Revised Syllabus of

M.E. (ELECTRONICS ENGINEERING)

[Effective from -2013 – 2014]
### Dr Babasaheb Ambedkar Marathwada University, Aurangabad

**Proposed Syllabus Structure of M.E. (Electronic Engineering) w.e.f. Academic Year 2013-14**

#### Semester-I

<table>
<thead>
<tr>
<th>Course code</th>
<th>Name of the Subject</th>
<th>Teaching Scheme Contact hours per week</th>
<th>Examination scheme Marks</th>
<th>Duration of Theory Exam</th>
<th>Credit</th>
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<tbody>
<tr>
<td>ME0601</td>
<td>Advanced Digital Signal Processing</td>
<td>3 1 4 Total hrs 80 20</td>
<td>100 Total 3 Hrs 4</td>
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<tr>
<td>ME0602</td>
<td>Advanced Digital Communication System</td>
<td>3 1 4 Total hrs 80 20</td>
<td>100 Total 3 Hrs 4</td>
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<td>MEX603</td>
<td>Advanced Control Systems</td>
<td>3 1 4 Total hrs 80 20</td>
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<td>MEX604</td>
<td>Digital System Design</td>
<td>3 1 4 Total hrs 80 20</td>
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<td>MEX(641-643)</td>
<td>Elective -I</td>
<td>3 1 4 Total hrs 80 20</td>
<td>100 Total 3 Hrs 4</td>
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<tr>
<td>MEX621</td>
<td>Digital Signal Processing Simulation Lab</td>
<td>4 4 Total hrs 80 20</td>
<td>50 Total 3 Hrs 4</td>
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<tr>
<td>MEX622</td>
<td>System lab-I</td>
<td>2 2 Total hrs 50 50</td>
<td>50 Total 1</td>
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<td>MEX623</td>
<td>Seminar-I</td>
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<tr>
<td>Total</td>
<td></td>
<td>15 3 8 28 Total hrs 400 100 50 100 650</td>
<td>15 24</td>
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#### Semester-II

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<tr>
<th>Course code</th>
<th>Name of the Subject</th>
<th>Teaching Scheme Contact hours per week</th>
<th>Examination scheme Marks</th>
<th>Duration of Theory Exam</th>
<th>Credit</th>
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<tr>
<td>ME0651</td>
<td>Advanced Optimization Techniques</td>
<td>3 1 4 Total hrs 80 20</td>
<td>100 Total 3 Hrs 4</td>
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<tr>
<td>ME0652</td>
<td>Audio Signal Processing &amp; Coding</td>
<td>3 1 4 Total hrs 80 20</td>
<td>100 Total 3 Hrs 4</td>
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<tr>
<td>MEX653</td>
<td>Advanced Power Electronics</td>
<td>3 1 4 Total hrs 80 20</td>
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<tr>
<td>MEX654</td>
<td>Image &amp; Video Processing</td>
<td>3 1 4 Total hrs 80 20</td>
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<td>MEX691-693</td>
<td>Elective -II</td>
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<td>MEX671</td>
<td>Audio Processing &amp; Coding Lab</td>
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<td>Total</td>
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### Semester III

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<th>Teaching Scheme Hrs per week</th>
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<td>MEX 731</td>
<td>Dissertation Phase I</td>
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### Semester IV

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<th>Name of the Subject</th>
<th>Teaching scheme Hrs per week</th>
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<td>L</td>
<td>CH</td>
<td>Total hrs</td>
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<tr>
<td>MEX 781</td>
<td>Dissertation Phase II</td>
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<td><strong>Total</strong></td>
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<td><strong>Grand Total</strong></td>
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- **Elective - I**
  - MEX641 - Detection & Estimation Theory
  - MEX642 - VLSI Design
  - MEEX6433 - Advanced Satellite Communication

- **Elective - II**
  - MEX691 - Embedded System Design
  - MEX692 - Pattern Recognition
  - MEX693 - Wireless Communication Network

L: Lecture hours per week  
T: Tutorial Hours per week  
P: Practical hours per week  
CH: Contact hours

Total Credits = SEM I + SEM II + SEM III + SEM IV

= 24 + 24 + 12 + 20

= 80
SEMESTER-1
ME0601 - ADVANCED DIGITAL SIGNAL PROCESSING

Teaching Scheme: Examination Scheme:
Lecture - 03 Hrs Theory Paper - 80 Marks
Tutorial - 01 Hrs Class Test - 20 Marks
Credit:-04

UNIT 1  (04 Hrs)
LTI DISCRETE-TIME SYSTEMS IN THE TRANSFORM DOMAIN
Types of Linear-Phase transfer functions, Simple Digital Filters, Complementary Transfer Function, Inverse Systems, System Identification, Digital Two Pairs, Algebraic Stability Test.

UNIT 2  (08 Hrs)
DIGITAL FILTER STRUCTURE AND DESIGN

UNIT 3  (08 Hrs)
MULTI RATE SIGNAL PROCESSING
Mathematical description of change of sampling rate Interpolation and Decimation , Decimation by an integer factor - Interpolation by an integer factor, Sampling rate conversion by a rational factor, Filter implementation for sampling rate conversion- direct form FIR structures, Polyphasefilter structures, time-variant structures. Multistage implementation of multirate system.

UNIT 4  (08 Hrs)
LINEAR ESTIMATION AND PREDICTION
Linear prediction- Innovations representation of a stationary Random process, Relationship between the filter parameters and the autocorrelation sequence, Autoregressive (AR) & moving average (MA) process,Forward and backward predictions, Solutions of the Normal equations-Levinson-Durbin algorithms. Least mean squared error criterion -Wiener filter for filtering and prediction, FIR Wiener filter and Wiener IIR filters.
UNIT 5 (08 Hrs)

POWER SPECTRAL ESTIMATION

UNIT 6 (04 Hrs)

ADAPTIVE FILTERS

TEXT BOOKS:
2. Digital Signal Processing Principles, Algorithms, Applications by J G Proakis, D G Manolokis,
PHI.

REFERENCE BOOKS:
SEMESTER-I

ME0602 - ADVANCED DIGITAL COMMUNICATION SYSTEM

Teaching Scheme:  Examination Scheme:
Lecture - 03 Hrs  Theory Paper - 80 Marks
Tutorial - 01 Hrs  Class Test - 20 Mark
Credit:-04

UNIT 1.  (04 Hrs)

INTRODUCTION: Digital communication system (description of different modules of the block diagram), Complex baseband representation of signals, Gram-Schmidt orthogonalization procedure. M-ary orthogonal signals, bi-orthogonal signals, simplex signal waveform

UNIT 2.  (08 Hrs)

MODULATION: Pulse amplitude modulation (binary and M-ary, QAM), Pulse position modulation (binary and M-ary), Carrier modulation (M-ary ASK, PSK, FSK, DPSK), Continuous phase modulation (QPSK and variants, MSK, GMSK).

UNIT 3.  (08 Hrs)

RECEIVER IN ADDITIVE WHITE GAUSSIAN NOISE CHANNELS: COHERENT AND NO COHERENT DEMODULATION: Matched filter, Correlator demodulator, square-law, and envelope detection. Detector: Optimum rule for ML and MAP detection. Performance: Bit-error-rate, symbol error rate for coherent and no coherent schemes.

UNIT 4.  (10 Hrs)

BAND-LIMITED CHANNELS: Pulse shape design for channels with ISI: Nyquist pulse, Partial response signaling (duo binary and modified duobinary pulses), demodulation; Channel with distortion: Design of transmitting and receiving filters for a known channel and for time varying channel (equalization); Performance: Symbol by symbol detection and BER, symbol and sequence detection, Viterbi algorithm.

UNIT 5.  (04 Hrs)

SYNCHRONIZATION: Different synchronization techniques (Early-Late Gate, MMSE, ML and spectral line methods).
UNIT 6. (06 Hrs)

COMMUNICATION OVER FADING CHANNELS: Characteristics of fading channels, Rayleigh and Rician channels, receiver performance-average SNR, outage probability, amount of fading and average bit/symbol error rate.

REFERENCE BOOKS:


SEMESTER-1

MEX603 – ADVANCED CONTROL SYSTEM

Teaching Scheme: Examination Scheme:
Lecture - 03 Hrs Theory Paper - 80 Marks
Tutorial - 01 Hrs Class Test - 20 Mark
Credit:-04

UNIT 1. (08 Hrs)

STATE VARIABLE MODELS: State Variables of a Dynamic System, State Differential Equation, Signal-Flow Graph and Block Diagram Models, Transfer Function from the State Equation, Time Response and the State Transition Matrix.

UNIT 2. (06 Hrs)
FEEDBACK CONTROL SYSTEM CHARACTERISTICS: Error Signal Analysis, Sensitivity of Control Systems to Parameter Variations, Disturbance Signals in a Feedback Control System, Control of the Transient Response, Steady-State Error.


UNIT 3. (04 Hrs)

UNIT 4. (08 Hrs)


UNIT 5. (08 Hrs)

UNIT 6. (06 Hrs)

DIGITAL CONTROL SYSTEMS: Digital Computer Control System, Sampled-Data Systems \( z \)-Transform, Closed-Loop Feedback Sampled-Data Systems, Stability analysis in \( z \) plane

TEXT BOOKS:

1) Richard C Dorf, Robert H Bishop Modern Control Systems Pearson Education

2) Norman Nise Control System Engineering Wiley India Pvt Ltd Sixth Ed

REFERENCE BOOKS:

1) Golnaraghi, Benjamin Kuo, Sridhar: Automatic Control Systems, Wiley India Ltd

2) Kannan M Moudgalya: Digital Control Wiley India Ltd

3) K Ogata: Modern Control Engineering Prentice Hall of India Fifth Ed

4) M Gopal: Digital Control and state variable methods Tata McGraw Hill
SEMESTER-I

MEX604 – DIGITAL SYSTEM DESIGN

Teaching Scheme:
Lecture - 03 Hrs
Tutorial - 01 Hrs

Examination Scheme:
Theory Paper - 80 Marks
Class Test - 20 Marks
Credit: 04

UNIT 1.

SEQUENTIAL CIRCUIT DESIGN: Introduction, Sequential Circuit Model, Classification of Sequential Circuits, State Table, State Diagram, State Equation, Design Procedure of Synchronous Sequential Circuits, State Reduction of Synchronous Sequential Circuits, Asynchronous Sequential Circuits, Design Procedure of Asynchronous Sequential Circuits, Algorithmic State Machines (ASM)

UNIT 2.

MODELING: Functional Modeling at the Logic Level, Register Level, Structural Models, Level of Modeling.

UNIT 3.

HAZARDS: Hazards in Combinational Networks, Detection of Static – 0 and 1 – Hazards, Dynamic Hazards, Design of Hazard-free Networks, Essential Hazards.

UNIT 4.


UNIT 5.

DESIGN OF ARITHMETIC BLOCKS: Serial Adder with Accumulator, Design of Parallel Multiplier.

UNIT 6.

PROGRAMMABLE LOGIC DEVICES: Introduction, PROM, PLA, PAL, CPLD, FPGA, CAD, Tools.

TEXT BOOKS:

1. Digital Electronics Principles and Applications by Soumitra Kumar Mandal: McGraw Hill
2. Modern Digital Electronics by R. P. Jain
REFERENCE BOOKS:

1. Fundamentals of Logic Design by Charles H. Roth; Jaico Publication
2. Digital Systems Testing and Testable Design by Miron Abramovici, Melvin A. Breuer, Arthur D. Friedman; Jaico Publication
SEMESTER-I

MEX641 – DETECTION AND ESTIMATION THEORY (EL-I)

Teaching Scheme:  
Lecture - 03 Hrs  
Tutorial - 01 Hrs

Examination Scheme:  
Theory Paper - 80 Marks  
Class Test - 20 Marks

Credit:-04

UNIT 1.  
CLASSICAL DETECTION & ESTIMATION THEORY  
(04 Hrs)

Introduction to Engineering Statistics, probability, probability density function, random and discrete variables, Joint probability etc.

UNIT 2.  
INTRODUCTION: Simple binary hypothesis tests, M, hypothesis, estimation theory, Composite hypothesis, General Gaussian problem, Performance bonds and approximations.

UNIT 3.  
DETECTION OF SIGNALS, ESTIMATION OF SIGNAL PARAMETERS  
(04 Hrs)


UNIT 4.  
ESTIMATION OF CONTINUOUS WAVEFORMS  
(08 Hrs)

Introduction, Derivation of estimation equation, Lower bound on the mean square estimation error, Multidimensional waveform estimation, Non random waveform estimation.

UNIT 5.  
PARAMETER ESTIMATION:  
(08 Hrs)

Estimation of a signal parameter, Estimation of a signal parameter. Estimation of time-varying signals. Kalman filtering, filtering signals in noise Simple problems. Weiner filters, relation between Weiner filters and Kalman filters. Recursive least squares (RLS), Weighted LS; Full and reduced order observers, Kalman filter; Parametric models, LS estimation, bias; Generalized least squares (GLS) and instrumental variable (IV) method; Persistently exciting input signal; Likelihood LS estimation, bias; Generalized least squares (GLS) and instrumental variable (IV) method; Persistently exciting input signal; Likelihood functions and maximum likelihood estimation (MLE); Singular value decomposition (SVD); Stochastic approximation algorithm (STA); Order and structure determination, Yule-Walker equation; Multivariable system representation, controllability and observability indices; Feedback system identification
UNIT 6.  
(04 Hrs)

DETECTION AND ESTIMATION IN COLOURED NOISE
Elements of sequential and non-parametric detection. Applications to communication, radar and sonar systems. Application to RADAR signal processing, estimation of range Detection of object, it’s size etc. Linear prediction and optimum linear filters: Forward and backward linear prediction, properties of linear prediction error filters, AR lattice and ARMA lattice ladder filters, Weiner filters for filtering and prediction.

REFERENCE BOOKS:
SEMESTER-I

MEX642 – VLSI DESIGN (EL-I)

Teaching Scheme:
Lecture - 03 Hrs
Tutorial - 01 Hrs

Examination Scheme:
Theory Paper - 80 Marks
Class Test - 20 Marks
Credit:-04

UNIT 1. (04Hrs)

MOS INVERTER:
Introduction, MOS Inverter and its characteristics: C-V Characteristics,
Nonideal I–V effect, Dc Transfer Characteristics, Threshold voltage equations,
effects, MOS device Design equations, Basic DC equations, Latch-up in CMOS
tubes and other second order effects.

UNIT 2. (04Hrs)

INTRODUCTION TO CMOS CIRCUITS: CMOS Logic- Complementary
CMOS inverter- DC Characteristics, Noise margin, Static load MOS Inverters,
Differential Inverter, the transmission gate, Tristate Inverter, Bi-CMOS Inverters,
SPICE Model; Combination logic- static and dynamic design strategies, The
NAND and NOR Gates, Compound gates, Multiplexers.

UNIT 3. (08 Hrs)

DESIGNING COMBINATIONAL LOGIC GATES IN CMOS:
Static CMOS Design, Dynamic CMOS Design, More Circuit Families:
Differential Circuits, Sense amplifier, BiCMOS Circuits.

UNIT 4. (08 Hrs)

DESIGNING SEQUENTIAL LOGIC CIRCUITS: Static latches and
registers, Dynamic latches and registers, non bistable sequential circuits.

UNIT 5. (08 Hrs)

DATAPATH SUBSYSTEMS AND: Addition, Subtraction, Parity Generator,
Comparator, Counters, Shifters, Multiplication and other arithmetic operators;
power and speed tradeoffs, Control FSM and Control Logic Implementation.

UNIT 6. (08 Hrs)

ARRAY SUBSYSTEMS: Memory cells and Arrays, ROM, RAM- SRAM,
DRAM, clocking disciplines; Design, power optimization, case studies in
memory design.
REFERENCE BOOKS:

4. L. Glaser and Dobberpuhi, “The Design and Analysis of VLSI Circuits”, Addison Wesley
5. Mnnn, “Introduction to VLSI System” Addison Wesley
SEMESTER-I

MEX643 – ADVANCED SATELLITE COMMUNICATION (EL-I)

Teaching Scheme:                      Examination Scheme:
Lecture - 03 Hrs                       Theory Paper - 80 Marks
Tutorial - 01 Hrs                      Class Test - 20 Marks
Credit:-04

UNIT 1.                                (08 Hrs)

UNIT 2.                                (10 Hrs)
EARTH SPACE PROPAGATION EFFECTS: Frequency window, Free space loss, Atmospheric absorption, Rainfall Attenuation, Inospheric scintillation, Telemetry, Tracking and command of satellite.
DETECTION: QPSK offset QPSK and MSK, Coherent and non-coherent detection, Error rate performance.

UNIT 3.                                (08 Hrs)
SATELLITE LINK DESIGN: Basic transmission theory, system noise temperature and G/T ratio, Design of downlinks, uplink design.

UNIT 4.                                (06 Hrs)
MODULATION, MULTIPLEXING AND MULTIPLE ACCESS FOR SATELLITE LINKS: FM, BPSK, QPSK, FDMA, TDMA, DAMA, and CDMA.

UNIT 5.                                (05 Hrs)
VSAT SYSTEMS: overview, network architectures, access control protocols, earth station engineering, antennas, link margins, system design procedure.

UNIT 6.                                (05 Hrs)
APPLICATIONS: GPS, direct broadcast satellite television: design and error control, satellite radio broadcasting, weather forecasting satellites.

REFERENCE BOOKS:
SEMESTER-I

MEX621 – DIGITAL SIGNAL PROCESSING SIMULATION LAB

Teaching Scheme:  
Lecture - NA  
Tutorial - NA  
Practical Hours: -04 H/Week

Examination Scheme:  
Theory Paper - NA  
Class Test - NA  
Term work: -50 Marks  
Credit: -02

Students are instructed to frame and perform laboratory assignment based on DSP of theory course. The assignment should encompass the hardware and software techniques/tools introduced in the concerned subjects and should prove to be useful for the PG program in the relevant field. Assignment should be a full-fledged system design problems with multidimensional solutions suggested.

Student shall submit a laboratory work document based on the assignment performed at the end of semester. The laboratory instructor shall guide the students in framing the assignments and defining the problems pertaining to the said subjects.
SEMESTER-I

MEX622 – SYSTEM LAB-I

Teaching Scheme: Examination Scheme:
Lecture - NA Theory Paper - NA
Tutorial - NA Class Test - NA
Practical Hours-02 H/Week Practical- 50 Marks
Credit-01

Individual student will perform the work as per the following guidelines and submit the report based on result obtained and/or study performed under the guidance of respective guide (Minimum 25 pages).

The work will be assessed by two examiners out of which one will be external examiner appointed by the University and second examiner (internal) will be guide itself.

Work to be carried out by student,

1) Student should perform experimentation in any subject of the stream as assign by the respective guide, leading towards concept understanding.
2) Literature survey about the topic, research and development or thrust area subject.
3) Student should study any one of the software from given list and develop a specific software based module using C/C++/Vb/Matlab/VHDL/Microwind/LabView/PSpice/EDA or ECAD etc.
SEMESTER-I

MEX623 – SEMINAR-I

Teaching Scheme:  Examination Scheme:
Lecture - NA  Theory Paper - NA
Tutorial - NA  Class Test - NA
Hours:-02 H/Week  Seminar:-50 Marks
Credit:-01

Student should deliver seminar on the state of the art topic in front of the external examiners and internal examiners, staff and student colleagues. Prior to presentation student should carry the details of literature survey form standard references such as international journals and periodicals, recently published reference books etc. student should submit a report on same along with computer based presentation copy to the concerned examiner/guide at the end of seminar. The assessment shall be based on selection of topic its relevance to present context, report documentation and presentation skills.
SEMESTER-II

ME0651 – ADVANCED OPTIMISATION TECHNIQUES

Teaching Scheme: Examination Scheme:
Lecture - 03 Hrs Theory Paper - 80 Marks
Tutorial - 01 Hrs Class Test - 20 Marks
Credit:-04

UNIT 1. (2Hrs)
INTRODUCTION: Optimal problem formulation, engineering optimization problems, optimization Algorithms.

UNIT 2. (6Hrs)
SINGLE VARIABLE OPTIMIZATION ALGORITHMS: Optimality criteria, bracketing methods, region elimination methods, point estimation methods, gradient base, root finding using optimization Techniques.

UNIT 3. (8Hrs)
MULTIVARIABLE OPTIMIZATION ALGORITHMS: Optimality criteria, unidirectional search, direct Search methods, gradient based methods, computer programs on above methods.

UNIT 4. (8Hrs)
CONSTRAINED OPTIMIZATION ALGORITHMS: Kuhn-Tucker conditions, transformation methods, sensitivity analysis, direct search for constrained minimization, linearised search techniques, feasible direction method, generalized reduced gradient method, gradient projection method, computer programs on above methods.

UNIT 5. (8Hrs)
SPECIAL OPTIMIZATION ALGORITHMS: Integer programming, Geometric programming, Genetic Algorithms, simulated annealing, global optimization, Computer programs on above methods.

UNIT 6. (8Hrs)
OPTIMIZATION IN OPERATIONS RESEARCH: Linear programming problem, simplex method, artificial variable techniques, dual phase method, sensitivity analysis

REFERENCE BOOKS:
University Press, UK
SEMESTER-II
ME0652 – AUDIO SIGNAL PROCESSING AND CODING

Teaching Scheme:  
Lecture - 03 Hrs  
Tutorial - 01 Hrs

Examination Scheme:  
Theory Paper - 80 Marks  
Class Test - 20 Marks  
Credit:-04

UNIT 1.  
FUNDAMENTALS OF SPEECH: Nature of Speech ,type of speech, voiced an unvoiced decision making, audio file formats, process of speech production, acoustic theory of speech production.

UNIT 2.  
DIGITAL MODELS FOR THE SPEECH SIGNAL: Lossless tube models and Digital models for speech signals, time domain model for speech processing, time dependent processing of speech, parameter of speech: pitch & formats, fundamental frequency or pitch frequency, Parallel Processing Approach for calculation of pitch frequency, pitch period measurement using spectral domain, cepstral domain, estimation of formats.

UNIT 3.  
SPECTRAL PARAMETER OF SPEECH: Homomorphic Processing, Cepstral analysis of speech, the auditory system as a filter bank, perceptual linear prediction, log frequency power coefficients, relative spectral perceptual linear prediction, short-time spectral analysis of speech, wavelet transformation analysis of speech.

UNIT 4.  
SPEECH QUANTIZATION AND CODING: Uniform and non-uniform quantization and coder, companded quantizer, waveform coding of speech, comparison of different waveform coding techniques, parameter speech coding technique, mixed excitation linear prediction coder, multi-mode speech coding, transform domain coding of speech.

UNIT 5.  
SHORT TIME FOURIER ANALYSIS: Linear filtering interpretation, filter bank summation method, overlap addition method, design of digital filter bank, implementation using FFT, spectrographic displays, pitch detection, analysis by synthesis, analysis synthesis system, Homomorphic speech processing: Homomorphic system for convolution, complex spectrum, pitch detection, format estimation, Homomorphic vocoder.
UNIT 6.  

SPEECH SYNTHESIS AND SPEECH PROCESSING APPLICATION: A text to speech system, synthesizer technologies ,speech synthesis using other methods, speech transformations, emotion recognition from speech, speech recognition for ASR, statical sequence recognition for ASR, VQ-HMM- based speech recognition, word spotting/keyword spotting, speaker recognition, speech enhancement, adaptive echo cancellation, audio processing: auditory perception and psychoacoustics masking frequency and loudness perception, spatial perception, digital audio, audio coding, high quality, low bit rate, audio coding standard, MPEG, AC-3

TEXT BOOKS:
5. Shaila D Apte “Speech and Audio Processing” John Wiley & Sons

REFERENCE BOOKS:
SEMESTER-II

MEX653 – ADVANCED POWER ELECTRONICS

Teaching Scheme:  
Lecture - 03 Hrs  
Tutorial - 01 Hrs

Examination Scheme:  
Theory Paper - 80 Marks  
Class Test - 20 Marks  
Credit:-04

UNIT 1.  
(05Hrs)

Power switching devices overview – Attributes of an ideal switch, application requirements, circuit symbols; Power handling capability ; Device selection strategy ,On-state and switching losses – EMI due to switching.

UNIT 2.  
(05Hrs)

Power diodes - Types, forward and reverse characteristics, switching characteristics – rating. Study of SCR, TRIAC, DIAC, UJT, SUS, IGBT, etc. Their ratings, characteristics, turn ON-OFF mechanisms, triggering circuit design, protection.

UNIT 3.  
(06 Hrs)

Definition, Need and block schematic of Drives, Efficient Drives, characteristics of various AC/DC drives, Basic circuit requirement of speed control system , Review of conventional speed control methods used for DC and AC motors, Speed control of induction motor using micro-controller system, recent trends in developments of variable speed drives, digital control of DC Drive.

UNIT 4.  
(10 Hrs)


UNIT 5.  
(06 Hrs)

Classification of inverter, forced communication methods, Inverters, frequency and voltage control harmonic limitation, choice of SCR inverters, Inverter control circuit.  
PWM Inverters: Need for PWM techniques various PWM techniques principle of sinusoidal PWM bipolar and unipolar PWM modulation

UNIT 6.  
(08 Hrs)

Applications: Power factor correction – Actual power factor – Displacement factor and distortion factor – principles of input line current shaping using boost rectifiers. UPS – Different topologies – block schematics. Brief about power quality improvement methods.
REFERENCE BOOKS:

1) Power Electronics: Converters, Applications and Design – Mohan, Undeland and Robbins, John Wiley and Sons, 2nd ed.
5) P. C. Sen-Power Electronics(THM)
6) M. H. Rashid- Power Electronics(PHI)
7) B. C. Bose-AC/DC Drives
8) Vedam subramanyam, Thyristor control of Electric drives(THM)
9) M.V. Deshpande Electric Motor:Application and control(A.H.Wheder &Co.)
SEMESTER-II

MEX654 – IMAGE AND VIDEO PROCESSING

Teaching Scheme: Examination Scheme:
Lecture - 03 Hrs Theory Paper - 80 Marks
Tutorial - 01 Hrs Class Test - 20 Marks
Credit:-04

UNIT 1. (08 Hrs)

IMAGE AND VIDEO ENHANCEMENT AND RESTORATION:
Basic Linear Filtering with Application to Image Enhancement, Nonlinear Filtering for Image Analysis and Enhancement, Morphological Filtering for Image Enhancement and Detection, Basic Methods for Image Restoration and Identification, Motion Detection and Estimation, Video Enhancement and Restoration

UNIT 2. (8 Hrs)

IMAGE REPRESENTATIONS AND IMAGE MODELS:
Computational Models of Early Human Vision, Multiscale Image Decompositions and Wavelets, Random Field Models, Statistical Methods for Image Segmentation, Video Segmentation

UNIT 3. (06 Hrs)

IMAGE COMPRESSION:
Lossless Coding, Block Truncation Coding, The JPEG Lossy Image Compression Standard, The JPEG Lossless Image Compression Standards

UNIT 4. (06 Hrs)

VIDEO COMPRESSION:

UNIT 5. (06 Hrs)

IMAGE AND VIDEO ACQUISITION:
Image Scanning, Sampling, and Interpolation, Video Sampling and Interpolation

UNIT 6. (06 Hrs)

IMAGE AND VIDEO RENDERING AND ASSESSMENT APPLICATIONS:

**REFERENCE BOOKS:**


SEMESTER-II

MEX691 – EMBEDDED SYSTEM DESIGN

Teaching Scheme:
Lecture - 03 Hrs
Tutorial - 01 Hrs

Examination Scheme:
Theory Paper - 80 Marks
Class Test - 20 Marks
Credit:-04

UNIT 1. (12Hrs)

INTRODUCTION: Embedded systems overview, Design Challenges, Processor Technology, IC Technology, Design Technology, Trade-offs, Custom Single purpose processors, RT level Custom Single purpose processor design, Optimization, General Purpose processors: pipelining, superscalar and VLIW architectures, Programmers view: Instruction set, program and data memory space, I/O, interrupts, operating system.
Development environment: design flow and tools, testing and debugging, Application specific instruction set processors (ASIPs), microcontrollers, digital signal processors, less-general AIP environments, selecting microprocessors, general purpose processor design.

UNIT 2. (5 Hrs)

ARCHITECTURE OF ARM7TDMI processor, Programming model, Registers, Operating modes, Instruction set, Addressing modes, memory interface.

UNIT 3. (5 Hrs)

PERIPHERALS: Introduction, timers, counters and watchdog timers, UART, Pulse width modulators, controlling a DC motor using PWM, LCD controllers, Keypad controllers, stepper motor controllers, ADCs, Real time clocks.

UNIT 4. (6 Hrs)

MEMORY: Memory write ability and storage permanence, common memory types, composing memory, memory hierarchy and cache, advanced RAM.

UNIT 5. (7 Hrs)

INTERFACING: Introduction, Communication basics, Basic protocol concepts, ISA bus protocol: memory access, Arbitration, Priority arbiter, Daisy chain Arbitration, wireless communication, Layering, error detection and correction, wireless protocols: IrDA, Bluetooth, IEEE802.11

UNIT 6. (5 Hrs)

INTRODUCTION TO ARM 9, ARM926EJ-S, Features, Specifications (LPC314x /LPC315x as reference controllers)
REFERENCE BOOKS:
2. Dr. K.V.K.K. Prasad ‘Embedded Real Time Systems’ Dreamtech
3. Andrew Sloss Embedded System Developers’
4. Frank Vahid and Tony Givargis, Embedded system design: A unified hardware/software introduction, John Wiley and Sons, 2002
5. Data Sheet of ARM7TDMI
6. Data Sheet of ARM926EJ-S, (LPC314x /LPC315x)
SEMESTER-II

MEX692 – PATTERN RECOGNITION

Teaching Scheme:
Lecture - 03 Hrs
Tutorial - 01 Hrs

Examination Scheme:
Theory Paper - 80 Marks
Class Test - 20 Marks
Credit:-04

UNIT 1.
Introduction to pattern recognition: Machine Perception, the classification model, the Descriptive Approach.

UNIT 2.
Baye’s Decision Theory: Baye’s Decision Theory, minimum error rate, classification, classifiers, Discriminate Functions and Decision surfaces, Error Probabilities and Integral, The Normal Density Discriminate function for the Normal Density Bayesian Decision Theory.

UNIT 3.
Parameter Estimation and Supervised learning the mean of a Normal Density, General Bayesian Learning, Sufficient statistics and Exponential family, Problems of Dimensionality, Estimating the Error rate.

UNIT 4.

UNIT 5.
Linear Discriminant Functions : Linear Discriminant functions and decision surfaces, GeneralisedLinear Discriminant functions, the two category linearly separable case, Minimizing theperception Criterion function, Relaxation procedures, Nonseparable behavior, minimum squarederror procedures, HoKashyapprocedures, linear programming procedures, the method of potentialfunction, multicategory generalizations.

UNIT 6.
Unsupervised learning and clustering: mixture densities and identifiability, maximum likelihoodestimates, Application to normal mixtures, Unsupervised Bayesian learning, data description and clustering, criterion functions for clustering, iterative optimization, hierarchical clustering, graphtheoretic methods, clustering and dimensionality reduction.
REFERENCE BOOKS:
1) Bose, Liang, Neural Network Fundamentals TMH
2) Zurada, Introduction to artificial Neural Systems, Jiao Books
3) Klir, Folger, Fuzzy sets, uncertainty & information, PHI
4) Yegnarayana, Artificial Neural Networks, PHI
5) Kosko, Neural Networks & Fuzzy Systems, PHI
6) H. Soloman, Industrial application of fuzzy Technology
SEMESTER-II

MEX693 – WIRELESS AND MOBILE COMMUNICATION

Teaching Scheme:                                Examination Scheme:
Lecture - 03 Hrs                                  Theory Paper - 80 Marks
Tutorial - 01 Hrs                                  Class Test - 20 Marks
Credit:-04

UNIT 1.                                           (8 Hrs)

CELLULAR CONCEPT AND WIRELESS STANDARDS:          
Frequency reuse, Channel Assignment Strategies, Hand off Strategies, Interference and 
System Capacity, Trunking and Grade of Service, Improving coverage and capacity in 
cellular systems, interference suppression and power control, multiple access schemes 
Standards - GSM, IS-95, UMTS, IMT-2000.

UNIT 2.                                           (8 Hrs)

WIRELESS NETWORK: 1G, 2G, 3G wireless networks, Fixed Network Transmission 
Hierarchy, Traffic Routing in Wireless Networks, Wireless Data Services, CCS, ISDN, SS7, 
PCS/PCNs, Protocols for network access, Network Data bases.

UNIT 3.                                           (4 Hrs)

WIRELESS LAN: Types of Networks, IEEE 802.11, System and Protocol Architecture, 
Physical and Medium Access Control Layers, MAC management. 802.11b, 802.11a, 
HIPERLAN

UNIT 4.                                           (4 Hrs)

BLUE TOOTH: Blue tooth Architecture, radio layer, base band layer, link manager 
protocol, L2CAP, Security, SDP, Profiles, 802.15.

UNIT 5.                                           (8 Hrs)

MOBILE NETWORK AND TRANSPORT LAYERS: Mobile IP, mobile adhoc network 
– Routing, DSDV, DSR, Traditional TCP, TCP improvements, Indirect TCP, Snooping TCP, 
mobile TCP, TCP over 2.5 / 3G wireless networks, MAC layer scheduling and connection 
admission in mobile communication.

UNIT 6.                                           (8 Hrs)

TRAFFIC MODELING: Tele-traffic modeling and Queuing theoretic analysis of cellular 
mobile networks, Resource allocation and mobility management.
REFERENCE BOOKS:
SEMESTER-II

MEX671 – AUDIO PROCESSING & CODING LAB

Teaching Scheme: 
Lecture - NA
Tutorial - NA
Practical Hours: -04 H/Week

Examination Scheme: 
Theory Paper - NA
Class Test - NA
Term work:-50 Marks
Credit:-02

Students are instructed to frame and perform laboratory assignment based on AP&C of theory course. The assignment should encompass the hardware and software techniques/tools introduced in the concerned subjects and should prove to be useful for the PG program in the relevant field. Assignment should be a full-fledged system design problems with multidimensional solutions suggested.

Student shall submit a laboratory work document based on the assignment performed at the end of semester. The laboratory instructor shall guide the students in framing the assignments and defining the problems pertaining to the said subjects.
SEMESTER-II
MEX672 – SYSTEM LAB-II

Teaching Scheme: Examination Scheme:
Lecture - NA Theory Paper - NA
Tutorial - NA Class Test - NA
Practical Hours-02 H/Week Practical- 50 Marks
Credit-01

Individual student will perform the work as per the following guidelines and submit the report based on result obtained and/or study performed under the guidance of respective guide (Minimum 25 pages).

The work will be assessed by two examiners out of which one will be external examiner appointed by the University and second examiner (internal) will be guide itself.

Work to be carried out by student,

1) Student should perform experimentation in any subject of the stream as assign by the respective guide, leading towards concept understanding.
2) Literature survey about the topic, research and development or thrust area subject.
3) Student should build any one of the software/Hardware based mini project as per guidelines given by respective committee and/or guide.
SEMESTER-II

MEX673 – SEMINAR-II

Teaching Scheme:  
Lecture - NA  
Tutorial - NA  
Hours: 02 H/Week

Examination Scheme:  
Theory Paper - NA  
Class Test - NA  
Seminar: 50 Marks  
Credit: 01

Student should deliver seminar on the state of the art topic in front of the external examiners and internal examiners, staff and student colleagues. Prior to presentation student should carry the details of literature survey form standard references such as international journals and periodicals, recently published reference books etc. Student should submit a report on same along with computer based presentation copy to the concerned examiner/guide at the end of seminar. The assessment shall be based on selection of topic its relevance to present context, report documentation and presentation skills.
SEMESTER-III

MEX731 – DISSERTATION-I

Teaching Scheme:  
Lecture - NA  
Tutorial - NA  
Hours:-12 H/Week

Examination Scheme:  
Theory Paper - NA  
Class Test - NA  
Termwork:-50 Marks  
Practical Oral-50 marks  
Credit:-12

The dissertation Seminar will consist of a type written report covering the topic selected for Final Dissertation. This should include the literature survey, technical details and related data required for the proposed dissertation work. The candidate shall deliver the dissertation seminar on the topic which will be judged by two examiners (one external and one internal guide). The assessment shall be based on selection of topic its relevance to present context, report documentation and presentation skills, utility of the dissertation work & publications based on the same.
SEMESTER-IV

MEX781 – DISSERTATION-II

Teaching Scheme: 
Lecture - NA
Tutorial - NA
Hours:-20 H/Week

Examination Scheme: 
Theory Paper - NA
Class Test - NA
Termwork:-100 Marks
Practical Oral-200 marks
Credit:-20

The student shall be allowed to submit the dissertation- II report only after the completion of dissertation- I. Student should deliver Viva-Voca Presentation on topic of Desertaion-II infront of the external examiners and internal examiners, staff and student colleagues. The assessment shall be based on design and implementation aspects, report documentation and presentation skills, utility of the dissertation work & publications based on the same.