BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI – 620 024.

M.Sc. Industrial Electronics - Course Structure under CBCS

(applicable to the candidates admitted from the academic year 2008-2009 onwards)

Semester	Course	Course Title	Ins. Hrs / Week	Credit	Exam Hrs	Marks		Total
						Int.	Extn.	
I	Core Course – I (CC)	Electronic Circuits	6	5	3	25	75	100
	Core Course – II (CC)	Analog and Digital ICs and Applications	6	4	3	25	75	100
	Core Course – III (CC)	Advanced Microprocessor and Applications	6	4	3	25	75	100
	Core Course – IV (CC)	Measurement and Instrumentation	6	5	3	25	75	100
	Core Course – V (CC)	Analog and Digital Electronics Lab	6	4	3	40	60	100
		Total	30	22				500
II	Core Course – VI (CC)	Microcontroller and Interfacing	6	5	3	25	75	100
	Core Course – VII (CC)	Power Electronics	6	5	3	25	75	100
	Core Course – VIII (CC)	Pulse Techniques	6	5	3	25	75	100
	Core Course – IX (CC)	Microprocessor Lab.	6	4	3	40	60	100
	Elective – I	Modern Communication Systems	6	4	3	25	75	100
		Total	30	23				500
III	Core Course – X (CC)	Digital Signal Processing	6	5	3	25	75	100
	Core Course – XI (CC)	Control Systems	6	5	3	25	75	100
	Core Course – XII (CC)	Advanced Electronics Lab	6	4	3	40	60	100
	Elective - II	C++ Programming	6	4	3	25	75	100
	Elective – III	Fibre Optic Communication	6	4	3	25	75	100
		Total	30	22				500
IV	Core Course – XIII (CC)	VLSI Design and VHDL Tools	6	5	3	25	75	100
	Core Course – XIV	Nano Electronics	6	5	3	40	60	100
	Project Work	Dissertation=80 Marks [2 reviews –20+20=40 marks Report Valuation = 40 marks] Viva = 20 Marks	6	5	-	-	-	100
	Elective - IV	Embedded Systems	6	4	3	25	75	100
	Elective - V	Microwave and Radar Communication	6	4	3	25	75	100
		Total	30	23				500
		Grand Total	120	90				2000

Note:

Core Courses include Theory, Practicals & Project

No. of Courses	14 - 17
Credit per Course	4 - 5
Total Credits	70

Elective Courses

(Major based / Non Major / Internship)

No. of Courses	4 – 5
Credit per Course	4 – 6
Total Credits	20

	Internal	External
Theory	25	75
Practicals	40	60

Project

Dissertation	80 Marks	[2 reviews – 20+20 = 40 marks Report Valuation = 40 marks]
Viva	20 Marks	20 marks

Passing Minimum in a Subject

CIA	40%	Aggregate 50%
UE	40%	

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CORE COURSE – I – ELECTRONIC CIRCUITS

UNIT – I : Bipolar Transistor Characteristics:

The junction transistor – transistor current components – transistor as an amplifier – common base Configuration – Common Emitter configuration – CE cut off and Saturation regions – typical function voltage values and transistor ratings – Ebers – Moll Model.

UNIT – II : Low Frequency Amplifiers:

Two port devices and the hybrid model – h parameters – Analysis of a transistor amplifier circuit using parameters – emitter follower – comparison of transistor amplifier configurations – cascading transistor amplifiers simplified CE and CC hybrid models – darlington pair – low frequency response of an RC coupled amplifier – effect of emitter by – pass capacitor on low frequency response.

UNIT – III : High Frequency Amplifiers:

Hybrid – transistor model at high frequencies – CE – short circuit current gain – current gain with resistive load generalized voltage gain function – single state CE transistor amplifier response – miller input impedance – gain – band with product emitter follower at high frequencies – Distortion in amplifiers – frequency response of an amplifier band pass of cascaded stages – High frequency response of two cascaded stages – multi stage CE amplifier cascade at high frequencies – transistor noise.

UNIT –IV : Power Amplifiers:

Large signal amplifiers – harmonic distortion – efficiency of class A Amplifier – Class B amplifier – Push – Pull Amplifiers – Class AB Operation.

Feed back Amplifiers:

Feed back concept – transfer gain with Feed back – general characteristics of negative feed back amplifiers – input and output resistances – method of analysis of a feed back k amplifier – voltage series feed back – voltage series feedback pair – Current series feedback – Current Shunt feedback – Voltage shunt feedback – offect of feed back an amplifier bandwidth.

UNIT – V : Oscillators:

Stability of feedback amplifiers – Nyquist Critorion –gain and phase margins – Compensation – dominant pole compensation – pole – Zero compensation – compensation by modification of the network – Sinusoidal oscillators – resonant circuit oscillators – wien bridge Oscillator – Crystal oscillator – Frequency Stability.

Books for Study :

1. Integrated Electronics by Jocob Millman and Christos C.Halkias - McGraw Hill.

Books for Reference:

1. Electronic Devices and Circuits – An Introduction by Allen Mottershead - Prentice Hall.
2. Electronic Devices and Circuits by G.K.Mithal – Khanna Publishers.
3. Solid State Electronic Circuits by Anthony S.Manera - McGraw Hill.
4. Electronic Circuits – Discrete and Integrated by Donald L.Schillling and Charles Belove - McGraw Hill.
5. Micro Electronics – Jacob Milliman - McGraw Hill.

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CORE COURSE II
ANALOG AND DIGITAL ICS AND APPLICATIONS

Unit I: OPERATIONAL AMPLIFIERS

Op-AMP Dc characteristics :- input bias current input -offset current - input offset voltage-total output offset voltage- thermal drift.

OP-AMP Ac characteristics: - frequency response-stability of op.amp-frequency compensation-slew rate-Inverting and non-inverting amplifiers and its applications:- Adder-Subtractor-Integrator-Differentiator-Current to voltage-Voltage to current converters-current amplifier- instrumentation amp-bridge amp-Voltmeters and current meter-Solving simultaneous equations-Solutions to differential equations for radio active decay, harmonic oscillator and damped harmonic oscillator.

Unit II: COMPARATORS AND APPLICATIONS

Comparator characteristics and limitations-comparator applications:- zero crossing detector-level detector-window detector-Time marker generator - Phase detector-Schmitt trigger-voltage limiter-Precision half wave –full wave rectifier-peak detector -clipper-clamper-sample and hold circuit – log and antilog amplifier-frequency multiplication and division-A/D and D/A converter.

Unit III: FILTER AND WAVE GENERATORS

Filters: first order low pass filter-second order low pass filter-High pass filter and second order band pass filter – Narrow band wideband pass filter-Band rejection filter-Notch filter and band rejection filters.
Astable – Monostable Multivibrator- Triangular wave generator -Sine wave generator-Phase shift and Weign bridge oscillator.

Unit IV: TIMER APPLICATIONS

IC 555 Application In Monostable mode: Missing pulse detector-Linear ramp generator-Frequency divider-Pulse width Modulation- Frequency Divider-water level fill control-Touch switch.

Adjustable duty cycle- rectangular wave generator-FSK generator-Pulse position modulator-Tone burst generator-Dual timing circuit-Voltage controlled frequency shifter-VOC(IC566) voltage to frequency converter factor.
PLL applications:- Frequency multiplication/division-frequency translation-AM/FM detection – FSK demodulator.

Unit V: POWER AMPLIFIERS AND REGULATOR ICS

Monolithic power amp. IC LM 380-Programmable Transconductance amplifier OTA3080 -. Voltage regulation:- IC 723 voltage regulator- Low /High Voltage regulator-current limit protection-current Fold back- current boosting - Swtiching regulator –SMPS.

TEXT BOOKS

1. Linear Integrated circuits - D. Roy choudry, Shail jain.
2. Operational amp and Linear IC's –Robert E. CoushIir-PHI Edition.
3. Opamp and linear IC's - Ramakant-A.- Gayakwad PHI Edition.
4. Digital and analog techniques-G.N. Navaneeth, V.M. Gokhulae Kitab Mahal Publishers.

REFERENCE BOOK:

1. Integrated circuits- K.R. Bothkar.

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CORE COURSE III – ADVANCED MICROPROCESSORS AND APPLICATIONS

Unit I: ARCHITECTURE:

Organization of the 8086 Microprocessor – Memory organization-Register structure-Addressing modes in 8086 – Minimum mode maximum mode-Exception handling in 8086 - Organization of 68000 microprocessor-Register structure –addressing modes in 68000 – Architecture of 80386 microprocessor.

Unit II

Instruction set (only for 8086)- Data transfer-Arithmetic –Branch-Loop - Flag manipulation-Logical –shift and rotate-instructions-Programming in 8086-Addition –Subtraction-Multiplication-Division BCD Arithmetic - Searching and array for a given number- choosing the biggest and smallest numbers from a list-arraganig a list of numbers in ascending or descending order – Time delay -Character manipulation.

Unit III:

Assembler and Multiprocessing-Assembler-Directives and operators- Data definition and storage allocation-structure - Records- Assigning names and expressions-Segment definition – program definition- Alignment directives-Assembly process-8086 based multiprocessing system-coprocessor configuration –closely coupled and Loosely coupled configuration-8087 numeric processor (architecture only)

Unit IV :

Interfacing memory and I/O devices-I/O Memory mapped I/O - Data Transfer –Parallel- programmed data transfer interrupt driven -Direct memory access data transfer-serial data transfer-Type of interfacing devices-8255 I/O Ports and Progamming-8251 Serial communication

interface-8253 timer Interface –interfacing 8257 DMA controller – 8259 interrupt controller.

Unit V:

Application and development tools: A/D-D/A interfacing -stepper motor interfacing-interfacing seven segment display-Keyboard interface- traffic control -Data acquisition –Temperature measurement and control – Microprocessor based software development tools-In circuit emulator.

REFERENCE BOOKS:

1. Introduction to microprocessor-Aditya P. Mathur
2. Micro Computer System 8086-8088 Family- Yuchangliv and Clenn A. Gibson Prentice Hall- New Delhi 1986.
3. Microprocessors and interfacing-Programming and Hardware Douglas V. Hall
4. Microprocessor Architecture Programming and application-Goankar.

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CORE COURSE – IV
MEASUREMENTS AND INSTRUMENTATION

UNIT – I : : Generalized Performance Characteristics of Instruments.

Static characteristics – accuracy, precision, repeatability, reproducibility, resolution, sensitivity, linearity, drift, span, range. Dynamic characteristics – transfer function, zero order instruments – first order instruments – step, ramp response of first order instruments – frequency response of first order instruments- second order instruments – step, ramp response of second order instruments. Dead-time elements. Errors – types of errors- cross errors-systematic errors-random errors.

UNIT – II : Transducers:

Selection, Resistive: Strain gauge, Capacitive, Inductive: LVDT, Magnetic: Hall effect transducers. Magneto resistive, piezoelectric, Optical junction - less detectors, junction devices, Temperature: Resistance Temperature Device, Thermocouples, Thermistors.

UNIT – III : Measurement of Parameters:

Application of PMMC Meter Movement in voltmeter and ammeter. BJT, FET and MOSFET voltmeter circuits. Solid state multimeter; DMM.
Generating Instruments: Audio and Radio frequency Signal Generators. AM Signal generator. Function generator.
Display Instruments: Storage CRO-Sampling CRO. Wave analyzer and spectrum analyzer.

UNIT – IV : Chemical and thermal measurements.

Principles of pH measurements- electrodes for pH measurements – digital pH meter – industrial pH meter- selective ion electrodes. Introduction to thermal methods analysis- thermo gravimeter – differential thermo analysis.

UNIT – V : : Biomedical Instrumentation.

Introduction to human physiology. Characteristics of recording system – Electrocardiography (ECG). Electro-encephalography (EEG). Electromyography (EMG) – Electro retinography (ERG). Electro oculo graphy (EOG). Pacemakers – artificial heart valves – defibrillators. Nerve and muscle stimulators. Heart lung machine. Kidney machine.

Books for Study:

1. Electronics Measurements Systems, Anton F.P. Van Putten, Prentice Hall.
2. Electrical and Electronics Instrumentation, H.H.Chiang, Wiley.
3. Digital Instrumentation, A.J.Bouwens, McGraw Hill.
4. Electronics Instrumentation and Measurements, D.A.Bell, Prentice Hall.
5. Electronic Instrumentation and Measurement Techniques, F.F.Mazda, Cambridge University Press.
6. Electronic Instrumentation Measurement Techniques, W.D.Cooper & Helfrick, Wiley Eastern.
7. Biomedical Instrumentation, M. Arumugam, Anuradha Agencies
8. Hand book on Biomedical Instrumentation, R. S. Khandpur, Tata McGraw Hill

CORE COURSE V - ANALOG AND DIGITAL ELECTRONICS LAB

(At least 20 experiments to be done, choosing at least 10 from each group)

Group I (Analog)

1. Phase shift oscillator FET/BJT.
2. Wien's Bridge oscillator FET/Opamp.
3. Characteristics of MOSFET.
4. Characteristics of DIAC.
5. Relaxation oscillator.
6. Design of two state FET amplifier.
7. Power amplifier – Push-pull type.
8. Astable and Bistable multivibrator – ICs.
9. Op. Amp – Characteristics
10. Op. Amp – Adder, subtractor, sign changer, differentiator and integrator.
11. Op. Amp – Logarithmic and Antilogarithmic amplifier.
12. Op. Amp – Solution of simultaneous differential equations.
13. Op. Amp – wave generator.
14. Study of modulation and demodulation.
15. Hall Effect – Magnetic field measurement.
16. Phase lock amplifier.

Group II (Digital)

1. Half- adder, Full-adder, Half-subtractor and Full-subtractor using NAND gates.
2. Scalars.
3. BCD to Seven segment display and decimal decoder.
4. Flip-Flops – RS and JK.
5. Encoder and Decoder.
6. Counters (ripple, up & down and ring).
7. Multiplexer and Demultiplexer.
8. D/A converter – R-2R resistor network.
9. D/A converter - weighted resistor network.
10. A/D converter.
11. Shift Register – Serial/Parallel input/output.
12. Memory circuits – RAM, ROM.
13. Digital Comparator.
14. Parity generator / checker.
15. Code converters.
16. ALU – 74181 – truth table.

CORE COURSE VI - MICROCONTROLLER AND INTERFACING

Unit I:

Introduction Microprocessors and Microcontrollers-comparison microprocessor and Microcontrollers-Microcontroller survey- 4,8, 16,32bit Microcontrollers-8051 architecture-internal memory-input, output pins, ports-External memory –Addressing modes.

Unit II:

Logical separation of program and data memory – timers/counters and programming of counters and timers-register in serial data input/output – serial data Transmission modes-Various types of interrupts –Assembly language Programming –Programming tool and techniques.

Unit III:

Assembly Language programming for 8051 microcontroller family-Data transfer Instruction-Arithmetic instruction –Branch Instructions- Bit manipulation instruction-rotate Instruction-Instructions stack operation-calls and subroutines-Interrupts and returns –multiplication-division – programmes-greatest-smallest no in an array-ascending and descending order- Evaluating simple expression –string manipulation-pattern comparision –alphabetical order-delay –routines-calculation of time delay.

Unit IV:

Microcontrollers design –External Memory and Memory space decoding – Memory -Mapped i/o –Memory decoding –Testing the Design –Timing subroutines-Time delay using software and timer-Look up tables-Serial data transmission –Character Transmission by polling –Interrupt –Driven Character Transmission and reception.

Unit V

Application:- Interfacing Keyboard-A Scanning program for small keyboards-Interfacing Large Matrix keyboard-Interfacing LED, LCD display –Pulse measurement And pulse width measurement-A/D –D/A interfacing -Multiple Interrupts-stepper motor interfacing –Data acquisition system using a Microcontrollers-Temperature measurement and control using a Microcontrollers.

BOOKS FOR STUDY:

1. The 8051 Microcontroller Architecture, Programming & Applications, Kenneth J. Ayla -Penram International Publishing (India) – Unit I,II,III, IV and V)
2. Microprocessor Architecture Programming and application by Goankar.(UNIT V)
3. Microprocessor and Interfacing: DOUGLAS V. HALL Mc Graw-Hill INTERNATIONAL EDITIONS.

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CORE COURSE VII – POWER ELECTRONICS

UNIT – I : Theory and Operation of SCR, UJT, and TRIAC:

Characteristics – design of relaxation oscillator using UJT – UJT in SCR and TRIAC triggering circuits – PUTs – silicon bilateral switch – speed control of DC shunt Motor using thyristors – single phase half wave speed control system – Single – phase speed control system – Reversible control system.

UNIT – II : Thyristor Communication Techniques:

Introduction – natural commutation – forced commutation – self commutation – impulse commutation – response pulse commutation – external pulse commutation – load side commutation – line side commutation – complementary commutation, single phase semi-converter – single phase series converter.

UNIT – III : Static Switches:

Introduction – single phase AC switches, three phase AC switches – Three phase reversing switches – AC switches for bus transfer – DC switches – Solid – state relays – AC voltage controller: Introduction – Principle of ON/OFF control – Principle of phase control – single phase bi-directional controllers with resistive loads and inductive loads – cycle converters – single phase cycle converters.

UNIT – IV : DC Choppers

Introduction – principle of step-down operation – step-down with RL load – Principle of step up operation – Switch mode regulator: buck regulator – boost regulator – Buck and Boost regulator – CUK regulator.

UNIT – V : Invertors and Power Supplies:

Introduction – Principle of operation – single phase bridge inverters – three phase inverters – Voltage control of single phase inverters – Introduction to power supply – AC and DC power supply – Switched mode DC power supplies – Resonant DC power supplies – Bi-directional power supplies – AC power supplies.

Books for Reference:

1. Power Electronics Circuits Devices & Applications, M.R.Rashid - Prentice Hall.
2. Power Electronics – Sen.

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CORE COURSE VIII - PULSE TECHNIQUES

UNIT – I : Pulse Fundamentals:

Types of waveforms – Characteristics of pulse waveforms – pulse width, rise time, fall time, tilt - Duty Cycle – Transistor switching times – Harmonic contents of the waveforms – Frequency Spectrum of Rectangular waveform – Distortion and Frequency response – Rise time and uppercut – off frequency - tilt and Lower cut – off frequency.

UNIT – II : Linear Wave Shaping:

High pass RC circuit – response of high pass RC to step, square – rectangular, ramp and exponential inputs – high pass RC as a differentiator – Steady state solution.

Low – Pass RC circuits – response of low pass RC to step, square, rectangular, ramp and exponential inputs – Low pass RC as an integrator – Steady state solution.

Non-Linear wave shaping:

Diode clipping circuits – series and shunt diode clippers – Transistor clipping – clipping at two independent levels – emitter coupled clippers – Diode comparators – Applications of voltage comparators.

Clamping circuits – Clamping operations – Negative and positive clamping circuits – Clamping circuit theorem – Biased Clamping – Zener diode clamper – voltage multiplying circuits.

UNIT – III : Multi Vibrator Circuits:

Collector coupled and emitter coupled astable multivibrators – Collector coupled and emitter coupled monostable multivibrator circuits – Collector coupled bistable multivibrators – Fixed and self bias – Triggering of bistable multivibrator – Speed up capacitors – Asymmetrical and Symmetrical triggering.
Schmitt Trigger Circuit – Designing for the UTP and LTP - Schmitt Trigger as squarer, flip-flop and voltage comparator.

UNIT – VI : Voltage and Current Time Base Generators:

General features of a time base signal – Sweep speed error – displacement error – exponential sweep circuit – UJT circuit – Miller and Bootstrap time base generators – General consideration – Transistor Miller time base generators – Bootstrap time base generators – Basic Principles – Transistor Bootstrap time base generators.
Constant – Current Ramp generators – Basic television sweep circuits.

UNIT – V : Blocking Oscillator Circuits:

Basic ideas of pulse transformers and delay lines Triggered Transistor blocking oscillator – base and emitter timing – Astable transistor blocking oscillator - diode and RC control – Elementary ideas of pulse modulation and time division multiplexing.

Books for Reference:

1. Solid state pulse circuits by David A.Bell, Prentice Hall of India.
2. Pulse Digital Circuits and Computer fundamentals by R.Venkatraman, Dhanpat and Son's Delhi.

CORE COURSE IX - -MICROPROECESSOR LAB - 8086

(At least 22 experiments to be done. All experiments are done using Microprocessor.)

1. Addition, Subtraction (8 bit).
2. Addition, Subtraction (16 bit).
3. Multiplication, division (8 bit).
4. Multiplication, division (16 bit).
5. To find the largest and smallest number.
6. Searching for a number in an array and pattern comparison.
7. Real time clock.
8. Six letter word display.
9. Rolling Display.
10. LED interface.
11. To find the sum of series.
12. Interfacing – A/D converter.
13. Interfacing – D/A converter.
14. Interfacing - Logic controller.
15. Interfacing – Traffic controller.
16. Interfacing – Keyboard.
17. Interfacing – Seven segment display.
18. Interfacing – Stepper Motor.
19. Interfacing – Object counters.
20. Interfacing – Relay.
21. Interfacing – Temperature measurement.
22. Printer Interfacing.
23. Square wave generator.
24. Sine wave generator.
25. Ramp wave generator.
26. Microprocessor –Block of data transfer.
27. Program involved in subroutine.
28. Program used interrupt.

ELECTIVE COURSE I – MODERN COMMUNICATION SYSTEMS

Unit I

Modulation: Introduction – Amplitude modulation (Theory and Mathematical Analysis) – Power in an Am Wave – Vector representation – Block diagram of an Am transmitter – Collector modulation – Double side band modulator – single Side Bank suppressed carrier (SSB/SC) – Vestigial Side Band System (VSM)

Frequency modulation (Theory and Mathematical Analysis) – Frequency Spectrum of FM – Vector representation – Narrow Bank FM – Wide Bank FM – Varactor diode FM Modulator – Transistor Reactance FM Modulator

Phase Modulation (Theory and mathematical Analysis) – Vector Representation – Armstrong phase Modulatior – Pulse Width Modulation (PWM) – Theory and Pulse position Modulation

Unit II

Demodulation and Noise: Detectors – Practical Diode Am Detector – VSB Demodulator – Synchronous Detector – Phase – Licked Loop (PLL) – FM Discriminator Foster – Seeky FM Discriminator – Ration Detector Demodulation of PM

Noise in Communication system: Noise in Am System: Noise in FM system – Noise in Phase Modulated system – Noise in Pulse Modulated System.

Unit III - Digital Communication

Introduction to Digital Communication system _ Amplitude shift Keying (ASK) – Bank width and Spectrum frequency of ASK – Binary ASK Modulator – Coherent ASK Detector – Non Coherent ASK Detector – Frequency shift keying (FSK) – Bandwidth of binary FSK – detection of FSK using PLL – Phase shift keying (PSK) Generation of Binary PSK wave – Detection of Differential phase shift keying (DPSK) – DPSK Transmitter Generator – DPSK Demodulator – Advantage and disadvantage of Digital Communication

Unit IV

Broad band and satellite Communication: Time Division Multiplexing (TDM) – Frequency Division Multiplexing (FDM) – Computer communication – Microwave Service Digital Network (ISDN) – Broadband ISDN (BISDN) – Local Area network (LAN) – Bus topology – Star

Topology – ring Topology – Hybrid Topology – Private Branch Exchange (PBX) – MODEMS

Communication Satellite Systematic Basic Components of Satellite Communication System – Telemetry, Tracking and Command System (Block Diagram) – Satellite Links – Uplink and Down Link – Commonly Used Frequency in Satellite Communication – Multiple Access – Error Detection

Unit V - MOBILE COMMUNICATION.

Evaluation and fundamentals – cellular structure and planning – frequency allocations – propagation problems – Base station antennas and mobile antennas – type of mobile system – access methods – TDMA, FDMA and CDMA – DIGITAL Cellular Radio.

Books for Study:

1. SK. Venkatraman – Digital Communication, S. Chand
2. Arokh Singh and A.K. Chhabra – Principles of Communication Engineering – S. chand
3. Subir Kumar Sarkar – Optical Fibres and Fibre Optic Communication system – S. chand.
4. Wireless Communication Principles & Practice – TS. Rapport
5. BL. Theraja – Basic Electronics – S. chand

Books for Reference:

1. George Kennedy – Electronic Communication systems – Mac Graw Hill International 3 ed.
2. Roddy and Coolen – Communication electronics – PHI
3. B.P. Lathi – Communication System – Wiley Eastern
4. K. Samshanmugam, John Wiley – Digital and Analog Communication System
5. Robert M. Gaghardi – Satellite Communication – CBS Publication

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CORE COURSE X - DIGITAL SIGNAL PROCESSING

Unit I: Theory of discrete time systems.

Z-transforms: definition – properties – Inverse Z-transforms and its evaluation- solution of difference equations using one sided Z-transform- Discrete Hilberts transform.

Discrete time systems:

Introduction- sequences – representation of arbitrary sequences- linear time invariant systems- Causality and stability – difference equation – frequency response – frequency response of the first order systems – frequency response of the second order systems.

Unit II: Finite duration Impulse response filters.

Digital Filters: Magnitude response and phase response of digital filters.

FIR filters : Design techniques – Window techniques – rectangular window Function- Hamming window function- Hamming window function - Hanning window function – Blackman window function – Bartlet window function – Kaiser window – Design using Kaiser window function

Basic structures: Basic realization block diagram and the signal flow graph Direct forms, Cascade form and linear phase form realization.

Unit III : Infinite duration impulse response filters.

IIR filters : Introduction – I.I.R. filler design by approximation of derivatives, Impulse invariant method, Bilinear transformation - Butter worth filters –Chesby shw filters – frequency transformation (analog and digital) Basic structures : Direct forms, Cascade form and linear phase form realization.

Unit IV : Effects of finite word length in digital filters

Introduction – rounding and truncation errors - Quantization Effects in Analog to digital conversion of signals – out put noise Power from a digital system – Coefficient quantization effects in Direct form realization of I I R and FIR filters – Limit cycle oscillations – product quantization – scaling – quantization Errors in the computation of DFT .

Unit V : Spectral analysis

Statistical techniques : Introduction – Energy density spectrum– Estimation of auto Correlation and power spectrum of random signals –DFT in spectral estimation–Power–spectral estimation–non –parametric methods. Bartlet Welch, Blackman and turkey methods – Quality of power spectrum estimators – parametric methods – Basics of AR, MA and ARMA models - Power spectrum estimation by AR, MA and ARMA models .

FFT technique : Introduction to radix 2 FFTs – some properties of radix 2 – Decimation in time FFT – data shuffling and bit refusal – ecimation in frequency algorithm.

Books for study : (1) Theory and application of Digital signal processing Signal processing L.R.Raliner and B.Gold Prentice Hall of India, New Delhi–2003

(2) Digital Signal processing Tata McGraw Hill publishing Company, New Delhi – 2004

Books for Reference:

- Digital Signal Processing : Allan V.Oppenheim and Ronald W Schafer Prenlice Hall of India – New Delhi 2000
- Architecture of Digital Signal processing – Peter Pirsoh John Wiley – 1998
- Introduction to Digital signal processing – Johny – R.Johnson PHI, Publication, New Delhi, year -1994
- Digital signal processing K.S.Srinivasan. Anuradha agencies 2003 Kumbakonam

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CORE COURSE XI – CONTROL SYSTEMS

UNIT –I : Introduction:

Open loop and closed loop systems – Representation of physical systems by differential equations and transfer functions – Block diagram algebra – Signal flow graph and Mason's gain formula. State Variable representation. Physical systems – Transfer function from state equations - solution of state equations.

UNIT – II : Time and Frequency Domain Analysis:

Time response of first and second order systems – Steady error and error constants -concept of stability; Routh – Hurwitz criterion – Root, focus techniques – Polar plots and Bode plots – All pass and minimum phase systems – Nyquist stability criterion – phase margin, gain margin – Relative stability.

UNIT – III : State Variable Feedback and Compensators:

Phase lag-phase lead – phase lag lead – networks using asymptotic Bode plots - concept of controllability, observability and reachability - state variable feedback techniques.

UNIT –IV : Non-Linear Systems:

Introduction to non-linearities and non-linear phenomena – Basic concepts of phase – plane method – construction of phase trajectories – System analysis by phase plane method – Describing function methods – Stability analysis using describing functions.

UNIT – V : Stability Analysis of Non-Linear Systems:

Lyapunov's Stability Theorems:

Methods of constructing Lyapunov's functions for non-linear systems – Krasovski's method variable – gradient method – Relative stability – Popov's method circle criterion and its applications.

Books for Study:

1. Modern Control System and Theory and Design, S.M.Shinners, Johy Weily Sons, 1992.
2. Control System Engineering, I.J.Nagrath and M.Gopal, II Edition Willy Eastern, 1985.
3. Modern Control Engineering, K.Ogata, II edition, Prentice Hall of India, 1991.
4. Automatic Control System, B.C.Xvo, VI edition, Prentice Hall of India, 1991.
5. Linear Control System, Melsa and Schultz, McGraw Hill, 1969.
6. Non-Linear Control Systems, M.Vidyasagar, II edition, Prentice Hall of India.

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CORE COURSE - XII – ADVANCED ELECTRONICS LAB

(At least 22 experiments to be done.)

1. Instrumentation amplifier.
2. Pulse rate monitor.
3. Amplitude modulation and demodulation.
4. Frequency modulation and demodulation.
5. Pulse amplitude modulation and demodulation.
6. Pulse width modulation and demodulation.
7. T.V. booster.
8. Timer circuit for T.V.
9. Remote controller
10. Transmission line characteristics
11. Study of SMPS.
12. Study of fibre optics transmission and reception.
13. Lamp dimmer using DIAC and TRIAC.
14. Study of DC to AC inverter.
15. Study of servo stabilizer.
16. Construction and study of overload and short circuit protection circuits.
17. Microcontroller – Data transfer and manipulation.
18. Microcontroller Interfacing – A/D converter.
19. Microcontroller Interfacing – D/A converter.
20. Microcontroller Interfacing - Logic controller.

21. Microcontroller Interfacing – Traffic controller.
22. Microcontroller Interfacing – Keyboard.
23. Microcontroller Interfacing – Seven segment display.
24. Microcontroller Interfacing – Stepper Motor.
25. Microcontroller Interfacing – Object counter.
26. Microcontroller Interfacing – Relay.
27. Microcontroller Interfacing – Temperature measurement.
28. Microcontroller Interfacing – Printer.

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ELECTIVE COURSE - II - PROGRAMMING IN C++

Unit I:

Principles of object oriented programming(OOP) : software evolution-object oriented Programming paradigm-basic concepts of OOP'S -benefits of oop's .
Introduction to C++ - tokens, keywords, identifiers, variables, operators, manipulators, expression.

Unit II:

Control structures in C++-Functions in c++ - main functions-function prototyping-call by reference –return by reference –functions overloading – friend and virtual functions.

Unit III:

CLASSES AND OBJECTS:- Specification of a class-Accessing class members-member functions of-class, -objects-array of objects-passing objects as Function arguments-Friend Functions-Const Member functions-Special member functions constructors-Destructors-operator overloading-overloading operators-Rules for overloading operators-Type conversions.

Unit IV: Inheritance:

Single inheritance-Multilevel inheritance-multiple inheritance-hierarchical inheritance-hybrid inheritance pointers-Virtual functions and polymorphism managing console I/O operations working with files –classes for file stream operations –opening and closing a file –end –of –file, deduction-file pointers

updating a file error handling during file operations- commandline arguments.

Unit V: PROGRAMS

1. Arranging words in alphabetical order
2. Picking largest and smallest of a set of numbers.
3. Solving quadratic equation
4. Multiplication of two square matrices
5. Least square curve fitting
6. Programs for handling files
7. To solve simultaneous equation by Gauss elimination method.
8. Write a program to convert a number given in base to other bases and number to words.
9. Write functions for (i) find the length of the string (ii) to find a substring with a given string.
10. Write functions for (i) reversing the string(ii) converting integer into string
11. Write functions for (i) String copy (ii)string compare(iii) to replace a substring with another string.
12. Read in a string of characters and determine if they are Palindrome (i) to replace the half with first holy (ii) reverse them half separately.

TEXT BOOK: E. Balagursamy- Object Oriented programing with C++ Tata Mc-Graw Hill publishing company Ltd., 1998.

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ELECTIVE COURSE III - FIBER OPTIC COMMUNICATION

Unit I: INTRODUCTION

Optical fibers: Structures and wave guiding fundamentals-basic optical laws and definitions –optical fiber modes and configurations- mode theory for circular waveguides –graded index fiber structure-fiber materials and fabrication methods-mechanical properties-fiber cables-attenuation-signal distortion in optical waveguides-pulse broadening-mode coupling.

Unit II: OPTICAL SOURCES AND DETECTORS

Optical sources-light emitting diodes-laser diodes-modes of threshold condition –light source linearity model and reflection noise –modulation and temperature effect -reliability consideration Photo detectors-Principles of photo –diodes –photodetectors-noise-response time- avalanche multiplication noise –temperature effects on avalanche gain.

Unit III: RECEIVERS AND MEASUREMENTS

Fundamental receiver operation –digital receivers-performance calculations-pre amplifier design –analog receivers Attenenuation measurements-fiber fault location-dispersion measurements-refractive index profile measurements-measurement of optical source characteristics-eye pattern.

Unit IV: ADVANCED SYSTEMS AND TECHNIQUES

Wavelength division multiplexing-Optical fiber bus -ring topology –star architecture-fail safe fiber optic nodes-optical amplifiers-types-gain-noise figure –application-optical bandwidth –photonic switching-integrated optical switch.

Unit V: APPLICATIONS AND FUTURE DEVELOPMENTS

Public network operation –trunk network –junction network –local access network-submerged systems-synchronous network - military, civil, consumer and industrial applications.

TEXT BOOKS:

1. Gerd Keiser- Optical fiber Communication-McGraw Hill- 1984
2. John M. Senior-Optical Fiber Communication-Principle

REFERENCE BOOKS:

1. Fiber Optics in Telecommunication-N. Sharma-TMH
2. H. Zanger and C.Zanger-Fiber Optic communications and other Applications-Maxwell International Edition.

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CORE COURSE – XIII - VLSI DESIGN AND VHDL TOOLS

Unit-I Introduction to MOS Technology:

Introduction- Basic MOS transistors – Enhancement mode transistor action-Depletion mode transistor action – n-MOS fabrication-n-MOS and C-MOS design rules-Basic electrical properties of MOS circuits – Scaling of MOS circuits- Inverters – super buffers-universal logic(NAND and NOR) circuits-Systems steering logic design – threshold voltage equation – basic dc equation – II order effects of MOS modules – Small signal ac characteristics.

Unit-II: Date and control flow in Systematic structure:

Introduction – 2 phase clocking and generator using D – flip-flops-Dynamic register- Dynamic shift register – Basic arrangement for bus lines – Combinational logic: Parity generator, Bus Arbitration Logic for n-line bus – Multiplexers – Programmable Logic Array – Finite State Machine.

Unit-III LSI Computer System Design:

System overview-overall structure of data path – ALU – Registers – Buses – Barrel shifter – Resister array- System-timing analysis.
C-MOS design projects: An Incrementer/Decremental – Left/Right Shift serial/Parallel Register.
Data flow modeling: Concurrent Signal Assignment Statement-Multiple Drivers – Conditional Signal Assignment Statement- Block Statement – Concurrent Assertion Statement – Value of a Signal.
Hardware Modeling: Modeling synchronize Logic –Clock dividers.

Unit – IV - VISI FABRICATION TECHNIQUES:

An overview of wafer fabrication – wafer processing – oxidation – pattering diffusion-ion implementation deposition – si gate n MOS process – C MOS process-n well-p well-Twin tub – si on insulator-C MOS process enhancement- interconnect circuit elements.

Unit –V Hardware Description Language:

Basic language Elements-Data Objects – Date types – Operators – Behavioral Modeling – Entity Declaration- Architecture Body-Process Statements – Variable Assignment statement – Signal Assignment Statement – Wait statement – If Statement Case statement- Null statement – Loop statement-Exit statement – Next statement – Assertion Statement – Report

statement – More on signal assignment statement – Other sequential statements – Multiple Processes – Postponed Processes.

Text Books:

1. Principle of CMOS VLSI design – Neil H.E.Weste and Kamaran Eshragtian Addison Wes leg (1985).
2. Basic VLSI Design – Daughlas A Puck Nell.
3. A VHDL Primer – J.Bhasker – Pearson Education – III edition.

Reference Books:

1. IC fabrication Technology – Elliot.

Introduction to VLSI design – Convey C.Mead.

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CORE COURSE XIV – NANO ELECTRONICS

Introduction and Classification: Classification of nanostructures, nanoscale structure – Effects of the nanometer length scale – Change to the system total energy, changes to the system structure, vacancies in nanocrystals, dislocations in nanocrystals – Effect of nanoscale dimensions on various properties – Structural, thermal, chemical, mechanical, magnetic, optical and electronic properties.

Nanomaterials and Characterization: Fabrication methods – Top down processes – Milling litho graphics, machining process – Bottom-up-process – Vapour phase deposition methods, plasma – assisted deposition process, MBE are MOVPE, liquid phase methods, colloidal and sol gel methods

Generic Methodologies for nanotechnology: Characterization, General classification of characterization methods – Analytical and imaging techniques – Microscopy techniques – Electron microcopy, scaning electron microscopy, transmission electron microscopy, atomic force microscopy – Diffraction techniques – Spectroscopy techniques – Raman spectroscopy – surface analysis and depth profiling

Self assembling Nanostructured Molecular materials and devices: Introduction – Building blocks – Principles of self – assembly, non-covalent interactions, intermolecular packing, nanomotors – Self assembly methods to prepare and pattern nanoparticles – Functionalized nano particles,

colloidal nanoparticles crystals, self-organizing inorganic nano particles, bio-nanoparticles – nanoobjects.

Nanodevices and Their various applications: Nanomagnetic materials – Particulate nanomagnets and geometrical nanomagnets – Magnetic resistance – Probing nanomagnetic materials – Nanomagnetism in technology – Carbon nanotubes – fabrication – applications – Organic FET, organic LED's – Organic, photovoltaics – Injection lasers, optical memories, electronic applications

Reference:

1. Kelsall Robert, Ian Hamley.W., Mark Geoghegan, "Nanoscale Science and Technology", Wiley Eastern 2004
2. Gregory Timp, 'Nanotechnology' Springer – Veriag, 1999
3. Charles P. Poole, Frank J. Owens, 'Introduction to Nanotechnology' John Wiley and Sons, 2003
4. Bharat Bhushan , 'Springer Handbook of nanotechnoloy' 2004
5. Michael Kohler, Wolfgang, Fritzsche, 'Nanotechnology, Introduction to nanostructuring Techniques', 2004
6. Mark Ratner, Danial Ratner, "Nanotechnology, A Gentle introduction to the Next Big idea", Pearson, 2003
7. William Goddard, Donald W. Brenner, 'Handbook of Nano Science Engineering and Technology', CRC Press 2004

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ELECTIVE COURSE IV – EMBEDDED SYSTEMS

Unit I PC Hardware

Motherboard – Daughterboard – FDD – HDD – I/O Port Address – Post Sequence SMPS – Functional Units and Intercommunications. Reset Logic – CPU Nucleus Logic – DMA Logic. Wait state Logic – Bus arbitration Logic.

Unit II Peripheral Interface and Controller

Printer Parallel Interface – Floppy Disk controller – Hard Disk controller – CRT display controller 6815 – CGA – Advanced graphic Adopters – RS232 Interface – 1488, 1489.

Unit III Trouble Shooting

Computer faults – Trouble shooting tools – bus faults – Trouble Shooting Levels – Post sequences – PC Diagnostic Software – Motherboard Problems Diagnostic – Printer Interface Problems – Serial port problems – HDC problems – Display adopter problems.

Unit IV Survey of Software Architecture

Introduction – A first look at Embedded Systems – Examples of Embedded Systems – Typical Hardware – Round Robin – with Interrupts – Function Queue – scheduling Architecture – Real Time Operating System – Introduction to RTOS – Tasks and task states – Task and data – shared data problem – Semaphores and shared data – Ways to protect data.

Unit V Embedded Software Development Tools

Cross Compiler – Assemblers – Linker / Locators for embedded software – Output File Formats – Locator Maps – Getting Embedded Software in to the target system – ROM – Emulator – Incircuit Emulators – Debugging Techniques – Basic Techniques – Calling Interrupt Routines – Calling Timer Interrupt Routines using Laboratory tools – Logic Analyser.

Text Books:

1. IBM PC & Clones : Hardware, Trouble Shooting & Maintenance – B.Govindarajalu. Tata McGraw Hill (Unit I, II & III).
2. Embedded System : A software Primer – E.Simon (Unit IV, V).

Reference Book:

1. IBM PC: Troubleshooting and Repair Guide – Robert C Brenner, BPB Publications, New Delhi.

ELECTIVE COURSE V
MICROWAVE AND RADAR COMMUNICATION

Unit I: INTRODUCTION TO MICROWAVES

Introduction –maxwell's equation-ampere's Law Faradays Law -Gauss law-Wave equation-TE –TM wave equation-Wave guides-Rectangular wave guides-propagation of waves in rectangular wave guides-TE-and TM modes-Propagation of TM waves in rectangular wave guides-TM modes in rectangular wave guides.

Unit II: MICROWAVE AMPLIFIERS AND OSCILLATORS

Klystrons-Two cavity Klystron -Multicavity Klystron-Reflex klystron-Power output and frequency characteristics - Efficiency of reflex Klystron – Travelling wave tube (TWT)-Application of TWT - Backward wave oscillator -Magnetron- Cavity Magnetron-sustained oscillation in Magnetron-characteristics and applications of magnetron.

Unit III: MICROWAVE ANTENNAS

Quantitative theory of short dipole antenna- characteristics of grounded quarter wave and ungrounded half wave antenna-radiation resistance and radiation pattern –folded dipole and its application-broad side and end fire array -loop antenna-direction finding by Adcock and beeline tossi system-helical rhombic -Yagi antenna-horn antenna and parabolic reflectors.

Unit IV : PRINCIPLES OF RADAR

Introduction-Block diagram of RADAR – Applications of RADAR – Range equation-minimum detectable signal-Receiver Noise-S/N Ratio – transmitter power –maximum ambiguous range –system losses. Receiver: Duplexer-Local Oscillator-Mixer - Line pulse modulator - Displays- PPI.

Unit V: FM RADAR AND MTI

Doppler effect -CW radar-FM CW radar - Multiple frequency CW radar moving target indicator (MTI) - Non coherent MTI - Pulsed Doppler Radar FM altimeter-Tracking –Sequential lobbing – Conical Scan –Monopulse tracking radar.

TEXT BOOK

1. Microwave and Radar Engineering – N.Kulkarni, Umesh Publication
2. Radar and Navigation-Scholnik- McGraw Hill International edition.
3. Antenna and Propagation- K.D. Prasad-Sathya Prakash Publications.