module III

**Arithmetic circuits**: Half adder, Full adder, Subtractor, Serial and parallel addition - Carry look ahead adder - Binary multiplication and division - Multivibrators - Monostable and astable multivibrators using discrete gates. Memories – ROM, RAM, EPROM

Module IV

**Logic families**: DCTL, RTL, DTL, TTL, ECL, CMOS - Tri-state logic - specification and transfer characteristics of basic TTL - Standard logic levels - Current and voltage parameters - fan in and fan out - Propagation delay, noise consideration - interfacing of CMOS to TTL and interfacing of TTL to CMOS

Text Book:


References:

Module I

Band theory of solids - Conductors, semiconductors and insulators - energy band diagram. -Semi conductor materials and their properties: elemental semiconductors- the energy band model of semiconductors. Valance band model of semiconductor equilibrium concentration of electrons and holes- the fermi level and energy distribution of carriers inside the bands- temperature dependence of carrier concentration inside the bands. - Carrier transport in semi conductors - drift of carriers in electric fields, carrier flow by diffusion - constancy of fermi level across junction, Excess carriers in semi conductors - injection of excess carriers - recombination of excess carriers - continuity equation - current flow equation.

Module II

PN junction- Abrupt PN junction - energy band diagram - barrier potential, biasing PN junction, excess carrier calculation - current components diffusion - drift - boundary conditions for long and short diodes - PN junction characteristics - calculation of diffusion – depletion layer capacitance - simple model - transient ac condition -principle of zener and avalanche diodes - photodiodes - tunnel diode and PIN diode -varactor diode.

Module III

Bipolar junction transistors - NPN, PNP types, Basic structures - biasing - mechanism of carrier flow - current components in transistors boundary conditions in active region - solution for short base width - base width modulation - Transistor configurations - Characteristics - current amplification factors - relations between alpha & beta - comparison Ebbers - Moll model - - basic principles of phototransistors - UJT, characteristics. Semiconductor heterojunctions - V-I characteristics - real heterojunctions - frequency limitation of transistor - transit time effect

Module IV

Field effect transistors: JFET - basic structures - principle of operation - Characteristics and current equation, MOSFET - semiconductor surfaces - C - V characteristics - the Si - SiO2 System - basic structures and operating principles - current equation - V-I characteristics - simple model – CMOS- structure, operation.

Text Books:-

References
Module I

**DC power supplies** - power transformers - rectification - half wave, full wave, bridge - expression for ripple factor, efficiency, comparison, diode ratings. Filters - capacitor - inductor LC filters- use of bleeder resistor - voltage multipliers - dual power supplies - simple voltage regulator. Series regulators - IC regulators.

Module II

**BJT Amplifiers**: Units of gain, CE amplifier- Biasing techniques - stabilization of operating point –compensation techniques- low frequency equivalent circuits - r-parameters, h-parameters Methods of coupling - D.C coupled amplifier - CE RC coupled amplifier - concept of load lines- loading effect at the input and output - emitter follower as Buffer stage- Darlington emitter follower-Boot strapping – High frequency equivalent circuit of CE amplifier-hybrid model - frequency response of RC coupled amplifier - frequency analysis of R C coupled amplifier - lower cut-off frequency - upper cut-off frequency - 3 db bandwidth - Frequency response of DC coupled amplifier.

Module III

**FET Amplifier**: FET biasing- Low frequency equivalent circuit- RC coupled common source amplifier - expression for gain - frequency response - FET source follower- - FET as a voltage variable resistor –comparison of FET with BJT. CMOS biasing-Amplifier circuits, Multistage Amplifier.

Module IV

**Pulse circuits**: pulse characteristics - Pulse shaping using RC circuits - Differentiating and integrating circuits - clipping and clamping circuits using diodes and transistors - Transistor as a switch- sweep circuits - Transistor sweep circuits - voltage and current sweep - Miller sweep circuit - Bootstrap sweep circuit - UJT relaxation oscillator. Multivibrators using transistors – Astable, Monostable and Bistable operation

**Text books:**


**References:**

1. Study of – Multi meter, Signal generators, CRO etc. and measurement of electrical quantities (V, I, FREQUENCY, PHASE)

2. Testing of Passive and Active components - Resistors, Capacitors, inductors, Transformers, diodes, Transistors etc.

3. Characteristics of Active devices
   i) Forward and reverse characteristics of a diode - measurement of forward resistance
   ii) Common base characteristics of a transistor - measurement of current gain, input resistance and output resistance, maximum ratings of the transistor.
   iii) Common emitter characteristics of a transistor - measurement of current gain, input Resistance and output resistance, relation between and study of the effect of leakage Current, maximum ratings of the transistor.
   iv) Common source characteristics of a JFET - measurement of transconductance $gm$ and drain to source resistance $rds$, use of FET as VVR.

4. Rectifying circuits
   i) HW rectifier
   ii) FW rectifier
   iii) FW Bridge rectifier
   iv) Filter circuits - Capacitor filter, inductor filter and Pi section filter
      ( Measurement of ripple factor, maximum ratings of the devices )

5. Zener Regulator

6. Design and implementation of Power supplies

7. Biasing of Active devices
   i) Voltage biasing, current biasing and Feedback biasing of BJT
   ii) Biasing of JFET

Compulsory experiments

1. (a) Preliminary study of AC and DC Power supplies in the laboratory.
   (b) Study of instruments and their mode of use
2. Open circuit characteristics of
   (a) Self excited generator
   (b) Separately excited generator.
3. Load characteristic of compound generator
4. Load characteristic of shunt generator
5. Study of face plate starter and starting of DC motors
7. Swinburn’s test
8. Polarity and transformation ratio test on single phase transformer.
9. OC & SC test on single phase transformer - equivalent circuit
10. Load rest on single phase transformer.
12. Load test on slip ring induction motor and study of characteristics.

Optional Experiments

1. Study of single-phase motors.
2. Load test of DC shunt motor.
3. Poly phase connection of single phase transformer.
4. Load test on squirrel cage induction motor
5. Study of alternators.
Module I

**Complex Analytic functions and conformal mapping**: curves and regions in the complex plane, complex functions, limit, derivative, analytic function, Cauchy - Riemann equations, Elementary complex functions such as powers, exponential function, logarithmic, trigonometric and hyperbolic functions.

Conformal mapping: Linear fractional transformations, mapping by elementary functions like $Z^2$, $e^z$, $\sin z$, $\cos z$, $\sin hz$, and $\cos hz$, $Z+1/Z$.

Module II

**Complex integration**: Line integral, Cauchy's integral theorem, Cauchy's integral formula, Taylor's series, Laurent's series, residue theorem, evaluation of real integrals using integration around unit circle, around the semi circle, integrating contours having poles, on the real axis.

Module III

**Partial differential equations**: Formation of partial differential equations. Solutions of equations of the form $F(p, q) = 0$, $F(x, p, q)=0$, $F(y, p, q)=0$, $F(z, p, q)=0$, $F1(x, p) = F2(y, q)$, Lagrange's form $Pp + Qq = R$. Linear homogeneous partial differential equations with constant coefficients.

Module IV

**Vibrating string**: one dimensional wave equation, D’ Alembert’s solution, solution by the method of separation of variables, One dimensional heat equation, solution of the equation by the method of separation of variables. Solutions of Laplace’s equation over a rectangular region and a circular region by the method of separation of variables.

**Text Books**:

**References**:
CS/EB/EC/EI 402 MICROPROCESSORS

Module I

**Introduction to 8 bit microprocessor:** Microcomputers and microprocessors, 8/ 16/ 32/ 64-bit microprocessor families; Internal architecture of Intel 8085 microprocessor: Block diagram, Registers, Internal Bus Organization, Functional details of pins, Control signals, External Address / Data bus multiplexing, Demultiplexing, I/ O mapped I/ O, and memory mapped I/ O techniques. Interrupts, Serial communication and DMA features

Module II

**Assembly Language Programming:** 8085 instruction set: Instructions, Classifications, Addressing modes, Stack and Subroutines, Delay routines, Counters etc. Programming examples.

Module III

**Instruction Timing and Interrupts:** Timing Diagrams (of various instructions): T- state, Machine cycle (Opcode fetch, Read / Write, Interrupt Acknowledge, Bus Idle, etc), Interrupts: types (h/w and s/w), Maskable / Non maskable, Interrupt organization.

Module IV

**Interfacing concepts and devices:**
Memory interface: Concept of memory chip/ Chip interface to 8085 with appropriate examples
Programmable interfacing devices: - Programmable peripheral interface (Intel 8255), Programmable timer interface (Intel 8253 / 54), Programmable display / Keyboard interface (Intel 8279), Programmable serial communication interface (Intel 8251)-(their architecture, register organization, initialization, hardware and software interface to 8085.

Text Books:

1. Ghosh and Sridhar, *0000 to 8085 Microprocessors for Engineers and Scientists*, PHI, 2nd ed.

References:

Module I


Module II.

Power amplifiers - classification - class A, class B, Class AB, Class C and class D - Transformer coupled class AB Power amplifier - Transformerless class AB push-pull Power amplifier - complementary symmetry power amplifier - Harmonic distortion in Power amplifiers - Transistor rating - Heat sinks - Switching amplifiers

Module III

High frequency amplifier - Filter Design and Tuned amplifier - coupled circuit, unilateralisation of transistor, Q-factor, single tuned, double tuned and stagger tuned amplifier (analysis not required) - Wide band amplifier: Gain-bandwidth trade off. Wide band transistor configuration cascade emitter coupled - broad banding, bandwidth trade-off, wide band transistor configuration with negative feedback, frequency compensation - low frequency RC compensation - High frequency compensation (analysis not required)

Module IV.

Differential amplifier:- Basic differential amplifier - dual input balanced output and unbalanced output - Internal block schematic of op amp - Biasing used in IC - Constant current source - Current mirror Circuits - Active Load - Level Shifters - Power amplifier stages. Power supply requirements.

Text Book:-


Reference:-

7. R.S. Moni, Amplifiers, Wiley Eastern,
EC/EI 404 SIGNALS AND SYSTEMS

Module I


Module II


Module III


Module IV

Noise: White noise, Narrow band noise, effective noise temperature and noise figure representation Sine wave contaminated with narrow band noise. Effect of noise in Systems; eg: Linear and angle modulation systems, threshold effect and threshold extension, pre-emphasis and de-emphasis filtering. Introduction to Detection and estimation, Matched filters.

Text Books:

References : 
Module I.


Module II.

Angle Modulation – mathematical analysis, principles, waveforms, frequency deviation, frequency analysis, bandwidth requirement, phasor representation–pre-emphasis, de-emphasis. FM modulators – direct, indirect, Phase modulators – direct. FM transmitters – direct FM, indirect FM; FM receivers-block diagram– demodulators – Tuned circuit frequency discriminators, slope detector, balanced slope detector, Foster-Seeley discriminators, ratio detectors – FM noise suppression; FM stereo broadcasting-stereo transmitter, stereo receiver (block level treatment only).

Module III.


Module IV.

Telephony –Simple telephone communication, classification of switching systems, Basics of a switching system; Switches & Multiplexers, DTMF & Pulse signaling, Electronic switching – stored program control, centralized and distributed SPC, enhanced services, Time division, space division & combination switching, Signaling techniques; Traffic Engineering – Network traffic, load and parameters, grade of service, blocking probability, traffic congestion.

Text Books:
2. Thiagarajan-Viswanathan, Telecommunication Switching Systems and Networks, PHI Ltd, 2001

References:
5. Wayne Tomasi, Electronic Communications Systems (Fundamentals through Advanced), Pearson Education 5th Ed.
Module I.

Power transistors - Design of high power amplifier – switching transistors - Parallel operation of transistor - Power MOSFET - Operating principles - Structure and characteristics. Thyristors – Classification & Constructional Details. SCR - Working principle - turn on, turn off and V - I characteristics - gate characteristics, and rating: Series and parallel operation of SCR - TRIAC - characteristics, modes of operation, Trigger circuits - magnetic & solid state, half-wave and full-wave operation.

Module II.

Single phase controlled rectifiers - half-wave, full-wave, half-controlled and fully controlled - typical waveforms with R, RL, RL with diode and RL with voltage source - voltage and current equation for half-wave controlled rectifier. Three phase half-wave and full-wave controlled rectifier with R load, waveforms. DC motor speed control - various schemes – multi quadrant operation - simple circuits for speed control of series, PM and separately excited motors.

Module III.

Commutation schemes - (different classes) waveforms - single-phase invertors - series, parallel and bridge -PWM invertor - square wave and sin wave output. Chopper circuits using SCR transistor (detailed analysis not required) - Jones Chopper. A.C Motor speed control - various schemes - electronic control of speed of induction motors and synchronous motors.

Module IV.


Text Book:


References:-

1. Half adder and full adder using NAND gates.
2. Code converters - Binary to Gray and gray to Binary using mode control
3. Binary addition and subtraction (a) 1’s complement (b) 2’s complement(using 7483)
4. BCD adder using 7483.
5. Study of MUX, DeMUX & Decoder Circuits and ICs
6. Set up R-S & JK flip flops using NAND Gates
7. Asynchronous UP / DOWN counter using JK Flip flops
8. Design and realization of sequence generators.
9. Study of shift registers and Implementation of Johnson and Ring counter using it.
10. Study of IC counters 7490, 7492, 7493 and 74192 or the CMOS equivalent.
12. Transfer characteristics and specifications of TTL gates

EC 408 ELECTRONIC CIRCUITS LABORATORY I

I Clipping and clamping circuits using diodes / transistors
II. Study of RC and RLC circuits - Frequency responses, pulse response, Filter characteristics,
III. Differentiating circuit and integrating circuit
IV Amplifying circuits
   (i) Simple common emitter amplifier configuration - gain and bandwidth.
   (ii)Common source amplifier
   Functions of each component, gain measurement, frequency responses
V Feedback amplifier circuits - Current series and voltage shunt - gain and bandwidth..
VI Oscillators - RC phase shift. Wein Bridge, crystal oscillator
VII Multivibrators - Astable, Bistable, Monostable.
VIII Switch& Sweep circuits - Simple transistor sweep, bootstrap sweep.
IX Power amplifiers
Module I

**Probability distributions:** random variables (discrete & continuous), probability density, mathematical expectation, mean and variance of a probability distribution, binomial distribution, Poisson approximation to the binomial distribution, uniform distribution, normal distribution.

**Curve fitting:** method of least squares, correlation and regression, lines of regression.

Module II

**Sampling distributions:** population and samples, the sampling distribution of the mean (unknown), \( \sigma \) known), the sampling distribution of the mean (unknown), the sampling distribution of the variance, point estimation, interval estimation, tests of hypotheses, null hypotheses and significance tests, hypothesis concerning one mean, type I and type II errors, hypotheses concerning two means. The estimation of variances: Hypotheses concerning one variance - Hypotheses concerning two variances.

Module III

**Finite difference Operators:** \( \nabla, \Delta, \delta, \mu, x^{(n)} \)

Newton’s Forward and Backward differences interpolation polynomials, central differences, Stirling’s central differences interpolation polynomial, Lagrange interpolation polynomial, divided differences, Newton’s divided differences interpolation polynomial

**Numerical differentiation:** Formulae for derivatives in the case of equally spaced points.

**Numerical integration:** Trapezoidal and Simpson’s rules, compounded rules, errors of interpolation and integration formulae. Gauss quadrature formulae (No derivation for 2 point and 3 point formulae)

Module IV

**Numerical solution of ordinary differential equations:** Taylor series method, Euler’s method, modified Euler’s method, Runge-Kutta formulae 4th order formula,

**Numerical solution of boundary value problems:** Methods of finite differences, finite differences methods for solving Laplace’s equation in a rectangular region, finite differences methods for solving the wave equation and heat equation.

Text Books:


References:

Module 1


Module 2


Module 3


Module 4


Text Books:

2. Jordan and Balmain, Electromagnetic waves and radiating systems, Pearson Education/ PHI Ltd, 2nd Ed.

Reference:

EC/EI 503 DIGITAL SYSTEM DESIGN

Module I


Module II

Introduction to digital systems, Synchronous and asynchronous- state diagram, state names, Mealy and Moore machines binary description. Time behavior of synchronous sequential systems, Minimization of no. of states, Specification of various types of sequential system.

Module III


Module IV

Design of sequential systems with small number of standard modules, State register and combinational networks - use of ROMs in sequential networks - Counter and combinational networks - RAM and combinational networks - SR and combinational networks. Multimodule implementation of sequential systems - Multimodule registers - Shift registers and RAMs - Multimodule counters.

Text Book:


References :

Module I

**Architecture 16 bit microprocessors:** Intel 8086 Architecture Memory address space and data organization Segment registers and memory segmentation I/O address space- Addressing modes Comparison of 8086 and 8088. Basic 8086/8088 configuration, Minimum mode-Maximum mode

Module II

**Intel 8086 programming:** 8086 Instruction set. Instruction Classifications, Program development tools: editor, assembler, linker, locator, debugger and emulator. Use of DEBUG and MASM

Module III

**Architecture of 32 bit Microprocessors:** Intel 80386 Architecture, Block Diagram, Segmentation, Paging, Real, Protected and Virtual modes, 80486 microprocessor Architecture, Block Diagram, Pentium Architecture Block Diagram, Superscalar Architecture, Branch Prediction. PentiumII, Pentium III, PentiumIV Processors (Block Diagram only).

Module IV

**Introduction to micro controllers** - comparison with microprocessors Study of micro controller (MCS 51 family- 8051) - Architecture, instruction set, addressing modes and programming - Comparison of various families of 8bit micro controllers. Interfacing of ADC, sensors, keyboard and DAC using microcontrollers

Texts :

References:
Module I


Module II


**Filters** : Transfer functions – LPF ,HPF,BPF, BRF Approximation methods – Butterworth – Chebyshev -Active Filters - I order and II order filters, Quality factor –Design- Gyrator- Negative Impedance Converter-Filter using Simulated Inductance –Universal Active Filters –All Pass filters. Switched Capacitive Filters

Module III

**Specialized ICs and applications:** Voltage regulator IC 723, current limiting, short circuit protection, Thermal protection -555 timers – Functional block diagram- Astable Multivibrator, Monostable Multivibrator and its applications.- 566 VCO chip- Phase locked loop (PLL) - block diagram, Mathematical Derivation of capture range, lock range and pull in time capture and lock range- 565 PLL - PLL applications: Frequency multiplication and division- AM demodulation - FM detection - FSK demodulation Analog multiplier circuits and applications. ADC and DAC – performance specification –weighted, R-2R, successive approximation, flash, integrating.

Module IV

**Introduction to Microelectronics:** Monolithic and hybrid ICs- Bipolar & MOS Technology- Fabrication of active and passive components, bonding, packaging, - Concepts of SSI, LSI, VLSI. Introduction to thick film and thin film Technology – resistors- capacitors- comparison

**Text Books:**

**References:**
Module I.

Discrete Fourier Transform and properties - Fast Fourier Transform Decimation in time FFT algorithms - decimation in frequency FFT algorithms - FFT algorithms for N a composite number, Block convolution, Discrete Hilbert transform–Other discrete transforms -.Discrete Cosine transform- Wavelet transforms.

Module II.

Introduction to digital filter design – specifications- FIR Digital Filters - Realizations - direct - cascade - lattice forms - hardware implementation - FIR filter design using Fourier series - window functions - frequency sampling technique-Finite word length effects in FIR filter design- Applications of FIR filters.

Module III.

IIR Digital Filters - Realizations - Direct - Cascade - Parallel forms - hardware implementation - Analog filter approximations - Butterworth and chebychev approximations – Transformation techniques-The method of mapping of differentials - impulse invariant transformation - Bilinear transformation - Matched Z transform technique - Finite word length effects in IIR filter design-effects due to truncation and rounding-limit cycles- Applications of IIR filters

Module IV.

General DSP architecture- features _ on chip subsystems- memory organization-Addressing modes- Instruction types - TMS320C54X fixed point processor- TMS320C4X floating point processor-ADSP21XXX sharc processor.

Reference :-

11. JAE S. Lim, Alan V. Oppenheim, Advanced topics in signal processing, Pearson education,1988
PART I – 3 Lab sessions

Part I A (Compulsory)
1. Study of a typical microprocessor trainer kit and its operation
2. Interfacing and programming of 8255 (eg: traffic light control, burglar alarm, stopwatch)
3. Interfacing and programming of 8253/8254.
4. Interfacing and programming of 8279.

Part I B*
1. A/D and D/A converter interface
2. Stepper motor interface
3. Display interface
4. Programming of different types of EPROM 2716, 2732 etc
(* At least two topics from part B to be covered.)

PART II – 7 Lab sessions
(Compulsory)
1. Introduction to IBM/PC and its DEBUG program commands
   - Examining and modifying the contents of the memory
   - Assembling 8086 instructions with the ASSEMBLER commands
   - Executing 8086 instructions and programs with the Trace and GO Command.
   - Debugging a program
2. Assembly language program development using IBM/PC Macro assembler
   - Creating an Assembler source file
   - Assembling source program with MASM
   - The link program - creating a RUN module
   - Typical programming examples.
3. Interfacing Experiments with micro controllers
PART A (Compulsory)

I  Linear circuits

II  Circuits using op-amps for waveform generation.
   i)  Astable, monostable multivibrators.
   ii) Wein bridge oscillator
   iii) Triangular, square waveform generators.

III  Second order Active RC filters
   High pass, low pass

IV  Astable and monostable multi-vibrator circuit using 555

V  PLL 565, voltage regulator 723

VI  Filters using simulated inductance

PART B (*)

1. Characteristics of SCR, TRIAC, MOSFET
2. Trigger circuits for full wave/ half wave fully controlled / half controlled thyristor circuits.
4. Study of motor speed control.
5. Study of UPS / SMPS

* At least two topics from part B has to be covered.
Module 1

**Introduction to Digital Communication**: Random variables & random process-Detection & Estimation: G-S Procedure, Geometric Interpretation of signals, Response of bank of correlators to noisy input, Detection of known signals in noise, Probability of error, correlation & matched filter receiver, detection of signals with unknown phase in noise.

**Estimation concepts & criteria**: MLE, Estimator quality measures, Cramer Rao Bound, Wiener filter for waveform estimation, Linear prediction.

Module 2

**Sampling Process**: Sampling theorem, Interpolation Formula, signal space interpretation, statement of sampling theorem, Quadrature sampling of band pass signals, Reconstruction of a message process from its samples, signal distortion in sampling, practical aspects. PAM, PPM, PWM (Generation & Reconstruction), Multiplexing- TDM, FDM.

**Waveform Coding Techniques**: PCM, Channel noise & error probability, Quantization Noise & Signal to noise ratio, robust quantization, DPCM, Delta Modulation.

Module 3

**Digital Modulation techniques**: Digital modulation formats, Coherent binary modulation techniques- PSK, FSK, QPSK, MSK. Non-coherent binary modulation techniques-DPSK. Comparison of binary & quaternary modulation techniques. M-ary Mod techniques- PSK, QAM, FSK( Block level treatment only)

**Base band data transmission**: Discrete PAM signals, Power spectra of discrete PAM signals, Intersymbol interference, Nyquist's criterion for distortion less base band binary transmission, Eye pattern, Adaptive equalization.

Module 4

**Information theory & Coding**: Discrete messages, amount of information, Entropy, Information rate, Coding, Shannon's theorem, Channel capacity, Capacity of a Gaussian channel, Bandwidth-S/N Trade off, Use of orthogonal signals to attain Shannon's limit, Efficiency of orthogonal signal transmission.

**Coding**: Parity check bit coding for error detection, Coding for error detection and correction- Block codes- Coding & Decoding; Systematic and Non Systematic codes; Cyclic codes -Generator polynomial, Generator & parity check matrices, Encoding & decoding of cyclic codes, Syndrome computation & error detection; Convolutional coding - Code generation, Decoding- code tree, sequential decoding, State & Trellis diagrams, Viterbi algorithm; Burst error Correction: Block & Convolutional interleaving; ARQ- Types of ARQ, Performance of ARQ; Comparison of error rates in coded & uncoded system.

**Text Books**:


**Reference**:

EC 602 MICROWAVE TECHNIQUES AND DEVICES

Module I

Introduction to microwaves - frequency range, significance, applications. Guided waves: TE, TM, TEM waves, Velocity of propagation.
Rectangular Waveguide:-TE waves, TM waves, Field configurations, Dominant mode, Degenerate mode, Impossibility of TEM.
Rectangular Cavity resonators:- Q factor-Unloaded, loaded and external Q - Coupling two cavities.

Module II

Scattering matrix -Concept of N port scattering matrix representation- Properties of S matrix- S matrix formulation of two-port junction. Microwave Passive devices - Tee junctions, Magic Tee, Rat race, Corners, bends and twists - Two hole directional coupler. Ferrite Isolator-Circulator- Phase shifter- Attenuator. S matrix of microwave components (E plane Tee, H plane Tee, Magic Tee, Directional coupler, Circulator only).

Module III


Module IV

Microwave tubes:- High frequency limitations - Principle of operation of two cavity Klystron, Reflex Klystron, Traveling Wave Tube Amplifier, Magnetron Oscillator (detailed mathematical analysis not needed), Microwave BJT structure and performance.
Microwave measurements: Measurement of wavelength, frequency, SWR, impedance, power, attenuation. Basic concepts of Network Analyzer and Anechoic chamber.

Text Books:

References:-
Module I.

**VLSI process integration**: - fundamental considerations in IC processing - NMOS IC technology - CMOS IC technology - BiCMOS IC technology. - GaAs technology. Ion implantation in IC fabrication.

The MOS device : (n - channel & p- channel) - capacitance of MOS structure - accumulation, depletion and inversion, threshold voltage, current equations - characteristics, channel pinch-off.

Second order MOS device effects : short-channel effect, narrow width effect, sub-threshold current, device saturation characteristics.

Module II.

Switch logic- pass transistors and transmission gates, Gate logic-The basic inverter using NMOS-circuit - current equations - pull up to pull down ratio- transfer characteristics- Alternate forms of pull up. Basic NAND, NOR circuits.

The CMOS inverter, characteristics – NAND, NOR and compound circuits using CMOS. Other forms of CMOS logic : pseudo CMOS, CMOS domino logic, n-p logic. Layout design of static MOS circuits – Layout rules - general principles & steps of lay-out design - use of stick diagrams - design rules - Layout examples of NAND and NOR.

Module III.


Module IV.

**Timing issues in VLSI system design**: timing classification- synchronous timing basics – skew and jitter- latch based clocking- self timed circuit design - self timed logic, completion signal generation, self timed signaling– synchronizers and arbiters.

Text Books :


References:

Module I.

**General measurement system:** Static characteristics -, accuracy, precision, linearity, hysteresis, threshold, dynamic range, calibration standards. Errors – measurement of errors, error reduction.

**Dynamic characteristics:** Transfer function-first and second order instruments-first and second order response – dynamic errors and dynamic compensation . Loading effect.

Module II.

**Transducers and sensors:** Transducers- sensors- active and passive, Temperature measurements:- RTD, Thermocouples analog and digital transducers . Review of transducers for pressure, velocity, vibration, torque, temperature. LVDT, piezo-electric transducers. Impedance measurement:- dc bridges for low, medium and high resistance-ac bridges for capacitance and inductance. Sources of error in bridge circuits- precautions. Vector impedance meter, digital impedance meter. Multimeters :- Principles of analog multimeter- digital multimeter (dual slope integrations)

Module III.

**Signal generators:** - AF and RF generators- Function generator- sweep frequency generator- Frequency synthesizers.
**Signal analyzers:**- Wave analyzer –spectrum analyzer. Frequency and time measurement. CRO, Digital storage oscilloscope, sampling oscilloscope. Recording instruments:- self balancing system, strip chart recorders, x-y-recorders.

Module IV.


References: -

Module I.

**Basic idea of control systems and their classification** - differential equations of systems - linear approximation - Laplace transform and transfer function of linear system - Model of physical system (Electrical, mechanical and electromechanical)- block diagram - signal flow graph - Mason’s gain formula.

Module II.


Module III.


Module IV.

**Root locus method** - basic theory and properties of root loci - procedure for the construction of root loci - complete root locus diagram. Design and compensation of feed back control system :- approaches to compensation - cascade compensation networks and their design in the frequency domain - simple design in S-plane.

**Text Book:**


**References:**

2. Franklin, *Feed back Control Systems*, Pearson Education
5. Ogata, *Discrete Time Control Systems*, 2\(^{nd}\) edn., Pearson Education/ Prentice-Hall India Ltd
Module I


Module II


Module III

Embedded System Design: Microchip PIC16 family, PIC16F873 processor architecture- features, memory organization, on chip peripherals, Watchdog timer, ADC, Data EEPROM, Asynchronous serial port, SPI mode, I2C mode. Development systems and compilers for PIC micro controllers. Interfacing with LCD, ADC, sensors, stepper motor, key board, DAC. Examples for data acquisition and control

Module IV


Text Books:

2. Rajkamal, Microcontrollers - Architecture, programming, Interfacing and system Design, Pearson Education, 2005
3. Nebojsamatic, The PIC Microcontroller, Mikro Elekronica, Year/Edn

References:

6. www.atmel.com
EC 607 COMMUNICATION LABARATORY I

PART A (compulsory)

1. Active Filters - Band Pass, Band reject (II order Butterworth)-Magnitude and phase characteristics, Q-factor.
2. Amplitude modulation - Collector and Emitter modulation schemes - measurement of modulation Indices.
4. Mixer using JFET/BJT
5. Frequency modulation using FET and VCO - Frequency deviation
6. FM generation (reactance modulator)
7. Implementation of intermediate frequency amplifier- Frequency response
8. PLL characteristics and demodulation using PLL
9. AM generation and demodulation using OP-AMPS and IC multipliers
10. SSB generation and demodulation using integrated circuits
11. AM Demodulator and Simple, Delayed and Amplified AGC
12. Time division multiplexing implementation.
13. High frequency oscillators (Any 2 from Hartely, Colpitts and Crystal oscillators)

PART B (*)

1. PAM modulator and demodulator
2. PWM modulator and Demodulator
3. PPM modulator and Demodulator.
4. TV receiver/video system demonstration and study using demonstration kits.
5. Implementation of a communication system including a radio receiver, FM transmitter etc.

* At least two topics from Part B has to be covered
EC608 MINI PROJECT

Each batch comprising of 3 to 5 students shall design, develop and realize an electronic product. Basic elements of product design must be considered. Fully software/simulation projects are not allowed. Each student shall submit a project report at the end of the semester. The project report should contain the design and engineering documentation including the Bill of Materials and test results. Product has to be demonstrated for its full design specifications. Innovative design concepts, reliability considerations and aesthetics / ergonomic aspects taken care of in the project shall be given due weight.

Guidelines for evaluation:

i) Attendance and Regularity  
   10

ii) Work knowledge and Involvement
    30

iii) End-Semester presentation & Oral examination
     20

iv) Level of completion and demonstration of functionality/specifications
    25

v) Project Report
   15

Total  100 marks

Note: External projects and R&D projects need not be encouraged at this level. Points (i) & (ii) to be evaluated by the project guide & co-ordinator and the rest by the final evaluation team comprising of 3 teachers including the project guide.
Module 1

Organisation: Introduction, definition of organization, system approach applied to organization, necessity of organization, elements of organization, process of organization, principles of organization, formal and informal organization, organization structure, types of organization structure.

Forms of business organization: Concept of ownership organization, types of ownership. Individual ownership, partnership, joint stock Company, private and public limited company, co-operative organizations, state ownership, public corporation

Module 2

Basic concept of management: Introduction, definitions of management, characteristics of management, levels of management, management skills

Management theory: Scientific management, contribution of Gilbreth. Gantt, Neo-classical theory, modern management theories

Functions of management: Planning, forecasting, organizing, staffing, directing, motivating, controlling, co-coordinating, communicating, decision making.

Module 3

Personnel management: Introduction, definition, objectives, characteristics, functions, principles and organization of personnel management

Markets and marketing: Introduction, the market, marketing information, market segmentation, consumer and industrial markets, pricing, sales, physical distribution, consumer behaviour and advertisement.

Financial management: the basics, financial accounts, inflation, profitability, budgets and controls, cost accounting, valuation of stock, allocation of overheads, standard costing, marginal costing

Module 4

Productivity and production: Measurement of productivity, productivity index productivity improvement procedure

Materials management and purchasing: Objectives, functions, importance of materials management. Stores and storekeeping

Inventory control: Classification, functions, inventory models, inventory costs, EOQ, Materials requirement planning

References:

1. Fraidoon Mazda, Engineering Management-, Addison -Wesley
5. Monks J.G Operations Management
Module I

Module II
Microwave antennas:- rectangular aperture, circular aperture - horn antenna
Antenna Measurements: - VSWR - Radiation pattern - Gain.

Module III

Module IV
Introduction to RADAR:- RADAR range equation – pulse RADAR- applications of RADAR – accuracy and resolution – Doppler effect to find velocity – pulse repetition frequency – unambiguous range and velocity – factors affecting the performance of RADAR. Synthetic and Raw displays (concepts only). CW RADAR with non zero IF – FM CW RADAR - applications – MTI and Pulse Doppler RADAR
Tracking RADAR:- Sequential lobing- conical scanning- helical scanning- Mono pulse tracking- SAR.(Basic concepts and Block diagrams only) Electronic counter measures – main beam jamming – side lobe jamming – passive ECM.

Text Books:

References:
Module I

Module II
**Application layer:** WWW and HTTP- File transfer protocol: FTP, DNS, SMTP, SNMP, RPC
**Security in Networks:** Principles of cryptography- symmetric key, public key, authentication protocol, digital signature, firewall.

Module III
**Network Layer and Routing:** Network Service model – Datagram and Virtual circuit service-Routing principles-Link state routing-distant vector routing-hierarchical routing-multicast routing-IGMP Internet Protocol (IP): IPv4 addressing-routing and forwarding datagram-datagram format-datagram fragmentation- ICMP- DHCP- Network Address Translators (NATs)- IPv6 packet format-transition from IPv4 to IPv6-

Module IV

**Text Books:**
2. F. Halsall, *Data Communication, Computer Networks and Open Systems*, Addison Wesley, 1996

**References:**
Module 1
Representation of development tasks using standard tools showing timing and dependencies- Product Life Cycle.

Module II

Module III

Module IV
EMI/EMC Considerations in Electronic Product Design: Sources of EMI, inter/intra system EMI- Noise performance of passive components- Cabling, Shielding and Grounding - Cables, Connectors, components and equipments for interference suppression/minimization- Intrinsic noise sources and their management- EMI standards and Regulations.
PCB design: PCB design process-Design rules for analog, digital, high-frequency, power-electronic and MW PCBs-PCB design guidelines for EM compatibility-Designing PCBs for manufacturability- Design considerations for power efficiency-Thermal Considerations in PCB design.
Introduction to SPICE simulation of circuits- Circuit description- Modeling of active and passive circuit elements - DC, AC, Transient and Parametric circuit analysis.

Module V (Tutorial Only-No questions from this module for University Examination)
Electronic Design Automation Tools: Introduction to PC based Electronic Design Automation Tools: Schematic Capture, Circuit Simulation, Layout Design etc. features like EMI analysis, Thermal analysis, 3d visualization etc. of such packages with reference to EDA tools such as OrCAD, EDWIN XP etc. (As assignment, each student shall design and simulate an electronic product following the above syllabus using EDA tools.)
Reference:
5. V. Prasad Kodali, Engineering Electromagnetic Compatibility-Principles, Measurements, and Technologies, S. Chand & Company Ltd., New Delhi, 2000
9. Richard Stillwell, Electronic Product Design for Automated Manufacturing, Marcel Dekker Pub,
Module I

Module II
Artificial Neural Networks: Biological aspects, Pitt’s Neuron Model, Perception model, Learning algorithm – supervised & unsupervised multilayer perception, Back propagation algorithm, Associative memory, Feed back networks, Applications of Neural Networks.

Module III

Module IV

Text Book:

References
1. Rajashekharan & Pai, Neural Networks, Fuzzy Logic and Genetic Algorithms, PHI,
**EC 705B FUNDAMENTALS OF RF DESIGN**

**Module I**
*Passive Components for RF*: Behavior at High Frequencies: Wire, Resistors, Capacitors, Inductors, Toroids and their winding, Impedance Transformation, Coupling of resonant circuits.

*Active RF components*: RF diodes, RF transistors; The Transistor at Radio Frequencies: Equivalent Circuit, Y-Parameters, S-Parameters, and other relevant two-port parameters, RF Transistor Data Sheets.

Computer-Aided Design and Analysis Interconnection of networks Analysis techniques, Optimization Use of SPICE (Practical assignments using HSPICE is recommended)

**Module II**
*Microwave Printed Circuits & Microwave Solid State Devices*: Bipolar Microwave Transistor, MESFET, MODFET/HEMT Microwave IC’s, Microwave Diodes, and MODAMPs, Strip lines, Micro strips, Printed Microwave Components, Surface Acoustic Wave device.


**Module III**

**Module IV**

**References:**
Module I


Module II


Module III


Module IV

**Advanced Features:** Entity Statements- Generate Statements- Aliases- Qualified Expressions- Type Conversions-Guarded Signals- Attributes- Aggregate Targets- Shared Variables- Groups - Model Simulation: Simulation- Writing a Test Bench- Converting Real and Integer to Time- Dumping Results into a Text File- A Test Bench Example- Initialising a Memory- Variable File Names- Hardware Modelling Examples: Modelling Entity interfaces- Modelling Simple Elements- - Different Styles of Modelling- Modelling Regular Structures- Modelling Delays- Modelling Conditional Operations- Modelling Synchronous Logic- State Machine Modelling- Interacting State Machines- Modelling a Moore FSM- Modelling a Mealy FSM.

**Text Book:**


**Reference:**

Module I
Introduction to Mechatronics- Elements of Mechatronic Systems.

Sensory System: Sensors & Transducers- Performance measure, static and dynamic characteristics- Sensing displacement, position, proximity, velocity and motion, force, pressure, flow, level, range, temperature and Light.

Signal Conditioning and Date Acquisition: Signal Conditioning Elements- amplification, attenuation, impedance matching, linearization, digitization, level shifting, filtering, error compensation, etc. Data acquisition and presentation in mechatronic systems- signal measurement and calibration- Design Considerations

Module II

Mechanical Actuation Systems: Translational and Rotational motions, Kinematic Chains, Cams, Gear Trains, Ratchet and Pawl, Belt and Chain drives, Bearings.


Power sources for mechatronic Systems

Module III
Mathematical modeling of Engineering Systems: System Building blocks for Mechanical, Electrical, Fluid and Thermal systems.


MEMS: Internal Structure, advantages, manufacturing, applications- Fiber Optic Devices in Mechatronics
(For this module assignments on Simulation studies using computer software such as MATLAB with SIMULINK is recommended)

Module IV
Mechatronic System Controllers: ON/OFF, P, I, D, PI and PID Controllers, Digital controllers, Intelligent Controllers in Mechatronics.

Programmable Logic Controllers: Structure, I/O processing, Programming, applications – Selection Criteria.

Typical Mechatronic Systems: Robotic Systems, CNC machines, FMC, FMS, AGV etc.

Text Books:

References:

M.D. Singh, J.G. Joshi, Mechatronics, Prentice Hall India, New Delhi, 2006


James Harter, Electromechanics- Principles concept and Devices, Prentice-Hall India Ltd, 2nd ed.
EC /EI 706 SIGNAL PROCESSING LABORATORY

1. Familiarization of Signal processing tool box-MATLAB
2. Familiarization of DSP trainer kit (Sampling & reconstruction of signals)

Experiments

1. Generation of basic input signals (both discrete & continuous)
2. DFT and spectral analysis - computation of DFT, properties of DFT
3. Convolution
4. Correlation
5. Digital filter design - FIR & IIR Filters
6. FFT
7. Spectral estimation

The above experiments should be done using MATLAB and DSP Trainer Kit. The student should be able to apply the above tools in a small application.
EC 707 COMMUNICATION LABORATORY II

PART A (Compulsory)

1. Sampling and reconstruction of signals
2. PCM generation
3. Differential PCM generation
4. Implementation of Delta modulator and demodulator
5. Matched filter receiver for rectangular pulse
6. Generation and detection of BASK and BFSK signals
7. Generation and detection of BPSK signals
8. Generation and detection of QAM using IC multipliers
9. Microwave Communication (Any 2 Experiments from)
   (a) Study of Klystron source-Power, mode and impedance, SWR, guide wave length
   (b) Gunn Source-Characteristics, Hybrid T, Directional coupler, Circulator
   (c) FET M/W source-SWR, Impedance, Guide wavelength, Tees
   (d) Study of Microwave links
10. Antenna characteristics- Radiation pattern and beam width, gain measurements.

PART B (*)

1. Communication system simulation using software tools
2. Data Acquisition System using Microprocessors
3. Experiments on Computer communication
4. Development of an optical fiber communication transmitter and receiver module.
5. A small project work using Artificial Neural Network, Image processing or Biomedical Instrumentation.

* At least two topics from part B has to be covered
EC 708 SEMINAR

Students shall individually prepare and submit a seminar report on a topic of current relevance related to the field of Electronics & Communication Engineering. The reference shall include standard journals, conference proceedings, reputed magazines and textbooks, technical reports and URLs. The references shall be incorporated in the report following IEEE standards reflecting the state-of-the-art in the topic selected. Each student shall present a seminar for about 30 minutes duration on the selected topic. The report and presentation shall be evaluated by a team of internal experts comprising of 3 teachers based on style of presentation, technical content, adequacy of references, depth of knowledge and overall quality of the seminar report.

EC 709 PROJECT DESIGN

Each batch comprising of 3 to 5 students shall identify a project related to the curriculum of study. At the end of the semester, each student shall submit a project synopsis comprising of the following.

- Application and feasibility of the project
- Complete and detailed design specifications.
- Block level design documentation
- Detailed design documentation including circuit diagrams and algorithms / circuits
- Bill of materials in standard format and cost model, if applicable
- Project implementation action plan using standard presentation tools

Guidelines for evaluation:

i) Attendance and Regularity  10
ii) Quality and adequacy of design documentation  10
iii) Concepts and completeness of design  10
iv) Theoretical knowledge and individual involvement  10
v) Quality and contents of project synopsis  10

Total  50 Marks

Note: Points (i)-(iii) to be evaluated by the respective project guides and project coordinator based on continuous evaluation. (iv)-(v) to be evaluated by the final evaluation team comprising of 3 internal examiners including the project guide.
Module I


Module II


Module III


Module IV


Text Books:


References:

2. Bernad Grob, Basic Television Engineering, McGraw hill, 1999
Module 1


Module II


Module III

Spread spectrum Communication: General concepts – Direct Sequence spread spectrum – frequency hopping – transmitter and receiver – time hopping – Antijam consideration – CDMA

Module IV


References:

5. A Grarwal and A N Zeng, Introduction to wireless and Mobile systems, Thomson Learning, 2nd ed.
Module 1


Module II


Module III


Module IV


Text Book:


References:

Module I

**Digital image fundamentals:** representation - elements of visual perception - simple image formation model - Image sampling and quantization - basic relationships between pixels – imaging geometry.

**Review of matrix theory results:** Row and column ordering - Toeplitz, Circulant and Block matrices. Review of Image transforms: 2D-DFT, FFT, Walsh, Hadamard, Haar, DCT and Wavelet transforms.

Module II

**Image enhancement:** Spatial domain methods: point processing - intensity transformations, histogram processing, image subtraction, image averaging; Spatial filtering- smoothing filters, sharpening filters. Frequency domain methods: low pass filtering, high pass filtering, homomorphic filtering. Generation of spatial masks from frequency domain specifications.

**Image segmentation:** Detection of discontinuities - point, line and edge and combined detection , Edge linking and boundary description - local and global processing using Hough transform – Thresholding - Region oriented segmentation - basic formulation, region growing by pixel aggregation, region splitting and merging - Use of motion in segmentation. Fundamentals of Representation and Description.

Module III

**Image restoration:** Degradation model - Diagonalization of circulant and Block circulant matrices - Algebraic approaches - Inverse filtering - Wiener filter - Constrained Least squares restoration - Interactive restoration - Geometric transformations.

**Fundamentals of Colour image processing:** colour models - RGB, CMY, YIQ, HIS - Pseudo color image processing - intensity slicing, gray level to color transformation.

Module IV


**Text Book:**


**References:**

Module I

Basic Concepts of Molecular Biology: Cells - Chromosomes, DNA, RNA, Proteins, Central dogma of molecular biology, Genomes and Genes - Genetic code, Transcription, Translation and Protein synthesis. Web based genomic and proteomic data bases: NCBI, Gene Bank

Module II

Sequence alignments – Dot plot-Pair-wise sequence alignments - local and global -Sequence similarity and distance measures - Smith-Waterman algorithm, Needleman-Wunch algorithm, Multiple sequence alignment –Sum-of-Pairs measure - Star and tree alignments – PAM and BLOSUM, Phylogenetic analysis

Module III

Informational view of Genomic data, Genomic Signal Processing, DNA Spectrograms, Identification of protein coding regions, Gene expression, Microarrays, Microarray image analysis

Module IV

Gene structure in Prokaryotes and Eukaryotes: Molecular Structure Prediction: Basic concepts and terminologies related to molecular structures, Basic molecular Visualization, RNA secondary structure prediction, Protein folding problem, Protein Threading, Protein Visualization, Introduction to Drug Discovery.

Case Study

Software Tools: Use of Tools for basic and specialized sequence processing such as: BLAST, FASTA, RasMol, Phylip, ClustalW

Text Books:


References:

Module I

**Introduction to ASICs:** - Types of ASICs - Design flow - Combinational Logic cell - Sequential logic cell - Data path logic cell – I/O cells - Transistors as Resistors - Transistor Parasitic Capacitance - Logical effort.

Module II

**Programmable ASICs:** - Anti fuse - static RAM - EPROM and EEPROM technology – practical issues - Programmable ASIC logic cells: Actel ACT - Xilinx LCA - Altera FLEX - Altera MAX.
Programmable ASIC I/O cells: DC & AC inputs and outputs - Clock & Power inputs.

Module III

**Programmable ASIC interconnect:** Actel ACT - Xilinx LCA - Altera MAX 5000 and 7000 –

**Testing:** Importance, Faults, Fault models, physical faults, Stuck at fault model, Logical faults, Fault collapsing, Fault simulation – serial fault simulation, parallel fault simulation, concurrent fault simulation, nondeterministic fault simulation, ATPG-D-Calculus, Basic ATPG algorithm, PODEM algorithm, controllability, observability.

Module IV

**ASIC construction:** System partition - FPGA partitioning - partitioning methods – Popular algorithms Floor planning and placement: physical design flow- algorithms. Routing : global routing - detailed routing - special routing - circuit extraction - DRC.

**Text book:**

**References:**
Module I


Module II


Module III

**Data Converter Fundamentals**. Nyquist-rate D/A and A/D Converters, Over sampling Converters with and without noise shaping, Sigma-delta A/D converters, Higher-order modulators, MASH architecture, band-pass over sampling converters, multi-bit over sampling converters, Continuous-time filters.

Module IV

**Analog Layout considerations**. CMOS Layout and design rules, Layout of integrated resistors, capacitors and analog switches.

Text Book:


References:

Each batch of students shall develop the project designed during the VII semester. The implementation phase shall proceed as follows:

- For hardware projects, practical verification of the design, PCB design, fabrication, design analysis and testing shall be done.
- For software projects, a proper front end (GUI) if applicable, shall be designed. A detailed algorithm level implementation, test data selection, validation, analysis of outputs and necessary trial run shall be done.
- Integration of hardware and software, if applicable, shall be carried out.
- A detailed project report in the prescribed format shall be submitted at the end of the semester. All test results and relevant design and engineering documentation shall be included in the report.
- The work shall be reviewed and evaluated periodically.

The final evaluation of the project shall be done by a team of minimum 3 internal examiners including the project guide and shall include the following.

- Presentation of the work
- Oral examination
- Demonstration of the project against design specifications
- Quality and content of the project report

**Guidelines for evaluation:**

<table>
<thead>
<tr>
<th>Category</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regularity and progress of work</td>
<td>30</td>
</tr>
<tr>
<td>Work knowledge and Involvement</td>
<td>100</td>
</tr>
<tr>
<td>End semester presentation and oral examination</td>
<td>50</td>
</tr>
<tr>
<td>Level of completion and demonstration of</td>
<td>70</td>
</tr>
<tr>
<td>functionality/specifications</td>
<td></td>
</tr>
<tr>
<td>Project Report – Presentation style and content</td>
<td>50</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>300</strong> marks</td>
</tr>
</tbody>
</table>

*Note: Points (i) and (ii) to be evaluated by the respective project guide and the project coordinator based on continuous evaluation. (iii)-(v) to be evaluated by the final evaluation team comprising of 3 internal examiners including the project guide.*
Each student is required to appear for a viva-voce examination at the end of the complete course work. The students shall produce the seminar report and project reports duly attested by the institutional authorities, before the examiners. The examination panel shall comprise of one internal examiner and one external examiner, both appointed by the University. The examiners shall evaluate the students in terms of their conceptual grasp of the course of study and practical/analysis skills in the field.