

Syllabus for B.Tech(Electronics & Communication Engineering) Up to Third Year

Revised Syllabus of B.Tech ECE (for the students who were admitted in Academic Session 2010-2011)



Third Year - Fifth Semester

A. THEORY							
Sl.No	Paper Code	Theory	Contact Hours/Week				Cr. Pts
			L	T	P	Total	
1	HU-501	Economics for Engineers	3	0	0	3	3
2	EC-501	Analog Communication	3	1	0	4	4
3	EC-502	Microprocessors & Microcontrollers	3	1	0	4	4
4	EC-503	Control System	3	0	0	3	3
5	F. E.- EC-504A EC-504B	Computer Architecture Data structure & C	3	1	0	4	3/4
Total of Theory						18	18
B. PRACTICAL							
6	EC-591	Analog Communication*	0	0	3	3	2
7	EC-592	Microprocessors & Microcontrollers*	0	0	3	3	2
8	EC-593	Control System*	0	0	3	3	2
9	F.E. EC-594A EC-594B	Computer Architecture Data structure & C	0	0	3	3	2
Total of Practical						12	8
Total of Semester						30	26

Laboratories to have both physical experiments and simulation. Only virtual laboratory is not accepted

Third Year - Sixth Semester

A. THEORY							
Sl.No.	Field	Theory	Contact Hours/Week				Cr. Pts
			L	T	P	Total	
1	HU-601	Principles of Management	2	0	0	2	2
2	EC601	Digital Communications	3	0	0	3	3
3	EC602	Digital Signal Processing	3	0	0	3	3
4	EC 603	Telecommunication System	3	0	0	3	3
5	(No Lab) EC-604A EC-604B (With Lab)	Antenna Theory & Propagation Information Theory & Coding	3	0	0	3	3
6	EC-605A EC-605B EC-605C	Object Oriented Programming (IT) Programming Language (CSE) Electronic Measurement & Instrumentation(EI)	3	0	0	3	3
Total of Theory						17	17
B. PRACTICAL							
8	EC691	Digital Communications	0	0	3	3	2
9	EC 692	Digital Signal Processing	0	0	3	3	2
10	F.E. EC-695A EC-695B EC-695C	Object Oriented Programming (IT) Programming Language (CSE) Electronic Measurement & Instrumentation	0	0	3	3	2
11		Seminar	0	0	3	3	2
Total of Practical						12	8
Total of Semester						29	25

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SEMESTER - VI Theory

Principles of Management

HU-601

Contracts: 2L

Credits- 2

Module-I

1. Basic concepts of management: Definition – Essence, Functions, Roles, Level.
2. Functions of Management: Planning – Concept, Nature, Types, Analysis, Management by objectives; Organisation Structure – Concept, Structure, Principles, Centralization, Decentralization, Span of Management; Organisational Effectiveness.

Module-II

3. Management and Society – Concept, External Environment, CSR, Corporate Governance, Ethical Standards.
4. People Management – Overview, Job design, Recruitment & Selection, Training & Development, Stress Management.
5. Managerial Competencies – Communication, Motivation, Team Effectiveness, Conflict Management, Creativity, Entrepreneurship.

Module-III

6. Leadership: Concept, Nature, Styles.
7. Decision making: Concept, Nature, Process, Tools & techniques.
8. Economic, Financial & Quantitative Analysis – Production, Markets, National Income Accounting, Financial Function & Goals, Financial Statement & Ratio Analysis, Quantitative Methods – Statistical Interference, Forecasting, Regression Analysis, Statistical Quality Control.

Module-IV

9. Customer Management – Market Planning & Research, Marketing Mix, Advertising & Brand Management.
10. Operations & Technology Management – Production & Operations Management, Logistics & Supply Chain Management, TQM, Kaizen & Six Sigma, MIS.

Readings:

1. Management: Principles, Processes & Practices – Bhat, A & Kumar, A (OUP).
2. Essentials for Management – Koontz, Revised edition, Tata McGraw Hill (TMH)
3. Management – Stoner, James A. F. (Pearson)
4. Management - Ghuman, Tata McGraw Hill(TMh)

Digital Communication

EC-601

Contracts: 3L

Credits- 3

MODULE – I:

Probability Theory and Random Processes:

Conditional probability, communication example, joint probability, statistical independence, random variable-continuous and discrete, cumulative distribution function, probability density function – Gaussian, Rayleigh and Rician, mean, variance, random process, stationary and ergodic processes, correlation coefficient, covariance, auto correlation function and its properties, random binary wave, power spectral density. 6L

MODULE – II:

Signal Vector Representation:

Analogy between signal and vector, distinguishability of signal, orthogonality and orthonormality, basis function, orthogonal signal space, message point, signal constellation, geometric interpretation of signals, likelihood functions, Schwartz inequality, Gram-Schmidt orthogonalization procedure, response of the noisy signal at the receiver, maximum likelihood decision rule, decision boundary, optimum correlation receiver; probability of error, error function, complementary error function, Type-I and Type-II errors. 6L

MODULE – III:

Digital Data Transmission:

Concept of sampling, Pulse Amplitude Modulation (PAM), interlacing and multiplexing of samples, Pulse Code Modulation (PCM), quantization, uniform and non-uniform quantization, quantization noise, binary encoding, A-Law and μ -law companding, differential PCM, delta modulation and adaptive delta modulation.

Digital transmission components, source, multiplexer, line coder, regenerative repeater, concept of line coding – polar/unipolar/bipolar NRZ and RZ, Manchester, differential encoding and their PSDs, pulse shaping, Inter Symbol Interference

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(ISI), Eye pattern, Nyquist criterion for zero ISI, equalizer, zero forcing equalizer, timing extraction. 10L

MODULE –IV:

Digital Modulation Techniques:

Types of Digital Modulation, coherent and non-coherent Binary Modulation Techniques, basic digital carrier modulation techniques: ASK, FSK and PSK,

Coherent Binary Phase Shift Keying (BPSK), geometrical representation of BPSK signal; error probability of BPSK, generation and detection of BPSK Signal, power spectrum of BPSK.

Concept of M-ary Communication, M-ary phase shift keying, the average probability of symbol error for coherent M-ary PSK, power spectra of MPSK,

Quadrature Phase Shift Keying (QPSK), error probability of QPSK signal, generation and detection of QPSK signals, power spectra of QPSK signals, Offset Quadrature Phase shift Queuing (OQPSK),

Coherent Frequency Shift Keying (FSK), Binary FSK, error probability of BFSK signals, generation and detection of Coherent Binary FSK signals, power spectra of BFSK signal,

Minimum Shift Keying (MSK), signal constellation of MSK waveforms, error probability of MSK signal, Gaussian Minimum Shift Keying: GMSK, basic concept of OFDM, constellation diagram,

Some performance issues for different digital modulation techniques - Error Vector Magnitude (EVM), Eye Pattern and Relative Constellation Error (RCE),

Conceptual idea for Vector Signal Analyzer (VSA) 14L

TEXT BOOKS:

- k) Digital Communications, S. Haykin, Wiley India.
- l) Principles of Communication Systems, H. Taub and D.L.Schilling, TMH Publishing Co.
- m) Wireless Communication and Networks : 3G and Beyond, I. Saha Misra, TMH Education.
- n) Digital Communications, J.G.Proakis, TMH Publishing Co.

o) REFERENCE BOOKS:

- d) Digital Communications Fundamentals and Applications, B. Sklar and P.K.Ray, Pearson.
- e) Modern Digital and Analog Communication Systems, B.P.Lathi and Z.Ding, Oxford University Press.
- f) Digital Communication, A. Bhattacharya, TMH Publishing Co.

Digital Signal Processing

EC- 602

Contracts: 3L

Credits- 3

MODULE – I:

Discrete-time signals:

Concept of discrete-time signal, basic idea of sampling and reconstruction of signal, sampling theorem, sequences – periodic, energy, power, unit-sample, unit-step, unit-ramp, real & complex exponentials, arithmetic operations on sequences. 3L

LTI Systems:

Definition, representation, impulse response, derivation for the output sequence, concept of convolution, graphical, analytical and overlap-add methods to compute convolution supported with examples and exercises, properties of convolution, interconnections of LTI systems with physical interpretations, stability and causality conditions, recursive and non-recursive systems. 6L

MODULE –II:

Z-Transform:

Definition, mapping between s-plane and z-plane, unit circle, convergence and ROC, properties of Z-transform, Z-transform on sequences with examples and exercises, characteristic families of signals along with ROCs, convolution, correlation and multiplication using Z-transform, initial value theorem, Perseval's relation, inverse Z-transform by contour integration, power series & partial-fraction expansions with examples and exercises. 6L

Discrete Fourier Transform:

Concept and relations for DFT/IDFT, Twiddle factors and their properties, computational burden on direct DFT, DFT/IDFT as linear transformations, DFT/IDFT matrices, computation of DFT/IDFT by matrix method, multiplication of DFTs, circular convolution, computation of circular convolution by graphical, DFT/IDFT and matrix methods, linear filtering using DFT, aliasing error, filtering of long data sequences – Overlap-Save and Overlap-Add methods with examples and exercises. 5L

Fast Fourier Transform:

Radix-2 algorithm, decimation-in-time, decimation-in-frequency algorithms, signal flow graphs, Butterflies, computations in one place, bit reversal, examples for DIT & DIF FFT Butterfly computations and exercises. 4L

MODULE – III:

Filter Design:

Basic concepts of IIR and FIR filters, difference equations, design of Butterworth IIR analog filter using impulse invariant and

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bilinear transforms, design of linear phase FIR filters, no. of taps, rectangular, Hamming and Blackman windows. 5L

MODULE – IV:

Digital Signal Processor:

Elementary idea about the architecture and important instruction sets of TMS320C 5416/6713 processor, writing of small programs in Assembly Language. 4L

FPGA:

Architecture, different sub-systems, design flow for DSP system design, mapping of DSP algorithms onto FPGA. 3L

TEXT BOOKS:

1. Digital Signal Processing – Principles, Algorithms and Applications, J.G.Proakis & D.G.Manolakis, Pearson Ed.
2. Digital Signal processing – A Computer Based Approach, S.K.Mitra, TMH Publishing Co.
3. Digital Signal Processing Signals, Systems and Filters, A. Antoniou, TMH Publishing Co.
4. VLSI Digital Signal Processing Systems Design and Implementation, Wiley International Publication.
5. Digital Signal Processing with Field Programmable Gate Arrays, U.Meyer-Baese, Springer.

REFERENCE BOOKS:

13. Digital Signal Processing, P. Rameshbabu, Scitech Publications (India).
14. Digital Signal Processing, S.Salivahanan, A.Vallabraj & C. Gnanapriya, TMH Publishing Co.
15. Digital Signal Processing; A Hands on Approach, C. Schuler & M.Chugani, TMH Publishing Co.
16. Digital Signal Processing, A. Nagoor Kani, TMH Education
17. Digital Signal Processing S. Poornachandra & B. Sasikala, MH Education
18. Digital Signal Processing; Spectral Computation and Filter Design Chi-Tsong Chen, Oxford University Press
19. Texas Instruments DSP Processor user manuals and application notes.
20. Xilinx FPGA user manuals and application notes.

Telecommunication System

EC-603

Contracts: 3L

Credits- 3

(to be modified as per workshop decision)

Module No.	Topic	Periods/ Classes
1.	Introduction to Telephone Systems: Evolution of Telecommunication; Components and Examples of Telecommunication systems; Pulse dialing & Tone dialing; Telephone Instruments -rotary dial and push button types.	3
2.	Telecommunication Transmission Lines:- Copper, Co-axial, and Fiber optic cables; Transmission Bridge -Hybrid circuit for 2-wire to 4-wire conversion and vice versa. PCM Carriers; American and European standards of carrier channels.	6
3.	Subscriber Loop Systems: BORSCHT Functions; Switching hierarchy & routing, signaling techniques-in channel & common channel signaling, SS7.	4
4.	Switching System: Electro-mechanical switching-Strouger & Crossbar; Circuit Switching & Packet Switching, Digital Switching systems - Time division Time switch, Time multiplexed Space switch, Time multiplexed Time switch, Hybrid switching, ; TS, ST, STS, TST systems; Architecture of 5ESS systems;	6
5.	Stored Program Control: Software architecture, Application software;. Electronic Exchanges, Introduction to cordless telephones and Digital PABX	4
6.	Traffic Engineering: Blocking network, blocking probability, grade of service, traffic load, Erlang-B and C-congestion formulas-case studies	4
7.	Modems and Their Standards: RS 232C; DTE and DCE, Facsimile Transmission, Broad band transmission-ISDN, DSL and ADSL, ISDN and B-ISDN	4
8.	IP Telephony: Voice over IP, Session initiation protocol, H.323 signaling, IP multimedia service	4

TOTAL LECTURE HOURS: 35

Text Books:

- b) T. Viswanathan, “ Telecommunications Switching Systems & Networks”, PHI
- c) J.C.Bellamy “Digital Telephony”- Wiley-India

Reference Books:

1. O Hersent, D Gurle, J P Petit “IP Telephony” Pearson
2. J.E.Flood “Telecommunications Switching, Traffic and Networks” Pearson
3. R L Freeman “Telecommunication System Engineering”- Wiley-India
4. A Gokhale “Introduction to Telecommunication”- Cengage Learning

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Professional Elective

Antenna Theory & Propagation

EC-604A

Contracts: 3L

Credits- 3

Module-I	A. Review of Maxwell's Equation; Radiation of e.m waves and introducing Antenna; Vector Potential and Retarded Vector Potential; Radiation fields of a Hertzian dipole(electric); Duality Principle, Radiation fields due to short magnetic dipole. B. Antenna Characteristics: Radiation Pattern, Beam Width; Radiation Resistance and efficiency; Directivity and Gain; Impedance, VSWR, Polarization; Effective height and Receive Aperture; Noise Temperature of Antenna.	7
Module-II	A. Radiation fields and Characteristics of $\lambda/2$ dipole; discussion on $\lambda/4$ monopole antenna; Current distribution and Radiation patterns of center-fed dipoles of length λ , $3\lambda/2$ and 2λ . Horizontal and Vertical antennas over a plane ground. B. Antenna Arrays: electric Field due to 2 element arrays, 3 element Arrays; Pattern Multiplication; Uniform Linear Array: End fire and Broad side; Phased array.	9
Module-III	A. Characteristics and properties of :Travelling Wave Antenna, Helical Antenna, Folded Dipole, Yagi-Uda Array, Loop Antenna, Electrically Short Antennas, Broad Band Antenna (Log periodic Antenna), Microstrip Patch Antenna. B. Radiation from an aperture: Sectoral and Pyramidal Horn Antennas, Design of Optimum Horn Antenna; Parabolic and Corner Reflectors and feed systems. [Major stress on Characteristics features, applications (including frequency at which used), advantages and disadvantages, major design principles and equations (without long and detailed derivations)]	10
Module-IV	A. Methods of Propagation: Ground Wave Propagation, Components of ground wave, Field strength dependence on physical factors. Sky wave Propagation; Ionospheric Layers; Virtual Height, Critical Frequency, MUF, Skip distance, Sporadic Reflections. Space wave propagation: Tropospheric Scatter, Ducting Super refraction, Sub refraction. B. Friss Transmission Formula, SNR of a Radio Link. Physical (Medium) effects on Radio wave Propagation: Absorption, Refraction and Radio Horizon, Diffraction, Multipath Propagation and fading, Noise, Doppler effect.	10

Recommended (Text Books)

1. Antenna (for all application), John D. Kraus and Ronald J. Marhefka; Tata- MacGraw Hill, 3rd Edition
2. Antenna & Wave Propagation, K.D Prasad; Satya Prakashan, New Delhi, 3rd Edition
3. Antenna Theory: Analysis & Design, Constantine A. Balanis; Willey, 3rd Edition

Reference Book

1. Elements of Electromagnetics; Mathew N.O. Sadiku, Oxford University Press, 5th Edition(2010)
2. Electromagnetic Waves & Radiating Systems, EC Jordan & K.G. Balmain; Pearson Education, 2nd Edition (2009)
3. Microstrip Antenna Design Handbook- Ramesh Garg; Artech House (2001)

Information Theory & Coding

EC604B

Contracts: 3L

Credits- 3

Source Coding [7L]

Uncertainty and information, average mutual information and entropy, information measures for continuous random variables, source coding theorem, Huffman codes.

Channel Capacity And Coding [7L]

Channel models, channel capacity, channel coding, information capacity theorem, The Shannon limit.

Linear And Block Codes For Error Correction [8L]

Matrix description of linear block codes, equivalent codes, parity check matrix, decoding of a linear block code, perfect codes, Hamming codes.

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Cyclic Codes [7L]

Polynomials, division algorithm for polynomials, a method for generating cyclic codes, matrix description of cyclic codes, Golay codes.

BCH Codes [8L]

Primitive elements, minimal polynomials, generator polynomials in terms of minimal polynomials, examples of BCH codes.

Convolutional Codes [8L]

Tree codes, trellis codes, polynomial description of convolutional codes, distance notions for convolutional codes, the generating function, matrix representation of convolutional codes, decoding of convolutional codes, distance and performance bounds for convolutional codes, examples of convolutional codes, Turbo codes, Turbo decoding.

Books

4. Information theory, coding and cryptography - Ranjan Bose; TMH.
5. Information and Coding - N Abramson; McGraw Hill.
6. Introduction to Information Theory - M Mansurpur; McGraw Hill.
7. Information Theory - R B Ash; Prentice Hall.
8. *Error Control Coding - Shu Lin and D J Costello Jr; Prentice Hall.*

Free Elective

Object Oriented Programming

Code: EC605A

Contact: 3L

Credits: 3

Object oriented design [10 L]

Concepts of object oriented programming language, Major and minor elements, Object, Class, relationships among objects, aggregation, links, relationships among classes-association, aggregation, using, instantiation, meta-class, grouping constructs.

Object oriented concepts [4 L]

Difference between OOP and other conventional programming – advantages and disadvantages. Class, object, message passing, inheritance, encapsulation, polymorphism

Basic concepts of object oriented programming using Java [22 L]

Implementation of Object oriented concepts using Java.

Language features to be covered:

Class & Object properties [6L]

Basic concepts of java programming – advantages of java, byte-code & JVM, data types, access specifiers, operators, control statements & loops, array, creation of class, object, constructor, finalize and garbage collection, use of method overloading, this keyword, use of objects as parameter & methods returning objects, call by value & call by reference, static variables & methods, garbage collection, nested & inner classes, basic string handling concepts- String (discuss charAt() , compareTo(), equals(), equalsIgnoreCase(), indexOf(), length() , substring(), toCharArray() , toLowerCase(), toString(), toUpperCase() , trim() , valueOf() methods) & StringBuffer classes (discuss append(), capacity(), charAt(), delete(), deleteCharAt(), ensureCapacity(), getChars(), indexOf(), insert(), length(), setCharAt(), setLength(), substring(), toString() methods), concept of mutable and immutable string, command line arguments, basics of I/O operations – keyboard input using BufferedReader & Scanner classes.

Reusability properties[6L] – Super class & subclasses including multilevel hierarchy, process of constructor calling in inheritance, use of super and final keywords with super() method, dynamic method dispatch, use of abstract classes & methods, interfaces. Creation of packages, importing packages, member access for packages.

Exception handling & Multithreading [6L] – Exception handling basics, different types of exception classes, use of try & catch with throw, throws & finally, creation of user defined exception classes.

Basics of multithreading, main thread, thread life cycle, creation of multiple threads, thread priorities, thread synchronization, inter-thread communication, deadlocks for threads, suspending & resuming threads.

Applet Programming (using swing) [4L] – Basics of applet programming, applet life cycle, difference between application & applet programming, parameter passing in applets, concept of delegation event model and listener, I/O in applets, use of repaint(), getDocumentBase(), getCodeBase() methods, layout manager (basic concept), creation of buttons (JButton class only) & text fields.

Textbooks/References:

1. Rambaugh, James Michael, Blaha – "Object Oriented Modelling and Design" – Prentice Hall, India
2. Ali Bahrami – "Object Oriented System Development" – Mc Graw Hill
3. Patrick Naughton, Herbert Schildt – "The complete reference-Java2" – TMH

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4. R.K Das – "Core Java For Beginners" – VIKAS PUBLISHING
5. Deitel and Deitel – "Java How to Program" – 6th Ed. – Pearson
6. Ivor Horton's Beginning Java 2 SDK – Wrox
7. E. Balagurusamy – " Programming With Java: A Primer" – 3rd Ed. – TMH

Programming Languages

Code: EC605B

Contacts: 3L

Credits: 3

Introduction [3L]

Programming paradigms, Language translator, Basics of OOP, Structure of C++ program, Class and object, Abstraction and encapsulation, Polymorphism, Inheritance, Static and dynamic binding.

Declaration, Expression and statements [4L]

Data types, Variables, Constants, Operator and expression, Operator precedence and associativity. Statements: Labelled, Expression, Compound, Control, Jump, Declaration, Try-throw-catch.

Array, pointer and function [4L]

Array, Addresses, Pointer. Function: Declaration, Definition and call, Inline function, Main function argument, Reference variable, Function overloading, Default argument, Parameter passing, Recursion, Scope of variable, Return-by-value and Return-by-reference, Pointer to function

Data abstraction through classes and user defined data types [6L]

Class, Members, Constructor and destructor, Copy constructor.

Dynamic memory management: Operators new and delete, Malloc and free, Static member, Scope of class names, Scope of variables.

Operator Overloading [5L]

Overloading unary and binary operator, Overloaded function calls, Subscripting, class member access, Non-member operator, New and delete, Cast operator.

Class relationships [6L]

Introduction, Polymorphism, Coercion, Overloading, Parametric and inclusion polymorphism

Inheritance: direct and indirect superclasses, Multiple inheritance, Virtual base class, Friend, Virtual function, Abstract class, Overriding and hiding, Dynamic binding of functions, Virtual destructor and operators.

Template and Exception Handling [5L]

Class template, Member function inclusion, Function template, Specialization, Inheritance, Namespace.

Concept of exception handling, Catch block, Nested try-catch block, Condition expression in throw expression, Constructor & destructor, Runtime standard exception

Standard Library in C++ [3L]

Standard library function, Input and output, Iostream class hierarchy, Class ios, Other stream classes.

Object oriented design and modelling [4L]

Software development, Qualities of software system, Software architecture, Process life cycle, phases, Modularity, OO methodology, Modeling, UML overview, Object oriented design patterns.

Textbooks/References:

1. Schildt, H., *The Complete Reference C++*, McGraw – Hill.
2. C++ object oriented programming paradigm, Debasish Jana, PHI
3. Pooley, R and P. Stevens, *Using UML*, Addison-Wesley.
4. Programming In C++, Y.I. Shah and M.H. Thaker, ISTE/EXCEL BOOKS
5. Rambaugh, James Michael, Blaha – "Object Oriented Modelling and Design" – Prentice Hall, India
6. Rajaram: Object Oriented Programming and C++, New Age International

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ELECTRONIC MEASUREMENT AND INSTRUMENTATION

Code: EC605C

Contact: 3L

Credits: 3

Module	Topic	Hrs
Module I	Basic Measurement Concepts: Measurement systems – Static and Dynamic Characteristics – Units and Standards of measurements, –errors analysis, –moving iron meters, dynamometer, wattmeter– multimeter, – True rms meters– Bridge measurements, Wheatstone Bridge, Kelvin, Wein, Maxwell, Hay, Schering and Anderson Bridges.	6
Module II	Basic Measurement Concepts: Electronic Multimeter Current measurement with analog electronic instruments. Chopper stabilized amplifier for measurement of very low voltage and currents. Cathode Ray Oscilloscopes- Block Schematic, Principles and applications. Dual Trace and Dual Beam Oscilloscopes, Digital Storage Oscilloscopes	7
Module III	Signal Generator and Analysis Function Generators- RF Signal Generators- Sweep Generators – Frequency Synthesizer-Wave Analyzer-Harmonic Distortion Analyzer – Spectrum Analyzer	7
Module IV	Digital Instruments Comparison of analog & digital techniques- digital voltmeter- multimeter – frequency counters-measurement of frequency and time interval – extension of frequency range- measurement errors.	7
Module V	Data Acquisition Systems Elements of digital data acquisition system- interfacing of transducers –multiplexing – computer controlled instrumentation : IEEE 488 Bus. Optical Power Measurement, Optical Time Domain Reflectometer.	7

Total Lecture Hours 34

Books:

9. Modern Electronic Instrumentation & Measurement Techniques – Albert D. Helfrick & William D. Copper, Prentice Hall of India, 2003
10. Elements of Electronics Instrumentation & Measurement, Pearson Education 2003
11. Measurement System- Application & Design – Ernest O.Doeblin, Tata McGraw Hill 2004

Practical

Digital Communication Lab

Code: EC691

Contact: 3P

Credits: 2

- c) Design, implementation and study of all the properties of 7-length and 15-length pn sequences using shift register.
- d) Study of PAM and demodulation.
- e) Study of PCM and demodulation.
- f) Study of line coders: polar/unipolar/bipolar NRZ, RZ and Manchester.
- g) Study of delta modulator and demodulator.
- h) Study of adaptive delta modulator and demodulator.
- i) Study of BPSK modulator and demodulator.
- j) Study of BFSK modulator and demodulator.
- k) Study of ASK modulator and demodulator.
- l) Study of QPSK modulator and demodulator.
- m) Simulation study of probability of symbol error for BPSK modulation.
- n) Simulation study of probability of symbol error for BFSK modulation.

Digital Signal Processing Lab

Code: EC692

Contact: 3P

Credits: 2

Simulation Laboratory using standard Simulator:

1. Sampled sinusoidal signal, various sequences and different arithmetic operations.
2. Convolution of two sequences using graphical methods and using commands- verification of the properties of convolution.
3. Z-transform of various sequences – verification of the properties of Z-transform.
4. Twiddle factors – verification of the properties.
5. DFTs / IDFTs using matrix multiplication and also using commands.

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6. Circular convolution of two sequences using graphical methods and using commands, differentiation between linear and circular convolutions.
7. Verifications of the different algorithms associated with filtering of long data sequences and Overlap –add and Overlap-save methods.
8. Butterworth filter design with different set of parameters.
9. FIR filter design using rectangular, Hamming and Blackman windows.

Hardware Laboratory using either 5416 or 6713 Processor and Xilinx FPGA:

1. Writing & execution of small programs related to arithmetic operations and convolution using Assembly Language of TMS320C 5416/6713 Processor, study of MAC instruction.
2. Writing of small programs in VHDL and downloading onto Xilinx FPGA.
3. Mapping of some DSP algorithms onto FPGA.

Object Oriented Programming Laboratory

EC695A

L-0, T-0, P-3;

Cr 2

1. Assignments on class, constructor, overloading, inheritance, overriding
2. Assignments on wrapper class, arrays
3. Assignments on developing interfaces- multiple inheritance, extending interfaces
4. Assignments on creating and accessing packages
5. Assignments on multithreaded programming
6. Assignments on applet programming

Note: Use Java for programming

Preferably download "java_ee_sdk-6u4-jdk7-windows.exe" from

<http://www.oracle.com/technetwork/java/javase/downloads/java-ee-sdk-6u3-jdk-7u1-downloads-523391.html>

Programming Language Laboratory:

EC695B

L-0, t-0, p-3

Cr 3

To be uploaded later.

ELECTRONIC MEASUREMENT AND INSTRUMENTATION

Code: EC695C

Contact: 3P

Credits: 2

1. Study of Static Characteristics of a Measuring Instrument
2. Study of Dynamic Characteristics of a Measuring Instrument
3. Acquaintance with basic structure of DMM and measurement of different electrical parameters
4. Realization of Data Acquisition system
5. Wave and spectrum analysis using Q meter
6. Realization of a V-to-I & I-to-V converter.
7. Statistical analysis of errors in measurement .
8. Study of VCO (Voltage controlled oscillator) & PLL (Phase Locked Loop).

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Fourth Year - Seventh Semester

A. THEORY							
Sl. No.	Field	Theory	Contact Hours/Week				Cr. Pts
			L	T	P	Total	
1	EC701	Wireless Communication & N/W	3	0	0	3	3
2	EC702	Microelectronics & VLSI Designs	3	0	0	3	3
3	EC703 (With Lab)	A. RF & Microwave Engg. B. Optical Communication & N/W C. Computer Networks D. FPGA & Reconfigurable Computing E. Power Electronics	3	0	0	3	3
4	EC704 (No Lab)	A. Radar Engg B. Embedded Systems C. Cellular & Mobile Communication D. Biomedical Instrumentation	3	0	0	3	3
5	F. E.	9. Artificial Intelligence 10. Robotics 11. Data Base Management System 12. Mobile Computing	3	0	0	3	3
Total of Theory						15	15
B. PRACTICAL							
6	HU	Group Discussion	0	0	0	3	2
7	EC792	VLSI Design	0	0	3	3	2
8	EC793	A. RF & Microwave Engg. B. Optical Communication & N/W C. Computer Networks D. FPGA & Reconfigurable Computing E. Power Electronics	0	0	3	3	2
9	F.E791	16. Artificial Intelligence 17. Robotics 18. Data Base Management System 19. Mobile Computing	0	0	3	3	2
10	Industrial training		4 wks during 6th -7th Sem-break				2
11	Project part 1					3	2
Total of Practical						15	12
Total of Semester						30	27

EC701: WIRELESS COMMUNICATION AND NETWORKS

MODULE – I:

Cellular Mobile Wireless Networks: Systems and Design Fundamentals:

Brief introduction to mobile wireless communication and systems, Description of cellular system, Cellular Structure, Frequency Reuse, Cell clustering, Capacity enhancement techniques for cellular networks, cell splitting, antenna sectoring, Co-channel and Adjacent channel interferences, Channel assignment schemes – Fixed channel, Dynamic channel and Hybrid channel, mobility management – location management and handoff management, handoff process, different types of handoff. 6L

Characteristics of wireless channel and propagation path loss models:

Different Multi-path propagation mechanisms, Multi-path effects on mobile communication, Fading, different types of fading, small and large scale fading, slow and fast fading, narrowband and wideband fading, Inter symbol interference, fast fading model, Doppler effect due to velocity of mobiles, Rayleigh envelop, free space propagation model, two ray ground reflection model, log distance path loss model, log normal shadowing model, macro and micro cell propagation models, types of base stations and mobile station antennas. 6L

MODULE – II:

Modern Mobile Wireless Communication Systems

Evolution strategies – First Generation (1G) to Fourth Generation (4G), Personal Area Networks :PAN, Low Tier Wireless System: Cordless Telephone, Second Generation (CT2), Digital European Cordless Telecommunications (DECT), Public wide-area Wireless Networks: 1 G to 3G cellular networks 2L

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Multiple Access Technologies in cellular communication

Time division multiple access (TDMA), narrowband and wideband TDMA, synchronous and asynchronous TDMA, Frequency division multiple access (FDMA), Code Division Multiple Access (CDMA), Direct-sequence CDMA, spread spectrum technique, spectral efficiency of different wireless access technologies: Spectral Efficiency in FDMA system, Spectral Efficiency in TDMA system, Spectral Efficiency for DS-SS-CDMA system 3L

Cellular Communication Networks and Systems

Second generation (2G) Network: Global system for mobile communication (GSM): Architecture and Protocols Air Interface, GSM spectrum, GSM Multiple Access Scheme, GSM Channel Organization, Traffic Channel multi-frame, Control (Signaling) Channel Multi-frame, Frames, Multi-frames, Super-frames and Hyper-frames, GSM Call Set up Procedure, Location Update Procedure, Routing of a call to a Mobile Subscriber 3L

The concept of packet data services The 2.5 G General Packet Radio Services: GPRS Networks Architecture, GPRS Interfaces and Reference Points, GPRS Mobility Management Procedures, GPRS Attachment and Detachment Procedures, Session Management and PDP Context, Data Transfer through GPRS Network and Routing, The IP Internetworking Model 3L

Overview of CDMA systems: IS-95 Networks and 3G – The Universal Mobile Telecommunication System (UMTS)

CDMA based IS-95 Systems, forward link and reverse link for IS-95, handoff process in CDMA based IS-95 network. UMTS Network Architecture –Release 99, UMTS Interfaces, UMTS Network Evolution UMTS Release 4 and 5, UMTS FDD and TDD, UMTS Channels, Logical Channels, UMTS Time Slots 3L

MODULE – III:

Wireless Local Area Networks (WLAN): IEEE 802.11 Standards and Protocols

IEEE 802.11 standards, WLAN family, WLAN transmission technology, WLAN system architecture, Collision Sense Multiple Access with Collision Detection (CSMA/CD) and CSMA collision avoidance (CSMA/CA), Frequency Hopping Spread Spectra, 802.11 PHY and MAC layers, IEEE 802.11 Distributed Coordination function (DCF) and Point coordination function (PCF), Back off algorithm, Virtual carrier sense, MAC frame format. Security and QoS issues, WLAN applications 4L

Wireless Broadband Networks and Access

Evolution of broadband wireless, IEEE 802.16 standards : **WiMAX** , Spectrum Allocation, IEEE 802.16 Standard Architecture, Overview of WiMAX PHY, IEEE 802.16 MAC Layer, IEEE 802.16 Scheduling Services, Unsolicited Grant Service (UGS), Real-time Polling Service (rtPS), Non-real-time Polling Service (nrtPS), Best Effort (BE)

Overview of 3G Long Term Evolution (3G LTE) for broadband wireless communication, Orthogonal Frequency Division Multiple Access (OFDMA) 3L

MODULE – IV:

Mobile Internet Protocol

Basic Mobile IP, Mobile IP Type-MIPv4 and MIPv6, Mobile IP: Concept, Four basic entities for MIPv4, Mobile IPv4 Operations, Registration, Tunneling, MIPv4 Reverse Tunneling, MIPv4 Triangular Routing, Configuring PDP Addresses on Mobile Station, Mobility Classification, Seamless Terminal Mobility Management, Limitations of current TCP/IP networks for mobility support, Mobility solution, Accessing External PDN through GPRS/UMTS PS Domain, Transparent Access, Use of Mobile IP for Non-transparent access, Dynamically accesses IP address from External Network. 3L

TEXT BOOKS:

1. Wireless Networks: Applications and Protocols, T. S. Rappaport, Pearson Education
2. Wireless Communication and Networks : 3G and Beyond, I. Saha Misra, TMH Education.
3. Wireless Communications: Principles and Practice, T.S.Rappaport, PHI Learning.
4. Wireless Communications, Goldsmith, Cambridge University Press.

REFERENCE BOOKS:

- a) Lee's Essentials of Wireless Communications, MH Prof. Med/Tech
- b) Wireless Digital Communications: Modulations and Spread Spectrum Applications,
- c) . Feher, Prentice Hall.
- d) Wireless Communications and Networking, J.W.Mark and W. Zhuang, PHI.

Microelectronics & VLSI Designs – Prof. A.Sinha

RF & Microwave Engineering

Total Lectures: 39 periods (minimum) :

Module	Topics	Hours
1	26. Introduction RF & Microwave Spectrum, Typical applications of RF and Microwave, Safety considerations.	1
	27. Microwave Waveguide and Waveguide Resonator Rectangular Waveguide- Design consideration, TE & TM modes, TE ₁₀ mode analysis, cut-off frequency, propagation constant, intrinsic wave impedance, phase and group velocity, power transmission,	6

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	attenuation, waveguide excitation, wall current; Introduction of circular waveguide; Rectangular waveguide resonator- Design consideration, resonant frequency, Q-factor, excitation.	
	28. Planar Transmission line Micro-strip lines, Coplanar waveguide, Slot line-design consideration, field patterns, propagation characteristics, Comparison for different characteristics of the above mentioned lines.	3
2	4.High frequency Circuit Elements: Difference in High frequency and relatively low frequency behavior of Lumped circuit components. Miniaturization and Design of Lumped components at High RF. Realization of reactive elements as Waveguide and Planar Circuit components.	4
	5.Waveguide Passive Components and their S-matrix Representation N-port networks-Properties of S matrix, Transmission matrix & their relationships; Microwave passive components and their S matrix representation: Attenuators, Phase shifter, Directional coupler, Bethe-hole coupler, Magic tee, hybrid ring, Circulators, Isolators; Design procedure of filter (maximally flat and equal ripple) using insertion loss method-specification, low-pass prototype design, scaling and conversion, implementation.	8
3	6.Microwave Tubes Electron beam & Field interaction for energy exchange in resonant (two cavity klystron, Reflex Klystron, Magnetron) and non-resonant (TWT &BWO) microwave active devices: Typical characteristics & applications (only physical explanation is required, no mathematical derivation required).	4
	7.Semiconductor Microwave devices TED (Gunn diode) & Avalanche Transit Time (IMPATT) device, Schottky diode, PIN diode-characteristics & applications; Microwave bipolar transistor, Microwave field effect transistor(MESFET).	5
	8.Microwave Amplifier Design Basic consideration in the design of RF amplifier- Transistor S-parameter, Stability, matching network, noise figure; Matching network design using lumped elements and L-Section. Brief introduction to NBA, LNA.	4
4	9.Typical Microwave Test Bench & measurement VSWR meter, Tunable detector, Slotted line and Probe detector, Frequency meter, Network analyzer, Measurement of VSWR – low, medium and high, Measurement of power: low, medium and high, Frequency measurement.	4

Text Books:

1. *Microwave Engineering*, 3Rd Ed David M. Pozar, Willey & Sons Inc.
2. *Microwaves*, K C Gupta, New Age Publishers.
3. *Microwave Engineering*, A Das & S Das, TMH.
4. *Microwave Devices & Circuits*, SY Liao , Pearson Education /PHI

References Books:

- (5) *Microwave Engineering-Passive Circuits*, PA Rizzi , Pearson Education.
- (6) *Foundation of Microwave Engineering*, 2ed edition, Robert E Collin, McGraw Hill, Inc.
- (7) *Microwave Devices & Circuit Design* , GP Srivastava & VL Gupta, PHI

EC793A: Microwave Engineering Laboratory

Experiments

1. Determination of phase and group velocities in a waveguide carrying TE₁₀ Wave from Dispersion diagram [ω - β Plot].
2. Measurement of unknown impedance using shift in minima technique using a waveguide test bench/ Measurement of the susceptance of an inductive and or a capacitive window using shift in minima technique using a waveguide test bench
3. Study of the characteristics of a Reflex Klystron oscillator
4. Study of Gunn-oscillator Characteristics using X-band waveguide test bench.
5. Measurement of coupling factor, Directivity, Insertion loss and Isolation of a Directional coupler using X-band waveguide test bench set up.
6. Scattering matrix of a magic tee / E-plane tee / H-plane tee using waveguide test bench at X-band.
7. Experimental/Simulation Study of filter (LPF, HPF,BPF) response.
8. Measuring of dielectric constant of a material using waveguide test bench at X-band.

Reference Books

1. ML Sisodia & GS Raghuvanshi Basic Microwave Techniques and Laboratory Manual; Wiley Eastern Limited 1987
2. EL Gintzton Microwave Measurements, McGraw-Hill Book Co.
3. M Sucher and J Fox, Handbook of Microwave Measurements, Vol I, Wiley-Interscience Inc.

Optical Communication & N/W

Computer Networks

FPGA & Reconfigurable Computing

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POWER ELECTRONICS
Code: PE 601 (iii) Contact per week: 3-1-0 Credit: 4

Module	Topic	Hrs
Module I	Advances in Power Electronics Power Semiconductor Switches: Rectifier diodes, fast recovery diodes, Schottky barrier diode, Power BJT, Power MOSFET, SCR, TRIAC, IGBT and GTO. Ratings, Static and Dynamic Characteristics, Trigger, driver and switching-aid circuits and cooling. SCR turn –on and turn - off methods, Triggering circuits, SCR Commutation circuits, SCR Series and Parallel operation, Snubber Circuit.	6
Module II	Rectifiers Single phase and three phase controlled Rectifiers with inductive loads, RL load Effect of source inductance- performance parameters .Dual Converters.	6
Module III	Step up and Step down choppers Time ratio control and current limit control, Buck, Boost, Buck Boost and Cuk Converters, Concept of Resonant Switching.	4
Module IV	Single phase and three phase inverters – PWM techniques, Sinusoidal PWM, modified Sinusoidal PWM - multiple PWM Voltage and harmonic Control – Series resonant inverter-Current Sources Inverter.	6
Module V	AC Voltage Controllers, Single phase and three phase Cycloconverters – Power factor control and Matrix Converters.	4
Module VI	DC and AC Drives DC Motor Speed control Induction Motor Speed Control Synchronous Motor Speed Control	8
Total Lecture Hours		34

Books:

- b) P.C. Sen, Power Electronics
- c) M.H. Rashid, Power Electronics, PHI/ Pearson Education
- d) C.W. Lander, Power Electronics, McGraw Hill
- e) B.K.Bose, Modern Power Electronics, JAICO
- f) Mohan, N Undeland, TM & Robbins, WP- Power Electronics, John Wiley & Sons

Radar Engg
Embedded Systems
Cellular & Mobile Communication

P.E. 702(D) Syllabus for Biomedical Instrumentation (ECE 4th year / 7th Semester)

Module -1 (Fundamentals)

- 1.1 Introduction to Physiological Systems –Organism, Cardiovascular, Respiratory, Renal, Hepatic, Gastrointestinal, Endocrinal, Nervous, Muscular, Cellular [2]
- 1.2 Biological Signals – Bioelectric events, Biomechanical Systems, Cellular & Membrane phenomenon. The Action Potential and Propagation through Nervous System. The Peripheral Nervous Systems and sensory mechanisms. Biomaterials. [2]
- 1.3 Fundamentals of Electrophysiology –EKG, EEG, EMG, Evoked potentials. Quantification of Biological Signals[2]

Module 2 (Measurement & Analysis)

- 2.1 Biological Sensors- Bio-electrodes, Biosensors and Transducers for Cardiology, Neurology, Pulmonary, Oxygen saturation & gaseous exchange, flow measurement, goniometry, Endoscopy, Impedance Plethysmography. [3]
- 2.2 Biological Amplifiers –Instrumentation Amplifiers for Electrophysiology (ECG, EMG, EEG, EOG), Filters, Power Supplies. [3]
- 2.3 Recording and Display systems, Digital Conversion for storage, Electrical Hazards in measurements, Isolation Circuits, calibration, alarms & Multi-channel re-constitution [2]
- 2.4 Hospital requirements – Multi-parameter bed-side monitors, Central Nursing Stations, Defibrillators, Ventilators, Catheters, Incubators. [2]

Module - 3 (Life-Support & Treatment)

- 3.1 Cardiac Support: Implantable & programmable Pacemakers, External & Internal Defibrillators, Coronary Angiography.

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- 3.2 Electro-physiotherapy : Shortwave & ultrasonic diathermy, Transcutaneous Nerve Stimulators in pain relief, Traction Systems, Ultrasound in bone fracture regeneration, hypothermia & hyperthermia systems. [2]
[3]
- 3.3 Lasers in treatment and surgery : Ophthalmic, Ablators, Endoscopic [2]
- 3.4 Assists and Artificial limbs- Orthoses , passive and powered Prostheses [2]
- Module-4 (Imaging)**
- 4.1 Fundamentals of X-Rays, Radiological Imaging, Digital Radiology, DSA. [3]
[3]
- 4.2 Computer Tomography, Image Processing, solid state sensors, whole-body scans. [1]
- 4.3 Gamma camera & radio- isotope imaging. [3]
[2]
- 4.5 Ultrasonography- Transducers, Signal Conditioners, 2D & 3D scans, Doppler & Colour Doppler [3]
[2]
- 4.6 Fundamentals of Magnetic Resonance Imaging and PET - scans [2]

Text Books:-

- 2) R S Khandpur:- Handbook of Biomedical Instrumentation (Tata –Mcgraw Hill Education) [Partly Downloadable]
- 3) M E Valentiniuzzi:- Understanding the Human Machine- A Primer for Bioengineering [Freely Downloadable in PDF] (World Scientific Publishing Co. Pte. Ltd, Singapore)
- 4) L Cornwell, F.J. Weibell & E.A. Pfeiffer:- Biomedical Instrumentation and Measurements(Prentice Hall/ Medical)
- 5) J G Webster & J W. Clark:- Medical Instrumentation – Application & Design (Houghton Mifflin Pub)
- 6) J J Carr & JM Brown:- Introduction to Bio-medical Equipment Technology(Regents / Prentice Hall)
- 7) J Tompkins & J G Webster :-Design of Micro- controller based Medical Instrumentation (Prentice Hall Inc)

Reference Books:

1. W.B. Blesser :- A systems approach to Biomedicine (McGraw Hill.,NY)
2. J H U Brown, J E Jacobs & L Stark:- Biomedical Engineering (Davis Co, Philadelphia, USA)
3. L A Geddes & L E Baker :- Principles of Applied Biomedical Instrumentation (John Wiley & sons, NY)
4. J H Milsum:- Biological Control Systems(Mc Graw Hill, NY)
5. R Plonsey:- Bioelectric Phenomena (McGraw-Hill Co, NY)

Artificial Intelligence – Existing CSE

Robotics – Existing CSE

Data Base Management System – Existing CSE

Mobile Computing – Existing CSE

Smart Antenna

Fourth Year - Eighth Semester

Sl. No.	Theory	Contact Hours/Week				Cr. Pts
		L	T	P	Total	
1	HU Organisational Behaviour	2	0	0	2	2
2	EC 13. Smart Antenna 801 14. Digital Image Processing 15. Audio & Speech Processing 16. Adaptive Signal Processing	3	0	0	3	3
F. E.- 8013	10. Neural N/W & Applications 11. Material Sc & Engg 12. Satellite Communication & Remote Sensing 13. Nonconventional Energy	3	0	0	3	3
Total of Theory					8	8
B. PRACTICAL						
4	Desi Design Lab / Industrial problem related practical gn training	0	0	6	6	4
5	Proj Project-2 ect.	0	0	12	12	6
10Grand Viva						3
Total of Practical					18	13
Total of Semester					26	21

P.E. 801(B) Syllabus for Image Processing (Elective) ECE 4th yr/8th semester

Objective: The course provides grounding in digital filter and transforms techniques for image processing and feature extraction, and an overview of common heuristic algorithms for Image Processing. The different representations of digital images, the importance of adequate sampling frequencies and the appearance of artifacts. Also how the important features in an image may be related to significant abstractions from the raw image. Prerequisite: Digital Signal Processing, Signals and Systems.

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Module 1

Digital Image Processing Systems:

Introduction to structure of human eye, Image formation in the human eye, Brightness adaptation and discrimination, Image sensing and acquisition, storage, Processing, Communication, Display Image Sampling and quantization, Basic relationships between pixels. [4]

Module 2

Image Transforms (implementation):

Introduction to Fourier transform, DFT and 2-D DFT, Properties of 2-D DFT, FFT, IFFT, Walsh transform, Hadamard transform, Discrete cosine transform, Slant transform, Optimum transform: Karhunen – Loeve (Hotelling) transform. [7].

Module 3

Image Enhancement in the Spatial and Frequency Domain:

Gray level transformations, Histogram processing, Arithmetic and logic operations, Spatial filtering: Introduction, Smoothing and sharpening filters. Frequency domain filters: Homomorphic filtering. [6]

Module 4

Image Data Compression:

Fundamentals, Redundancies: Coding, Interpixel Psycho-visual, fidelity criteria, Image compression models, Error free compression, Lossy compression, Image compression standards: Binary image and Continuous tone Still Image compression standards, Video compression standards. [6]

Module 5

Morphological Image Processing:

Introduction, Dilation, Erosion, Opening, closing, Hit -or-miss transformation, Morphological algorithm operations on binary Images, Morphological algorithm operations on gray-scale Images. [6]

Module 6

Image Segmentation, Representation and Description: Detection of discontinuities, Edge linking and Boundary detection, Thresholding Region based segmentation, Image Representation schemes, Boundary descriptors, and Regional descriptors. [7]

Text Books:

1. R.C Gonzalez and R. Woods :-Digital Image Processing, (Indian reprint: Pearson publication, 2001)
2. Anil K. Jain :- Digital Image Processing (Prentice-Hall, India)

Reference Books:

1. W. K. Pratt :- Digital Image Processing, - 2nd Edition, (John Wiley & Sons).
2. B. Chanda & D. Dutta Majumder, Digital Image Processing and Analysis, (Prentice-Hall, India)
3. M. A. Sid-Ahmed :- Image Processing- Theory, Algorithms & Architecture, (McGraw-Hill).

EC801(C) Syllabus for Audio & Speech Processing (Elective) ECE 4th yr/8th sem.

Objective: The course provides fundamentals in human speech and music analysis, modeling and processing using digital filters and Pattern Recognition techniques, and an overview of Hidden Markov Models for speech encoding. The different representations of digitized human speech, the importance of adequate voiced and unvoiced speech sounds grouped into phonemes, are used along with spectrograms for speech recognition, articulation and understanding. Also covered are - how the dominant features of speech may be analyzed to form significant abstractions for speaker identification and speaker-independent linguistic comprehension. Prerequisites: Audio Systems, Analog Filters, Digital Signal Processing.

Module -1

Introduction : Production and transmission of acoustic signals : articulation of human speech. Acoustic-phonetic structure of Speech and Music : music synthesis and speech synthesis. A history of Voders & Vocoders and early speech recognition methods. [4]

Module -2

Acoustic-Phonetic classification : Phonemes, Auto-spectra. Review of Digital Signal Processing and FFT. Short-term Spectral Analysis and STFT, the ARPA and DARPA projects, Pattern matching, introduction to Hidden Markov (HMM) Models. Adaptive segmentation of speech. [6]

Module -3

The stochastic parameters of human speech, Gaussian densities and statistical model training, voiced and unvoiced speech, voice-box modeling, resonance. Acoustic travelling waves. Psycho-acoustics, Physiological exploration of periodicity, audio-spectrograms and sonograms, pitch-perception models. [7]

Module -4

Physiology of the ear and hearing mechanism, the Auditory System modeled as a Filter-bank, Gamma-tone and Roex filters, Spectrum and Complex Cepstrum analysis of speech as perceived by detectors, Automatic Speech Recognition (ASR), Linear Prediction analysis [7]

Module -5

Phonetic and phonemic alphabets, phonological models of ASR, Linear and Dynamic Time-warping, connected word recognition, Statistical sequence recognition and model training in speech pattern recognition, HMM training, Viterbi training, MLP architecture

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and training,

[8]

Module -6

Speech Synthesis and coding, Formant synthesizers, Vocoders, Speech transformation, Speaker verification, Music synthesizers, speech-assisted applications in industry, defence and medicine. [5]

Text Books :

7. B.Gold & N.Morgan :- Speech & Audio Signal Processing -*Processing and Perception of Speech & Music* (Wiley Student edition)
8. L.R. Rabiner & B.H.Juang :- Fundamentals of Speech Recognition (Prentice-Hall Signal Processing series)
9. B.Plannerer : An Introduction to Speech Recognition [Freely downloadable e-Book]
10. F.Mihelic & J.Zibert : Speech Recognition (InTech) [Freely downloadable e-Book]
11. I. McLaughlin : Applied Speech and Audio Processing with MATLAB examples (Cambridge University Press)

Reference Books :

- viii) G. Young :-The Application of Hidden Markov Models in Speech Recognition [freely downloadable e-Book]
- ix) M.Grimm & K.Kroschel :-Robust Speech Recognition & Understanding (Intech)[Freely downloadable]
- x) L. R.Rabiner & R.W.Schafer : Theory and Applications of Digital Speech Processing (Hewlett-Packard Labs/Pearson Pub)
- xi) C. Schmandt :- Voice Communication with Computers-Conversational Systems (Van Norstrand Reinhold Computers Series)
- xii) SOUND FORGE software package (SONY) for practice sessions [freely downloadable]

Adaptive Signal Processing –

Neural N/W & Applications - CSE

Material Sc & Engg –

Satellite Communication & Remote Sensing

Nonconventional Energy