Aliah University

Course Structure and Syllabi

For

4 year B.Tech Programme

In

Electronics and Communication Engineering

ALIAH UNIVERSITY

Course Structure of 4 year B.Tech Programme
In Electronics and Communication Engineering
(Departmental Code: ECE)

Note: Subject code indicated by CSE/EE, the concerned departments (CSE/EE) will have to organize the course. The detailed courses in such cases have to be recommended by the concerned departments.

Subject Coding followed

1	2	3	4	5	6

123 Three Character Department Code

4 One digit Year code

5 One digit code of Nature of Subject as per the following:

'0' for theory, '9' for practical, '7' for project, '8' for Industrial training / seminar / viva, '3' for subsidiary

6 One digit serial number of subject (odd numbers for Odd Semester and even number of Even Semester)

Summary of Credits

	1st Semester	2nd Semester	3rd Semester	4th Semester	5th Semester	6th Semester	7th Semester	8th Semester	Total
B.Tech	28	32	30	28	28	32	28	20	226

First Semester Structure

Sl. No.	Subject Code	Name of the Subject	Contacts (periods/week)				Credits
			L	T	P	Total	
Theory							
1	AI131	Arabic &Islamic Studies	3	1	0	4	4
2	ECE101	Basic Electrical and Electronics-I	3	1	0	4	4
3	MA133	Engineering Mathematic-I	3	1	0	4	4
4	CE101	Mechanics-I	3	1	0	4	4
5	PH133	Engineering Physics	3	1	0	4	4
					Total Theory	22	20
Practical							
8	ECE191	Basic Electrical & Electronics Lab-I	0	0	3	3	2
9	PH191	Physics Lab	0	0	3	3	2
11	CE191	Engineering drawing and graphics	2	0	3	5	4
					Total Practical	11	8
					Total of Semester	33	28

2nd Semester Structure

Sl. No	Subject Code	Name of the Subject	Contacts (periods/week)				Credits
			L	T	P	Total	
Theory							
2	EN102	English language & Communication	3	1	0	4	4
3	EE102	Basic Electrical & Electronics- II	3	1	0	4	4
4	MA102	Engineering Mathematics-II	3	1	0	4	4
5	CE102	Mechanics-II	3	1	0	4	4
6	CH102	Chemistry	3	1	0	4	4
8	CSE102	Introduction to Computing	3	1	0	4	4
					Total Theory	24	24
Practical							
9	EE192	Basic Electrical & Electronics Lab- II	0	0	3	3	2
10	CH192	Chemistry Lab	0	0	3	3	2
12	ME192	Workshop Practices	0	0	3	3	2
13	CSE192	Computer Programming Lab	0	0	3	3	2
					Total Practical	12	8
					Total of Semester	40	32

3rd Semester Structure

Theory							
Sl. No	Subject Code	Name of the Subject	Contacts (periods/week)				Credits
			L	T	P	Total	
Theory							
2	HSS231	Environmental Studies	3	1	0	4	4
3	EE201	Signals and Networks	3	1	0	4	4
4	MA233	Mathematics-III	3	1	0	4	4
5	ECE201	Analog Electronics	3	1	0	4	4
6	CSE201	Data Structures and algorithms	3	1	0	4	4
7	ECE203	Physics of Semiconductor Devices	3	1	0	4	4
					Total Theory	24	24
Practical							
7	EE291	Signals and Networks Lab	0	0	3	3	2
8	ECE291	Analog Electronics Lab	0	0	3	3	2
9	CSE291	Data Structure and Algorithm Lab	0	0	3	3	2
					Total Practical	9	6
					Total of Semester	33	30

4th Semester Structure

Theory							
Sl. No.	Subject Code	Name of the Subject	Contacts (periods/week)				Credits
			L	T	P	Total	
Theory							
2	ECE202	Digital Electronics & Logic Design	3	1	0	4	4
3	ECE204	Electromagnetic Engineering	3	1	0	4	4
4	ECE206	Analog Communication	3	1	0	4	4
5	ECE208	Electrical & Electronic Measurements	3	1	0	4	4
6	CSE206	Computer Architecture	3	1	0	4	4
					Total Theory	20	20
Practical							
7	ECE292	Digital Electronics & Logic Design Lab	0	0	3	3	2
8	ECE294	Transmission Line and Antenna Lab	0	0	3	3	2
9	ECE296	Analog Communication Lab	0	0	3	3	2
10	EE294	Electrical & Electronic Measurement Lab	0	0	3	3	2
					Total Practical	12	8
					Total of Semester	32	28

5th Semester Structure

Sl. No	Subject Code	Name of the Subject	Contact periods/week)				Credits
			L	T	P	Total	
Theory							
1	ECE301	Microprocessor & Microcontroller	3	1	0	4	4
2	ECE303	Digital Communications	3	1	0	4	4
3	ECE305	Microelectronics	3	1	0	4	4
4	EE303	Control Systems	3	1	0	4	4
5	CSE333	Elective-I (Inter disciplinary group)	3	1	0	4	4
					Total Theory	20	20
Practical							
6	ECE391	Microprocessor & Microcontroller Lab.	0	0	3	3	2
7	EE393	Control Systems Lab	0	0	3	3	2
9	ECE393	Digital Communications Lab	0	0	3	3	2
8	ECE395	Electronic Design lab	0	0	3	3	2
					Total Practical	12	8
					Total of Semester	32	28

6th Semester Structure

Sl. No	Subject Code	Name of the Subject	Contacts (periods/week)				Credits
			L	T	P	Total	
Theory							
1	ECE302	Digital Signal Processing	3	1	0	4	4
2	ECE304	Photonic Devices & Optical Communication	3	1	0	4	4
4	ECE306	VLSI Circuit Design	3	1	0	4	4
5	EE306	Power Electronics	3	1	0	4	4
3	CSE302	Computer Network	3	1	0	4	4
					Total Theory	20	20
Practical							
6	ECE392	Digital Signal Processing Lab	0	0	3	3	2
7	ECE394	Optical Communication lab	0	0	3	3	2
8	ECE396	VLSI Circuit and Systems Lab	0	0	3	3	2
9	EE396	Power Electronics Lab	0	0	3	3	2
Sessional							
9	ECE382	Seminar-I	0	0	2	2	2
10	ECE384	Industrial Visit / Summer training	0	0	0	0	2
					Total Practical and Sessional	14	12
					Total of Semester	32	32

7th Semester Structure

Sl. No.	Subject Code	Name of the Subject	Contacts (periods/week)				Credits
			L	T	P	Total	
Theory							
1	HU401	Professional Values and Ethics	2		0	2	2
2	ECE401	Information Theory and Coding	3	1	0	4	4
3	ECE403	RF & Microwave Engineering	3	1	0	4	4
4	ECE415	Elective II (Communication group)	3	1	0	4	4
5	ECE417	Elective-III (Signal Processing group)	3	1	0	4	4
		Total Theory				18	18
Practical							
6	ECE493	Microwave Engineering Lab	0	0	3	3	2
7	ECE495	Electronic Design Automation	0	0	3	3	2
Sessional							
8	ECE471	Project I	0	0	4	4	4
9	ECE481	Seminar II	0	0	2	2	2
		Total Practical and Sessional				12	10
		Total of Semester				30	28

8th Semester Structure

Sl. No.	Subject Code	Name of the Subject	Contacts (periods/week)				Credits
			L	T	P	Total	
Theory							
1	HU402	Industrial Management	2	0	0	2	2
2	ECE402	Wireless and Mobile Communication	3	1	0	4	4
3	ECE412	Elective-IV(Emerging Technology Group)	3	1	0	4	4
		Total Theory				10	10
Practical							
5	ECE494	Wireless and Mobile Communication lab	0	0	3	3	2
Sessional							
6	ECE472	Project II	0	0	4	4	4
7	ECE482	Comprehensive Viva Voce	0	0	0	0	4
		Total Practical and Sessional				7	10
		Total of Semester				17	20

List of Elective papers

Elective-I:Interdisciplinary Group		
SL. No	Code	Subjects
1	CSE331	Distributed and Mobile Computing
2	ECE307	Renewable Energy
3	CSE333	Object Oriented Programming
4	CSE335	Data Base Management System
Elective-II: Communication Group		
SL. No	Code	Subjects
1	ECE405	EMI/EMC Techniques
2	ECE407	Remote Sensing
3	ECE409	Advanced Optical Communication
4	ECE411	Radar Systems
5	ECE413	Adhoc & Sensor Networks
6	ECE415	Satellite Communication
Elective-III: Signal Processing Group		
SL. No	Code	Subjects
1	ECE417	Digital Image Processing
2	ECE419	Medical Signal Processing
3	ECE421	Adaptive System and Signal Processing
4	ECE423	Advanced Digital signal processing
Elective-IV: Emerging Technology Group		
SL. No	Code	Subjects
1	ECE404	Micro Electro Mechanical System (MEMS)
2	ECE406	Nanotechnology
3	ECE408	Embedded System
4	ECE410	Robotics and Intelligent Systems
5	ECE412	Soft Computing
6	ECE414	Optimal & Adaptive Control
7	ECE416	Advanced Semiconductor Devices

Syllabus

First Semester

Basic Electrical and Electronics-I
Code: EE101
Contacts: 3L+1T
Credits: 4

Electrical:

Introduction: Source of Energy: General structure of Electrical power system, Power transmission.
DC Networks: Theorems: Kirchhoff's current and voltage law, Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem, nodal analysis, mesh analysis., Transient Analysis**:** R-L transient and R-C transient.
Electromagnetism: Biot-savart law, Ampere's circuital law, Magnetic circuits, Faradays' laws of Electromagnetic induction, Inductance; Hysteresis and eddy current losses, Energy stored in a magnetic field.
Electrostatics: Coulomb's law. Electric Field Intensity, Electric flux, Flux density, Electric potential, potential difference, Gauss's law, Capacitors. Energy stored in a capacitor.
AC fundamental: Waveforms, average and RMS values, form factor, concept of phase and phase difference, phasor diagram, Active power and reactive power.
Power factor; AC series and parallel circuits,
Three phase system: Voltages of three balanced phase system, delta and star connection, relationship between line and phase quantities, phasor diagrams. star-delta and delta-star transformation.

Electronics:
Semiconductor Basic: Energy band theory, Fermi levels, Conductors, Semiconductors and Insulators: electrical properties, Semiconductors: intrinsic and extrinsic, P-type and N-type semiconductors ; electrical conduction phenomenon,, drift and diffusion carriers, mass action law.
Rectifying Devices: Formation of P-N junction, formation of depletion zone, Junction capacitance: V-I characteristics, Zener breakdown, Avalanche breakdown. Linear piecewise model; rectifiers: half wave, full wave, ripple factor, efficiency, Clipper and Clamper circuits
Transistors: Formation of PNP / NPN junctions, principle of operation, configurations, transistor characteristics. Biasing and Bias stability: small signal low frequency operation of transistors; equivalent circuits h parameters. Transistors as amplifier: voltage gain, current gain, input impedance and output impedance, Decibel power.

Text/Reference Books:

1. Rakshit & Chattopadhyay, Electronics-Fundamentals and Applications, New Age
2. Cathey,Electronic Devices and Circuits, Shaum series, TMH
3. Boylestead & Nashlesky, Electronic Devices and Circuits, Pearson
4. R S Sedha, Electronic Circuits, S Chand

Basic Electrical and Electronics Lab-I
Code: EE191
Contacts: 3P
Credits: 2

List of Experiments

A. Electrical

1. CHARACTERISTIC OF FLUORESCENT AND INCANDESCENT LAMPS
2. VERIFICATION OF NETWORK THEOREMS
3. MEASUREMENT OF CURRENT, VOLTAGE AND POWER IN R-L-C SERIES CIRCUIT EXECUTED BY SINGLE PHASE A.C SUPPLY
4. Measurement of Electrical Energy (kWh) by Single Phase Energy Meter.

B. Electronics

1. Familiarization of Electrical and Electronics Components
2. Familiarization of Various Instruments like Power Supply, Digital Multimeter, Function Generator, CRO etc.
3. Study of Junction Diode Characteristics
4. Study of Zener Diode Characteristics
5. Study of Clipping Circuits
6. Study of Clamping Circuits

Second Semester

Basic Electrical and Electronics-II
Code: ECE102
Contacts: 3L + 1T
Credits: 4

Electrical:
DC Machines: Construction, Basic concepts of winding (Lap and wave), DC generator: Principle of operation, EMF equation, characteristics DC motors: Principle of operation, Speed-torque Characteristics (shunt and series machine), starting (3-point starter), speed control (armature voltage and field control) Losses and efficiency of D.C. machine.

Single phase transformer: Core and shell type construction, EMF equation, no load and on load operation, phasor diagram and equivalent circuit, losses of a transformer, open and short circuit tests, regulation and efficiency calculation, auto transformer.

3 phase induction motor: Different types induction motor, Construction, production of rotating field, principle of operation, equivalent circuit and phasor diagram, torque-speed characteristics ,starter for squirrel cage and wound rotor induction motor.

Electronics:
Field Effect Transistor: Construction and characteristics of JFET and MOSFET characteristics; depletion and enhancement type, FET small signal model.

Feed Back Amplifier: Block diagram, properties, positive and negative feedback, loop gain, topologies of feedback amplifier; effect of feedback on gain, output impedance, input impedance, sensitivities (qualitative), bandwidth stability

Operational Amplifier: Introduction to integrated circuits, operational amplified and its terminal properties; concept of virtual earth, Gain-frequency and Slew rate; inverting and non-inverting mode of operation, voltage summing, difference, voltage follower, integrator, and differentiator.

Electronic Instruments:
Principle of operation of CRO; Electron ballistics and electron beam deflection; Concept of time base; Measurement of voltage, and frequency;

Text/Reference Books:
1. Rakshit & Chattopadhyay, Foundation of Electronics, New Age
2. Cathey, Electronic Devices and Circuits, Shaum series, TMH
3. Boylestead & Nashlesky, Electronic Devices and Circuits, Pearson
4. S M Sze, Physics of Semiconductor Devices, John Willy
5. Franco, Operational Amplifier, TMH
6. Millman and Halkias, Integrated Electronics, TMH

Mechanics-II
Code: ME102
Contacts: 3L + 1T
Credits: 4

Elementary problems of dynamics of particles, kinematics of particles in 2-D and 3-D; different types of coordinate systems; cylindrical, spherical and tangent–normal; nested frames and relative velocity; Equations of motion of a particle; Integration of equation of motion; Equations of motion of a rigid body; motions in different reference frames; Forces on different components; Work and Energy: Impulse-momentum equation.

Properties of Fluids; Real fluids and ideal fluids; Hydrostatics; Fluid kinematics; Fluid Dynamics: Euler's and Bernoulli's Equation, Conservation of momentum.

Basic Electrical and Electronics Lab-II
Code: ECE192
Contacts: 3P
Credits: 2

List of Experiments

A. Electrical

1. TO MEASURE POWER IN A THREE – PHASE CIRCUIT BY THE TWO WATTMETER METHOD 2
2. Short-circuit and Open circuit test of single phase transformer 2
3. Speed Control of DC shunt Motor 2
4. Starting and reversing of DC shunt motor 2

B. Electronics

1. Study of Rectifier Circuits
2. Study of BJT Characteristics
3. Study of FET Characteristics
4. Study of fundamental characteristics of OP-AMP
5. Determination of Slew rate and bandwidth of an OP-AM.

Workshop Practices-I
Code: ME192
Contacts: 3P
Credits: 2

Introduction to hand tools – files, hacksaw, hammers, chisels, vices, marking block, angle plates, etc.

Introduction to basic instruments: Vernier Caliper, Micrometer, Tri-square, Surface Plates, Height Gauge, Vernier Bevel Protractor, Screw Pitch Gauge, Radius Gauge, etc.

Demonstration on different machines & Equipments: Lathe, Milling, Drilling, Shaping, Radial Drilling, Grinding, Welding, Power Saw, Power Press, Planer Machine, Microscope, Profile Projector, etc.

Practical Exercises: Exercises covering- Sawing, Maintaining of perpendicularity of all surfaces by filing, making of taper surface by filing, making of curved surface by filing, marking, plain turning, step turning, drilling, etc.

Third Semester

Analog Electronics
Code: ECE201
Contacts: 3L + 1T
Credits: 4

BJT and MOSFETS Amplifiers: Large signal models; inverse mode of operation, BJT as an amplifier and as a switch; high frequency models and frequency response.; Bode plot; Rise Time bandwidth relation, Miller Effects, Typical configurations: R-C coupled, Transfer coupled, Classes of operation, Cascade connection, Cascade connection, Darlington amplifier, Tuned Amplifiers; Current Mirror circuits, Constant current source. Feedback amplifiers; Differential amplifiers.
Oscillators and waveform generators: Principle of sinusoidal oscillators and Barkhausen criterion; starting voltage in oscillator, Beat frequency, Wien Bridge; Twin-T, R-C Phase-Shift audio Oscillator; Tuned Circuit oscillators: Hartley, Colpitts, Armstrong, Clapp-oscillators, Crystal controlled RF Oscillators; Multivibrators – Astable, Monostable and Bistable circuits; Generation of square, triangular waveforms; Timer, Voltage controlled oscillator, Phase Locked loops.
Operational Amplifiers and its Applications: Voltage to Current and Current to Voltage converters; Common OP-AMP ICs; Instrumentation amplifiers; Logarithmic Amp; Multipliers; Comparators; Schmitt triggers
Filters: Filter characteristics and specifications; First and Second Order Low-Pass and High-Pass Butterworth Filter: Filter Design, Band-Pass and band reject (Notch Filter) ; All Pass Filter.
Regulated Power Supply: Voltage feedback regulation, Current Limiting, three terminal regulators Fixed and Variable voltage regulators, Switched Voltage regulators

Text/Reference Books:

1. Millman and Halkias, Integrated Electronics, TMH
2. Cathey,Electronic Devices and Circuits, Shaum Series, TMH
3. Boylestead & Nashlesky, Electronic Devices and Circuits, Pearson
4. S M Sze, Physics of Semiconductor Devices, John Willy
5. R A Gayakwad, Op-Amps and Linear Integrated Circuits, PHI
6. Malvino, Electronic Principles, TMH

Physics of Semiconductor Devices
Code: ECE203
Contacts: 3L
Credits: 3

Crystal and Band Theory: lattice structure and type, Miller indices, Diamond lattice, Growth of semiconductor crystal, E - K diagram, Direct and Indirect band gap semiconductor, concept of hole, effective mass and carrier lifetimes, Fermi-Dirac distribution statistics, density of states.
Carrier Transport Phenomena: Mobility and conductivity, drift and diffusion, Fick's diffusion law, electron and hole concentration, equilibrium concentration.

Junction Devices : P-N and metal-semiconductor junctions, Schottky Barrier diode and Varacter diode, Photovoltaic effect, solar cells, Zener and Varacter diodes.

Qualitative Analysis of BJT, FET, MOSFET, CCD: Structure and fabrication of BJT, Physical mechanism of current gain, Equivalent circuits –h and pi-models
Field Effect Transistors:- JFETS, MOSFETS, CMOS and VLSI MOSFETS, enhancement and depletion mode devices, MOS-capacitor and Charge Coupled Devices (CCD),

Negative Resistance devices: Tunnel, Gunn & Impatt diodes

Text/Reference Books:
1) Semiconductor physics and Devices by Neamen (TMH)
2) Principles of semiconductor devices by Dimitrijev (oxford)
3) Microelectronics (2/e) by millman & Grabel (TMH)
4) Solid state Electronic Devices (5/e)- by Streetman & Banerjee (PHI)/Pearson Education
5) Electronic Devices and Circuits by Cathey– (TMH)

Mathematics-III
Code: ECE231
Contacts: 3P
Credits: 2

Calculus of Complex Variable:
Functions; Limits and Continuity; Analytic Functions; Cauchy Riemann Conditions; Analytic Continuation; Complex Integration and Cauchy's Theorem; Cauchy's Integral Formula; Taylor's and Laurent Series; Zeros of an Analytic Function; Poles; Essential Singularities; Residue Theorem (statement only) and it's application to evaluation of integral; Introduction to Conformal Mapping; Simple problems.

Probability and Statistics:
Mean, Median, Mode and Standard Deviation; Samples Space; Definition of Probability; Conditional Probability; General Multiplication Theorem; Independent Events; Bayes' Theorem; Random Variable;
Discrete and Continuous Probability Distributions - Probability mass function; Probability density function; Distribution Function; Expectation; Variance; Probability Distribution— Binomial, Poisson and Normal. Correlation and Regression; Method of Least Squares; Linear Curve Fitting.

Text/Reference Books:

1. Rathor, Choudhari,: Descrete Structure And Graph Theory.
2. Gupta S. C and Kapoor V K: Fundamentals of Mathematical Statistics - Sultan Chand & Sons.
3. Lipschutz S: Theory and Problems of Probability (Schaum's Outline Series) - McGraw Hill Book. Co.
4. Spiegel M R: Theory and Problems of Probability and Statistics (Schaum's Outline Series) – McGraw Hill Book Co.

5. Goon A.M., Gupta M K and Dasgupta B: Fundamental of Statistics - The World Press Pvt. Ltd.
6. Spiegel M R: Theory and Problems of Complex Variables (Schaum's Outline Series) - McGraw Hill Book Co.
7. Bronson R: Differential Equations (Schaum's Outline Series) - McGraw Hill Book Co.

Environment Science
Code: ES231
Contacts: 3L
Credits: 2

Multidisciplinary nature of environmental studies: Definition, scope and importance, need for public awareness.
Natural Resources: Renewable and non-renewable resources:
Natural resources and associated problems.
a) Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people.
b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.
d) Food resources: World food problems, changes caused by agriculture and over-grazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.
e) Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. Case studies.
f) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification.

- Role of an individual in conservation of natural resources.
- Equitable use of resources for sustainable lifestyles.

Ecosystems
• Concept of an ecosystem • Structure and function of an ecosystem. • Producers, consumers and decomposers. • Energy flow in the ecosystem • Ecological succession • Food chains, food webs and ecological pyramids • Introduction, types, characteristic features, structure and function of the following ecosystems:
a. Forest ecosystem
b. Grassland ecosystem
c. Desert ecosystem
d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Biodiversity and its conservation
• Introduction – Definition : genetic, species and ecosystem diversity • Bio geographical classification of India • Value of biodiversity : consumptive use, productive use, social, ethical, aesthetic and option values • Biodiversity at global, National and local levels • Inida as a mega-diversity nation • Hot-sports of biodiversity • Threats to biodiversity : habitat loss, poaching of wildlife, man-wildlife conflicts • Endangered and endemic species of India • Conservation of biodiversity : In-situ and Ex-situ conservation of biodiversity

Analog Electronics Lab
Code: ECE291
Contacts: 3P
Credits: 2

List of Experiments

1. Study of line and load regulation using Zener Diode
2. Study of Voltage Regulator using BJTs and Regulator ICs
3. Study of Emitter-Follower Circuit
4. Study of Single Stage R-C Coupled Amplifier
5. Study of Single Stage FET Amplifier
6. Study of Adder and Subtractor Circuit using OP-AMP 741
7. Study of Integrator and Differentiator Circuits using OP-AMP 741
8. Study of Phase Shift Oscillator using OP-AMP
9. Study of Wien Bridge Oscillator using standard OP-AMP
10. Study of Active filter using OP-AMP
11. Study of Timer Circuit using NE 555 and its Configuration for Monostable and Astable Multivibrators

Fourth Semester

Digital Electronics and Logic Design
Code: ECE202
Contacts: 3L + 1T
Credits: 4

Number system and codes: Decimal, binary, hexadecimal Octl; number conversion; binary and gray codes, Excess 3 code
Binary Arithmetic - r's and (r-1)'s complement representation, Subtraction using 1's and 2's complement representation, Concept of overflow, BCD addition.
Boolean Algebra: Basic logic gates -NOT, AND, OR, NAND, NOR, XOR and XNOR – operations, truth tables and Venn diagram representations; universal gates; postulates and laws of Boolean algebra, De Morgan's theorem; Canonical forms of expressions, minterms and maxterms, SOP and POS forms Simplification and minimization of logic expressions; K-maps, and Quinn McClusky methods (up to 6 variables);
Logic Families - TTL, PMOS, NMOS, CMOS, ECL.
Combinational and arithmetic logic circuits: multiplexers and demultiplexers; decoders and encoders, priority encoders, parity generator and checkers, comparators; Arithmetic circuits- Half adder, Full adder and common adder /subtractor circuit using logic gates, CLA adder. BCD adder and subtractor.
Sequential machine design - Concept of Moore and Mealy machine, State transition diagram and State transition table, Various memory elements, NAND-latch and its use, Clocked flip-flops, SR, JK, D, T. Timing constraints on edge triggered flip-flops; Design of sequence detector. Asynchronous and synchronous counter design. Ring and Johnson (twisted ring) counters. Different types of registers.

Analog- Digital Conversion: D/A conversion- R-2R ladder type, weighted resistor type, switched current type and switched capacitor type; A/D conversion-counter type, flash type, tracking type, successive approximation type and dual-slope type.

Text Books:
1) Digital design by M. Mano (Pearson)
2) Digital Fundamentals by T.L. Floyd, R.P.Jain (Pearson)
3) Fundamental of digital circuits by A. Anand Kumar (PHI)

Reference Books:
1) Digital systems (9/e) by R.J.Tocci, N.S.Widemer,G.L.Mos (Pearson)
2) Modern digital Electronics (3/e) by R. P. Jain (TMH)
3) 2000 solved problems in digital electronics by S.P.Bali (TMH)
4) Digital design principals and applications (6/e) by D.P.Leach, A.P.Malvino, G.Saha (TMH)
5) Digital Electronics-Bignell & Donovan,Delmer,Thompson Learning
6) Digital principals and design by D.D.Givone (TMH)
7) Digital design principles and practices by J.F.Wakerly (Pearson/PHI)

Electrical & Electronic Measurements
Code: ECE202
Contacts: 3L
Credits: 3

FUNDAMENTALS OF MEASUREMENT: Systems and Standards; Types of errors: Gross errors, systematic errors and random errors; probability of errors- normal distribution of errors probable errors; limiting errors.
GALVANOMETERS: Construction, Performance, Steady state and Dynamic Behaviors of d'Arsonval, Vibration, and Ballistic Galvanometers.; ELECTROMECHANICAL INDICATING INSTRUMENTS: *Ammeters and Voltmeters:* PMMC, Moving-Iron, and Electrodynamic type; *Ohmmeters:* Series-type and Shunt-type Ohmmeters; Thermo-instruments, Watt-hour Meters, Power-Factor Meters and Instrument Transformers; POTENTIOMETERS: DC and AC; BRIDGES: *D.C. Bridges:* Wheatstone bridge, and Kelvin bridge., *A.C. Bridges and their Applications:* Maxwell bridge, Hay bridge, Schering bridge, and Wein bridge, Measurement of high resistance by Megger; ELECTRONIC INSTRUMENTS FOR MEASURING BASIC PARAMETERS: Amplified DC Meter, AC Voltmeter Using Rectifiers, True RMS– Responding Voltmeter, Electronic Multimeter, *Digital Voltmeters:*Ramp-type, Integrating type, and Successive-Approximation type; Component Measuring Instruments: Q-meter, Vector Impedance Meter, Vector Voltmeter, RF Power and Voltage Measurements.

CATHODE RAY OSCILLOSCOPES: Cathode Ray Tube, Deflection Amplifiers, Oscilloscope Time Base, Dual-Trace Oscilloscopes, Oscilloscope Controls, Oscilloscope Probes, Delayed time base oscilloscope, Digital Storage Oscilloscope.
DIGITAL INSTRUMENTS: Basic Digital Displays – LEDs and LCD panels. Display Drivers and Latches, Time Base generation with Crystal Oscillators. Digital Frequency: Meter, Errors Time and Ratio measurement.

TRANSDUCERS : Resistance type, potentiometer & strain gauges, Inductive type, LVDT, Capacitive type, Piezoelectric transducer; Measurements : Dimensional change, Motion, Force, Torque, Pressure, Sound; Sensing Elements : Temperature sensing elements: RTD, Thermistor, Thermocouple, Semiconductor sensor; Pressure sensing elements: Manometer, Bourdon tube, Diaphragm, Bellow; Measurement methods : Measurement of vacuum pressure using Mcleod gauge & Pirani gauge, Flow sensing elements: Orifice, Venturi Flow-nozzle, Rotameter, Electromagnetic flowmeter, Coriolis flowmeter. Ultrasonic transducer.

Measurement of non electrical quantities such as Strain, Temperature, pressure, force,speed, flow, humidity, sound, etc.Optical sources and sensors.Application of transducers in measurement and control

Text Books:

1. Golding E.W. & Wides F.C., "Electrical Measuring Instruments & Measurements", Wheeler.
2. Sawhney A K, "A course in Electrical & Electronic Measurements & Instruments", Dhanpat Rai.
3. Ernest O. Doebelin, "Measurement Systems Application and Design", McGraw Hill.

Reference books:

1. Heltrick A.D. & Copoper W.D., "Modern Electronic Instrumentation & Measuring Instruments", Wheeler.
2. Singh, "Industrial Instrumentation &control", 2/e Tata Mcgraw-Hill.
3. Bolton W, "Instrumentation & Process Measurement", Universities Press
4. Heltrick A.D. & Copoper W.D., "Modern Electronic Instrumentation & Measuring Instruments", Wheeler.
5. Singh, "Industrial Instrumentation &control", 2/e Tata Mcgraw-Hill.
6. Bolton W, "Instrumentation & Process Measurement", Universities Press.

Electromagnetic Engineering
Code: ECE204
Contacts: 3L + 1T
Credits: 4

Fundamentals of Vector Laws, Electrostatics and Magnetostatics: Del operator; Gradient, Divergence, Curl – their physical interpretations; Laplacian operator. Coulomb's law, electric field intensity, charge distribution; Gauss' law, flux density and electric field intensity. Divergence theorem. Current Densities, , Poisson's & Laplace's equations, Biot-Savart law, Ampere's law, Relation between J & H, Vector magnetic Potential, Stokes' theorem. Faraday's law & Lenz's law, , Maxwell's equations, Displacement Current Time-harmonic fields, Boundary Conditions between media interface; Uniform Plane wave; Wave Propagation in Lossy Dielectric, Loss-less Dielectric, Free space. Poynting Theorem, Power flow.

Transmission Lines: Concept of Lump parameters and Distributed parameters, Line Parameters, Transmission line equations and solutions, Propagation constant, Characteristic Impedance;

Wavelength; Velocity of Propagation; Distortion-less Line, Reflection and Transmission coefficients; Standing Waves, , Smith Chart – Applications; Load Matching Techniques.

Antennas: Retarded Potential Functions, Field solutions; Radiations from Hertzian and Half wave Dipole and short Magnetic Loop; Near-Field and Far-Field Concept. Antenna Parameters - Radiation Pattern, Beam Area, Beam width, Band width, Directivity, Gain, Antenna Aperture, Aperture Efficiency, Radiation Resistance.

Propagation : Different modes of Radio Wave Propagation: Ground Wave Propagation, Sky Wave Propagation, Skip Distance, Critical Frequency, Virtual Height. Space Wave Propagation, Troposphere Propagation.

Text/Reference Books:

1. Mathew N O Sadiku, Elements of Electromagnetics, Oxford
2. E C Jordon and K G Balmain, Electromagnetic Waves and Radiating Systems, PHI
3. Roger F Harrington, Time Harmonic Electromagnetic Fields, Willey Interscience
4. Hayt and Buck, Engineering Electromagnetics, TMH

Analog Communication
Code: ECE206
Contacts: 3L + 1T
Credits: 4

Introduction to communication system- base-band transmission, various types of signals, noise, bandwidth; Various types of systems, LTI systems; Energy and power signals, Parseval's theorem; Modulation: Time domain and frequency domain analysis.
Random signal and Noise: Signals power and spectral representations, energy and power signals, auto correlation and cross correlation functions, power spectral density functions, White noise, thermal noise, PSDF of white signal; Noise in communication systems, Signal to noise Ratio (SNR) and Carrier to Interference Ratio (CIR). Noise power, Noise bandwidth. Narrowband Noise Representation;
Amplitude Modulation (AM): Generation and transmission of AM signals, DSBSC, SSBSC and VSB with balance modulators, switching and ring modulators, modulation index, normalized power, side band filters: Demodulation of AM signals, square law and envelop detectors. Superheterodyne receiver for standard AM radio, Synchronous demodulation of AM, DSB, SSB and VSB; PLL for detection of AM;
Angle and phase Modulation: Frequency and phase modulations, modulation index; Generation of FM signals using Armstrong method, Modulation and Demodulation of FM and PM signals with limiter discriminator and PLL respectively, narrow band and wide-band FM.
Pulse Modulation: Sampling theory, Shannon's law, PAM, orthogonal signals, Sample and hold, signal reconstruction, PCM, , PWM, PPM techniques.
Communication Systems: Concept of Multiplexing, Concept of commercial FM radio and Stereo FM radio; Recording and reproduction of sound; high fidelity stereophonic systems; compact disc. Television broadcasting- block diagram of TV transmitter and receiver, characteristics of TV transmission;

Text/Reference Books:

1. B.P.Lathi, Modern digital and analog communication systems, OUP
2. A.B.Carlson, Communication systems, TMH
3. Taub and Schilling, Communication systems, TMH
4. S.Haykin, Communication systems, Wiley
5. M.S.Roden, Communication system, PHI

Computer Architecture
Code: CSE206
Contacts: 3L + 1T
Credits: 4

Basic functional blocks of a computer: CPU, memory, input-output subsystems, control unit. Instruction set architecture of a CPU - registers, instruction execution cycle, RTL interpretation of instructions, addressing modes, instruction set. Case study - instruction sets of some common CPUs.

Data representation: signed number representation, fixed and floating point representations, character representation. Computer arithmetic - integer addition and subtraction, ripple carry adder, carry look-ahead adder, etc. multiplication - shift-and-add, Booth multiplier, carry save multiplier, etc. Division - non-restoring and restoring techniques, floating point arithmetic.

CPU control unit design: hardwired and micro-programmed design approaches, Case study - design of a simple hypothetical CPU.

Memory system design: semiconductor memory technologies, memory organization.

Peripheral devices and their characteristics: Input-output subsystems, I/O transfers - program controlled, interrupt driven and DMA, privileged and non-privileged instructions, software interrupts and exceptions. Programs and processes - role of interrupts in process state transitions.

Performance enhancement techniques

Pipelining: Basic concepts of pipelining, throughput and speedup, pipeline hazards.

Memory Organization: Memory interleaving, concept of hierarchical memory organization, cache memory, cache size vs block size, mapping functions, replacement algorithms, write policy.

1. Familiarization with assembly language programming.
2. Synthesis/design of simple data paths and controllers, processor design.
3. Interfacing - DAC, ADC, keyboard-display modules, etc.

Text Books:

1. Computer Architecture & Organization , Hayes, 4/e, MH
2. Computer Architecture , B. Parhami, OUP
3. Computer System Architecture, 3/e, Mano, Pearson/PHI

Reference Books:

1. Computer Organization, Hamacher, 5/e, MH
2. Computer Architecture , N.Carter, Schaum Outline Series, MH
3. Computer Organization, ISRD, MH
4. Digital Logic & Computer Organization, V. Rajaraman & T. Radhakrishnan, PHI
5. Computer Architecture, A.S Tannenbaum, Pearson
6. Computer Architecture & Organization, P.Chakraborty, Jaico
7. Computer Architecture & Organization, Govindrajan, MH
8. Computer Architecture & Organization, Stallings, PHI/Pearson.
9. Computer System Organization & Architecture-Carpinelli-Pearson.

Digital Electronics & Logic design Lab
Code: ECE292
Contacts: 3P
Credits: 2

List of Experiments

1. Verification of truth table of the basic gates.
2. Study of half adder and full adder circuit.
3. Study of half subtractor and full subtractor circuit.
4. Study of encoder and decoder circuit.
5. Study of MUX and DEMUX circuit.
6. Study of SR, JK, D, T Flip flop.
7. Study of shift registrar.
8. Study of counter circuit.

Transmission Line and Antenna Lab
Code: ECE294
Contacts: 3P
Credits: 2

List of Experiments

1. Study of Simple Dipole λ/2 Antenna and Folded Dipole l/2 Antenna
2. Measuring Antenna Beam width
3. Study of Antenna Band width
4. Study of Antenna Radiation with distance
5. Study of Voice Communication using Antenna
6. Measuring the characteristics parameters of a transmission line
7. Measuring the attenuation of a transmission line
8. Measuring the Input Impedance of a transmission line
9. Frequency characteristic of the transmission line
10. Study of Stationary Waves in a transmission line

Analog communication Lab
Code: ECE296
Contacts: 3P
Credits: 2

List of Experiments

1. Study of AM system.
2. Study of DSB-SC system.
3. Study of SSB-SC system.
4. Study of FM.
5. Study of sampling theorem.
6. Study of PAM, PPM, PWM.
7. Study of FDM system.
8. Study of TDM system.

Electrical and Electronic Measurements Lab
Code: EE294
Contacts: 3P
Credits: 2

List of Experiments

1. Measurement of Resistance
2. Measurement of Inductance
3. Measurement of Capacitance
4. Measurement of Frequency
5. Experiment using LVDT
6. LOADCELL Experiment
7. Temperature Transducer
8. Piezoelectric Transducer
9. Measurement of 3-phase power using two watt meters

Fifth Semester

Microprocessor and Microcontroller
Code: ECE301
Contacts: 3L+ 1T
Credits: 4

Microprocessor. Emergence form 8 bit to 64 bit; Programmer's model, data formats. RICS and CISC processor
Architecture of 8085 microprocessors: Instruction timing & execution, Demultiplexing & buffering of system buses of 8085 CPU. Instruction set, classification of instructions, addressing modes, software model of 8085 CPU. Bus structures: IEEE bus interface, RS 232 and USB applications.
Instruction sets: Addressing modes**:** Assembly Language Programming using 8085 CPU: Program writing with 8-bit & 16-bit binary numbers and BCD numbers, program for searching & sorting. Code conversion, concept of look-up table. Writing program using time delays & calculation of T-states. Stacks & Sub-routines. Interrupt structure of 8085 & their uses.
Memory and interfacing: Interfacing of RAM, ROM, EPROM & DRAM .Battery backup of memories, EPROM programming algorithm & its software implementation. I/O interfacing technique: Interrupts, Addressing the I/O devices, data transfer schemes-synchronous & asynchronous data transfer, interrupt driven data transfer, DMA. SCSI and IDE peripherials
Digital peripherals: Support chips: 8255, 8253, 8251, 8279, 8259, 8237, 8212. Interfacing of DAC, ADC, keyboards, printer, and displays using 8255.
Architecture of 8086/8088 microprocessors: Addressing modes, software model, instruction sets, classification of instructions, assembly language programming, memory interfacing, interrupts, I/O interfacing, interfacing of support chips, interfacing of ADC, DAC , keyboards, displays etc.
Microcontroller: 8051 microcontroller, I/O ports memory & memory organization, addressing modes & instruction set, 8051 assembly language programming, interrupts-a few applications of Microcontroller. Industrial applications of Microcontroller: Traffic Control, Stepper motor, Scrolling Display.

Text Books:

1. Microprocessor Architecture, Programming & Application-R. Gaonkar, Wiley
2. Microprocessor & interfacing, Hall, MH
3. Microcontroller, Deshmukh, MH 2/e

Reference Books:
1. Advanced Microprocessor & Peripherals-Ray & Bhurchnadi, MH
2. Fundamental of microprocessor, Uday Kumar, Pearson
3. The 8051 microcontroller & Embedded System, Mazidi & Mazidi, Pearson/PHI
4. Microprocessor & Microcontroller, Krishnakant, PHI
5. 8085 Microprocessor Programming & Interfacing- N.K Srinath-PHI
6. Microprocessor-Theory & Application-M. Rafiquezzaman;PHI
7. Microcontroller & Microcomputer Principles of H/W & S/W Engg. F.M Cady-Oxford.

Digital Communications
Code: ECE303
Contacts: 3L+1T
Credits: 4

Elements of digital communication system: Discrete signals. Spectra and bandwidth
Source encoding: Pulse code modulation, quantization noise, linear and non-linear quantization, companding- A-law and μ-law. Differential pulse code modulation, delta modulation, adaptive delta modulation, Linear predictive coders
Baseband transmission: Baseband signal receiver: probability of error calculations, coherent reception, Regenerative repeater, Bit synchronization, Inphase and midphase synchronizer. Early late gate synchronizer. Frame synchronization.
Line coding: Polar/Unipolar/Bipolar NRZ and RZ; Manchester, differential encoding and their spectral characteristic. Equalization: Inter symbol interference (ISI), Purpose of equalization, Eye pattern, Nyquist criterion for zero ISI, fixed equalizer. Design of equalizer, Adaptive equalizer.
Digital modulation techniques: BPSK, DPSK. BFSK, M-Ary PSK & FSK, QPSK, MSK, QASK, Bit error rate calculations. Spread-spectrum modulation: Direct- Sequence Spread-Spectrum with Coherent Binary Phase-Shift Keying, Processing Gain, Probability of Error, Frequency-hop Spread Spectrum, Code-Division Multiplexing.
Information theory: Discrete and continuous messages, Message source, zero memory source, Discrete memory-less source, extension of zero memory source; Hartley and Shannon's law.
Elements of Coding Theory: Compact codes, Instantaneous codes, Huffman code, Shannon-Fano code. Error control and correcting Codes; Linear block codes, Cyclic codes- BCH, Convolution codes

Text/Reference Books:
1. B.P.Lathi, Modern digital and analog communication systems, OUP
2. A.B.Carlson, Communication systems, TMH
3. Taub and Schilling, Communication systems, TMH
4. S.Haykin, Communication systems, Wiley
5. M.S.Roden, Communication system, PHI

Microelectronics
Code: ECE305
Contacts: 3L +1T
Credits: 4

Material properties: SiGe and Group III-V compound semiconductors; band gap and lattice structures; gap narrowing; Heterostructures: Drift and diffusion equations: bipolar transistors: Heterostructure technologies for SiGe-HBT, AlGaAs/GaAs HBT; Heterostructure field effect devices; Double heterstructures; Strained layer superlattices; III-V compound heterostructure; Quantum well and Quantum well devices;
Semiconductor substrate: Crystal growth-defects; Wafer preparation;
Unit processes and equipments:, Diffusion and thermal oxidation, Ion implantation; Rapid thermal processing.
Pattern transfer: optical Lithography: Photoresists: etching: plasma : reactive ion eching;

Thin films: Deposition; dielectric and poly silicon film deposition; evaporation and sputtering; chemical vapour deposition; epitaxial growth;
Process integration: Device isolation, contacts and metallization**:** bipolar and MOS processing: GaAs technologies
Molecular Building Blocks for Nanostructures – Nano-scale 1D to 3D Structures – Electrical, Mechanical and Optical Properties – Nanoelectronic Devices – Quantum Dots and Wells – Nano-scale Functional Materials – Carbon Nanotubes and Fullerenes – Nano-scale Fabrications processes: Characterization: electron microscope; atomic force microscope

Text/Reference Books:

1. Behzard Razavi, Fundamentals of Microelectronics, John Willey
2. D NagChoudhury, Principles of Microelectronics Technology, Wheeler(India)
3. Sedra & Smith, Microelectronic Circuits, Oxford
4. Schilling & Belove, Electronic Circuit: Discrete & Integrated, TMH
5. J M Rabaey, Digital Integrated Circuits, PHI
6. Millman & Halkias, Integrated Electronics, TMH

Microprocessor and Microcontroller Lab
Code: ECE391
Contacts: 3P
Credits: 2

List of Experiments

1. Study of prewritten programs on trainer kit using the basic instruction set (data transfer, Load/Store, Arithmetic, Logical) Assignments based on above.
2. Familiarization with 8085 simulator on PC.
   Study of prewritten programs using basic instruction set (data transfer, Load/Store, Arithmetic, Logical) on the simulator. Assignments based on above
3. Programming using kit and simulator for:
   i. Table look up
   ii. Copying a block of memory
   iii. Shifting a block of memory
   iv. Packing and unpacking of BCD numbers
   v. Addition of BCD numbers
   vi. Binary to ASCII conversion
   vii. String Matching Multiplication using Booth's Algorithm
4. Program using subroutine calls and IN/OUT instructions using 8255 PPI on the trainer kit e.g. subroutine for delay, reading switch state and glowing LEDs accordingly.
5. Study of timing diagram of an instruction on oscilloscope.
6. Interfacing of 8255: Keyboard and Multi-digit Display with multiplexing using 8255
7. Study of 8051 Micro controller kit and writing programs for Interfacing of Keyboard, DAC and ADC using the kit.
8. Serial communication between two trainer kits

Digital Communications Lab
Code: ECE393
Contacts: 3P
Credits: 2

List of Experiments

1. Study of Delta modulator and demodulator.
2. Study of PCM system.
3. Study of ASK system.
4. Study of PSK.
5. Study of FSK.
6. Study of pseudo noise generator.
7. Study of spread spectrum systems DSSS, FHSS.
8. Study of MSK system.

Electronic Design lab
ECE395
Contacts: 3P
Credit: 2

Supervised Learning

Objective: To impart the essential knowledge of electronic circuit design and fault analysis, to enhance hands on experience and to encourage innovativeness.

Guidelines: The teacher will prepare an exact design problem with specified parameters and assign to the student. As such the teacher can further elaborate or specialize the problem creating enough room for the student to learn and innovate.

If same job is assigned to more than one student/group, it must be with different parameter values.

The students will find their own design solutions with minimum input from the teacher. Of course there can be more than one solution but the student should ultimately know their comparative merits/demerits.

The hardware assembly and testing has to be done only during assigned class hours under general supervision of a teacher. The student must always make a comparative study between the theoretical and measured performance parameters and analyze their causes.

At the end of each job, the student will prepare a report including detail technical specification of his design, circuit diagram, design calculations, theoretical & measured values, graphs, references etc.

Sixth Semester

Digital Signal Processing
Code: ECE302
Contacts: 3L+1T
Credits: 4

Discrete-time signals: Discrete-time sequences, their frequency domain behaviour, comparison with analog signals, convolution of two sequences, sampling theorem, Reconstruction of continuous-time signals. Unit-sample response of a system, Time-invariant systems, Superposition principle for linear systems, Stability criterion for discrete-time systems, Causality criterion for discrete-time systems, Linear constant-coefficient difference equations.
Discrete-time Fourier transform: FT of special sequences, the inverse FT; Computation of the DFT from the discrete-time sequence, linear and circular convolution; computations for evaluating the DFT: increasing the computational speed of the DFT.
Z-transform: Definition and properties of the z-transform, the inverse z-transform; relationship between the Fourier transform and the z-transform.
Digital filter: filter categories: IIR and FIR, recursive and non-recursive. Digital Filter Structures: The direct form I and II structures, Cascade combination of second-order sections, parallel combination of second-order sections, Linear-phase FIR filter structures, Polyphase decomposition; Frequency-sampling structure for the FIR filter. Uniform DFT filter banks.
Digital Signal Processor: Architecture of TMS320C 5416/6713 Processor (any one; programs in Assembly Language.

Text Books:
1. Digital Signal Processing – Principles, Algorithms and Applications - J.G.Proakis & D.G.Manolakis, Pearson Education/ PHI.
2. Digital Signal Processing- Alan V. Oppenheim, Ronald W. Schafer
3. Digital Signal Processors Architectures, Implementations and Applications – S.M.Kuo & W. Gan, Pearson Education

Reference Books:
1. Digital Signal Processing – A Computer Based Approach – S.K.Mitra, TMH Publishing Co,
2. Digital Signal Processing – P. Rameshbabu, Scitech Publications (India)
3. Digital Signal Processing – S. Sharma, S. K. Kataria & Sons

Photonic Devices and Optical Communication
Code: ECE 304
Contacts: 3L+1T
Credits: 4

Optical Fiber: Materials, Fabrication Process, Types of fibers, Wave guiding fundamentals: NAs, Acceptance angle, Modes, V number, Number of modes. Transmission characteristics: Attenuation and Dispersion mechanism and their effects. Special type Fibers.

Optical Sources and Detectors: LEDs and ILDs, Characteristics, Drive circuits; Optical detection principle, P-N, P-I-N and APD, Photo transistor, Receiver Structure, SNR, Sensitivity.

Inter-Connecting Devices: Couplers, Isolators, Polarizers, Circulators, Filters, Add/Drop Mux/Demux, Fiber Optic Repeaters, Optical Amplifiers.

Communication System: System design issues, Link analysis, Intensity modulation/ direct detection system. Digital systems: coding and multiplexing mechanism, OTDM and WDM system, Wavelength converter, Router, SONET.

Text/Reference Books:

1. John M Senior, Optical Fiber Communications: Principles and Practice, PHI
2. Ghatak and Thyagaragan, Introduction to Fibre Optics, Cambridge
3. G Keiser, Optical Fiber Communications, MH
4. D K Mynbaev and L L Scheiner, Fiber Optic Communication Technology, Pearson
5. John Gowar, Optical Communication Systems, PHI

VLSI Circuits & Systems
Code: ECE306
Contacts: 3L +1T
Credits: 4

ASIC Design: Hierarchy, Regularity, Modularity & Locality; Chip Design Options: Gate Array, Field Programmable Gate Array, PLA, PLD, Standard Cell,
Fabrication & Layout of CMOS: Fabrication Process Flow; CMOS n-Well Process: Layout & Design Rules; CMOS inverter Layout Design; MOS Inverter Characteristics: Transfer Characteristics: MOS, n-MOSFET (Enhancement & Depletion mode, CMOS inverter; Transient Analysis of CMOS Inverter and Delay analysis
CMOS Logic Circuits: NAND & NOR Gates; Pseudo n-MOS logic; CMOS Full adder circuit; CMOS Transmission Gate (Pass transistor Logic); Dynamic CMOS Logic; Domino CMOS Logic; Differential Cascode voltage switch logic; Sequential CMOS logic circuits: Bi-stable elements; SR Latch Circuit; clocked JK Latch/Master-Slave JK; CMOS D-latch and edge triggered Flip-flop
Subsystem Design: Adders: Carry ahead adder, carry save adder, Manchester carry chain. Multipliers: Serial-parallel Multiplier, array multiplier; High Density Memory: ROM, Static RAM, Dynamic RAM, SD RAM, Flash Memory
Physical Design: Floor Planning Methods: Block Placement & Channel Definition, Global and Channel Routing
Analog VLSI Circuits : Analog VLSI Mixed Signal Circuits: MOS Switches; Resistor realisation using Switched Capacitor; Voltage level shifter; CMOS Current Sources and sinks; CMOS Voltage and Current references; CMOS Differential Amplifier; CMOS Operational Amplifier; Comparator; Switched Capacitor Filter

Text/Reference Books:

1. S M Sze, VLSI Technology, M Hill
2. Philips E. Allen & Douglas R. Holberg, " CMOS Analog Circuit Design" , Oxford University Press
3. J. M. Rabaey, A. Chandrakasan, B. Nikolic , "Digital Integrated Circuits"
4. W Wolf, Modern VLSI Design Systems on Silicon, Pearson
5. S Gandhi, VLSI Fabrication Principles, John Willey
6. S A Campbell, The Science and Engineering of Microelectronic Fabrication, Oxford
7. D A Pucknell and Eshraghian, Basic VLSI Design, PHI

Computer Networks
Code: CSE302
Contacts: 3L +1T
Credits: 4

Overview of data communication and Networking:
Introduction; Data communications: components, data representation (ASCII, ISO etc.),direction of data flow(simplex, half duplex, full duplex); Networks: distributed processing, network criteria, physical structure (type of connection, topology), categories of network (LAN, MAN,WAN);Internet: brief history, internet today; Protocols and standards; Reference models: OSI reference model, TCP/IP reference model, their comparative study.

Physical level:
Overview of data (analog & digital), signal (analog & digital), transmission (analog & digital)& transmission media (guided & non-guided); TDM, FDM, WDM; Circuit switching: time division & space division switch, TDM bus; Telephone network;

Data link layer:
Types of errors, framing (character and bit stuffing), error detection & correction methods; Flow control; Protocols: Stop & wait ARQ, Go-Back- N ARQ, Selective repeat ARQ, HDLC;

Medium access sub layer:
Point to point protocol, LCP, NCP, FDDI, token bus, token ring; Reservation, polling, concentration; Multiple access protocols: Pure ALOHA, Slotted ALOHA, CSMA, CSMA/CD, FDMA, TDMA, CDMA; Traditional Ethernet, fast Ethernet;

Network layer:

Internetworking & devices: Repeaters, Hubs, Bridges, Switches, Router, Gateway; Addressing : Internet address, classful address, subnetting; Routing : techniques, static vs. dynamic routing , routing table for classful address; Routing algorithms: shortest path algorithm, flooding, distance vector routing, link state routing; Protocols: ARP, RARP, IP, ICMP, IPV6; Unicast and multicast routing protocols.

Transport layer:
Process to process delivery; UDP; TCP; Congestion control algorithm: Leaky bucket algorithm, Token bucket algorithm, choke packets; Quality of service: techniques to improve Qos.

Application layer:
DNS; SMTP, SNMP, FTP, HTTP & WWW; Security: Cryptography, user authentication, security protocols in internet, Firewalls.

Modern topics:
ISDN services & ATM ; DSL technology, Cable modem, Sonet.
Wireless LAN: IEEE 802.11; Introduction to blue-tooth, VLAN's, Cellular telephony & Satellite network.

Text Books:

1. B. A. Forouzan – "Data Communications and Networking (3rd Ed.) " – TMH
2. A. S. Tanenbaum – "Computer Networks (4th Ed.)" – Pearson Education/PHI
3. W. Stallings – "Data and Computer Communications (5th Ed.)" – PHI/ Pearson Education
4. Zheng & Akhtar, Network for Computer Scientists & Engineers, OUP
5. Black, Data & Computer Communication, PHI
6. Miller, data Communication & Network, Vikas
7. Miller, Digital & Data Communication, Jaico
8. Shay, Understanding Data Communication & Network, Vikas

Reference Books:

1. Kurose and Rose – " Computer Networking -A top down approach featuring the internet" – Pearson Education
2. Leon, Garica, Widjaja – "Communication Networks" – TMH
3. Walrand – "Communication Networks" – TMH.
4. Comer – "Internetworking with TCP/IP, vol. 1, 2, 3(4th Ed.)" – Pearson Education/PHI

Power Electronics
Code: EE308
Contacts: 3L
Credits: 3

Power semiconductor devices: structure and characteristics; snubber circuits, switching loss. Controlled rectifiers: full/half controlled converters, dual converters, sequence control. AC regulator circuits, reactive power compensators. dc-dc converters, switching dc power supplies. Inverters: square wave and pwm types, filters, inverters for induction heating and UPS.

Text/Reference Books:

1.Industrial Electronics: S.K. Bhattacharya / S Chatterjee, Tata McGraw-Hill Publishing Company Limited
2. Industrial Electronics: Biswanath Paul PHI
4. Industrial Electronics for Technicians: J.A.Sam Wilson Joseph Rissi , Prompt Publications
4. Thyristors and its Application by Ramamurthy, East West New Delhi
5. Muhammed Rashid, "Power Electronics - Circuits, Devices and Applications", PHI,Pearson Education N Delhi-1, 1994
6. Mohan, Udeland, Robbins, "Power Electronics - Converters, Application and Design, John Wiley and Sons

7. V. R. Moorthi "Power Electronics-Devices,Circuits and Industrial Applications" Oxford UP, N Delhi-1, 2005
8.P. C. Sen, "Modern Power Electronics", S. Chand, NDelhi-55, 2004
9. Industrial Electronics by James A. Rehg, Glenn J. Sartori, Prentice Hall, 2005

Digital Signal Processing Lab
ECE392
Contact: 3P
Credit: 2

Simulation Laboratory using Standard Simulator:

1. Simulation of sampled Sinusoidal signal, various sequences and different arithmetic operations.
2. Write a program for linear convolution of two sequences.
3. Simulation of z-transform of various sequences - verification of the properties of z-transform.
4. Simulation of Twiddle factors – verification of the properties.
5. Write a program to perform N-point DFT. Also perform the IDFT on the result obtained to verify the result.
6. Write a program for circular convolution
7. Write a program to perform linear convolution using (a) overlap save method (b) overlap add method.
8. Write a program to perform FFT on a sequence using the following methods. (a) Decimation in time (b) Decimation in frequency
9. Write a program to design an FIR filter using windowing technique.
10. Write a program to design an IIR filter using (a) impulse invariant method (b) bilinear transformation method.

Hardware Laboratory using either 5416 or 6713 Processor:

1. Practising of writing & execution of small programs related to arithmetic operations & convolution using Assembly Language of TMSC205416/6713 Processor, Study of MAC instruction.

Optical Communication Lab
Code: ECE 394
Contacts: 3P
Credits: 2

List of Experiments

1. Study of Components/Instruments used in Optical fiber communication
2. Determination of NA of Optical Fiber
3. Determination of Fiber attenuation at different wave lengths

4. Study of modal dispersion in multimode fiber
5. Study of different modulation/demodulation techniques in optical fiber communication
6. Study of digital fiber optic communication schemes
7. Study of audio link establishment using optical fiber
8. Study of data transfer between two computers using optical fiber

VLSI Circuits Design Lab
Code: ECE 396
Contacts: 3P
Credits: 2

List of Experiments

1. Study of different analog and digital circuits using Pspice
2. Study of different analysis (transient, ac, Fourier) for analog/hybrid circuit using Pspice
3. Simulation study of Op-amp based circuits (adder, waveform generator, oscillator, filter)
4. Study of CMOS analog circuits using Pspice/TCAD
5. Study of CMOS digital circuits using Pspice/TCAD
6. Familiarization with EDA tools like ModelSim or Tanner EDA
7. Programming techniques using VHDL
8. Programming techniques (realization of different combinational and sequential circuits) using Verilog

Power Electronics Lab
Code: EE 398
Contacts: 3P
Credits: 2

List of Experiments

1. To study V-I characteristics of SCR and measure latching and holding currents.
2. To study UJT trigger circuit for half wave and full wave control.
3. To study single-phase half wave controlled rectified with (i) resistive load (ii) inductive load.
4. To study single phase (i) fully controlled (ii) half controlled bridge rectifiers with resistive and inductive loads.
5. To study three-phase fully/half controlled bridge rectifier with resistive and inductive loads.
6. To study single-phase ac voltage regulator with resistive and inductive loads.
7. To study single phase cyclo-converter
8. To study triggering of (i) IGBT (ii) MOSFET (iii) power transistor
9. To study operation of IGBT/MOSFET chopper circuit
10. To study MOSFET/IGBT based single-phase series-resonant inverter

Seventh Semester

Industrial Management
Code: HU401
Contacts: 3L
Credits: 3

Basic concepts of management, objectives, classification and hierarchy, different schools of management thought, principal functions of management, Management as an organizing and directing force, Structure of the management decision making process, Organization structure, authority and responsibility, Organisation dynamics, Managerial leadership, communication systems, Managing human factors in business and industry, Industrial relation, Union activities, trade union acts, collective bargaining, disciplinary procedure.

Organizational objectives and long range forecasting, planning, organizing, programming and controlling process, managerial control strategies; quantity and quality control, cost benefit analysis, present work and breakeven analysis, budgetary control, use of management science for the efficient administration of economic units, production, financial and marketing management.

Adoption of statistical and computer methods and techniques to managerial research and managerial decision making and general management.

Information Theory & Coding
Code: ECE401
Contacts: 3L
Credits: 3

Information Theory-Basic Definition, Information & Entropy, Shannon's Charred Capacity Theorem, Channel capacity of a discrete memory less channel, Channel capacity of a continuous channel.
Reliability of information: Modelling, Markovian model; parameter estimation;
Coding for reliable digital transmission: Error Control Strategies. Linear block codes: Syndrome and Error detection, Minimum distance, Error detecting and Error-correcting capabilities, Standard Array and Syndrome decoding, Hamming code.
Cyclic codes: Generator & parity-check matrices of cyclic codes, Encoding of cyclic codes, Syndrome computation and error detection, Decoding, Cyclic Hamming Codes, Shortened cyclic codes.
BCH codes: Description, Decoding BCH codes, Implementation of error correction, Non binary BCH codes and Reed-Solomon codes, Weight distribution and Error detection of Binary BCH codes.
Convolution codes: Encoding, Structural properties, Distance properties, Maximum likelihood decoding of convolution codes, Viterbi algorithm, Performance bound for convolution codes, Application of Viterbi decoding
Cryptography -Encryption & decryption, Public & private key cryptography, DES algorithm, RSA algorithm, Diffy-Hellman key exchange, Introduction of quantum cryptography,

Text/Reference Books:

1. Information Theory, Coding and Cryptography, Ranjan Bose, TMH.

2. Information and Coding Theory, Jones, Springer.
3. Introduction to Information Theory, M. Mansurpur, MGH.
4. Error Control Coding, Shu Lin & D I Costello Jr., Prentice Hall.

RF and Microwave Engineering
Code: EC403
Contacts: 3L +1T
Credits: 4

RF & Microwave Spectrum :
Microwave Waveguides: Rectangular and Circular Waveguides– Mode structures, Cut-off frequency, Propagation Characteristics, wall currents, Attenuation constant, waveguide excitations.
Waveguide Passive Components: Waveguide Resonators – Rectangular & Cylindrical; Resonant frequencies, Mode structures, Q-factor, Co-axial Resonators; Excitation & coupling of cavities, Design of resonators. Periodic Structures-Filters.
N-port networks – circuit representations, transmission matrix,; attenuators, phase shifter, directional couplers, Bethe-hole coupler, Magic tee, hybrid ring, circulators, isolators,
Antennas: Concepts of lines of force; Short antenna; Horns- sectoral horns, Pyramidal horns, Parabolic reflector, Cassigran feed, Patch antennas, antenna arrays. Scattering matrix representations of passive components. Transitions: coaxial lines to waveguide, to micro-strip lines. Design of transitions.
Planar structure: Strip lines, Micro-strip lines, coplanar structure, Slot lines, Suspended strip lines, Fin lines – Configurations, Field patterns, propagation characteristics, Design considerations..
Microwave Tubes and semiconductor microwave devices: Limitations of conventional tubes in microwaves; Multi-cavity Klystron, Reflex klystron; Magnetron, Travelling wave tube, Backward wave oscillator; Tunnel diode; Gunn diode; Avalanche diode; IMPATT, TRAPATT, Microwave bipolar transistor, hetero-junction bipolar transistor, Microwave field-effect transistor–JFET, MOSFET, MESFET, Parametric amplifiers;
Radar and satellite communication systems – Pulsed radar, MTI, Tracking radars, Altimeter ; Kepler's law; Orbital mechanics; Propagation characteristics; frequency spectra and band ; up-link & down-link gain budgets.
Microwave Measurements:
Microwave Bench, Slotted line, Tunable Probe, VSWR Meter, Slide screw tuner, Variable shorted line; Power Measurement – Calorimetric method, Thermocouple, Bolometers, Frequency measurement, Impedance measurement by shift in minima. Network Analysers, TDR, and Spectrum analyser.

Text/Reference Books:

1. S Liao, Microwave Devices and Circuits, ?
2. D Pozar, Microwave Engineering, John Wiley & Sons
3. Sisodia & Gupta, Microwave: Introduction to Circuits and Antennas, ?
4. Mathew M Radmanesh, Radio frequency and Microwave Electronics Illustrated, PHI

Microwave Engineering Lab
Code: ECE493
Contact: 3P
Credit: 2

List of Experiments

1. To study V-I characteristics of Gunn Diode.
2. To study the following characteristic of Gunn Diode
   a. Output power and frequency as a function of voltage.
   b. Square wave modulation through PIN diode.
3. To determine the frequency & wavelength in a rectangular waveguide working on TE10 mode.
4. To determine the Standing Wave-Ratio and Reflection Coefficient.
5. Study of the characteristics of Klystron Tube and to determine its electronic tuning range.
6. To measure the polar pattern and the gain of a wave-guide horn Antenna.
7. Study of Magic Tee
8. Study of Attenuator (Fixed and Variable type).
9. Study the voice communication by using microwave test bench.
10. Phase shift measurement

Electronic Design Automation
Code: ECE 495
CONTACT: 3P
CREDIT: 2

1. Familiarity with Spice simulation tool
2. Spice Simulation of Inverter, NAND, NOR Gates
3. Familiarity with EDA tools for VLSI design /FPGA based system design
4. Layouts, Transistors and tools
5. Standards cell Design
6. Design of CMOS XOR/XNOR Gates
7. Design of CMOS Full adder
8. Design of CMOS Flip flops (R-S, D, J-K)
10. Design of 8 bit synchronous Counter
11. Design of 8 bit bi-directional register with tri-stated input/output bus
12 Design of a 12 bit CPU with few instructions and implementation and validation on FPGA

Project-I
ECE471
Contact: 4P
Credit: 4

- Students (preferably not more than four in each group) need to complete one project during 7th & 8th semester together.
- It is suggested that the project involves investigative study over & above the routine curriculum and also hardware activity. It should be result oriented and should explore newer topics.
- Students will finally prepare a comprehensive project report and give a demonstration & presentation of their project to the class of students and the review committee as nominated by the university.
- Total score of 200 (credit = 8) is distributed in 7th & 8th semester. Depending on the progress and quality, each student will be given a score out of 100 at the end of 7th semester, and at the end of 8th semester.

Eighth Semester

Professional Values and Ethics
Code: HU402
Contacts: 3L
Credits: 3

HUMAN VALUES
Morals, Values and Ethics – Integrity – Work Ethic – Service Learning – Civic Virtue – Respect for Others – Living Peacefully – caring – Sharing – Honesty – Courage – Valuing Time – Co-operation – Commitment – Empathy – Self-Confidence – Character – Spirituality

ENGINEERING ETHICS
Senses of 'Engineering Ethics' - variety of moral issued - types of inquiry - moral dilemmas - moral autonomy - Kohlberg's theory - Gilligan's theory - consensus and controversy – Models of Professional Roles - theories about right action - Self-interest - customs and religion - uses of ethical theories.

ENGINEERING AS SOCIAL EXPERIMENTATION
Engineering as experimentation - engineers as responsible experimenters - codes of ethics - a balanced outlook on law - the challenger case study

SAFETY, RESPONSIBILITIES AND RIGHTS
Safety and risk - assessment of safety and risk - risk benefit analysis and reducing risk - the three mile island and chernobyl case studies.
Collegiality and loyalty - respect for authority - collective bargaining - confidentiality - conflicts of interest - occupational crime - professional rights - employee rights - Intellectual Property Rights (IPR) - discrimination.

GLOBAL ISSUES
Multinational corporations - Environmental ethics - computer ethics - weapons development - engineers as managers-consulting engineers-engineers as expert witnesses and advisors -moral leadership-sample code of Ethics like ASME, ASCE, IEEE, Institution of Engineers (India), Indian Institute of Materials Management, Institution of electronics and telecommunication engineers (IETE),India, etc.

References:
1. Stephen H Unger, Controlling Technology: Ethics and the Responsible Engineers, John Wiley & Sons,
New York 1994 (2nd Ed)
2. Deborah Johnson, Ethical Issues in Engineering, Prentice Hall, Englewood Cliffs, New Jersey 1991.

Wireless and Mobile Communication
Code: ECE402
Contacts: 3L+1T
Credits: 4

Introduction to mobile communication. Past, present and Future wireless– Mobile technology. Introduction to GSM and CDMA Technology. GSM system architecture overview, call management and system operation. CDMA based cellular system. Cellular radio system design, frequency assignment, frequency reuse channels, Concept of cell splitting. Handover in cellular systems. Handoff algorithms. Radio wave propagation, propagation models, reflection, scattering, fading, shadowing multipath effects Path loss over hilly and flat terrain, Power prediction over flat and hilly terrain. RF design, received signal phase and envelope characteristic. Simulation of wireless channel. Bandwidth and power spectral density, pulse shaping techniques, BPSK, QPSK, QQPSK, MSK, GMSK
Cellular concept. Mobile radio propagation. Co-channel interference. Diversity. Multiple access. Cellular coverage planning. Wireless networking. Wireless systems and standards. Fading channels, spreading codes, power control. WAP and other protocols for internet access. Data transmission in GSM and UMTS, TCP in wireless environment, multi-user detection and its performance analysis. Blue-tooth and other wireless networks, system comparison. Spread spectrum concept. Basics of CDMA. Properties and generation of PN sequences. Applications of CDMA to cellular communication systems. Second and third generation CDMA systems/ standards. Multicarrier CDMA. Synchronization and demodulation .Diversity techniques and rake receiver.

Text/Reference Books:
1. T.S. Rappaport, Principles of wireless communication, PHI
2. Wireless and Cellular Communications, William C Y Lee
3. Wireless Communications, Andrews Molisch, John Willey

Wireless and Mobile Communication Lab
Code: ECE492
Contacts: 3L
Credits: 2

1. Generation of baseband signal for GSM, CDMA, Bluetooth, WLAN and WiMAX. Estimation of the signal spectrum at baseband.
2. Analyze the working of the RF section of a mobile cellular receiver.
3. Signal generation, reception and analysis of Bluetooth signal using random number as information bits.
4. Simulate the working of codec in a GSM receiver using MATLAB and Labview.
5. Analyze propagation characteristics of GSM, IS95, CDMA2000 using Qualnet simulator.
6. Determine the mobile channel transfer function using vector network analyzer, signal generator and spectrum analyzer.
7. Test an error correction coding scheme using software defined radio system.
8. Design equalizer for GSM receiver on a software defined radio system.
9. Design a mobile CDMA receiver using software defined radio set.

Elective papers

Elective-I (Interdisciplinary Group):

Distributed and Mobile Computing
Code: CSE331
Contacts: 3L
Credits: 3

Introduction to Personal Communications Services (PCS): PCS Architecture, Mobility management, Networks signalling. Global System for Mobile Communication (GSM) system overview: GSM Architecture, Mobility management, Network signalling.

General Packet Radio Services (GPRS): GPRS Architecture, GPRS Network Nodes. Mobile Data Communication: WLANs (Wireless LANs) IEEE 802.11 standard, Mobile IP.

Wireless Application Protocol (WAP): The Mobile Internet standard, WAP Gateway and Protocols, wireless mark up Languages (WML). Wireless Local Loop(WLL): Introduction to WLL Architecture, wireless Local Loop Technologies.

Third Generation (3G) Mobile Services: Introduction to International Mobile Telecommunications 2000 (IMT 2000) vision, Wideband Code Division Multiple Access (W-CDMA), and CDMA 2000, Quality of services in 3G.

Global Mobile Satellite Systems; case studies of the IRIDIUM and GLOBALSTAR systems. Wireless Enterprise Networks: Introduction to Virtual Networks, Blue tooth technology, Blue tooth Protocols.

Server-side programming in Java, Pervasive web application architecture, Device independent example application

Text :

1. "Pervasive Computing", Burkhardt, Pearson
2. "Mobile Communication", J. Schiller, Pearson
3. "Wireless and Mobile Networks Architectures", Yi-Bing Lin & Imrich Chlamtac, John Wiley & Sons, 2001
4. "Mobile and Personal Communication systems and services", Raj Pandya, Prentice Hall of India, 2001.

Reference :

1. "Guide to Designing and Implementing wireless LANs", Mark Ciampa, Thomson learning, Vikas Publishing House, 2001.
2. "Wireless Web Development", Ray Rischpater, Springer Publishing,
3. "The Wireless Application Protocol", Sandeep Singhal, Pearson .
4. "Third Generation Mobile Telecommunication systems", by P.Stavronlakis, Springer Publishers,

Renewable Energy
Code: ECE307
Contacts: 3L
Credits: 3

Energy analysis; Energy cost and audit; Energy conservation and management; Space conditioning; conservation through storage: flywheel, sensible and latent heat storage

Photovoltaic energy conversion; design consideration and manufacturing processes; efficiency; thermoelectric phenomena, Thomson, Peltier, Seebech effects; Kelvin,s relation Thermoelectric conversion; Thermionic emission; nuclear reactors; Heat pipes, MHD generation; Ionization and seeding: Fuel cells; performance analysis: low, medium and high temperature fuel cells.

Object Oriented Programming
Code: CSE333
Contacts: 3L
Credits: 3

Concepts of structural program development; concept of data types; precedence and associatively of operators; conditional transfer; deterministic and in-deterministic loops; recursions; functions and procedures - call by value, call by reference and their differences; programming for numerical methods; records.

Data-type handling and various constructs (conditional, loop, functions etc); pointers: concept of pointers and passing parameters using pointers, non-numeric processing, concept of arrays of pointers and pointers to pointers; structures and unions – advantage of using structures, concept of information hiding, pointers to structures; files - basic concept of various types of file access methods: sequential, indexed sequential, random, various statements for file handling

Advanced Programming Languages like C++, ADA, LISP, PROLOG, and PASCAL. Comparison of various languages

Programming methodologies-Comparison-Object Oriented concepts-Basics of C++ environment.

Definition-Data members-Function members-Access specifiers-Constructors-Default constructors-Copyconstructors-Destructors-Static members-This pointer-Constant members-Free store operators-Control statements.

Overloading operators-Functions-Friends-Class derivation-Virtual functions-Abstract base classes-Multiple inheritance. Class templates-Function templates-Exception handling-Streams.

Text books:

1. Tennence W.Pratt, “Programming languages design and implementation”, Prentice Hall of India.

2. Allen B. Tucker, “Programming Languages”, Tata McGraw Hill.
3. Gottfried BS – Programming with C, TMH pub.
4. Balagurusamy:ANSI C TMH
5. Kanetkar, Yashvant – Understanding Pointers in C- 2nd Edn. BPB
5. Kanetkar, Yashvant - Let us C. - 3rd revised Edn. BPB

6. Roosta- Foundation of Programming Languages,Vikas
7. Jeyapoovan- A First Course in Prog with C, Vikas
8. Programming In C++, Y.I. Shah and M.H. Thaker, ISTE/EXCEL BOOKS
9. Fundamentals of Programming Languages, R. Bangia,Cyber Tech.

Database Management System
Code: CSE335
Contacts: 3L
Credits: 3

Introduction: Concept & Overview of DBMS, Data Models, Database Languages, Database Administrator, Database Users, Three Schema architecture of DBMS.
Entity-Relationship Model: Basic concepts, Design Issues, Mapping Constraints, Keys, Entity-Relationship Diagram, Weak Entity Sets, Extended E-R features.

Relational Model:
Structure of relational Databases, Relational Algebra, Relational Calculus, Extended Relational Algebra Operations, Views, Modifications of the Database.

SQL and Integrity Constraints :
Concept of DDL, DML, DCL. Basic Structure, Set operations, Aggregate Functions, Null Values, Domain Constraints, Referential Integrity Constraints, assertions, views, Nested Subqueries, Database security application development using SQL,PL/SQL, Stored procedures and triggers, Cursors.

Relational Database Design:
Functional Dependency, Different anamolies in designing a Database., Normalization using functional dependencies, Decomposition, 1NF, 2NF, 3NF, Boyce-Codd Normal Form, Nomalization using multi-valued depedencies, 4NF, 5NF, 6NF.

Internals of RDBMS:
Physical data structures, Query optimization: join algorithm, statistics and cost bas optimization. Transaction processing, Concurrency control and Recovery Management: transaction model properties, state serializability, lock based protocols, two phase locking, Deadlocks, Deadlock avoidance, Wait die & wound wait protocol.

File Organization & Index Structures:
File & Record Concept, Placing file records on Disk, Fixed and Variable sized Records, Types of Single-Level Index (primary, secondary, clustering), Multilevel Indexes, Dynamic Multilevel Indexes using B tree and B+ tree.

Elective-II (Communication Group):

EMI/EMC Techniques
Code: ECE405
Contacts : 3L
Credits: 3

EMC rules and regulations;
EMC requirements in electronic systems: radiated emission, conducted emission, radiated and conducted susceptibility;
Electrostatic discharge:
Antenna for EMC; signal spectra, Cross talks in 3 conductor line: shielded wires, grounding techniques.
System design for EMC: printed board, application in VLSI/LSI
Instruments: Spectrum analyzer, network analyzer,

Text/Reference Books :

1. Introduction to Electromagnetic Compatibility by Clayton R Paul, John Willey
2. EMI/EMC by G K Deb
3. Principles of Electromagnetic Compatibility by Bernhard Keiser, Artech House, 3rd ed

Remote Sensing
Code ECE407
Contacts: 3L
Credits: 3

Concept of Remote Sensing: Distance Remote Sensing , Remote Sensing Process , Sources of Energy , Interaction with atmosphere, Ideal remote sensing.
Global Positional System: Functions and advantages of GIS , Process of GIS , Planning , Implementation Management of GIS , Data models of GIS.
Photogrammetry: Development and Classification, Stereo model, Stereoscopic 3D viewing, Measurement and extraction
Orthorectification: Low and High resolution DEM, Multiimage fusion, Spatial domain fusion, spectral domain fusion , Scale -space fusion.
Image Processing: Visual image interpretation, Data integration: Analysis and presentation , Thermatic maps , Thermal image interpretation
Noise and Correction: Noise réduction , Global noise, Sigma filter , Local noise , Periodic noise, Radiometric calibration , Distortion correction
Sensors: Introduction, Photographic Sensors, Multispectral remote sensing system , Thermal remote sensing system, Microwave remote sensing system , Atmospheric sensors-Radar , LIDAR , SONAR
Modern trends in GIS: Local and global concepts , Increase in dimension of GIS , Linear and Non linear techniques in GIS , 3D GIS , Mobile GIS , CGIS. 8

Text/Reference Books :

1. Remote Sensing and Geographical Information Systems by Anji Reddy, BS Pub, 2001

2. Remote Sensing Applications by M G Srinivas (Edited)
3. Remote Sensing Method and Applications by Michael Hord, John Willey & Sons, 1986
4. Remote Sensing and image Interpretation by T M Lillesand and R W Keifer, John Willey & Sons, 1987

Advanced Optical Communication
Code: ECE409
Contacts: 3L
Credits: 3

Special type Optical Fiber and their characteristics; fiber dispersion management. Line Amplifiers, EDFA; Optical Filter and FBG
Coherent communication: homodyne and heterodyne systems
Optical network: Wavelength Division multiplexing; Fiber optic subscriber loop; SONET, Photonic switching; Optical time division multiplexing
Fiber non linearity: Soliton propagation
Introduction to Photonic crystal

Text/Reference Books :

1. John M Senior, Optical Fiber Communications: Principles and Practice, PHI
2. G Keiser, Optical Fiber Communications, MH
3. D K Mynbaev and L L Scheiner, Fiber Optic Communication Technology, Pearson
4. John Gowar, Optical Communication Systems, PHI

Radar Systems
Code: ECE411
Contacts: 3L
Credits: 3

Introduction- Nature of Radar, Maximum Unambiguous Range, Radar Waveforms, Simple form of Radar Equation, Radar Block Diagram and Operation, Radar Frequencies and Applications. Related Problems.

Radar Equation : Prediction of Range Performance, Minimum Detectable Signal, Receiver Noise and SNR, Integration of Radar Pulses, Radar Cross Section of Targets (simple targets - sphere, cone-sphere), Transmitter Power, PRF and Range Ambiguities, System Losses (qualitative treatment). Related Problems.

CW and Frequency Modulated Radar : Doppler Effect, CW Radar – Block Diagram, Isolation between Transmitter and Receiver, Non-zero IF Receiver, Receiver Bandwidth Requirements, Applications of CW radar.

FM-CW Radar, Range and Doppler Measurement, Block Diagram and Characteristics Approaching/ Receding Targets), FM-CW altimeter, Measurement Errors, Multiple Frequency CW Radar.

MTI and Pulse Doppler Radar : Introduction, Principle, MTI Radar with - Power Amplifier Transmitter and Power Oscillator Transmitter, Delay Line Cancellers – Filter Characteristics, Blind Speeds, Double Cancellation, Staggered PRFs. Range Gated Doppler Filters. MTI Radar Parameters, Limitations to MTI Performance. Non-coherent MTI, MTI versus Pulse Doppler Radar.

Tracking Radar : Tracking with Radar, Sequential Lobing, Conical Scan, Monopulse Tracking Radar – Amplitude Comparison Monopulse (one- and two- coordinates), Phase Comparison Monopulse. Target Reflection Characteristics and Angular Accuracy. Tracking in Range, Acquisition and Scanning Patterns. Comparison of Trackers.

Detection of Radar Signals in Noise : Introduction, Matched Filter Receiver – Response Characteristics and Derivation, Correlation Function and Cross-correlation Receiver, Efficiency of Non-matched Filters, Matched Filter with Non-white Noise.

Radar Receivers – Noise Figure and Noise Temperature. Displays – types. Duplexers – Branch type and Balanced type, Circulators as Duplexers. Introduction to Phased Array Antennas – Basic Concepts, Radiation Pattern, Beam Steering and Beam Width changes, Series versus Parallel Feeds, Applications, Advantages and Limitations.

Text/Reference Books :

1. Introduction to Radar Systems – Merrill I. Skolnik, 2nd ed, McGraw-Hill, 1981.
2. Introduction to Radar Systems – Merrill I. Skolnik, 3rd ed, Tata McGraw-Hill, 2001

Adhoc and Sensor Networks
Code: ECE413
Contacts: 3L
Credits: 3

1. Introduction to Wireless Networks: Evolution of Wireless Networks, Challenges, Overview of various Wireless Networks.

2.WirelessCommunications Principles and Fundamentals: Introduction, The Electromagnetic Spectrum, The Cellular Concept, The Ad Hoc and Semi Ad Hoc Concepts, Wireless Services, Data Delivery Approaches, Overview of Basic Techniques and Interactions Between the Different Network Layers

3.FirstGeneration (1G) Cellular Systems: Introduction, Advanced Mobile Phone System (AMPS), Nordic Mobile Telephony (NMT).

4.SecondGeneration (2G) Cellular Systems: D-AMPS, CDMA One (IS-95), GSM, IS-41, Data Operations, Cordless Telephony (CT).

5.ThirdGeneration (3G) Cellular Systems: Introduction, 3G Spectrum Allocation, Third Generation Service Classes and Applications, Third Generation Standards.

6.FourthGeneration (4G): Introduction, Design Goals for 4G and Beyond and Related Research Issues, 4G Services and Applications, Challenges.

7.Satellite Networks: Introduction, Satellite Systems, VSAT Systems, Examples of Satellite-based Mobile Telephony Systems, Satellite based Internet Access.

8.FixedWireless Access Systems: Wireless Local Loop versus Wired Access, Wireless Local Loop, Wireless Local Loop Subscriber Terminals (WLL), Wireless Local Loop Interfaces to the PSTN, IEEE 802.16 Standards.

9.WirelessLocal Area Networks: Introduction, Wireless LAN Topologies, Wireless LAN Requirements, The Physical Layer, The Medium Access Control (MAC) Layer, Latest Developments.

10.WirelessATM and Ad Hoc Routing: Introduction, Wireless ATM Architecture, HIPERLAN 2: An ATM Compatible WLAN, Routing in Wireless Ad Hoc Networks.

11.PersonalArea Networks (PANs): Introduction to PAN Technology and Applications, Commercial Alternatives: Bluetooth, Commercial Alternatives: HomeRF.

12.SecurityIssues in Wireless Systems: The Need for Wireless Network Security, Attacks on Wireless Networks, Security Services, Wired Equivalent Privacy (WEP) Protocol, Mobile IP, Weaknesses in the WEP Scheme, Virtual Private Network (VPN).

13.Economics of Wireless Networks: Introduction, Economic Benefits of Wireless Networks, The Changing Economics of the Wireless Industry, Wireless Data Forecast, Charging Issues.

14.CaseStudies on Simulation of Wireless Network Systems: Performance Evaluation of IEEE 802.11 WLAN Configurations Using Simulation, Simulation Analysis of the QoS in IEEE 802.11 WLAN System, Simulation Comparison of the TRAP and RAP Wireless LANs Protocols, Simulation Modeling of Topology Broadcast Based on Reverse-Path Forwarding (TBRPF) Protocol Using an 802.11 WLAN-based MONET Model.

Text/Reference Books:

1. “Wireless Networks”, P. Nicopolitidis, M. S. Obaidat, G. I. Papadimitriou, A. S. Pomportsis, John Wiley & Sons, Ltd.
2. “Wireless Communications Principles and Practices”, T. S. Rappaport, Pearson Education.
3. “Wireless Communications and Networks”, William Stallings, Pearson Education.
4. “Wireless and Mobile Network Architectures”, Yi-BaNG Lin and Imrich Chlamtac, Wiley
5. “Mobile Communication System”, Y. C. Lee.
6. “Guide to Wireless Network Security”, John R. Vacca, Springer.
7. “The Wireless Application Protocol”, Steve Mann, Scott Sbihli, Wiley.
8. “Mobile Communications”, Jochen Schiller, Pearson, Second Edition.

9. "Mobile Computing- Technology, Applications and Service Creation", A. K. Talukder, R.R. Yavagal, TMH.

Satellite Communication
Code: ECE415
Contacts: 3
Credit: 2

Introduction: Original Satellite Communications, History, Current State, Overview of Satellite System Engineering; **Orbital Aspects of Satellite Communication:** Orbital mechanism, look angle determination, orbit determination, orbit effects on Communication, System performance; **Satellite Link Budget:** Basic transmission theory, system noise and G/T ratio, down link design, satellite system using small earth station, up-link design; **Modulation Multiplexing Techniques:** Analog telephone transmission, Television transmission, Digital transmission, Digital TV and bandwidth Compression, time division multiplexing; **Multiple Access Techniques:** Frequency division multiple access, time division multiple access, code division multiple access, practical demand access systems, random access, multiple access with on-board processing; **Satellite Earth Solution Techniques:** Earth solution design, tracking, small earth station antennas, Equipment for the Earth station.

Text/Reference Books:
1. Dennis Roddy, Satellite Communications, McGraw-Hill Publication Third edition 2001
2. Timothy Pratt – Charles Bostian & Jeremy Allmuti, Satellite Communications, John Willy & Sons (Asia) Pvt. Ltd. 2004
3. Wilbur L. Pritchars Henri G.Suyder Hond Robert A.Nelson, Satellite Communication Systems Engineering, Pearson Education Ltd., Second edition 2003.
4. M.Richharia : Satellite Communication Systems (Design Principles Macmillan Press Ltd

Elective-III (Signal Processing group):

Digital Image Processing
Code: ECE417
Contacts: 3L
Credit: 3
Introduction, image definition and its representation, neighborhood, Image capturing techniques. Orthogonal transformations like DFT, DCT, Wavelet
Enhancement / Restoration: contrast enhancement, multi-scals / multi-resolution enhancement Smoothing and sharpening, least square restoration, constrained least square restoration, Wiener filter.
Segmentation: pixel classification, global/local gray level thresholding, region growing, split/merge techniques, model based – Facet model, edge detection operators, Hough transform. Image feature/primitive extraction, component labeling, medial axis transform, Skeletonization/

thinning, shape properties, textural features-moments, gray level co-occurrence matrix, structural features, Fourier descriptor, polygonal approximation.
Compression: coding, quantization, spatial and transform domain based compression. Color image processing: color model, enhancement, and segmentation.
Content-based image retrieval. Few applications of image processing, Assignment

Medical Signal Processing
Code: ECE419
Contacts: 3L
Credit: 3
Introduction to Human physiological system, Types of Biomedical signals: ECG, EEG, EMG, EOG, ERG etc.
Introduction to short term Fourier transform (STFT), Design of filters, Hamming window, Kaiser window, Haar window
Introduction to Electrocardiograph and ECG signals, Types of interferences in ECG signals, ECG signal analysis and noise removal, Detection of ECG abnormalities,
Introduction to Electroencephalograph and EEG signals, EEG signal analysis, Kurtosis coefficients,
Diagnostic Optical Spectroscopy – Photon Migration and Optical Imaging – Time Domain and Frequency Domain Methods for Imaging – Endoscopic imaging; Optical Coherence Tomography; Biomedical signal processing

Adaptive Systems and Signal Processing
Code: ECE421
Contacts: 3L
Credits: 3

Discrete time stochastic process, correlation matrix and spectra; AR, MA and ARMA models; Yule-Walker equation; Levinson-Durbin algorithm; analysis and synthesis of lattice; Estimation and recursion methods; Adaptive filters, adaptive noise cancellation. Method of steepest descent; gradient adaptive lattice; Recursive least square formulation; filtering via orthogonal projection; Radial basis function; Blind convolution**;**

Advanced Digital Signal Processing
Code: ECE423
Contacts: 3L
Credits: 3

Multi-rate Digital Signal Processing: Decimation by a factor D, interpolation by a factor 1, sampling rate conversion by a national factor I/D.; Sampling rate conversion of band pass signals. ; Implementation of low pass filter and digital filter banks. ; Lattice filters, Linear prediction, forward and backward linear prediction, FIR wiener filter. ; Power spectrum

estimation, non-parametric method Barlett, Parametric method. ; Yule-Walker MA and ARMA models. Higher order statistics and its applications. ; DSP transforms: Discrete Hartely transform, Discrete cosine transform, Discrete Wavelet transform, S-transform. Introduction to DSP architecture. DSP techniques for bioinformatics, recent topics

Elective-IV (Emerging Technology group):

Micro Electro Mechanical System (MEMS)
Code: ECE404
Contacts: 3L
Credits: 3L

Microelectro mechanical system (MEMS) origins.. Material for MEMS. MEMS device physics : Processes for micro machining. Stress in thin films; mechanical to electrical transduction; MEMS fabrication technologies. Bulk micromachining etching; Surface micromachining:: MEMS devices: Actuators; The cantilever beam. Microwave MEMS applications: MEM switch design considerations.. MEMS-based microwave circuit and system. Optical MEMS and MOEMS

Nano Technology
Code: ECE406
Contacts: 3L
Credits: 3

Building Blocks for Nanostructures – Nano-scale 1D to 3D Structures – Electrical, Mechanical and Optical Properties – Nanoelectronic Devices – Quantum Dots and Wells – Nano-scale Functional Materials – Carbon Nanotubes and Fullerenes – Nano-scale Fabrications processes: Characterization: electron microscope; atomic force microscope; Applications of nanotechnology based devices and systems.

Embedded System
Code: ECE408
Contacts: 3L
Credits: 3

Introduction to Embedded Systems - definitions and constraints; hardware and processor requirements; special purpose processors; input-output design and I/O communication protocols; design space exploration for constraint satisfaction; co-design approach; example system design; Formal approach to specification; specification languages; specification refinement and design; design validation; Real Time operating system issues with respect to embedded system applications; time constraints and performance analysis.

Robotics and Intelligent System
Code: ECE410
Contacts: 3L
Credits: 3

Robot configurations, types and applications to different range of industrial applications. Kinematics and Dynamics of robots. Analysis, synthesis and design of robot mechanisms. Control systems design. Motion and trajectory planning and control. Sensor fusion in trajectory planing and control. AI based systems in trajectory and motion planing and control. Basics of vision, monocular and stereo vision. Various vision processing algorithms and techniques for identification, feature extraction, tracking. Integration of vision with various functions of the robot. Advances in Robotics viz, Humanoid robot, toy /pet robots, service and health care robot systems.

Text /Reference Books:

1. Computer Vision - A modern approach, by D. Forsyth and J. Ponce, Prentice Hall
2. Computer and Robot Vision, Robert M. Haralick and Linda G. Shapiro, Volumes 1 and 2, Addison-Wesley Publishing Company, 1993.

Soft Computing
Code: ECE412
Contacts: 3L
Credits: 3

Fundamental Concepts:- Introduction to Artificial Neural Networks (ANN). Learning Process:- error–correction learning, Hebbian learning, competitive learning, Boltzmann learning, the credit-assignment problem, supervised learning, and other learning techniques. Single neuron/ Perceptron networks:- training methodology, typical application to linearly separable problems. Multilayer Perceptron:- Back propagation algorithm, virtues and limitation of BP algorithm, modifications to back-propagation. Radial-basis function Networks – interpolation problem, Covers theorem, regularization networks, applications. Recurrent Networks. ; Introduction to Fuzzy systems, Membership function, Fuzzy relational operation, fuzzy IF THEN rules, Sugeno and Mamdani type systems, Adaptive Neuro-Fuzzy sytems, training methods Application of ANN and Fuzzy systems to non-stationary time series prediction; pattern classification; control; communication engineering; system identification and pattern classification.

Text/Reference Books

1. S. Haykin, *Neural Networks - A Comprehensive Foundation;* Pearson Education, India (The book is also published by Prentice Hall of India), 2008 (ISBN- 81-203-2373-4).
2. M.T. Hagan, Howard B. Demuth, Mark H. Beale; *Neural Network Design*; (ISBN: 0-9717321-0-8); Thomson 2002
3. Jang, Sun and Mizutani; *Neuro-Fuzzy and Soft-Computing – A computational approach to learning and machine intelligence*; Prentice Hall of India; ISBN-81-203-2243-6

Optimal & Adaptive Control
Code: ECE414
Contacts: 3L
Credits: 3

Adaptive Control:

Introduction; Recursive parameter estimation; Model reference adaptive control; Adaptive pole placement control; Robust adaptive control schemes ; Averaging-based analysis

Adaptive control of nonlinear systems

Optimal Control:

Introduction to Optimal Control Problem: Performance Index ; Calculus of Variations, Functions and Functionals.

The Fundamental theorem of the Calculus of Variations, Extrema of Functionals of a Single Function and n Functions, Euler Equation

Optimal Control Problem, Pontryagin's Minimum Principle

The LQ Problem, the Hamilton-Jacobi Approach

The Matrix Riccati Equation, Finite Control Horizon

Linear Regulator Design (Infinite-Time Problem), Optimal Controller for Discrete System, Linear Digital Regulator Design (Infinite-Time Problem)

Text Books:

1. Ajit K Mandal, "Introduction to Control Engineering : Modeling , Analysis and Design" New Age International (P) Ltd , Second Edition, New Delhi, 2006
2. M. Gopal "Digital Control and State Variable Methods", 2nd Ed. Tata McGraw-Hill, New Delhi, 2002
3. K. J. Astrom and B. Wittenmark, Adaptive Control, 2nd Edition, Addison-Wesley, 1995
4. K. S. Narendra and A. M. Annaswamy, Stable Adaptive Systems, Prentice-Hall, 1989

Reference Books:

1. Franklin, G. F., J. G. Powell, and M. L. Workman, Digital Control of Dynamic Systems , 3rd Edition,
Pearson Education , Inc Reading Mass, 2000.

2. Fuzzy Logic:

Text/Reference Books:

1. L. X. Wang, "A Course in Fuzzy Systems and Control", Prentice-Hall, 1997.
2. K. M. Passino, "Fuzzy Control", Addison-Wesley, 1998.
3. L. Reznik, "Fuzzy Controllers", 1997.
4. M. Margaliot and G. Langholz, "Fuzzy Modeling and Control", 2000.
5. H. Ying, "Fuzzy Control & Modeling", 2000.
6. K. Tanaka and H. Wang, "Fuzzy Control Systems", 2001.
7. G. Chen and T. T. Pham, "Introduction to Fuzzy Sets, Fuzzy Logic, and Fuzzy Control Systems", 2001.
8. K. Michels et. al., " Fuzzy Control, Fundamentals, Stability and Design", 2005.

Advanced Semiconductor Devices
Code: ECE416
Contacts: 3L
Credits: 3

Review of Semiconductor and Junction Physics
Quantum Devices- RTD, HBT, HEMT
Advanced Microwave Devices-MIS/MIM type Switch Diode & Tunnel Diode, Electron Transferred Devices
Advanced Photonic Devices-Herojunction high efficient IR LEDs, Organic LEDs, double heterojunction IR LASERS (VCSEL, MQM, DFB, TUNABLE, Q-SWITCHING), High Speed Infrared Optical Detectors
Device modeling & Design-high frequency amplifier, oscillator design using Spice/T-CAD etc.

Text/Reference Books:

1. High Speed Semiconductor Devices by S M Sze, John Wiley
2. Understanding Semiconductor Devices-Dimitrizev, OUP
3. Handbook of Advanced Electronic and Photonic Materials and Devices, Hari Singh Nalwa
4. Electronics Engineering: Materials and Devices, J Allison