The following shall be the scheme of instruction and examination for Master of Engineering (Electronics) form June 2002.

Full Time : Four Semester Course

Part – I (First Term)

Sub. No.	Subject	Teaching Scheme L	Pr./Tu.	Total	Examination Scheme (Max. Marks) Paper	Tw.	Pr./Oral	Total
1	2	3	4	5	6	7	8	9
01	Advanced Digital Signal Processing	4	2	6	100	25	----	125
02	Digital Systems Design	4	2	6	100	25	----	125
03	Advanced Instrumentation Systems	4	2	6	100	25	----	125
04	Digital Comm. Systems	4	2	6	100	25	----	125
05	Elective – I	4	2	6	100	25	----	125
06	Seminar – I	--	01	01	--	25	--	25
Total of Part – I		20	11	31	500	150	---	650

Part – II (Second Term)

Sub. No.	Subject	Teaching Scheme L	Pr./Tu.	Total	Examination Scheme (Max. Marks) Paper	Tw.	Pr./Oral	Total
1	2	3	4	5	6	7	8	9
07	Computer Networks	4	2	6	100	25	----	125
08	Embedded system Design	4	2	6	100	25	----	125
09	Advanced Power Electronics	4	2	6	100	25	----	125
10	Advanced Computer System	4	2	6	100	25	----	125
11	Elective – II	4	2	6	100	25	----	125
12	Seminar - II	--	01	01	--	25	--	25
Total of Part – II		20	11	31	500	150	---	650

Part - III

Sub. No.	Subject	Teaching Scheme L	Pr./Tu.	Total	Examination Scheme (Max. Marks) Paper	Tw.	Pr./Oral	Total
1	2	3	4	5	6	7	8	9
13	Dissertation (Part –I)	--	6	6	--	50	--	50
	Total of Part – III	--	6	6	--	50	--	50
	Part – IV (Fourth Term)							
Sub. No.	Subject	Teaching Scheme L	Pr./Tu.	Total	Examination Scheme (Max. Marks) Paper	Tw.	Pr./Oral	Total
1	2	3	4	5	6	7	8	9
14	Dissertation (Part-II)	--	6	6	--	50	200	250
Total of Part – I,II,III,&IV		-----			1000	400	200	1600

	Group – I	Group – II	Group – III
	Computer Applications	Signal Processing	Communication
Elective – I	Computer System Software	Digital Image Processing	Wireless & Mobile Communication
Elective – II	Artificial Neural Networks	Pattern Recognition	Advanced Telematics

The student have to choose one of the Group as Elective – I & II for the Course for Maser of Engineering in Electronics.

Part Time : Six Semester Course

Part – I (First Term)

Sub. No.	Subject	Teaching L	Pr./Tu.	Scheme Examination Scheme (Max. Marks) Total	Paper	Tw.	Pr./Oral	Total
1	2	3	4	5	6	7	8	9
01	Advanced Digital Signal Processing	4	2	6	100	25	----	125
02	Advanced Instrumentation Systems	4	2	6	100	25	----	125
03	Digital Comm. Systems	4	2	6	100	25	----	125
Total Of Part – I		12	6	18	300	75	-----	375

Part – II (Second Term)

Sub. No.	Subject	Teaching L	Pr./Tu.	Scheme Examination Scheme (Max. Marks) Total	Paper	Tw.	Pr./Oral	Total
1	2	3	4	5	6	7	8	9
04	Digital System Design	4	2	6	100	25	----	125
05	Advanced Computer System	4	2	6	100	25	----	125
06	Elective - I	4	2	6	100	25	----	125
Total Of Part – I		12	6	18	300	75	-----	375

Part – III (Third Term)

Sub. No.	Subject	Teaching Scheme L	Pr./Tu.	Total	Examination Scheme (Max. Marks) Paper	Tw.	Pr./Oral	Total
1	2	3	4	5	6	7	8	9
07	Advanced Power Electronics	4	2	6	100	25	----	125
08	Computer Networks	4	2	6	100	25	----	125
09	Seminar – I	--	01	01	--	25	--	25
Total Of Part – III		08	5	13	200	75	-----	275

Part – IV (Fourth Term)

Sub. No.	Subject	Teaching Scheme L	Pr./Tu.	Total	Examination Scheme (Max. Marks) Paper	Tw.	Pr./Oral	Total
1	2	3	4	5	6	7	8	9
10	Embedded System Design	4	2	6	100	25	----	125
11	Elective – II	4	2	6	100	25	----	125
12	Seminar – II	--	01	01	--	25	--	25
Total Of Part – IV		08	5	13	200	75	-----	275

Part – V (Fifth Term)

Sub. No.	Subject	Teaching Scheme L	Pr./Tu.	Total	Examination Scheme (Max. Marks) Paper	Tw.	Pr./Oral	Total
1	2	3	4	5	6	7	8	9
13	Dissertation (Part-I)	--	6	6	--	50	--	50
Total Part – V			6	6	--	50	--	50

Part – VI (Sixth Term)

Sub. No.	Subject	Teaching Scheme L	Pr./Tu.	Total	Examination Scheme (Max. Marks) Paper	Tw.	Pr./Oral	Total
1	2	3	4	5	6	7	8	9
14	Dissertation (Part –II)	--	6	6	--	50	200	250
Total of Part – I to Part VI		--			1000	400	200	1600

CLASS: ME(EC)

Advanced Digital Signal Processing

(One paper : 3 hours, 100 marks, Term work: 25 marks)

Overview:- Z transforms, Discrete Fourier transforms, FFT, radix-2, radix-4, Split Radix FFT algorithms, Implementation of FFT algorithms, FFT algorithms in Linear filtering & correlation, Quantization Error in FFT algorithms.

Design of FIR Filters: Design of Linear phase FIR filters using windows, frequency sampling method, design of optimum equi- ripple linear phase FIR Filters design of FIR differentiators, Hilbert transformers comparison of FIR filter design methods.
Design of IIR filters: Design of IIR filters by approximation of derivatives, Impulse invariance bilinear transformation, matched Z- transforms, Design of IIR filters by frequency transformations in analog and digital domain.

Design of Digital filters based on least- squares method padie approximation method least- square design method FIR least square Inverse (Wiener) filters. Design of IIR in the frequency domain.

Linear prediction: Innovations representation of a stationary Random process, Relationship between the filter parameters and the autocorrelation sequence, Autoregressive (AR) & moving average (MA) process, forward & backward linear reduction.

Power Spectrum estimation: Estimation of spectra from finite duration observations of signals, energy density spectrum, estimation of autocorrelation and power spectrum use of DFT in power spectrum estimation,

Adaptive filters:
Adaptive implementation of wiener filter, correlation canceller loop,Windrow-hoff LMS adaptation algorithm, Adaptive linear combiner, FIR Wiener filters, Speed of convergence, Adaptive echo cancellor, Adaptive Noise canceller (ANC) adaptive linear enhancer (ALE) Adaptive linear prediction.

DIGITAL SYSTEMS DESIGN
(One paper :3 hours, 100 marks, Term work: 25 marks)

Design state machine- More and mealy machine, state diagram, ASM techniques, Implementation of Combinational, synchronous sequential & Asynchronous sequential machine, Algorithmic synchronous machine
Modelling: Functional modeling at the logic level, functional modeling at register level, structural models level of modeling.

Logic simulation: Applications, problems in simulation based design verification, types of simulation, Unknown logic value compiled simulation event driven simulation, delay models, elements, evaluation,Hazard detection, simulation engines.
Fault modeling: General fault simulation techniques, statistical fault analysis.
Testing for single stuck fault:- Basic issues, ATG for SSF in combined ckts. ATG for SSFs in sequential ckts. PLA testing.
Design for Testability:- Classical testability scan design, compression tech. Built in self test logic level diagnosis, self checking design.
Specific digital system: Design such as digital IC tester Micricontrolleo cards PC add on cards design, PLA based product design.

ADVANCED INSTRUMENTATION SYSTEM
(One paper :3 hours, 100 marks, Term work: 25 marks)

Review of Control system principles:
Basic concept, variables & degrees of freedom, control modes and controllers on off, P,PI,PD,PID, controllers, feedback & feedforword control, ratio, cascade, selective Adaptive Optimising control tuning of controllers.
Computer controls: Advantages, Implementation problems – sampling Quantization, Aspect of control theory- Transfer function approach, state space approach system Design optimal control, self tuning and adaptive control, Mathematical modeling, Design of digital controller general synthesis methods, Dahlin design, kalman design.

On-line control,

offline control, direct digital control
SCADA, computer interfacing techniques, programmable logic controllers
Evaluation, specifications, applications, relay ladders, eg. Boiler control and others NC,CNC, and DNC.
Simulation and process control:- Study of plant, subplant and instrumentation process used thermal power station, suger cement paper and pharmaceutical industries.
Introduction of Electronic Instrumentation:-
Measurements on Transmitters and receivers:- General performance characteristics, Basic and special measurements, measurement on transmitting Receiving systems, sensitivity, modulation, acceptance band width, signal to noise ratio, equipment specifications.
Microwave signal Analysis- Power measurement, spectrum analysis, wave analyzers, Electromagnetic interference measurements, Microwave Network analysis, Automatic analyzer systems and Automatic Test systems.

DIGITAL COMMUNICATION SYSTEMS
(One paper :3 hours, 100 marks, Term work: 25 marks)

1) Review:- PMA,PTM and PPM generation and reception, Digital PAM formats transmission, power spectra, noise and errors. Regenerative repeaters,
   Bandlimited PAM systems, Synchronization techniques.

2) Digital modulation: OOK,FSK, PSK,BPSK,MSK,QAM,QOSK, their comparison Optimum detection.
3) PCM generation and reconstruction, linear and nonlinear quantisation, channels, bandwidth, noise in PCM, its comparison with noise in AM,DPCM,DM,ADM techniques, systems and comparison, there all details with modifications.
4) Error Detection and correction:- Repetition and parity check codes, code vectors and hamming distance, FEC and ARQ systems, linear block codes, convolution coding and decoding techniques and system, Turbo codes, Data encryption, distortion and reshaping of the wave forms.
5) Information and detection theory:- Probability stochastic Processes Information measure and source coding information transmission on discrete channels, continuous channels and system comparison, signal space, Optimum digital detection.
6) Narrow band and Broadband ISDN overview and some application. Networks protocol Hierachies.
7) Spread spectrum signal, Direct spread spectrum, frequency of spread spectrum, performance, CDMA system based on FHSS system, synchronization spread spectrum system.

Group - II

Digital Image Processing(Elective – I)
(One paper; 3 hours, 100 marks, Term Work :25marks)

1)Introduction : Digital Image Representation, Fundamental steps in image Processing, Elements of Digital Image Processing systems, JPEG's JPG, Tif bmp image format.

2)Digital Image Fundamentals: Elements of Visual Perception, A simple Image Model, Sampling and Quantisation, Some basic relationship between Pixels, Image Geometry, Photographic Film.

3)Image Transforms: Introduction to the Fourier Transform, The Discrete Fourier Transform, Some properties of the Two – dimensional Fourier Transform, The Fast Fourier Transform, Hadamand Hough Hotelling, wavelet transforms.

4)Image Enhancement: Background Enhancement by point processing, spatial filtering Enhancement in the Frequency Domain, Generation of Spatial Mask from Frequency Domain Specification, Color Image Processing.

5)Image Restoration: Degradation Model, Diagonalisation of Circulant and Block circulant Matrices, Algebraic approach to Restoration, Inverse Filtering, Least Mean Square(Wiener) Filter, Constrained Least Square Restoration, Interactive Restoration, Restoration I the Spatial Domain Geometric Transformation.

6)Image Compression: Fundamentals Image Compression Models, Elements of Information theory, Error – free Compression Lossy Compression, Image Compression Standards.

7)Image Segmentation :Detection of Discontinuous, Edge Linking and Boundary Detection, Thresholding , Region – Segmentation, The use of Motion in Segmentation.

8)Representation And Description:- Representation Schemes Boundary Discriptors, Regional Descriptions Morphology, Relational Descriptors.

9)Recognition and Interpretation: Elements of Image Analysis, Pattern and Pattern Classes, Decision – Theretic Methods, Structural Methods, Interpretation.

Group – III

WIRELESS AND MOBILE COMMUNICATION (Elective – I)

(One paper; 3 hours, 100 marks, Term Work :25marks)

Introduction to mobile comm., Cellular mobile, telephone architecture, IP telephony overview.

Cellular Radio System Design: Frequency assignments, Frequency reuse channels, concept of cell splitting, Handover in cellular system, Handoff algorithms.

Multiple access schemes in mobile communication: TDMA, FDMA, CDMA, Random multiple access in, Performance analysis issue. MAC layer, scheduling & connection admission in mobile communications interference suppression & power control.

Teletraffic modeling & Queueing therotic analysis of cellular mobile networks.
Resource allocation & mobility management.

Practical Cellular mobile system:- AMPS and GSM system architecture overview. Call management & system operation, CDMA based cellular system wireless in local loop DECT and CDMAWLL.

Group – I

COMPUTER SYSTEM SOFTWARE (Elective – I)

(One paper; 3 hours, 100 marks, Term Work :25marks)

System Programming:- Language processor data structures for language processing, Single / two pass assembler design, Micros & Microprocessors for program development.

Operating system:- Evaluation , Memory management processor management, Device management, Information (File) management , Security & protection.

Multiprogramming O.S., Distributed O.S. , Multiprocessor system
Implementation: Input / Output :- Principle & Programming, Design & Implementation of Kernel of Multitasking O.S. (KMOS)

EMBEDDED SYSTEM DESIGN

(One paper- 3 hours, 100 marks, term work-25 marks)

- **Introduction and scope of embedded system :** Overview of MCS 89C51 IC, Internal architecture and programming of micro chip PIC 16F84 Microcomputer.
  Application using MCS 89C51-
  On chip timers, watch dog timers, on chip serial ports, inter facing ADC, DAC power devices EXT, RAM/ROM, DM printers, LED/LCD display, relay RS232.
  Use of development tools like assemblers, compilers, simulators, emulators, RTOS.

- PROM programming flash, ROM programming.

- Introduction to MCS-96 family .

- MCS-96 8096 BH architecture, programming and hard ware designing.

- **Development support tools :** 8096/196 software development packages, VLSI/ CE96 in circuit Emulators, Real time transparent 80C196 in circuit emulators .

- **Project Design :** Concept designing, Methodology for the flowing case studies-
  i) Cellular phone (using 8-bit microcontroller)
  ii) Digital camera (using 16-bit microcontroller)

- Introduction to 32-bit microcontroller power PC 80960.

COMPUTER NETWORKS

(One paper : 3 hours, 100 marks, Term Work : 25 marks)

1) **System Network Architecture :** Path control, transmission control, data flow control, RS-449 interface, X.25 standard ARPANET, TCP/INTERNET.

2) **Protocol design :** Design issues, basic flow control, sliding window protocol, protocol correctness, data-link control protocol, Kermit protocol, protocol hierarchies.

3) **Wireless networks :** Specifications for a wireless network, IEEE 802.11, mobile phone service fundamentals, cell, frequency utilization, allocation channel center frequency, channel utilization, TDMA, TDMA frame, time slot format, subscribe to base station slot format. GSM, GSM multi-frame, multi – frame format.

   CDMA , CDMA downlink channel structure, CDMA channel parameters, CDMA-air interface protocol stack Data compression, Huffman code rum-length encoding, relative encoding, Lampel-Ziv encoding, image compression, JPEG, MPEG.

4) **Electronics mail :** X-400 & X-500 standards, NETWORK security.

5) **ISDN :** ISDN Architecture, physical frame format, ISDN Overview,
   ISDN Interfaces and Functions : Transmission and structure, user network interface configurations, protocol architecture, ISDN connections Addressing, Inter-working physical and data layers.

6) **Global Mobile Satellite System :** Iridium system, Global-star system, ICO system, Tele-desic system.

7) **Network Management :** Network management tools, network statistics measurement systems, Network Management systems.
   Applications for configuration management, fault management, performance management, security management, accruing management, expert management.

ADAVANCED COMPUTER SYSTEMS

(One paper : 3 hours, 100 marks, Term Work : 25 marks)

1) Architecture features of Pentium, Register structure, Memory management.
2) Advanced micro controllers : 8096, COP*ACC7, COP*SGX5, COP888EB and design of system for applications like –
    a) Temperature Controller
    b) Data Acquisition system
    c) Power management.

   With computer interface.
3) Parallel Processing : Processor requirement for parallel processing, multi processor Operating system, Vector processors, Pipeline processing, parallel databases, parallel system memory.
4) Multi media : Multimedia Operating Systems, JPEG, MPEG, DVI, Data compression techniques, multimedia research issues, multimedia applications.
5) Vo-coders, homo-morphic, linear predictive, voice over IP networking, voice over IP gateways, voice over frame relay, voice over ATM., Speech coding techniques for audio and video like performance comparison PCM, ADM, Vocoders.
   CODEC ICs like LM4540, LM 4548 applications.

6) Imperfections in communication causes of noise & distortion, delays & blocking, computer dialing connections timings.

ADVANCED POWER ELECTRONICS

(One paper : 3 hours, 100 marks, Term Work : 25 marks)

1) Review of power electronic devices such as SCR, TRIAC, DIAC, UJT, SUS, SBS, MOSFET, IGBT, etc.
   Their ratings, characteristics, turn ON-OFF mechanisms, triggering circuit design, protection, selection criteria.

2) Study of different characteristics of various AC/DC drives, Speed control. Review of conventional speed control methods used for DC and AC induction motor design. Review of Thyristor converters and DC choppers, phase control inverter, regeneration by phase control inverters. Regeneration by phase control, chopper control microprocessors and micro-controller based systems.
3) Classification of inverter, forced communication methods, Inverters, frequency and voltage control harmonic limitation, choice of SCR inverters, Inverter control circuit, phase control cyclo-converters, speed control of Induction motor using microprocessor and micro-controller system. Economic selection of electric drives, recent trends in developments of variable speed drives.

ARTIFICIAL NEURAL NETWORKS (ELETIVE - II)

(One paper : 3 hours, 100 marks, Term Work : 25 marks)

1) Basics of ANN : Neural networks, Neuron topology, Activation dynamics models, synaptic dynamics models, Stability & convergence.
2) Uncertainty, Shannon entropy, Boltzman entropy, measures of confusion, measures of non-specificity.
3) Fuzzy logic : crisp sets, fuzzy sets, operation on fuzzy sets, fuzzy relations, ERIC (Extended Rule Based System for Intelligent Control), FP-3000 digital fuzzy processor, analog fuzzy processor, interface chip, defussification chip.
4) Neural networks : Analysis of feed forward, feedback neural networks, stability of neural networks, noise suppression.
5) Application like pattern recognition, Architecture for complex pattern recognition tasks, pattern mapping, stability-plasticity dilemma, temporal pattern, pattern variability.
6) Neural Networks learning rules, Hebbian perception delta widrow-Hoff, correlation, winner take all out star.
7) ANN model, active building blocks for realizing the systems design of fuzzy controller, applications of ANN like auto vehicle navigation, speech recognition, hand written digit recognition, fuzzy based washing machine, vacuum cleaners, video equipment, automatic train operation.

SEMINAR – II
(Term Work : 25 marks)

Seminar at the end of second semester of full time course and fourth semester of part time course in M.E. (Electronics) will be based upon the technical essay or a report or analysis topic of dissertation chosen by the candidate. He/ she shall submit short report on the topic and will deliver a talk thereon which along with the report will be assessed by two internal examiners, one of whom will be the guide and the other being appointed by Principal of the Institution.

DISSERTATION (PART – I)
(Term Work : 25 marks)

Dissertation (part I) at the end of third semester of full time course and fifth semester of part- time course in M.E. (Electronics) will be based upon the dissertation chosen by the candidate. He / She will deliver a talk thereon, which will be assessed by two internal examiners, one of whom will be the guide and the other being appointed by Principal.

DISSERTATION (PART – II)
(Term Work : 50 marks, Practical : 200 marks)

The dissertation shall consist of a report on any research work done by the candidate or Detailed report of the project work consisting of a design and development work that the candidate has done.

The candidate shall submit the dissertation report in triplicate to the Head of the Institution, duly certified that the work has been satisfactorily completed.

TERM WORK : The dissertation will be assessed by two internal examiners, appointed by the Principal of the Institution, one of whom will be the guide and the other a Senior staff member of the respective Department.

Practical Examination : It shall consists of a defence presented by the examinee on his work in the presence of examiners, appointed by the University, one of whom eill be the guide and other an external examiner.

PATTERN RECOGNITION (ELCETIVE - II)

(One paper : 3 hours, 100 marks, Term Work : 25 marks)

1) Introduction to pattern recognition : Machine Perception, the classification model, the Descriptive Approach.
2) Baye's Decision Theory : Baye's Decision Theory, minimum error rate, classification, classifiers, Discriminate Functions and Decision surfaces, Error Probabilities and Integral, The Normal Density Discriminate function for the Normal Density Bayesian Decision Theory.
3) Parameter Estimation and Supervised leasning the mean of a Normal Density, General Bayesian Learning, Sufficient statics and Exponential family, Problems of Dimensionality, Estimating the Error rate.
4) Nonparametric Technique : Density Estimation Parzen windows, K- Nearest neighbor Estimation, Estimation of a Posteriori Probability, the nearest- Neighbor Rule, Approximation by series Expansion, Approximation for the Binary case, Fisher's linear discriminate, Multiple discriminate analysis.
5) Linear Discriminant Functions : Linear Discriminant functions and decision surfaces, Generalised Linear Descriminant functions, the two category linearly separable case, Minimizing the perception Criterion function, Relaxation procedures, Nonseparable behavior, minimum squared error procedures, Ho-Kashyap procedures, linear programming procedures, the method of potential function, multicategory genelalizations.
6) Unsupervised learning and clustering : mixture densities and identifiability, maximum likelihood estimates, Application to normal mixtures, Unsupervised Bayesian learning, data description and clustering, criterion functions for clustering, iterative optimization, hierarchical clustering, graph theoretic methods, clustering and dimensionality reduction.
7) Introduction to seene analysis representation and initial simplifications, the spatial frequency domain, description of line and shape, perspective transformations, projective invariants, descriptive methods in scene analysis.

ADVANCED TELEMATICS (ELECTIVE- II)

(One paper : 3 hours, 100 marks, Term Work : 25 marks)

1) Telephone network overview circuit switching and packet switching, Electronic exchange.
2) Line coding technique, interfacing, ADSL, Switching techniques & their comparison. ISDN – overview , ITU – Standardization sector.
3) ISDN interfaces & functions: Transmission structures, user network interface configuration, Protocol architecture, ISDN connection addressing, Interworking physical & data layers.
4) Frame relay: Introduction, Protocol, Architecture frame mode call control LAPF core protocol, Frame relay congestion control.
5) Broadband ISDN: Architecture, standards, Services requirements protocols.
   ATM protocols: Overview, Hierarchy, ATM cells, their details and transmissions, AAL, ATM, traffic & congestion control.
   Networks;- Protocols Hierarchies, Design issues for the layer, OSI & TCP/IP reference model, comparison, Novel network, ARPANET, NSFNET, INTERNET, TCP/UDP, SMDS, X-25 Networks, Frame relay, Broadband ISDN & ATM Network standardization, Network security, High speed & bridged LAN, INTERNET working.
6) IP Telephony:- H.323 and a general background, session initiation protocol media gateway to media controller protocol, Voice technology background networks.

SEMINAR – II
(Term Work : 25 marks)

Seminar at the end of second semester of full time course and fourth semester of part time course in M.E. (Electronics) will be based upon the technical essay or a report or analysis topic of dissertation chosen by the candidate. He/ she shall submit short report on the topic and will deliver a talk thereon which along with the report will be assessed by two internal examiners, one of whom will be the guide and the other being appointed by Principal of the Institution.

DISSERTATION (PART – I)
(Term Work : 25 marks)

Dissertation (part I) at the end of third semester of full time course and fifth semester of part- time course in M.E. (Electronics) will be based upon the dissertation chosen by the candidate. He / She will deliver a talk thereon, which will be assessed by two internal examiners, one of whom will be the guide and the other being appointed by Principal.

DISSERTATION (PART – II)
(Term Work : 50 marks, Practical : 200 marks)

The dissertation shall consist of a report on any research work done by the candidate or Detailed report of the project work consisting of a design and development work that the candidate has done.

The candidate shall submit the dissertation report in triplicate to the Head of the Institution, duly certified that the work has been satisfactorily completed.

TERM WORK : The dissertation will be assessed by two internal examiners, appointed by the Principal of the Institution, one of whom will be the guide and the other a Senior staff member of the respective Department.

Practical Examination : It shall consists of a defence presented by the examinee on his work in the presence of examiners, appointed by the University, one of whom eill be the guide and other an external examiner.