NORTH MAHARASHTRA UNIVERSITY, JALGAON (M.S.)

MASTER OF ENGINEERING (M.E.)

ELECTRONICS AND COMMUNICATION,

ELECTRONICS AND TELECOMMUNICATION

(Communication Engg.)

W.E.F 2010 - 2011

North Maharashtra University Jalgaon

ME Electronics and Telecommunication / Electronics and Communication (Communication Engg)

(W.E.F: 2010-11)

Structure

First Year Term-I

Sr No	Subject	Teaching Scheme Hours/Week		Examination Scheme				
		Lectures	Practical	Paper Duration Hours	Maximum Marks			
					Paper	Term Work	Practical	Oral
1	Advanced Digital Signal Processing & Processors	3	-	3	100	-	-	-
2	Advanced VLSI Design	3	-	3	100	-	-	-
3	Advanced Light Wave Communication	3	-	3	100	-	-	-
4	Advanced Communication Systems	3	-	3	100	-	-	-
5	Elective-I	3	-	3	100	-	-	-
6	Laboratory Practice-I	-	6	-	-	100	-	50
7	Seminar-I	-	4	-	-	100	-	-
	Total	15	10	-	500	200	-	50
	Grand Total	25			750			

First Year Term-II

Sr No	Subject	Teaching Scheme Hours/Week		Examination Scheme				
		Lectures	Practical	Paper Duration Hours	Maximum Marks			
					Paper	Term Work	Practical	Oral
1	Advanced Digital Image Processing	3	-	3	100	-	-	-
2	Communication System Design	3	-	3	100	-	-	-
3	Mobile Communication	3	-	3	100	-	-	-
4	Antenna Theory & Design	3	-	3	100	-	-	-
5	Elective-II	3	-	3	100	-	-	-
6	Laboratory Practice-II	-	6	-	-	100	-	50
7	Seminar-II	-	4	-	-	100	-	-
	Total	**15**	**10**	**-**	**500**	**200**		**50**
	Grand Total	**25**			**750**			

Elective for First Year Term I & II

Sr No	Elective-I	Sr No	Elective-II
1	Modeling and Simulation	1	Multimedia Communication
2	Advanced Telecomm Network Management	2	Error Control Codes
3	Linear System Theory	3	Advanced Embedded System Design
4	Optimization Technique	4	Speech and Audio Processing
5	Random Process	5	Artificial Intelligence and Soft Computing

Second Year Term - I

Sr No	Subject	Teaching Scheme Hours/Week		Examination Scheme				
		Lectures	Practical	Paper Duration Hours	Maximum Marks			
					Paper	Term Work	Practical	Oral
1	Seminar III	-	4	-	-	50	-	50
3	Project Stage-I	-	18	-	-	100	-	-
	Total	**22**			**200**			

Second Year Term - II

Sr No	Subject	Teaching Scheme Hours/Week		Examination Scheme				
		Lectures	Practical	Paper Duration Hours	Maximum Marks			
					Paper	Term Work	Practical/ Presentation	Oral
1	Progress Seminar	-	-	-	-	50	-	-
2	Project Stage –II	-	18	-	-	150	-	100
	Total	**18**			**300**			

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First Year Term – I

ADVANCED DIGITAL SIGNAL PROCESSING AND PROCESSORS

Teaching Scheme:
Lectures: 3 Hrs / week

Examination Scheme:
Theory Paper: 100 Marks (3 Hours)

Introduction and Transforms: Discrete time signal and systems, its representation, types of discrete time system, DFT, IDFT, FFT (DIF and DIT), Wavelet Transform.

Power spectral estimation - parametric and nonparametric method for power spectral estimation, minimum variance.

Realization of FIR and IIR filter.

Design of digital filters-symmetric and anti-symmetric, linear phase, optimum, Equi-ripple, FIR differentiation, Hilbert's transformers.

Design of FIR filters using different Window technique.

Design of IIR filters-impulse invariance, bilinear transformation, matched transformation, frequency transformation in analog and digital domain.

Least mean square Adaptive filter: Overview of the structure, operation of the LMS algorithm, LMS adaptive algorithm, statistical LMS theory, Comparison of the LMS algorithm with the steepest Descent algorithm, Computer experiment on adaptive prediction, Computer experiment on adaptive equalization, Computer experiment on a minimum- variance distortion less response beam former, Directionality of convergence of the LMS algorithm for Nonwhite Inputs, Robustness of the LMS filter, Upper bound on the step size Parameters for Different Scenarios, Transfer function approach for deterministic input summary problems.

Multirate digital signal processing-decimation by factor D, interpolation, filter design and implementation, sampling rate conversion, application of multirate signal processing.

Design of digital filters based on least square method.

Application of DSP to speech processing and radar signal processing.

Introduction to TMS320c62XX DSP processors.

References:

1. John Proakis, Digital Signal Processing Prentice Hall
2. A.V.Oppenhiem & R.W.Schafer, Digital Signal Processing - Prentice Hall
3. L.R.Rabiner & B.Gold, Theory & application of digital signal processing- Prentice Hall
4. A. Antiniou, Digital Filters; analysis, design & application- Mcgraw Hill
5. Salivahanan, vallavaraj ,gnanapriya, Digital Signal Processing-TMH
6. S.K.Mitra, Digital Signal Processing - TMH

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First Year Term – I

ADVANCED VLSI DESIGN

Teaching Scheme:
Lectures: 3 hrs / week

Examination Scheme:
Theory Paper: 100 Marks (3 Hours)

Review of HDL Programming: Hardware modeling with VHDL, different VHDL constructs, and Logic Synthesis. Levels of abstraction, different modeling styles: Data flow, Behavioral, Structural, Mixed and switch level Description.

Designing steps in ASIC: Physical Design flow, Different type of ASIC, CAD Tools, System Partitioning, Estimating ASIC size, Power dissipation, FPGA Partitioning methods, Floor planning, Placement Physical design flow; Information Formats; global routing, detailed routing; special routing; circuit extraction and DRC

Introduction to CMOS circuits: MOS Transistor, CMOS Logic The inverter, combination logic, The NAND and NOR Gates, Compound gates, Multiplexers, Memory Latches and Registers, Circuit and Systems representation and examples Behavioral, Structural and Physical representation.

Review of MOS Transistor Theory: n-MOS and p-MOS Enhancement transistor, Threshold voltage equations, Body effects, MOS device Design equations, Basic DC equations, second order effects, MOS Models, Complementary CMOS inverter DC Characteristics, Noise margin, Static load MOS Inverters, Differential Inverter, the transmission gate, Tristate Inverter, Bi-CMOS Inverters.

CMOS Processing Technology: Basic CMOS technology, n and p well processes, CMOS Process Enhancements, Layout design rules, Technology related CAD issues

Circuit Characterization and performance Estimation: Resistance and capacitance estimation, Inductance m switching characteristics analytical, empirical delay models, gate delays, CMOS Gate transistor sizing, Power dissipation, Sizing routing conductors, Charge sharing, Yield, reliability, Scaling of MOS Transistor dimensions

CMOS Circuit and Logic Design: CMOS logic gate design, Basic Physical design of simple logic gates, CMOS logic structures, Clocking strategies, I/O structures, Low power design.

References:

1. Nazeib M. Botros "HDL programming Fundamentals VHDL and Verilog", Thomson Publication.
2. Neil H. E. Weste, Kamran Eshrghian, "Principles of CMOS VLSI design: a systems perspective", 2nd ed., Pearson Education Asia (Addison Wesley Publishing Company).
3. M J S Smith "Application Specific Integrated Circuits", Pearson Education Asia
4. J Bhaskar, "A VHDL Primer", Pearson Education Asia
5. Douglas Perry , "VHDL Programming" , Tata MC-Graw Hill
6. Xilinx data manual, "The Programmable Logic data Book"
7. Yu. Chin Hsu, K. Tsai, "VHDL Modeling for Digital Design Synthesis", Kluwer publishers.
8. Jan M Rabaey, Anantha Chandrakasan, BorivojeNikolic "Digital Integrated Circuits: A Design Perspective", 2nd ed, Pearson Education Asia.
9. Sung-Mo Kang, Y. Leblebici "CMOS Digital Integrated Circuits" TMH.
10. Ivan Sutherland "Logical effort", Morgan Kauf

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First Year Term – I

ADVANCED LIGHT WAVE COMMUNICATION

Teaching Scheme:
Lectures: 3 hrs / week

Examination Scheme:
Theory Paper: 100 Marks (3 Hours)

Light Wave Components: Optical sources, ternary materials, qua-ternary materials, detectors, APD. Fiber bragg gratings, linear and non linear FBG. Electro-optic devices, magneto-optic devices, acousto-optic devices, nonlinear optical devices, filters, amplifiers.

Light Wave Sensors: FBG sensors and their applications, fiber sensors for current and voltage measurement .

Light Wave Communication: Analog and digital optical transmitter and receiver concept, loss limited and dispersion limited light wave system, telecommunication fiber link, dispersion compensation techniques, power and rise time budget, power penalty. Radio over fiber technology, microwave photonics, wireless optical communication system.

Coherent Light Wave System: Modulation and demodulation scheme for coherent communication, heterodyne synchronous and non synchronous detection, homodyne detection, phase diversity reception, receiver sensitivity, single and multicarrier system.

Mutichannel Light Wave System: WDM components and devices, multiplexing techniques and system performance issues, WDM network design, cost tradeoffs, LTD and RWA problems, routing and wavelength assignment, wavelength conversion.

Soliton Communication: Fiber solitons, soliton based communication principles, soliton amplification, soliton system design, WDM soliton systems.

Light Wave Networks: Network topologies, SONET / SDH, single hop networks, multihop networks, wavelength routed network, optical CDMA, photonic packet switching, ultrahigh capacity networks, network management functions, management frame work, ATM function, adaption layers, frame structure, quality of services and flow control, ESCON, HIPPI.

References :

1. John M. Senior, “Optical Fiber Communications”, Pearson education.
2. Rajiv Ramswami, N Sivaranjan, “Optical Networks”, M. Kauffman Publishers.
3. Gerd Keiser, “Optical Fiber Communication”, MGH.
4. G. P. Agarawal, “Fiber Optics Communication Systems”, John Wiley New York
5. P. E. Green, “Optical Networks”, Prentice Hall, 1994.
6. B. P. Pal, “Optical Devices & Sensors”
7. Ajoy Ghatak ,”Optical Electronics” Cambridge Uuniversity Press.

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First Year Term – I

ADVANCED COMMUNICATION SYSTEMS

Teaching Scheme:
Lectures: 3 Hrs / week

Examination Scheme:
Theory Paper: 100 Marks (3 Hours)

Characterization of Communication Signal and Optimum Receiver for AWGN Channel:
Signal space representation, Memory less modulation methods, Linear Modulation with memory, Non linear modulation methods with memory, CPFSK and CPM, Power spectral of linear modulated signal, CPFSK and CPM Signals, Correlation demodulator, Match filter demodulator, Optimum detector, Probability of error for binary and M-array signals.

Source and Channel Coding: Discrete stationary sources, LZ algorithm, Coding of analog sources, Rate distortion functions, Scalar quantization and vector quantization, Temporal and spectral waveform coding, BCH codes, Reed Solomon codes, Reed Muller codes, convolution codes, transfer function of convolution codes, Viterbi decoding algorithm, stack algorithm (no problems expected) trellis coded modulation.

Signal Design for Band Limited Channel and Equalization. Design of band limited signal for zero ISI, Nyquist criterion, design of band limited signal for controlled ISI, partial response signal. Data detection for controlled ISI, Linear Equalization – peak distortion criteria, mean square error (MSE) criteria, decision feedback equalization, coefficient optimization, adaptive linear equalization, zero forcing algorithm

Spread Spectrum Techniques: Generation of PN sequence, direct sequence spread spectrum system, processing gain, jamming margin, application of direct sequence spread spectrum signal, frequency hopped spread spectrum signal, time hopping spread spectrum signal, synchronization of spread spectrum signal - acquisition and tracking.

Text Books:

1. J G Proakis, "Digital Communication" 4th Ed. MGH
2. Shu Lin, Daniel J. Costello, "Error Control Coding – Fundamentals & applications," Prentice Hall

References :

1. Bernard Sklar, "Digital Communication" Fundamental & application", 2nd Ed. Pearson Education, Asia.
2. Simon Haykins, "Digital Communication" John Wiley & Sons. PHI
3. J P Proakis, M Salehi, "Communication System Engineering" 2nd Ed. Pearson Edition (LPE)
4. Salvatore Gravano, "Introduction to Error Control Codes", 1st Edition, Oxford Press.
5. Stephen Wicker, "Theory of Error Correcting Codes", PHI
6. K S Shanmugan, "Digital& Analog Communication System" John Wiley & Sons.

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First Year Term – I (**Elective I)**

MODELING AND SIMULATION

Teaching Scheme:
Lectures: 3 hrs / week

Examination Scheme:
Theory Paper: 100 Marks (3 Hours)

Methods of solution of network, Network equations and formulations, DC , AC and transient analysis of networks, Simulation examples using Spice or other relevant packages.

Types of modeling, Models of diode, BJT and FET, Design and simulation of Logic circuits and analog circuits, Sensitivity and optimization of networks and functions.

Features, levels of abstraction, elements, simulation process, types of simulators, FSM modeling, test benches, generics and attributes, synthesis tools features and optimization in VHDL, Synthesis guidelines, Timing issues : terminology, flow diagram, clock, gated clock, setup & hold time, violation, meta stability, static & dynamic timing analysis.

CMOS and Bi-CMOS logic families and PLD architecture, Power dissipation, noise and ESD issues, clock distribution, signal connections, synchronous and asynchronous design features, and memory system design. Classification of CPLD architecture, CPLD 9500 series, Xilinx FPGA –XC4000 series, designing steps in ASIC.

References:

1. L. Vlach & K. Singhal "Computer methods for circuit Analysis and Design" John Wiley & Sons, Inc.
2. M. Law, W. D. Kelton, "Simulation Modeling and Analysis", MGH
3. James E. Buchanan "Bicmos – CMOS System design" McGraw Hill
4. Douglas Perry, "VHDL", MGH
5. Yu. Chin Hsu, K. Tsai , "VHDL Modeling for Digital Design Synthesis" Kluwer publishers.

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First Year Term – I (**Elective I)**

ADVANCED TELECOM NETWORK MANAGEMENT

Teaching Scheme:
Lectures: 3 Hrs / week

Examination Scheme:
Theory Paper: 100 Marks (3 Hours)

Management Platforms:
The Well designed Platform system, Methods and tools, Standards and platform building blocks. Management of Personal communication systems Managing Mobile Networks from cellular to satellite networks, Digital and analogue microwave radio systems: System protection, FM analogue microwave radio, Digital microwave radio - transceiver, low capacity and high capacity.

Telecom Networks:
Introduction, Analog Networks, Integrated Digital Networks, Integrated services Digital Networks, Cellular radio Networks, Intelligent Networks, Private Networks, Numbering, National Schemes, International Numbering, Numbering Plan for the ISDN , Public Data Networks, Charging, Routing, General, Automatic alternative routing, Numbering, Network Management, IN, VPN, B-ISDN Telecommunications Network, Management.

Traffic Engineering:
Network Traffic Load and Parameters Grade of Service and Blocking Probability, Modeling switching Systems, Incoming Traffic and Service Time Characterizations, Blocking Models and Loss Estimates, Delay Systems, Traffic Measurement, Lost call System, Queuing System.

Symmetric Ciphers:
Overview of network security and cryptography, model for network security, classical encryption techniques, block ciphers and data encryption standard (DES), Advanced encryption standard (AES), contemporary symmetric ciphers, and confidentiality using symmetric encryption.

Public key Cryptography:
RSA, key management, Different Hellman key exchange, elliptic curve Arithmetic, elliptic curve cryptography.

Message Authentication and Hash functions:
Authentication requirements, authentication functions, message authentication codes, Hash functions, security of Hash functions and MACs.

Hash Algorithms:
MD5 message Digest Algorithm, Secure Hash Algorithm, Digital Signatures and authentication protocols, Digital signature standard.

References:

1. Viswanathan, "Telecommunication Switching Systems and Networks", PHI.
2. J. E. Flood, "Telecommunication Switching Traffic and Network", Pearson Education.
3. Robert G. Winch, "Telecommunication Transmission Systems", MGH.
4. Wayne Tomasi, "Introduction to Telecommunication Voice Data Internet", PHI.
5. William C. Y. Lee, "Mobile Cellular Telecommunication", MGH.
6. John C. Bella, "Digital Telephony", John Wiley & Sons.

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First Year Term – I (**Elective I)**

LINEAR SYSTEM THEORY

Teaching Scheme:
Lectures: 3 hrs / week

Examination Scheme:
Theory Paper: 100 Marks (3 Hours)

Mathematical Review and Introduction

Upper and lower triangular, symmetric matrices, various operations on matrices, Eigen values and Eigen vectors, similarity transformation , modal matrix, companion form, diagonal form, Cayley- Hamilton theorem, matrix functions, vectors, linear spaces, basis, orthonormal basis, norms and their properties, singular value decomposition (SVD). Limitations of conventional control theory, Introduction of modern control theory and its applications.

State Space Representation of Linear Continuous Time Systems

State variable representation of continuous time linear system, Conversion of state variable models to transfer function, Conversion of transfer function to canonical state variable models, State transition matrix and its properties, Controllability and observability, State and output feedback, Pole region assignment

Signal Processing in Digital Control

Principles of signal conversion, Basic discrete time signals, Time domain models for discrete-time systems. Transfer function models, Stability on the Z-plane and jury stability criterion. Sampling as impulse modulation, Sampled spectra and aliasing. Filtering, choice of sampling rate, Principles of discretisation.

State Space Representation of Linear Discrete Time Systems

State space representation of discrete system - Decomposition of Transfer functions - Solution of discrete time system - state transition matrix - Discretisation of continuous time state equations, Characteristic equation, Eigen values and Eigen vectors, Invariance of Eigen values , Diagonalization, Jordan Canonical form, controllability and observability, Kalman's and Gilbert's tests, Controllable and observable phase variable forms, State feedback, Pole placement design

References:

1. Katsuhiko Ogata, "Modern Control Engineering", Prentice Hall of India Private Ltd.
2 Nagrath I J and Gopal M, "Control Systems Engineering", New Age International Publisher,
3. Gopal M, “Digital Control and State Variable Methods”, Tata McGraw-Hill Publishing Company
4. Nise S Norman, “Control Systems Engineering”, John Wiley & Sons, Inc.
5. Benjamin C Kuo, “Automatic Control Systems”, John Wiley & Sons, Inc., Delhi, 2002.
6 Chen C T “Linear Systems Theory and Design”. Oxford Univ. Press

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First Year Term – I (**Elective I)**

OPTIMIZATION TECHNIQUES

Teaching Scheme:
Lectures: 3 hrs / week

Examination Scheme :
Theory Paper: 100 Marks (3 Hours)

Introduction: Historical development, Application to Engineering. problems, Statement of optimization.

Classification of Optimization: Multivariable optimization with and without constraints, linear programming standard form of linear programming, Geometry, Simplex programming, revised simplex algorithm, revised simplex method.

Duality in Linear Programming: Decomposition principle, Transportation problem. Nonlinear programming , single dimensional minimization methods, Exhaustive search, Fibonacci method, Golden section, Quadrature interpolation, Cubic interpolation , Direct root method, Steepest decent method, Fletcher-Reeves method, David-Fletcher-Powell Method.

Dynamic Programming: Multistage decision process, principle of optimality, Computational procedures in dynamic programming, Linear programming as a case of dynamic programming.
Optimization application for assignment and Network problems, Pareto optimality, and Finite element based optimization.

References:

1. S.S. Rao, "Optimization Theory & Application", Wiely Eastern
2. G. Hadly, "Linear Programming", Welsly
3. Peithpler Philips Wilde, "An Introduction to Optimization", PHI
4. A. D. Belegundu, Tirupati R. Chandrupatla, "Optimization concepts & application in Engg", PHI

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First Year Term – I (**Elective I)**

RANDOM PROCESSES

Teaching Scheme:
Lectures: 3 hrs / week

Examination Scheme:
Theory Paper: 100 Marks (3 Hours)

Concepts of Probability: Conditional probability and Baye's theorem, Independence of events, Bernoulli trails.

Random Variables: Cumulative distribution, Joint probability density function, Statistical properties, Jointly distributed Gaussian random variables, Conditional probability density, properties of sum of random variables, Central limit theorem, Estimate of population means, expected value and variance and covariance, Computer generation of random variables.

Multiple Random Variables: joint cumulative distribution function, Joint probability density function statistical properties, Jointly distributed Gaussian random variables, Conditional probability density, properties of sum of random variables, Central limit theorem, Estimate of population means, Expected value and variance and covariance, Computer generation of random variables.

Markov Chains: Chapman Kolmogorov equation, Classification of states, Limiting probabilities, Stability of Markov system, Reducible chains, Markov chains with continuous state space.

Queuing Theory: Introduction, Cost equation, steady state probabilities, Models of single server exponential queuing system with no limit and with finite buffer capacity (M/M/I, M/M/N). Queuing system with bulk service, Network of queues with open system and closed system. The M/G/I system and application of work to M/G/I.

Random Processes: Properties, Auto correlation and cross correlation function, Estimate of auto correlation function.

Spectral Density: Definition, Properties, white noise, Estimation of auto-correlation function using frequency domain technique, Estimate of spectral density, cross spectral density and its estimation, coherence.

References :

1. Sheldon M. Ross, "Introduction to probability Models", 3rd Ed, Academic Press.
2. Alberto Lean-Garcia, "Probability and Random Processes for Electrical Engg" Pearson Education.
3. J. Medhi, "Stochastic Processes" , New Age International
4. Athanasios Papoulis, "Probability random variables & Stochastic process" MGH
5. Murrary R. Spiegel, "Probability & Statistics", MGH

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First Year Term – I

LABORATORY PRACTICE-I

Teaching Scheme:
Practical: 6 Hrs per week

Examination Scheme:
Term Work: 100 Marks
Oral: 50 marks

Experiments / Assignments based on any three subject out of which one should be elective from First Year Term – I syllabus. The concerned subject in-charge should frame minimum of six laboratory experiments or assignments, two from each subject.

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First Year Term – I

SEMINAR-I

Teaching Scheme:
Practical: 4Hrs / week

Examination Scheme:
Term Work: 100 Marks

Seminar on related state of the art topic of student's own choice approved by the department.

Term Work

The term-work and presentation of the Seminar-I will be evaluated by departmental committee consisting of guide and two faculty members of the department appointed by Director / Principal of the college as per the recommendation of the Head of the Department.

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First Year Term – II

ADVANCED DIGITAL IMAGE PROCESSING

Teaching Scheme:
Lectures: 3 Hrs / week

Examination Scheme:
Theory Paper: 100 Marks (3 Hours)

Introduction: Digital Image representation, Elements of visual perception, Image model, sampling uniform and non-uniform Sampling , Quantization-uniform and non-uniform, relationship between pixels - neighbors, connectivity, distance, Imaging Geometry-Basic Transformation, Perspective Transformations, camera model, camera calibration, stereo imaging, arithmetic and logic operations on images.

Image Transformation: overview of 1D Fourier Transform, Discrete Fourier Transform, Fast Fourier Transform, Properties of 2D Fourier transform, Fast Fourier transform, DCT, properties, Introduction to wavelet Transform continuous and discrete, properties, Other Separable Image transforms- Walsh Transform, Hadamard Transform, K L Transform, Hough Transform and properties of all.

Image Enhancement: Spatial-Domain Method and Frequency-Domain Method, Histogram Modification Techniques, Local Enhancement. Spatial domain filters-Average, median, Frequency domain filter- Ideal Filters, Low pass Filtering, Butterworth Filter, High Pass filter, Ideal Filter, Butterworth Filter and Differentiation.
Image Restoration: Degradation Model, Diagonalization of Circulant and Block Circulant Matrices, Algebraic Approach to restoration, Restoration in Spatial Domain, Grey-level Interpolation.

Image Compression: Compression Fundamentals, lossy and lossless compression, Fidelity criteria, Coding Redundancy, Encoding Process, Huffman Code, RLE, 1-D/2-D Run Length Encoding, Coding Considerations. Image standards: JPEG, JPEG2000, MPEG Standards, Various Image file formats such as - BMP, TIFF, GIF.

Image Segmentation: Detection of Discontinuities, Point/Line/Edge Detection, Combined Detection, Edge Linking and Boundary Detection. Thresholding -Global/ Optimal, Region Oriented Segmentation, Basic formulation, Region growing, Region splitting and Merging. Representation and description: Representation Schemes, descriptors, regional descriptors, pattern and pattern classes, Classifiers. Image texture analysis, co-occurrence matrix, measures of textures, statistical models for textures, principal component analysis.

Patterns and Pattern Classes: Recognition based on decision theoretic methods, matching, optimum statistical classifiers, neural networks, structural methods: matching shape numbers, string matching, syntactic recognition of strings, syntactic recognition of trees.

References:

1. Rafael Gonzalez and Richard E Woods, "Digital Image Processing", Pearson Education
2. Arthur R. Weeks, Jr "Fundamentals of Electronic Image Processing", PHI
3. Anil K. Jain, "Fundamentals of Digital Image Processing", PHI.
4. K P Soman K I Ramchandran, "Insight into Wavelets from theory to practice" 2nd Ed, PHI
5. Sid Ahmad, "Image Processing, Theory, Algorithm and architecture", McGraw Hill

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First Year Term – II

COMMUNICATION SYSTEM DESIGN

Teaching Scheme:
Lectures: 3 hrs / week

Examination Scheme:
Theory Paper : 100 Marks (3 Hours)

Designer's perspective of communication system: Wireless channel description, path loss, multi path fading.

Communication concepts, Receiver Architectures: Introduction, Overview of Modulation Schemes, Classical Channel, Wireless Channel Description, Path Losses: Detailed Discussion, Multipath Fading: Channel model and Envelope Fading, Multipath Fading: Frequency Selective and Fast Fading, Summary of Standard Translation, Introduction Receiver Architectures, Receiver front End: general discussion, Filter Design, rest of Receiver Front Eng: Nonideatlites and Design Parameters,

Derivation of NF, IIP3 of Receiver Front End, Partitioning.

Low Noise Amplifier: Introduction, Wideband LNA, Design, Narrow band LNA: Impedance Matching, Narrowband LNA: Core Amplifier,

Active Mixer: Introduction, Balancing, Qualitative Description of The Gilbert Mixer, Conversion Gain, Distortion, And Low-Frequency Case: Analysis of Gilbert Mixer, Distortion, High-Frequency Case, Noise, A Complete Active Mixer, References, Problems.
Analog to Digital Converters: Demodulators, A to D Converters used in receivers, Low cost Sigma delta modulators and its implementation.

Design Technology for Wireless Systems: Design entry / simulation, Validation and analysis tools

References :

1. Bosco Leuing, VLSI for Wireless Communication, PE
2. T Lee , The design of CMOS Radio frequency integrated circuits, Cambridge university press
3. P Gray and R Meyer , Analysis and design of analog integrated circuits, John Wiley & Sons
4. G Gonzalez , Microelectronics Transistor Amplifier, Analysis and design, Prentice Hall

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First Year Term – II

MOBILE COMMUNICATION

Teaching Scheme:
Lectures: 3 hrs / week

Examination Scheme:
Theory Paper: 100 Marks (3 Hours)

Introduction to Wireless Mobile Communications:

History and evolution of mobile radio systems. Types of mobile wireless services / systems-Cellular, WLL, Paging, Satellite systems, Standards, Future trends in personal wireless systems

Cellular Concept and System Design Fundamentals:

Cellular concept and frequency reuse, Multiple Access Schemes, channel assignment and handoff, Interference and system capacity, trucking and Erlang capacity calculations

Global System for Mobile (GSM):

GSM Architecture and Interfaces; Radio Link features in GSM Systems; GSM Logical Channels and Frame Structure; Messages, Services and Call Flows in GSM; Data Services in GSM: SMS, GSM GPRS; Privacy and Security in GSM.

Mobile Radio Propagation:

Radio wave propagation issues in personal wireless systems, Propagation models, Multipath fading and Base band impulse respond models, parameters of mobile multipath channels, Antenna systems in mobile radio

Modulation and Signal Processing:

Analog and digital modulation techniques, Performance of various modulation techniques-Spectral efficiency, Error-rate, Power Amplification, Equalizing Rake receiver concepts, Diversity and space-time processing, Speech coding and channel coding

System Examples and Design Issues:

Multiple Access Techniques-FDMA, TDMA and CDMA systems, operational systems, Wireless networking, design issues in personal wireless systems

References:

1. Feher, “Wireless Digital Communications”, PHI, New Delhi
2. T.S.Rappaport, “Wireless Digital Communications: Principles and Practice”, Prentice Hall, NJ
3. W.C.Y.Lee, “Mobile Communications Engineering: Theory and Applications”, 2nd Ed, Mc Graw Hill
4. Schiller, “Mobile Communications”, Pearson Education Asia Ltd.

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First Year Term – II

ANTENNA THEORY & DESIGN

Teaching Scheme: Examination Scheme:

Lectures: 3 Hrs / week Theory Paper: 100 Marks (3 Hrs)

Antenna Fundamentals and Definitions: Radiation mechanism - over view, Electromagnetic Fundamentals, Solution of Maxwell's Equations for Radiation Problems, Ideal Dipole, Radiation Patterns, Directivity and Gain, Antenna Impedance, Radiation Efficiency. Antenna Polarization, Resonant Antennas**:** Wires and Patches, Dipole Antennas, Yagi -Uda Antennas, Micro strip Antenna.

Arrays: Array factor for linear arrays, uniformly excited, equally spaced Linear arrays, pattern multiplication, directivity of linear arrays, non- uniformly excited -equally spaced linear arrays, Mutual coupling, multidimensional arrays, phased arrays, feeding techniques, perspective on arrays.

Broad Band Antennas: Traveling - wave antennas, Helical antennas, Biconical antennas, sleave antennas, and Principles of frequency - independent Antennas, spiral antennas, and Log - Periodic Antennas.

Aperture Antennas: Techniques for evaluating Gain, reflector antennas - Parabolic reflector antenna principles, Axi -symmetric parabolic reflector antenna, offset parabolic reflectors, dual reflector antennas, Gain calculations for reflector antennas, feed antennas for reflectors, field representations, matching the feed to the reflector, general feed model, feed antennas used in practice.

Antenna Synthesis: Formulation of the synthesis problem, synthesis principles, line sources shaped beam synthesis, linear array shaped beam synthesis — Fourier Series, Woodward — Lawson sampling method, comparison of shaped beam synthesis methods, low side lobe narrow main beam synthesis methods Dolph Chebyshev linear array, Taylor line source method.

Method of Moments : Introduction to method of Moments, Pocklington's integral equation, integral equations and Kirchhoff's Networking Equations, Source Modeling Weighted residuals formulations and computational consideration, calculation of antenna and scatter characteristics.

CEM for Antennas : Finite Difference Time Domain Method Geometrical Optics Wedge diffraction theory, ray fixed coordinate system, uniform theory of wedge diffraction, E - Plane analysis of Horn antennas. Cylindrical parabolic antenna, radiation by a slot on a finite ground plane, radiation by a monopole on a finite ground plane, equivalent current concepts, multiple diffraction formulation, by curved surfaces, physical optics, method of stationary phase, Physical theory of diffraction, cylindrical parabolic reflector antennas.

References :

1. Stutzman and Thiele, "Antenna Theory and Design", 2nd Ed, John Wiley and Sons Inc.
2. C. A. Balanis: "Antenna Theory Analysis and Design", John Wiley, 2nd Edition,
3. Kraus, "Antennas", McGraw Hill, TMH, 3" Edition,
4. Kraus and R.J. Marhefka:, "Antennas", McGraw Hil1, 2nd Edition,.

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M.E. Electronics and Telecommunication / Electronics & Communication (Communication Engg)

W.E.F: 2010-11

First Year Term – II (**Elective-II**)

MULTIMEDIA COMMUNICATION

Teaching Scheme:
Lectures: 3 hrs / week

Examination Scheme:
Theory Paper: 100 Marks (3 Hrs)

Multimedia Communications: multimedia information representation, multimedia networks, multimedia applications, network QoS and application QoS.

Information Representation: text, images, audio and video, Text and image compression, compression principles, text compression, image compression. Audio and video compression, audio compression, video compression, video compression principles, video compression standards: H.261, H.263, P1.323, MPEG 1, MPEG 2, Other coding formats for text, speech, image and video.

Detailed study of MPEG 4: coding of audiovisual objects, MPEG 4 systems, MPEG 4 audio and video, profiles and levels. MPEG 7 standardization process of multimedia content description, MPEG 21 multimedia framework, Significant features of JPEG 2000, MPEG 4 transport across the Internet.

Synchronization: notion of synchronization, presentation requirements, References model for synchronization, Introduction to SMIL, Multimedia operating systems, Resource management, and process management techniques.

Multimedia Communication Across Networks: Layered video coding, error resilient video coding techniques, multimedia transport across IP networks and relevant protocols such as RSVP, RTP, RTCP, DVMRP, multimedia in mobile networks, multimedia in broadcast networks.

References:

1. Fred Halsall, "Multimedia Communications", Pearson education
2. K. R. Rao, Zoran S. Bojkovic, Dragorad A. Milovanovic, "Multimedia Communication Systems", Pearson education
3 Raifsteinmetz, Klara Nahrstedt, "Multimedia: Computing, Communications and Applications", Pearson education
4. Tay Vaughan, "Multimedia: Making it Work", 6th edition, Tata McGraw Hill

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First Year Term – II (**Elective-II**)

ERROR CONTROL CODES

Teaching Scheme:
Lectures: 3 Hrs / week

Examination Scheme:
Theory Paper: 100 Marks (3 Hrs)

Introduction to Algebra: Groups, Fields, Binary Field Arithmetic, Construction of Galois Field GF (2m) and its basic properties, Computation using Galois Field GF (2m) Arithmetic, Vector spaces and Matrices.

Linear Block Codes: Generator and Parity check Matrices, Encoding circuits, Syndrome and Error Detection, Minimum Distance Considerations, Error detecting and Error correcting capabilities, Standard array and Syndrome decoding, Decoding circuits, Hamming Codes, Reed – Muller codes.

Cyclic Codes: Introduction, Generator and Parity check Polynomials, Encoding using Multiplication circuits, Systematic Cyclic codes – Encoding using Feedback shift register circuits, Generator matrix for Cyclic codes, Syndrome computation and Error detection, Meggitt decoder, Error trapping decoding, Cyclic Hamming codes.

BCH Codes: Binary primitive BCH codes, Decoding procedures, Implementation of Galois field Arithmetic, Implementation of Error correction. Non – binary BCH codes: q – ary Linear Block Codes, Primitive BCH codes over GF (q), Reed – Solomon Codes, Decoding of Non – Binary BCH and RS codes: The Berlekamp - Massey Algorithm.

Convolutional Codes: Encoding of Convolutional codes, Structural properties, Distance properties, Viterbi Decoding Algorithm for decoding, Soft – output Viterbi Algorithm, Stack and Fano sequential decoding Algorithms, Majority logic decoding

Majority Logic Decodable Codes: One – Step Majority logic decoding, one – step Majority logic decodable Codes, Two – step Majority logic decoding, Multiple – step Majority logic decoding.

Cryptography: Principles The Data Encryption Standard and Public Key cryptosystems, Asymmetric Encryption Systems, Digital Signature Systems, Basic of digital watermarking

References:

1. Shu Lin, Daniel J. Costello Jr. "Error Control Coding", Prentice Hall, 2nd Edition
2. Blahut, R.E. "Theory and Practice of Error Control Codes" Addison Wesley
3. D. R. Stinson, "Cryptography: Theory and Practice," CRC Press

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M.E. Electronics and Telecommunication / Electronics & Communication (Communication Engg)

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First Year Term – II (**Elective-II**)

ADVANCED EMBEDDED SYSTEM DESIGN

Teaching Scheme:
Lectures: 3 Hrs / week

Examination Scheme:
Theory Paper: 100 Marks (3 Hrs)

Embedded System Introduction: Introduction to Embedded System, History, Design challenges, optimizing design metrics, time to market, applications of embedded systems and recent trends in embedded systems, embedded design concepts and definitions, 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, and general purpose processor design

Standard Single Purpose Processors: 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. Memory: memory write ability and storage permanence, common memory types, composing memory, memory hierarchy and cache, advanced RAM. Memory management, hardware and software design and testing, communication protocols like SPI, SCI, I2C, CAN etc

Interfacing: Introduction, Communication basics, Basic protocol concepts, ISA bus protocol: memory access, Arbitration, Priority arbiter, Daisy chain Arbitration, Network oriented Arbitration methods, multilevel bus architectures, Advanced communication principles, Parallel and serial communication, wireless communication, Layering, error detection and correction, serial protocols, parallel protocols, wireless protocols: IrDA, Bluetooth, IEEE802.11

System Architecture:ARM7/ARM9 architecture, instruction set, thumb Instruction set, Pipeline, memory management, Bus architecture, Programming concepts, Embedded programming in c and C++. Multiprocessors Scheduling: Model of multiprocessor and distributed systems, Multiprocessor priority ceiling protocol, Elements of scheduling algorithms for end-to-end periodic tasks, Schedulability of fixed priority end-to-end periodic tasks, end-to-end tasks in heterogeneous systems.

Real Time Systems: Characterizing real time systems and tasks, Performance measures, Estimating program runtimes, Task assignment and scheduling, Real time operating systems (RTOS), Task management, Race condition, Inter-task communication, Implementation aspects and estimation modeling in embedded systems, Validation and debugging of embedded systems, Real time communication, Hardware-software co-design in an embedded system, Applications of Real time systems.

References:

1. Krishna & Shin, “Real -Time Systems”, McGraw Hill International
2. Rajkamal, “Embedded systems”, Tata McGraw Hill
3. Valvano, “Embedded Microcomputer systems”, Thomson Delmar publishing
4. Atmel / ARM Data books.
5. Iyer & Gupta, “Embedded Real Time Systems Programming”, Tata McGraw Hill
6. Lewis Daniel, “Fundamentals of Embedded software”, Prentice Hall India
7. Jane Liu, “Real Time Systems”, Pearson India
8. Frank Vahid and Tony Givargis, “Embedded system design: A unified hardware/software Introduction”, John Wiley and Sons.

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First Year Term – II (**Elective-II**)

SPEECH AND AUDIO PROCESSING

Teaching Scheme:
Lectures: 3 Hrs / week

Examination Scheme:
Theory Paper: 100 Marks (3 Hours)

Digital Models For The Speech Signal: Process of speech production, Acoustic theory of speech production, Lossless tube models, and Digital models for speech signals.

Time Domain Models for Speech Processing: Time dependent processing of speech, Short time energy and average magnitude, Short time average zero crossing rate, Speech vs silence discrimination using energy and zero crossings, Pitch period estimation, Short time autocorrelation function, Short time average magnitude difference function, Pitch period estimation using autocorrelation function, Median smoothing.

Digital Representations of the Speech Waveform: Sampling speech signals, Instantaneous quantization, Adaptive quantization, Differential quantization, Delta Modulation, Differential PCM, Comparison of systems, direct digital code conversion.

Short Time Fourier Analysis: Linear Filtering interpretation, Filter bank summation method, Overlap addition method, Design of digital filter banks, Implementation using FFT, Spectrographic displays, Pitch detection, Analysis by synthesis, Analysis synthesis systems.

Homomorphic Speech Processing: Homomorphic systems for convolution, Complex cepstrum, Pitch detection, Formant estimation, Homomorphic vocoder.

Linear Predictive Coding of Speech: Basic principles of linear predictive analysis, Solution of LPC equations, Prediction error signal, Frequency domain interpretation, Relation between the various speech parameters, Synthesis of speech from linear predictive parameters, Applications.

Speech Enhancement: Spectral subtraction and filtering, Harmonic filtering, parametric re-synthesis, Adaptive noise cancellation.

Speech Synthesis: Principles of speech synthesis, Synthesizer methods, Synthesis of intonation, Speech synthesis for different speakers, Speech synthesis in other languages, Evaluation, Practical speech synthesis.

Automatic Speech Recognition: Introduction, Speech recognition vs. Speaker recognition, Signal processing and analysis methods, Pattern comparison techniques, Hidden Markov Models, Artificial Neural Networks.

Audio Processing: Auditory perception and psychoacoustics - Masking, frequency and loudness perception, spatial perception, Digital Audio, Audio Coding - High quality, low-bit-rate audio coding standards, MPEG, AC-3, Multichannel audio - Stereo, 3D binaural and Multichannel surround sound.

References:

1. L. R. Rabiner and R. W. Schafer, “Digital Processing of Speech Signals", Pearson Education (Asia) Pte. Ltd
2. D. O’Shaughnessy, “Speech Communications: Human and Machine”, Universities Press.
3. L. R. Rabiner and B. Juang, “Fundamentals of Speech Recognition”, Pearson Education (Asia) Pte. Ltd.
4. Z. Li and M.S. Drew, “Fundamentals of Multimedia”, Pearson Education (Asia) Pte. Ltd.

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M.E. Electronics and Telecommunication / Electronics & Communication (Communication Engg)

W.E.F: 2010-11

First Year Term – II (**Elective-II**)

ARTIFICIAL INTELLIGENCE AND SOFT COMPUTING

Teaching Scheme:
Lectures: 3 Hrs / week

Examination Scheme:
Theory Paper: 100 Marks (3 Hours)

Introduction to A.I. and Soft Computing: Introduction, Soft Computing Constituents and Conventional Artificial Intelligence, Neuro-Fuzzy and Soft Computing Characteristics.

Fuzzy Sets: Classical sets, fuzzy sets, Basic fuzzy properties and operations, Fuzzy relations, Fuzzy tolerance and equivalence relations, membership functions, fuzzy arithmetic, numbers and vectors.

Fuzzy Rules and Fuzzy Reasoning: Extension principle, fuzzy If-Then rules, Fuzzy reasoning.

Fuzzy Inference and Decision Making: natural language, linguistic hedges, rule based systems candrical rule forms, decomposition of compound rules, likelihood and truth quantification, aggregation of fuzzy rules, fuzzy synthetic evaluation, pReferencess and consequences, multi objective decision making.

Fundamentals of Neural Networks: basic concepts, model of artificial neural network, neural network architectures, Characteristics of neural networks, Learning methods, Taxonomy of Neural Network Architectures,

Back Propagation Networks: Architecture of back propagation network, Back propagation learning, Selection of various parameters in BPN, Variations of Standard Back propagation algorithm, Associative memory.

Classifiers: Classifiers based on Bay's decision theory, Bayesian classification for normal distribution, Baysian inference, estimation of unknown probability distribution, bay's error, linear classifiers, linear discriminant functions and decision hyper planes. the perceptron algorithm, support vector machine(SVM),separable and non separable classes, an introduction to non linear classifiers, the XOR problem, the two layer perceptron and radial basis function(RBF) network, context dependent classification.

Evolutionary Algorithms: Genetic algorithm, cycle of genetic algorithm, crossover, mutation, fitness function, schema, fundamental theorem of GA(schema theorem), differential evolution(DE), modified differential evolution(Mo DE), multi objective optimization using evolutionary algorithms, hybridization with clustering, genetic programming.

Hybrid Systems and Applications: Hybrid systems, Neuro-Fuzzy hybrids, Application of neural network and fuzzy logic in image processing and pattern recognition.

References:

1. Timothy J Ross, "Fuzzy logic with engineering applications", TMH
2. J. S. R. Jang, C. T. Sun, E. Mizutani, "Neuro- Fuzzy and Soft Computing: A Computational Approach to Learning and Machine Intelligence", PHI
3. S. Rajasekaran, G. A. Vijayalakshmi Pai, "Neural Networks, Fuzzy logic, and Genetic Algorithms", PHI
4. George J Klir, Bo Yuan, "Fuzzy sets and fuzzy logic", PHI
5. Simon Haykin, "Neural Networks", Pearson Education
6. Bart Kasko, "Fuzzy Engineering", PHI
7. Dan W. Patterson, "Introduction to A.I. & Expert Systems", PHI
8. Nils J. Nilsson, "Artificial Intelligence: A new synthesis", Harcourt Asia PTE Ltd, Morgan Kaufmann
9. Duda and Hart, "Pattern Recognition", Willy Publication

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First Year Term – II

LABORATORY PRACTICE-II

Teaching Scheme:
Practical: 6 Hrs/week

Examination Scheme:
Term Work: 100 Marks
Oral: 50 marks

Experiments / Assignments based on any three subjects out of which one should be Elective from First Year Term – II syllabus. The concerned subject in-charge should frame minimum of six laboratory experiments or assignments, two from each subject.

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First Year Term – II

SEMINAR-II

Teaching Scheme:
Practical: 4Hrs/week

Examination Scheme:
Term Work: 100 Marks

Seminar on related state of the art topic of student's own choice approved by the department.

Term Work

The term-work & presentation of the Seminar-II will be evaluated by departmental committee consisting of guide and two faculty members of the department appointed by Director / Principal of the college as per the recommendation of the Head of the Department.

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Second Year Term – I

SEMINAR-III

Teaching Scheme:
Practical: 4Hrs/week

Examination Scheme:
Term Work: 50 Marks
Oral: 50 Marks

Seminar on special topic: The topic should be on any of the area not included in the regular curriculum. The report should include detailed study of specific concept (i.e. analysis, design & implementation.). This can be a theoretical study or practical implementation approved by the department/guide.

Term Work

1. Seminar-III should be conducted at the end of Second Year Term I.

2. The term-work of the Seminar-III will be evaluated by departmental committee consisting of guide and two faculty members of the department appointed by Director / Principal of the college as per the recommendation of the Head of the Department.

3. The Seminar-III presentation will be evaluated by examiners appointed by University, one of which should be the guide.

4. Student must submit the Seminar Report in the form of soft bound copy

5. The marks of seminar-III should be submitted at the end of Second Year Term I to the University.

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Second Year Term – I

PROJECT STAGE-I

Teaching Scheme:
Practical: 18 Hrs / week

Examination Scheme:
Term Work: 100 Marks

Project will consist of a system Development in Software / Hardware. Project Work should be carried out using Software Engineering principles and practices.

Term Work

The term-work of the Project Stage-I will be evaluated by departmental committee consisting of guide and two faculty members of the department appointed by Director / Principal of the college as per the recommendation of the Head of the Department.

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Second Year Term – II

PROGRESS SEMINAR

Examination Scheme:
Term Work: 50 Marks

1. Progress Seminar should be conducted in the middle of Second Year Term II.
2. The Progress Seminar Term-Work will be evaluated by departmental committee consisting of guide and two faculty members of the department appointed by Director / Principal of the college as per the recommendation of the Head of the Department.
3. Student must submit the progress report in the form of soft bound copy.
4. The marks of progress seminar should be submitted along with the marks of Project Stage II

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Second Year Term – II

PROJECT STAGE-II

Teaching Scheme:
Practical: 18 Hrs / week

Examination Scheme:
Term Work: 150 Marks
Oral: 100 Marks

This is in continuation of Project Stage-I. The complete System Development in software / hardware carried out using Software Engineering principles and practices is expected. It should be a working system either software or hardware or combination of both.

He / she has to present / publish at least one paper in reputed National / International Journal / Conference on his / her Project work before submission of his / her Thesis / Dissertation.

Term Work

1. The Term Work of Project Stage –II will be assessed jointly by the pair of Internal (Guide) and External examiner along with oral examination of the same**.**