EC010 601 DIGITAL COMMUNICATION TECHNIQUES

Teaching scheme **Credits:** 4

2 hours lecture and 2 hour tutorial per week

Objectives: To develop ability to analyze communication engineering problems and also to design and develop different communication and electronics systems for processing signals and data.

MODULE I (12 hrs)

Random Signal Theory: Random process*:* stationarity,ergodicity, mean, auto correlation, cross correlation, covariance, random process transmission through linear filters, power spectral density, cross correlation functions, cross spectral densities, Gaussian process*,* Discrete Time Random Process, White Process

Signal Space Representation of Waveforms: Vector Space Concept, Signal Space Concepts, Orthogonal Expansion, Gram- Schmidt Orthogonalization Procedure

MODULE II (12 hrs)

Detection and Estimation: Model of digital communication system, response of bank of correlators to noisy input. Detection of known signals in noise:-ML Receiver. Probability of error calculation, erf, Correlation Receiver, Matched Filter Receiver, properties, detection of signals with unknown phase in noise, Estimation concepts: ML Estimate.

MODULE III (12 hrs)

Pulse Modulation Techniques: Sampling and pulse modulation: Sampling theorem, Ideal sampling and reconstruction, practical sampling and Aliasing, PAM, PWM, PPM, Quantizing, Quantization Noise, Companding, PCM generation and reconstruction, DPCM, Delta Modulation, Adaptive Delta Modulation, digital multiplexing

MODULE IV (12 hrs)

Baseband shaping for Data Transmission: Binary signaling format, Inter Symbol Interference, Nyquist criterion for distortion less base band binary transmission: Ideal solution, practical solution, correlative coding: Duobinary signaling, modified duobinary, generalized form of correlative coding, eye pattern, equalization ,adaptive equalization, synchronization techniques: bit synchronization, frame synchronization

MODULE V (12 hrs)

Bandpass Digital Transmission: Digital CW Modulation: ASK, BFSK, BPSK, MSK, Coherent binary system, timing and synchronization, Non coherent binary system, Differentially coherent PSK, Quadrature carrier and M-ary systems: quadrature carrier system, MPSK, M-ary QAM, Trellis coded modulation

References:

1. Simon Haykin , *Introduction To Analog And Digital Communications*, Wiley India Edition

2. Proakis& Salehi*, Digital Communications*, Mc Graw Hill International Edition.

3. Herbert Taub, Schilling Donald L.,"*Principles of Communication Systems*,3rd e/d, Tata Mc Graw Hill,2007.

4. Carlson, Crilly, Rutledge, "*Communication Systems" 4th Edition*, McGraw Hill

5. Simon Haykin , *Digital Communications*, Wiley India Edition

6. Sklar,Kumar Ray*, Digital Communications*, Pearson Education

7. Glover,Grant, *Digital Communications*, Pearson Education

EC010 602 DIGITAL SIGNAL PROCESSING

Teaching scheme **Credits**: 4

2 hours lecture and 2 hours tutorial per week

Objectives

- *To study the fundamentals of discrete-time system analysis, digital filter design and the DFT*

Module I (12 hrs)

Advantages of DSP – Review of discrete time signals and systems – Discrete time LTI systems – Review of DTFT – Existence – Symmetry properties – DTFT theorems – Frequency response- Review of Z transform – ROC – Properties

Sampling of Continuous time signals – Frequency domain representation of sampling – Aliasing - Reconstruction of the analog signal from its samples – Discrete time processing of continuous time signals – Impulse invariance – Changing the sampling rate using discrete time processing – Sampling rate reduction by an integer factor – Compressor – Time and frequency domain relations – Sampling rate increase by an integer factor – Expander – Time and frequency domain relations – Changing the sampling rate by a rational factor.

Module II (12 hrs)

Transform analysis of LTI systems – Phase and group delay – Frequency response for rational system functions – Frequency response of a single zero and pole – Multiple poles and zeros - Relationship between magnitude and phase – All pass systems – Minimum phase systems – Linear phase systems – Generalised linear phase – 4 types – Location of zeros.

Module III (12 hrs)

Structures for discrete time systems – IIR and FIR systems – Block diagram and SFG representation of difference equations – Basic structures for IIR systems – Direct form - Cascade form - Parallel form - Transposed forms – Structures for FIR systems – Direct and Cascade forms - Structures for Linear phase systems – Overview of finite precision numerical effects in implementing systems

Analog filter design: Filter specification – Butterworth approximation – Pole locations – Design of analog low pass Butterworth filters – Chebyshev Type 1 approximation – pole locations – Analog to analog transformations for designing high pass, band pass and band stop filters.

Module IV (12 hrs)

Digital filter design: Filter specification – Low pass IIR filter design – Impulse invariant and Bilinear transformation methods – Butterworth and Chebyshev – Design of high pass, band pass and band stop IIR digital filters – Design of FIR filters by windowing – Properties of commonly used windows – Rectangular, Bartlett, Hanning, Hamming and Kaiser.

Module V (12 hrs)

The Discrete Fourier Transform - Relation with DTFT – Properties of DFT – Linearity – Circular shift – Duality – Symmetry properties – Circular convolution – Linear convolution using the DFT – Linear convolution of two finite length sequences – Linear convolution of a finite length sequence with an infinite length sequence – Overlap add and overlap save – Computation of the DFT – Decimation in time and decimation in frequency FFT – Fourier analysis of signals using the DFT – Effect of windowing – Resolution and leakage – Effect of spectral sampling.

References

1. A V Oppenheim, R W Schaffer, *Discrete Time Signal Processing* , 2nd Edition Pearson Education.
2. S K Mitra, *Digital Signal Processing: A Computer Based Approach* ,Tata Mc.Graw Hill.
3. J G Proakis, D G Manolakis, *Digital Signal Processing: Principles, Algorithms and Applications*, Prentice Hall of India..
4. L C Ludeman, *Fundamentals of Digital Signal Processing*, Wiley
5. J R Johnson, *Introduction to Digital Signal Processing*, Prentice Hall of India.

EC010 603 RADIATION AND PROPAGATION

Teaching Schemes **Credits: 4**

3 hours lecture and 1 hour tutorial per week.

OBJECTIVES

- *To impart the basic concepts of radiating structures and their arrays*
- *To give understanding about analysis and synthesis of arrays*
- *To give idea about basic propagation mechanisms*

MODULE 1 (13 hours)

Retarded potentials: Concept of vector potential- Modification for time varying- retarded case- Fields associated with Hertzian dipole- Power radiated and radiation resistance of current element-Radiation from half-wave dipole and quarter-wave monopole antennas.

Antenna Parameters: Introduction, Isotropic radiators, Radiation pattern, Gain -radiation intensity-Directive gain, Directivity, antenna efficiency- antenna field zones. Reciprocity theorem & its applications, effective aperture, Effective height, radiation resistance, terminal impedance, front-to-back ratio, antenna beam width, antenna bandwidth, antenna beam efficiency, antenna beam area or beam solid angle, polarization, antenna temperature.

MODULE 2 (13hours)

Antenna Arrays: Introduction, various forms of antenna arrays, arrays of point sources, non isotropic but similar point sources, multiplication of patterns, arrays of n-isotropic point sources, Grating lobes, Properties and Design of Broadside, Endfire, Binomial and Dolph Chebyshev arrays, Phased arrays, Frequency- Scanning arrays- Adaptive arrays and Smart antennas.

MODULE 3 (13hours)

Antenna Types:- Horizontal and Vertical Antennas above the ground plane. Loop Antennas: Radiation from small loop and its radiation resistance- Radiation from a loop with circumference equal to a wavelength-Helical antenna: Normal mode and axial mode operation-Yagi uda Antenna- Log periodic antenna- rhombic antenna- Horn antenna-Reflector antennas and their feed systems- Micro strip antenna-Selection of antenna based on frequency of operation – Antennas for special applications: Antenna for terrestrial mobile communication systems, Ground Penetrating Radar(GPR), Embedded antennas, UWB, Fractal antenna ,Plasma antenna.

MODULE 4 (13hours)

Ground wave propagation: Attenuation characteristics for ground wave propagation-Calculation of field strength at a distance –

Space wave propagation: Reflection characteristics of earth- Resultant of direct and reflected ray at the receiver- LOS distance – Effective earth's radius – Field strength of space wave - duct propagation

Sky wave propagation: Structure of the ionosphere- effect of earth's magnetic field Effective dielectric constant of ionized region- Mechanism of refraction- Refractive index- Critical frequency- Skip distance- Effect of earth's magnetic field- Attenuation factor for ionospheric propagation- Maximum usable frequency(MUF) – skip distance – virtual height – skip distance, Fading and Diversity reception.

MODULE 5 (8 hours)

Antenna Measurements: Reciprocity in Antenna measurements – Measurement of radiation pattern – Measurement of ranges - Measurement of different Antenna parameters- Directional pattern, Gain, Phase, Polarization, Impedance, and Efficiency, Effective gain,SAR.

REFERENCES

1. John D. Krauss, Ronald J Marhefka: "*Antennas and Wave Propagation"*, 4th Edition, Tata Mc Graw Hill
2. Jordan & Balman. "*Electromagnetic waves & Radiating Systems"*– Prentice Hall India
3. Constantine. A. Balanis: "*Antenna Theory- Analysis and Design*", Wiley India, 2nd Edition, 2008
4. R.E Collin: "*Antennas & Radio Wave Propagation",* Mc Graw Hill. 1985.
5. Terman: "*Electronics & Radio Engineering"*, 4th Edition**,** McGraw Hill.
6. Kamal Kishor: *"Antenna and Wave propagation"* , IK International

EC010 604: COMPUTER ARCHITECTURE AND PARALLEL PROCESSING

Teaching scheme **Credits:** 4
3 hours lecture and 1 hour tutorial per week

Objectives

- *To impart the basic concepts of architecture and organisation of computers*
- *To develop understanding about pipelining and parallel processing techniques.*
- *To impart knowledge about the current PC hardware*

Pre-requisites: *Digital Electronics and Microprocessors*

Module I (12 hours)

Introduction : Difference between Architecture, Organisation and Hardware, Review of basic operational concepts – Stored program concept, Instruction sequencing, bus structure, Software support- translating and executing a program- assembler, linker, loader, OS, Instruction types and Addressing modes.
CPU Performance and its factors, Performance evaluation, The Power wall, Switch from uniprocessors to multiprocessors, Basic concepts of pipelining, superscalar architecture and multithreading, Instruction level parallelism (basic idea only).

Module II (12 hours)

Processor Organisation: Control Unit design: Execution of a complete instruction, Single bus and multibus organisation, Sequencing of control signals, Hardwired control unit, Microprogrammed control unit.
Arithmetic and logic design – review of signed and unsigned binary arithmetic, fast adders, Array multiplier, sequential multiplier, Booth's algorithm, fast multiplication methods, integer division – restoring and non restoring methods, floating point numbers.

Module III (12 hours)

Memory and I/O Organisation Memory hierarchy, Memory characteristics, Internal organization of semiconductor RAM memories, Static and Dynamic RAM memories, flash memory, Cache memory – mapping function, replacement algorithm, measurement and improvement of cache performance, Virtual memory and address translation, MMU.
Secondary memories – magnetic and optical disks, I/O accessing – Programmed, Interrupt driven and DMA , Buses- synchronous and asynchronous, bus standards.

Module IV (12 hours)

Parallel Processing :Enhancing performance with pipelining-overview, Designing instruction set for pipelining, pipelined datapath, Hazards in pipelining.
Flynn's classification, Multicore processors and Multithreading, Multiprocessor systems-Interconnection networks, Multicomputer systems, Clusters and other message passing architecture.

Module V (12 hours)

PC Hardware: Today's PC architecture – block diagram, Familiarisation of PC hardware components.

Processor - Pentium series to higher processors - single core, hyperthreading, dual core, multi core and many core processors (brief idea about evolution and improvements in performance)

Motherboard – Typical architecture , Essential Chipsets, Sockets, Slots and ports – serial, parallel, USB, RAM , Brief idea about buses, Subsystems (Network, Sound and Graphics, Ethernet port),

Storage devices : Hard Disks-Types and Classification based on interface- Optical Storage – CD, DVD, BLURAY

SMPS – Functions, power connectors.

Typical specifications for a computer

Reference Books

1. Carl Hamacher : "Computer Organization ", Fifth Edition, Mc Graw Hill.
2. David A. Patterson and John L.Hennessey, "Computer Organisation and Design", Fourth Edition, Morgan Kaufmann.
3. William Stallings : "Computer Organisation and Architecture", Pearson Education.
4. John P Hayes : "Computer Architecture and Organisation", Mc Graw Hill.
5. Andrew S Tanenbaum : "Structured Computer Organisation", Pearson Education.
6. Craig Zacker : "PC Hardware : The Complete Reference", TMH.
7. Nicholas P Carter : "Computer Architecture and Organization", Mc Graw Hill.
8. Pal Chaudhari: "Computer Organisation and Design", Prentice hall of India.

EC010 605 MICROCONTROLLERS AND APPLICATIONS

Teaching scheme **Credits:** 4
3 hours lecture and 1 hour tutorial per week

Objectives

- *To study the architecture of 8051, PIC18 microcontrollers*
- *To understand the instruction set and programming of 8051.*
- *To know the Interfacing methods and programming using 8051.*

Module I (9hours)
Introduction to Microcontrollers: Comparison with Microprocessors – Harvard and Von Neumann Architectures - 80C51 microcontroller – features - internal block schematic - pin descriptions, I/O ports.

Module II (9 hours)
Memory organization – Programming model - Program status word - register banks - Addressing modes - instruction set –Programming examples.

Module III (9 hours)
Interrupts - interrupt sources - interrupt handling – programming examples. Timers operation- different modes –waveform generation- programming examples - Serial communication- different modes - programming examples.

Module IV (9 hours)
Interfacing of DIP switch- LED -7 segment displays -alphanumeric LCD – relay interface – Stepper motor –ADC-DAC-interfacing programs using assembly language.

Module V(9 hours)
Overview of PIC 18, memory organisation, CPU, registers, pipelining, instruction format, addressing modes, instruction set, interrupts, interrupt operation, resets, parallel ports, timers, CCP.

References

1. Muhammad Ali Mazidi, *The 8051 Microcontroller and embedded sytems*, Pearson Education 2nd edition, 2006
2. Kenneth J Ayala, *The 8051 Microcontroller*, Penram International, 3rd edition 2007
3. Myke Predko, "*Programming and customizing the 8051 microcontroller*" Tata Mc.Graw Hill, 2004
4. Han Way Huang, "*PIC microcontroller An introduction to software and hardware interfacing*", Cenage learning 2007
5. Muhammad Ali Mazidi "*PIC microcontroller and embedded systems using assembly and C for PIC 18*" , Pearson 2009

EC010 606 L01: DATA STRUCTURES AND ALGORITHMS

Teaching scheme **Credits:** 4
3 hours lecture and 1 hour tutorial per week

Objectives

- *To impart the basic concepts of data structures and algorithms.*
- *To develop understanding about writing algorithms and solving problems with the help of fundamental data structures using object oriented concepts.*

Module I (10 hours)
Introduction to Data Structures, arrays, records, stacks, queue, linked list, linked stacks and queues, doubly linked list. Polynomial representation using arrays and lists.

Module II (12hours)
Trees, binary tree, traversals, binary search tree, creation insertion, deletion, searching. Graph:-representation, depth first search, breadth first search, path finding.

Module III (12hours)
Search algorithms, sequential binary interpolation, sorting, insertion, bubble, radix, quick sort, merge sort, and heat sort.

Module IV (14 hours)
Analysis of algorithms: - Time and space complexity, complexity notations, best, worst, average cases.
Algorithmic techniques-brute force, greedy, divide and conquer, dynamic programming

Module V (12 hours)
Analysis of search algorithms, sort algorithms. P and NP problems, travelling sales man problems.

Reference Books

1. Horowitz ,Sahni & Anderson Freed, Fundamentals of Data Structures in C, 2nd ed., Universities Press, Hyderabad, 2009
2. Sartaj Sahni , *Data Structures, Algorithms and Applications in C++* , 2nd ed., Universities Press, Hyderabad, 2009
3. Michael T Goodrich, Roberto Tamassia, David Mount, *Data Structures and Algorithms in C++*, Wiley India Edition, New Delhi, 2009
4. B.M. Harwani, *Data Structures and Algorithms in C++*, Dreamtech Press, New Delhi, 2010
5. Langsam, Augenstein ,Tanenbaum, *Data Structures in C & C++* , 2nd Edition, Pearson Education.
6. John Hopcroft, Rajeev Motwani & Jeffry Ullman, *Introduction to Automata Theory, Languages & Computation*, Pearson Education.
7. Tremblay & Sorenson, *Introduction to Data Structures with Applications*, Tata Mc Graw Hill
8. Sara Baase & Allen Van Gelder ,*Computer Algorithms – Introduction to Design and Analysis* , Pearson Education
9. Sahni, *Data Structures algorithms and applications* , Tata Mc GrHill

10. K.L.P. Mishra, N. Chandrashekharan, *Theory of Computer Science* , Prentice Hall of India

EC010 606 L602: DATABASE MANAGEMENT SYSTEMS

Teaching scheme **Credits:** 4
3 hours lecture and 1 hour tutorial per week

Objectives

- *To impart an introduction to the theory and practice of database systems.*
- *To develop basic knowledge on data modelling and design of efficient relations.*
- *To provide exposure to oracle database programming.*

Module I (10 hours)

Basic Concepts - Purpose of Database Systems- 3 Schema Architecture and Data Independence- Components of DBMS –Data Models, Schemas and Instances-Data Modeling using the Entity Relationship Model-Entity types, Relationship Types, Weak Entity Types .

Module II (14 hours)

Relational Model Concepts –Constraints – Entity Integrity and Referential Integrity, Relational Algebra -Select, Project, Operations from Set Theory, Join, OuterJoin and Division - Tuple Relational Calculus.

SQL- Data Definition with SQL - Insert, Delete and Update Statements in SQL, Defining Domains, Schemas and Constraints, Constraint Violations - Basic Queries in SQL - Select Statement, Use of Aggregate functions and Group Retrieval, Nested Queries, Correlated Queries – Views.

Module III (12 hours)

Oracle Case Study : The Basic Structure of the Oracle System – Database Structure and its Manipulation in Oracle- Storage Organization in Oracle.- Programming in PL/SQL- Cursor in PL/SQL - Assertions – Triggers.

Indexing and Hashing Concepts -: Ordered Indices, Hash Indices, Dense and Sparse Indices, Multi Level Indices, Cluster Index, Dynamic Hashing.

Module IV (11 hours)

Database Design– Design Guidelines– Relational Database Design – Functional Dependency- Determination of Candidate Keys, Super Key, Foreign Key, Normalization using Functional Dependencies, Normal Forms based on Primary keys- General Definitions of First, Second and Third Normal Forms. Boyce Codd Normal Form– Multi-valued Dependencies and Forth Normal Form – Join Dependencies and Fifth Normal Form – Pitfalls in Relational Database Design.

Module V (13 hours)

Introduction to Transaction Processing- Transactions- ACID Properties of Transactions- Schedules- Serializability of Schedules- Precedence Graph- Concurrency Control – Locks and Timestamps-Database Recovery

Query processing and Optimization- Translating SQL Queries into a Relational Algebra Computing Select, Project and Join

Object Relational Databases-Distributed Databases-Different Types-Fragmentation and Replication Techniques-Functions of DDBMS.

Reference Books

1. Elmsari and Navathe, *Fundamentals of Database System,* Pearson Education Asia, 5th Edition, New Delhi, 2008.
2. Henry F Korth, Abraham Silbershatz , *Database System Concepts*, Mc Graw Hill 6td Edition, Singapore, 2011.
3. Elmsari and Navathe, *Fundamentals of Database System,* Pearson Education Asia, 3rd Edition, New Delhi, 2005, for oracle
4. Alexis Leon and Mathews Leon, *Database Management Systems*, Leon vikas Publishers, New Delhi.
5. Narayanan S, Umanath and Richard W.Scamell*, Data Modelling and Database Design,Ce*ngage Learning, New Delhi, 2009.
6. S.K Singh,*Database Systems Concepts,Design and Applications,* Pearson Education Asia, New Delhi, 2006.
7. Pranab Kumar Das Gupta, *Database management System Oracle SQL And PL/SQL,* Easter Economy Edition, New Delhi, 2009
8. C.J.Date *, An Introduction to Database Systems,* Pearson Education Asia, 7th Edition, New Delhi.
9. Rajesh Narang, *Database Management Systems,* Asoke K ghosh , PHI Learning, New Delhi, 2009.
10. Ramakrishnan and Gehrke, *Database Management Systems*, Mc Graw Hill, 3rd Edition , 2003.

EC010 606L03 HIGH SPEED DIGITAL DESIGN

Teaching scheme **Credits:** 4
3 hours lecture and 1 hour tutorial per week

Objectives

- *To develop the skills for analyzing high-speed circuits with signal behaviour modelling.*
- *To demonstrate proficiency in understanding signal integrity concepts and terminology and to understand the signal integrity on circuit design.*
- *To be able to perform and analyze signal measurements and to be able to make trade off decisions based on signal budget and design requirements.*

Pre-requisites: Digital Electronics, Digital system design

Module I (12hours)
High Speed Digital Design Fundamentals: Frequency and time, Time and distance, Lumped vs distributed, four kinds of reactance- ordinary capacitance and inductance, mutual capacitance and inductance, Relation of mutual capacitance and mutual inductance to cross talk.
High Speed properties of Logic gates: Power, Quicent vs active dissipation, Active power driving a capacitive load, Input power, Internal dissipation, drive circuit dissipation, Totem pole and open circuit, speed, Sudden change in voltage and current.

Module II (12 hours)
Measurement Techniques; Rise time and bandwidth of oscilloscope probes, self inductance of probe ground loop, Effects of probe load on a circuit, special probing fixtures.
Transmission Lines; Problems of point to point wiring, signal distortion, EMI, cross talk.

Module III (12 hours)
Transmission Lines at High frequency: Infinite uniform transmission line, Lossy transmission line, Low loss transmission line, RC transmission line, Skin effect, Proximity effect, and Dielectric loss.

Module IV (12 hours)
Termination: End termination, rise time, dc biasing, power dissipation, Source termination, Resistance value, Rise time, Power dissipation, Drive current, Middle terminators,
Vias: mechanical properties, capacitance and inductance
Connectors: mutual, series and parasitic capacitance.

Module V (12 hours)
Power system: Stable voltage reference, Uniform voltage distribution, choosing a bypass capacitor,
Clock Distribution: Timing margin, Clock skew, delay adjustments, Clock jitter.

Reference

1. Howard Johnson, *High-Speed Digital Design: A Handbook of Black Magic* , Prentice Hall
2. Dally W.S. & Poulton J.W., "*Digital Systems Engineering*", Cambridge University Press.
3. Masakazu Shoji, "*High Speed Digital Circuits*", Addison Wesley Publishing Company
4. Jan M, Rabaey, *Digital Integrated Circuits: A Design perspective*, Second Edition, 2003.

EC 010 606 L04 MEDICAL ELECTRONICS

Teaching Scheme

3 hours lecture and 1 hour tutorial per week. **Credits: 4**

Objectives:-

- *To study the working of different medical equipments.*

Module 1 (12 hrs)

Introduction to the physiology of cardiac, nervous & muscular and respiratory systems. Transducers and Electrodes: Different types of transducers & their selection for biomedical applications. Electrode theory, selection criteria of electrodes & different types of electrodes such as, Ag - Ag Cl, pH, etc

Module 2 (12 hrs)

Cardiovascular measurement: The heart & the other cardiovascular systems. Measurement of Blood pressure-direct and indirect method, Cardiac output and cardiac rate. Electrocardiography-waveform-standard lead systems typical ECG amplifier, phonocardiography, Ballisto cardiography, Cardiac pacemaker –defibrillator –different types and its selection.

Module 3 (12 hrs)

EEG Instrumentation requirements –EEG electrode –frequency bands – recording systems EMG basic principle-block diagram of a recorder –pre amplifier. Bed side monitor –block diagram- measuring parameters-cardiac tachometer-Alarms-Lead fault indicator-central monitoring. Telemetry – modulation systems – choice of carrier frequency – single channel telemetry systems.

Module 4 (12 hrs)

Instrumentation for clinical laboratory: Bio electric amplifiers-instrumentation amplifiers-isolation amplifiers-chopper stabilized amplifiers –input guarding - Measurement of pH value of Blood-blood cell counting, blood flow, Respiratory transducers and instruments.

Module 5 (12hrs)

Medical Imaging: Computer tomography – basic principle, application –advantage, X ray tubes, collimators, detectors and display - Ultra sound imaging

References

1. J J Carr, "*Introduction to Biomedical Equipment Technology"* : Pearson Education 4th e/d.
2. K S Kandpur, "*Hand book of Biomedical instrumentation"*, Tata McGraw Hill 2nd e/d.
3. John G Webster, "*Medical Instrumentation application and design*", John Wiley 3rd e/d.
4. Richard Aston, "*Principle of Biomedical Instrumentation and Measurement*".

EC010 606 L05 SOFT COMPUTING

Teaching scheme **Credits: 4**
3 hour lecture and 1 hour tutorial per week.

Objectives

- *To develop basic knowledge about neuron and neural networks.*
- *To develop basic knowledge about fuzzy stems.*
- *To be able to understand basic concepts of soft computing frame work and neuro fuzzysystems*

Module 1 (12 hrs)

Introduction- artificial neuron - activation functions - Single layer & multi-layer networks - Training artificial neural networks - Perception - Representation - Linear separability - Learning - Training algorithms.

Module 2 (12 hrs)

Back Propagation - Training algorithm - Applications - network configurations - Local minima -. Hopfield nets - Recurrent networks - Adaptive resonance theory - Architecture classification - Implementation

Module 3 (12 hrs)

Introduction to Fuzzy sets and systems: Fuzzy operations-support of a fuzzy set, height - normalised fuzzy set, α – cuts- The law of the excluded middle and law of contradiction on fuzzy sets. Properties of fuzzy set operations.

Module 4 (12 hrs)

Operations on fuzzy relations - projection, max-min. and min and max-compositions. Fuzzy membership functions- Fuzzy logic controller: fuzzification - Rule base – Defuzzifiifaction-case study for engineering applications.

Module 5 (12hrs)

Soft computing frame work – comparisons- evolutionary algorithm/Genetic Algorithm: basic structure – Neuro fuzzy controller – Applications – case study.

Reference

1. C.T lin & C S George Lee, *Neural Fuzzy Systems*, Prentice Hall of India, 1996
2. Lawrence Fausset, *Fundamentals of Neural Networks*, Prentice Hall
3. Timmoty J. Rose, *Fuzzy Logics & Applications*, Willey publications, 2010
4. Bart Kosko. *Fuzzy Engineering*, Prentice Hall.
5. A.R.Alive, *Soft Computing & its applications*
6. Fakhreddine O, Karray Clarence W De Silva, *Soft Computing and Intelligent Systems Design: Theory, Tools and Applications*, Pearson India
7. Christina Ray, *Artificial neural networks*, Tata Mc.Graw Hill, 1997
8. J.S.R.Jang, C.T. Sun and E.Mizutani, *Neuro-Fuzzy and Soft Computing*, Prentice hall of India, 2004,

EC010 606L06– TELEVISION AND RADAR ENGINEERING

Teaching Scheme:

3 hours lecture and 1 hour tutorial. **Credit 4**

Objective

- *To familiarise the students with the fundamentals of TV Engineering and its applications*
- *To familiarise the students with the fundamentals of Radar Engineering and its applications*

Module 1 (12 hrs)

Principles of television - image continuity - interlaced scanning - blanking - synchronizing – composite video signal - video and sound signal modulation - channel bandwidth - vestigial sideband transmission – television signal propagation
Television receiver circuits – IF section, video detector-video amplifiers-AGC,Sync processing and AFC-Horizontal and vertical deflection circuits –sound section-tuner .

Module 2 (12 hrs)

Colour TV - Colour perception - luminance, hue and saturation - colour TV camera and picture tube(working principle only) - colour signal transmission - bandwidth - modulation - formation of chrominance signal - principles of NTSC, PAL and SECAM coder and decoder.

Module 3(12 hrs)

Digital TV - composite digital standards - 4 f sc NTSC standard - general specifications - sampling structure - digital transmission, Flat panel display TV receivers-LCD and Plasma screen receivers-3DTV-EDTV.
Cable TV - cable frequencies - co-axial cable for CATV - cable distribution system - cable decoders - wave traps and scrambling methods, Satellite TV technology-Geo Stationary Satellites-Satellite Electronics

Module 4(12hrs)

Introduction- Radar Equation- Block diagram- Radar frequencies- Applications- Prediction of range performance –Pulse Repetition Frequency and Range ambiguities –Antenna parameters- System losses.
CW Radar-The Doppler Effect- FM-CW radar- Multiple frequency radar – MTI Radar-Principle- Delay line cancellors- Noncoherent MTI-Pulse Doppler Radar- Tacking Radar – Sequential lobing-Conical Scan- Monopulse – Acquisition- Comparison of Trackers.

Module 5(12 hrs)

Radar Transmitters- Modulators-Solid state transmitters, Radar Antennas- Parabolic-Scanning feed-Lens- Radomes, Electronically steered phased array antenna-Applications, Receivers-Displays-Duplexers.
Special purpose radars-Synthetic aperture radar- HF and over the horizon radar- Air surveillance radar- Height finder and 3D radars – Bistatic radar-Radar Beacons- Radar Jamming and Electronic Counters .

References:-

1. Gulati R.R., *Modern Television Engineering*, Wiley Eastern Ltd.
2. Dhake A.M., *Television Engineering*, Tata McGraw Hill, 2001 .
3. R.P.Bali, "*Color Television, Theory and Practice",* Tata McGraw-Hill, 1994
4. R.G Gupta., " *Television Engineering and Video System",* Tata McGraw-Hill, 2005
5. Bernard Grob & Charles E. Herndon, "*Basic Television and Video Systems"*, McGraw Hill International
6. Damacher P., "*Digital Broadcasting",* IEE Telecommunications Series
7. Merrill I. Skolnik, "*Introduction to Radar Systems*"– 3rd Edition, McGraw Hill, 2001.
8. Merril I.Skolnik , *"Radar Handbook"-,* 3rd Edition, McGraw Hill Publishers,2008.
9. J. C. Toomay, Paul Hannen, *"Radar Principles for the Non-Specialist*", Printice hall of India,2004

EC010 607 MICROPROCESSOR & MICROCONTROLLER LAB

Teaching scheme **Credits: 2**

3 hours practical per week.

Objectives:-

- *To provide experience on programming and testing of few electronic circuits using 8086*
- *. To provide experience on programming and testing of few electronic circuits using 8051simulator.*
- *To understand basic interfacing concepts between trainer kit and personal computers.*

A. Programming experiments using 8086 (MASM)

1. Sum of N Numbers.
2. Display message on screen using code and data segment.
3. Sorting, factorial of a number
4. Addition /Subtraction of 32 bit numbers.
5. Concatenation of two strings.
6. Square, Square root, & Fibonacci series.

B. Programming experiments using 8051 simulator (KEIL).

1. Addition and subtraction.
2. Multiplication and division.
3. Sorting, Factorial of a number.
4. Multiplication by shift and add method.
5. Matrix addition.
6. Square, Square root, & Fibonacci series.

C. Interface experiments using Trainer kit / Direct down loading the programs from Personal computer.

1. ADC / DAC interface.
2. Stepper motor interface.
3. Display (LED, Seven segments, LCD) interface.
4. Frequency measurement.
5. Wave form generation.
6. Relay interface.

EC 010 608 MINI PROJECT LAB

Teaching Scheme

3 hours practical per week. **2 credits**

The mini project will involve the design, construction, and debugging of an electronic system approved by the department. There will be several projects such as intercom, SMPS, burglar alarm, UPS, inverter, voting machine etc. The schematic and PCB design should be done using any of the standard schematic capture & PCB design software. Each student may choose to buy, for his convenience, his own components and accessories. Each student must keep a project notebook. The notebooks will be checked periodically throughout the semester, as part of the project grade.

In addition to this, the following laboratory experiments should also be done in the lab.

1. 555 applications
2. Light activated alarm circuit
3. Speed control of electric fan using TRIAC
4. Illumination control circuits
5. Touch control circuits
6. Sound operated circuits
7. Relay driver circuit using driver IC
8. Interfacing using Opto coupler
9. Schematic capture software (OrCAD or similar) familiarization.
10. PCB design software (OrCAD Layout or similar) familiarization.

A demonstration and oral examination on the mini project also should be done at the end of the semester. The university examination will consist of two parts. One of the lab experiments will be given for examination to be completed within 60 to 90 minutes with a maximum of 30% marks. 70% marks will be allotted for the demonstration and viva voce on the mini project.