

ANNA UNIVERSITY CHENNAI : : CHENNAI – 600 025

AFFILIATED INSTITUTIONS

B.E. (8 SEMESTER) ELECTRONICS AND COMMUNICATION ENGINEERING

CURRICULUM – R 2008

SEMESTER V

(Applicable to the students admitted from the Academic year 2008–2009 onwards)

| CODE NO. | COURSE TITLE | L | T | P | C |
|------------------|--|-----------|----------|----------|-----------|
| THEORY | | | | | |
| EC2301 | Digital Communication | 3 | 0 | 0 | 3 |
| EC2302 | Digital Signal Processing | 3 | 1 | 0 | 4 |
| EC2303 | Computer Architecture and Organization | 3 | 0 | 0 | 3 |
| EC2305 | Transmission Lines and Wave guides | 3 | 1 | 0 | 4 |
| GE2211 | Environmental Science and Engineering | 3 | 0 | 0 | 3 |
| EC2304 | Microprocessors and Microcontrollers | 3 | 1 | 0 | 4 |
| PRACTICAL | | | | | |
| EC2306 | Digital Signal Processing Lab | 0 | 0 | 3 | 2 |
| EC2307 | Communication Systems Lab | 0 | 0 | 3 | 2 |
| EC2308 | Microprocessor and Microcontroller Lab | 0 | 0 | 3 | 2 |
| TOTAL | | 18 | 3 | 9 | 27 |

EC2301 DIGITAL COMMUNICATION

L T P C
3 0 0 3

UNIT I DIGITAL COMMUNICATION SYSTEM 8

Introduction to Analog Pulse Communication Systems – Digital Communication Systems – Functional description, Channel classification, Performance Measure; Geometric representation of Signals, Bandwidth , Mathematical Models of Communication Channel.

UNIT II BASEBAND FORMATTING TECHNIQUES 10

Sampling – Impulse sampling, Natural Sampling, Sampler Implementation; Quantisation – Uniform and Non-uniform; Encoding Techniques for Analog Sources- Temporal waveform encoding, Spectral waveform encoding, Model-based encoding, Comparison of speech encoding methods.

UNIT III BASEBAND CODING TECHNIQUES 9

Error Control Codes - Block Codes , Convolutional Codes, Concept of Error Free Communication; Classification of line codes, desirable characteristics and power spectra of line codes.

UNIT IV BASEBAND RECEPTION TECHNIQUES 9

Noise in Communication Systems; Receiving Filter – Correlator type, Matched Filter type; Equalising Filter - Signal and system design for ISI elimination, Implementation, Eye Pattern analysis; Synchronisation; Detector – Maximum Likelihood Detector, Error Probability, Figure-of-Merit for Digital Detection.

UNIT V BANDPASS SIGNAL TRANSMISSION AND RECEPTION 9

Memory less modulation methods - Representation and Spectral characteristics, ASK, PSK, QAM, QPSK, FSK; Bandpass receiving filter, Error performance – Coherent and Non-coherent detection systems.

TOTAL= 45 PERIODS

TEXT BOOKS:

1. Amitabha Bhattacharya, “Digital Communications”, Tata McGraw Hill, 2006.
2. Simon Haykin, “Digital Communications”, John Wiley, 2006.

REFERENCES:

1. John.G. Proakis, “Fundamentals of Communication Systems”, Pearson Education, 2006.
2. Michael. B. Purrusley, “Introduction to Digital Communication”, Pearson Education, 2006.
3. Bernard Sklar, Digital Communication, 2nd Edition, Paerson Education, 2006
4. Herbert Taub & Donald L Schilling – Principles of Communication Systems (3rd Edition) – Tata McGraw Hill, 2008.
5. Leon W. Couch, Digital and Analog Communication Systems, 6th Edition, Pearson Education, 2001.

UNIT I DISCRETE FOURIER TRANSFORM 9

DFT and its properties, Relation between DTFT and DFT, FFT computations using Decimation in time and Decimation in frequency algorithms, Overlap-add and save methods

UNIT II INFINITE IMPULSE RESPONSE DIGITAL FILTERS: 9

Review of design of analogue Butterworth and Chebyshev Filters, Frequency transformation in analogue domain – Design of IIR digital filters using impulse invariance technique – Design of digital filters using bilinear transform – pre warping – Realization using direct, cascade and parallel forms.

UNIT III FINITE IMPULSE RESPONSE DIGITAL FILTERS 9

Symmetric and Antisymmetric FIR filters – Linear phase FIR filters – Design using Hamming, Hanning and Blackmann Windows – Frequency sampling method – Realization of FIR filters – Transversal, Linear phase and Polyphase structures.

UNIT IV FINITE WORD LENGTH EFFECTS 9

Fixed point and floating point number representations – Comparison – Truncation and Rounding errors - Quantization noise – derivation for quantization noise power – coefficient quantization error – Product quantization error - Overflow error – Roundoff noise power - limit cycle oscillations due to product roundoff and overflow errors - signal scaling

UNIT V MULTIRATE SIGNAL PROCESSING 9

Introduction to Multirate signal processing-Decimation-Interpolation-Polyphase implementation of FIR filters for interpolator and decimator -Multistage implementation of sampling rate conversion- Design of narrow band filters - Applications of Multirate signal processing.

L: 45, T: 15, TOTAL= 60 PERIODS

TEXT BOOKS:

1. John G Proakis and Manolakis, “ Digital Signal Processing Principles, Algorithms and Applications”, Pearson, Fourth Edition, 2007.
2. S.Salivahanan, A. Vallavaraj, C. Gnanapriya, Digital Signal Processing, TMH/McGraw Hill International, 2007

REFERENCES:

1. E.C. Ifeachor and B.W. Jervis, “ Digital signal processing – A practical approach”, Second edition, Pearson, 2002.
2. S.K. Mitra, Digital Signal Processing, A Computer Based approach, Tata McGraw Hill, 1998.
3. P.P.Vaidyanathan, Multirate Systems & Filter Banks, Prentice Hall, Englewood cliffs, NJ, 1993.
4. Johny R. Johnson, Introduction to Digital Signal Processing, PHI, 2006.

UNIT I INTRODUCTION 9

Computing and Computers, Evolution of Computers, VLSI Era, System Design- Register Level, Processor - Level, CPU Organization, Data Representation, Fixed – Point Numbers, Floating Point Numbers, Instruction Formats, Instruction Types. Addressing modes.

UNIT II DATA PATH DESIGN 9

Fixed Point Arithmetic, Addition, Subtraction, Multiplication and Division, Combinational and Sequential ALUs, Carry look ahead adder, Robertson algorithm, booth's algorithm, non-restoring division algorithm, Floating Point Arithmetic, Coprocessor, Pipeline Processing, Pipeline Design, Modified booth's Algorithm

UNIT III CONTROL DESIGN 9

Hardwired Control, Microprogrammed Control, Multiplier Control Unit, CPU Control Unit, Pipeline Control, Instruction Pipelines, Pipeline Performance, Superscalar Processing, Nano Programming.

UNIT IV MEMORY ORGANIZATION 9

Random Access Memories, Serial - Access Memories, RAM Interfaces, Magnetic Surface Recording, Optical Memories, multilevel memories, Cache & Virtual Memory, Memory Allocation, Associative Memory.

UNIT V SYSTEM ORGANIZATION 9

Communication methods, Buses, Bus Control, Bus Interfacing, Bus arbitration, IO and system control, IO interface circuits, Handshaking, DMA and interrupts, vectored interrupts, PCI interrupts, pipeline interrupts, IOP organization, operation systems, multiprocessors, fault tolerance, RISC and CISC processors, Superscalar and vector processor.

TOTAL= 45 PERIODS

TEXTBOOKS:

1. John P.Hayes, 'Computer architecture and Organisation', Tata McGraw-Hill, Third edition, 1998.
2. V.Carl Hamacher, Zvonko G. Varanescic and Safat G. Zaky, " Computer Organisation", V edition, McGraw-Hill Inc, 1996.

REFERENCES:

1. Morris Mano, "Computer System Architecture", Prentice-Hall of India, 2000.
2. Paraami, "Computer Architecture", BEH R002, Oxford Press.
3. P.Pal Chaudhuri, , "Computer organization and design", 2nd Ed., Prentice Hall of India, 2007.
4. G.Kane & J.Heinrich, ' MIPS RISC Architecture ', Englewood cliffs, New Jersey, Prentice Hall, 1992.

UNIT I FILTERS 9

The neper - the decibel - Characteristic impedance of Symmetrical Networks – Current and voltage ratios - Propagation constant, - Properties of Symmetrical Networks - Filter fundamentals – Pass and Stop bands. Behaviour of the Characteristic impedance. Constant K Filters - Low pass, High pass band, pass band elimination filters - m - derived sections – Filter circuit design – Filter performance – Crystal Filters.

UNIT II TRANSMISSION LINE PARAMETERS 9

A line of cascaded T sections - Transmission lines - General Solution, Physical Significance of the equations, the infinite line, wavelength, velocity, propagation, Distortion line, the telephone cable, Reflection on a line not terminated in Z_0 , Reflection Coefficient, Open and short circuited lines, Insertion loss.

UNIT III THE LINE AT RADIO FREQUENCY 9

Parameters of open wire line and Coaxial cable at RF – Line constants for dissipation - voltages and currents on the dissipation less line - standing waves – nodes - standing wave ratio - input impedance of open and short circuited lines - power and impedance measurement on lines – $\lambda / 4$ line, Impedance matching – single and double-stub matching circle diagram, smith chart and its applications – Problem solving using Smith chart.

UNIT IV GUIDED WAVES BETWEEN PARALLEL PLANES 9

Application of the restrictions to Maxwell's equations – transmission of TM waves between Parallel planes – Transmission of TE waves between Parallel planes. Transmission of TEM waves between Parallel planes – Manner of wave travel. Velocities of the waves – characteristic impedance - Attenuators

UNIT V WAVEGUIDES 9

Application of Maxwell's equations to the rectangular waveguide. TM waves in Rectangular guide. TE waves in Rectangular waveguide – Cylindrical waveguides. The TEM wave in coaxial lines. Excitation of wave guides. Guide termination and resonant cavities.

L: 45, T: 15, TOTAL= 60 PERIODS**TEXT BOOK:**

1. John D.Ryder, "Networks, lines and fields", Prentice Hall of India, 2nd Edition, 2006.

REFERENCES:

1. E.C.Jordan, K.G. Balmain: "E.M.Waves & Radiating Systems", Pearson Education, 2006.
2. Joseph Edminister, Schaum's Series, Electromagnetics, TMH, 2007.
3. G S N Raju, Electromagnetic Field Theory and Transmission Lines, Pearson Education, 2006.

UNIT I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY 14

Definition, scope and importance of environment – need for public awareness - 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 (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to biodiversity definition: genetic, species and ecosystem diversity – biogeographical classification of India – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – Biodiversity at global, national and local levels – India as a mega-diversity nation – hot-spots 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.

Field study of common plants, insects, birds

Field study of simple ecosystems – pond, river, hill slopes, etc.

UNIT II ENVIRONMENTAL POLLUTION 8

Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards – soil waste management: causes, effects and control measures of municipal solid wastes – role of an individual in prevention of pollution – pollution case studies – disaster management: floods, earthquake, cyclone and landslides.

Field study of local polluted site – Urban / Rural / Industrial / Agricultural.

UNIT III NATURAL RESOURCES 10

Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. case studies – 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.

Field study of local area to document environmental assets – river / forest / grassland / hill / mountain.

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT 7

From unsustainable to sustainable development – urban problems related to energy – water conservation, rain water harvesting, watershed management – resettlement and rehabilitation of people; its problems and concerns, case studies – role of non-governmental organization- environmental ethics: Issues and possible solutions – climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies. – wasteland reclamation – consumerism and waste products –

environment production act – Air (Prevention and Control of Pollution) act – Water (Prevention and control of Pollution) act – Wildlife protection act – Forest conservation act – enforcement machinery involved in environmental legislation- central and state pollution control boards- Public awareness.

UNIT V HUMAN POPULATION AND THE ENVIRONMENT 6

Population growth, variation among nations – population explosion – family welfare programme – environment and human health – human rights – value education – HIV / AIDS – women and child welfare – role of information technology in environment and human health – Case studies.

TOTAL= 45 PERIODS

TEXT BOOKS:

1. Gilbert M.Masters, "Introduction to Environmental Engineering and Science", 2nd Edition, Pearson Education ,2004.
2. Benny Joseph, "Environmental Science and Engineering", Tata McGraw-Hill, New Delhi, 2006.

REFERENCES:

1. R.K. Trivedi, "Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards", Vol. I and II, Enviro Media.
2. Cunningham, W.P. Cooper, T.H. Gorhani, "Environmental Encyclopedia", Jaico Publ., House, Mumbai, 2001.
3. Dharmendra S. Sengar, "Environmental law", Prentice hall of India PVT LTD, New Delhi, 2007.
4. Rajagopalan, R, "Environmental Studies-From Crisis to Cure", Oxford University Press (2005)

**EC2304 MICROPROCESSORS AND MICROCONTROLLERS L T P C
3 1 0 4**

UNIT I INTRODUCTION TO 8 BIT AND 16 BIT MICROPROCESSORS – H/W ARCHITECTURE 9

Introduction to microprocessor, computer and its organization, Programming system, Address bus, data bus and control bus, Tristate bus, clock generation, Connecting Microprocessor to I/O devices , Data transfer schemes, Architectural advancements of microprocessors. Introductory System design using microprocessors, 8086 – Hardware Architecture, External memory addressing, Bus cycles, some important Companion Chips, Maximum mode bus cycle, 8086 system configuration, Memory Interfacing, Minimum mode system configuration, Maximum mode system configuration, Interrupt processing, Direct memory access.

UNIT II 16 BIT MICROPROCESSOR INSTRUCTION SET AND ASSEMBLY LANGUAGE PROGRAMMING 9

Programmer's model of 8086, operand types, operand addressing, assembler directives, instruction set - Data transfer group, Arithmetic group, logical group, control transfer group, miscellaneous instruction groups, programming.

USING TMS320C5X/TMS320C 67XX/ADSP 218X/219X/BS531/532/561

1. Study of various addressing modes of DSP using simple programming examples
2. Implementation of Linear and Circular Convolution
3. Sampling of input signal and display
4. Waveform generation
5. Implementation of FIR filter

USING MATLAB

1. Generation of Signals
2. Linear and circular convolution of two sequences
3. Sampling and effect of aliasing
4. Design of FIR filters
5. Design of IIR filters
6. Calculation of FFT of a signal
7. Decimation by polyphase decomposition.

TOTAL= 45 PERIODS**Requirement for a batch of 30 students**

| S.No. | Description of Equipment | Quantity required |
|--------------|--|-------------------------------------|
| 1. | PCs with Fixed / Floating point DSP Processors (Kit / Add-on Cards) | 15 Units (2 students per system) |
| 2. | List of software required: MATLAB with Simulink and Signal Processing Tool Box | 10 Users license |
| 3. | Function Generators (1MHz) | 15 |
| 4. | CRO (20MHz) | 15 |

1. Amplitude modulation and Demodulation.
2. Frequency Modulation and Demodulation
3. Pulse Modulation – PAM / PWM / PPM
4. Pulse Code Modulation
5. Delta Modulation, Adaptive Delta Modulation.
6. Digital Modulation & Demodulation – ASK, PSK, QPSK, FSK (Hardware & MATLAB)
7. Designing, Assembling and Testing of Pre-Emphasis / De-emphasis Circuits.
8. PLL and Frequency Synthesizer
9. Line Coding
10. Error Control Coding using MATLAB.
11. Sampling & Time Division Multiplexing.
12. Frequency Division Multiplexing,

TOTAL= 45 PERIODS

Requirement for a batch of 30 students

| S.No. | Description of Equipment | Quantity required |
|--------------------|--|---------------------------|
| 1. | CRO – 20 MHz | 15 |
| 2. | Function Generator (1 MHz) | 15 |
| 3. | Power Supply (0 - 30 Volts Variable) (IC Power supply) | 15 |
| 4. | Bread Board | 10 |
| 5. | AM Transceiver Kit | 2 |
| 6. | FM Transceiver Kit | 2 |
| 7. | PAM,PPM,PWM Trainer Kits | 2 |
| 8. | PCM /DM/ ADM Trainer Kit | 2 |
| 9. | Line Coding & Decoding Kit | 2 |
| 10. | ASK,PSK,FSK,QPSK Trainer Kits | 2 |
| 11. | Sampling & TDM trainer kit | 2 |
| 12. | Mat lab (Communication tool box) | 5 user license |
| Consumables | | |
| 13. | IC 565,566,567,741 | Minimum of 50 No. each |
| 14. | BC 107 | |
| 15. | BFW10 | |
| 16. | OA79 | |
| 17. | Resistors (Various ranges) | |
| 18. | Capacitors (Various ranges) | |
| 19. | Decade Inductance box | |

1. Programs for 16 bit Arithmetic operations (Using 8086).
2. Programs for Sorting and Searching (Using 8086).
3. Programs for String manipulation operations (Using 8086).
4. Programs for Digital clock and Stop watch (Using 8086).
5. Interfacing ADC and DAC.
6. Parallel Communication between two MP Kits using Mode 1 and Mode 2 of 8255.
7. Interfacing and Programming 8279, 8259, and 8253.
8. Serial Communication between two MP Kits using 8251.
9. Interfacing and Programming of Stepper Motor and DC Motor Speed control.
10. Programming using Arithmetic, Logical and Bit Manipulation instructions of 8051 microcontroller.
11. Programming and verifying Timer, Interrupts and UART operations in 8051 microcontroller.
12. Communication between 8051 Microcontroller kit and PC.

TOTAL= 45 PERIODS

Requirement for a batch of 30 students

| S.No. | Description of Equipment | Quantity required |
|--------------|---------------------------------|--------------------------|
| 1. | 8086 Trainer | 15 Nos. |
| 2. | 8051 Trainer | 15 Nos. |
| 3. | 8255 Interfacing Card | 3 Nos. |
| 4. | 8279 Interfacing Card | 3 Nos. |
| 5. | 8259 Interfacing card | 3 Nos. |
| 6. | 8251 Interfacing Card | 3 Nos. |
| 7. | ADC Interfacing card | 3 Nos. |
| 8. | DAC Interfacing Card | 3 Nos. |
| 9. | Stepper motor Interfacing card | 3 Nos. |
| 10. | DC motor Interfacing card | 3 Nos. |