

MD UNIVERSITY, ROHTAK (HARYANA)

SCHEME OF STUDIES & EXAMINATION

MASTER OF ENGINEERING

IN

Signal Processing



Lingaya's Jankalyan Sikshan Sanstha's

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M.D. UNIVERSITY, ROHTAK (HARYANA)
SCHEME OF STUDIES & EXAMINATION
M.E. in Signal Processing

SEMESTER – I

Course No.	Course Title	Teaching Schedule			Marks			Credits			Duration of Exam.
		L	T	P	Sess	Exam	Total	Sess	Exam	Total	
MESP-501	Signal Theory	4	0	0	50	100	150	2	4	6	3
MESP-503	Digital Communication and Information system	4	0	0	50	100	150	2	4	6	3
MESP-505	Microprocessor and its applications	4	0	0	50	100	150	2	4	6	3
EET-601	Digital Signal Processing	4	0	0	50	100	150	2	4	6	3
EMT-509	Numerical Techniques	4	0	0	50	100	150	2	4	6	3
MESP-507	Microprocessor Lab	0	0	3	50	50	100	2	2	4	3
MESP-509	Digital Signal Processing Lab	0	0	3	50	50	100	2	2	4	3
Total		20	0	6	350	600	950	14	24	38	

Note:

- The paper setter will set each theory paper of 100 marks covering the entire syllabus. However, the examiner will evaluate the performance of the student in the theory course finally by assigning one of the grades out of A, A(-), B, B(-), C, C(-), D & F. Examination of Practical courses shall also be evaluated on the basis of these grades.
- The sessionals of Theory and Practical Courses shall also be evaluated on the basis of above grades.
- The grading system is defined at the end of the Scheme of Studies and Examinations.

SEMESTER – II

Course No.	Course Title	Teaching Schedule			Marks			Credits			Duration of Exam.
		L	T	P	Sess	Exam	Total	Sess	Exam	Total	
EET-603	Embedded Systems & Applications	4	0	0	50	100	150	2	4	6	3
MESP-502	Digital System Design	4	0	0	50	100	150	2	4	6	3
MESP-504	Advance Signal Processing	4	0	0	50	100	150	2	4	6	3
MESP-506	Analog MOS Integrated Circuits for Signal Processing	4	0	0	50	100	150	2	4	6	3
MESP	Elective-I	4	0	0	50	100	150	2	4	6	3
MESP-508	Digital System Design Lab.	0	0	3	50	50	100	2	2	4	3
MESP-510	Advance Signal Processing Lab.	0	0	3	50	50	100	2	2	4	3
Total		20	0	6	350	600	950	14	24	38	

LIST OF ELECTIVE – I

- MESP-520 Wireless Communication**
EET-510 Artificial Intelligence
MESP-522 Optical Fiber Communication System

Note:

- The paper setter will set each theory paper of 100 marks covering the entire syllabus. However, the examiner will evaluate the performance of the student in the theory course finally by assigning one of the grades out of A, A(-), B, B(-), C, C(-), D & F. Examination of Practical courses shall also be evaluated on the basis of these grades.
- The sessionals of Theory and Practical Courses shall also be evaluated on the basis of above grades.
- Any Elective course to be offered from the above lists will be finalized by the HOD, depending on the availability of the expertise as well as the faculty strength in the department. The choice of the student for any elective shall not be a binding for the department to offer it.
- The grading system is defined at the end of the scheme of studies & examination.

SEMESTER – III

Course No.	Course Title	Teaching Schedule			Marks			Credits			Duration of Exam.
		L	T	P	Sess	Exam	Total	Sess	Exam	Total	
MESP-601	General & Special Purpose Digital Signal Processors	4	0	0	50	100	150	2	4	6	3
MESP-603	Statistical signal processing	4	0	0	50	100	150	2	4	6	3
MESP	Elective-II	4	0	0	50	100	150	2	4	6	3
MESP-605	Seminar-I	0	0	2	50	0	50	2	0	2	-
MESP-607	Dissertation (Phase I)	0	0	6	100	0	100	4	0	4	-
MESP-609	DSP Processors & Application Lab.	0	0	3	50	50	100	2	2	4	3
MESP-611	Statistical Signal processing Lab.	0	0	3	50	50	100	2	2	4	3
Total		12	0	14	400	400	800	16	16	32	

LIST OF ELECTIVE – II

MESP-621 Radar System Analysis and Design

MESP-623 Sonar Signal Processing

MESP-625 Digital Image Processing

Note:

- The paper setter will set each theory paper of 100 marks covering the entire syllabus. However, the examiner will evaluate the performance of the student in the theory course finally by assigning one of the grades out of A, A(-), B, B(-), C, C(-), D & F. Examination of Practical courses shall also be evaluated on the basis of these grades.
- The sessionals of Theory, Practical, Dissertation (Phase-I) and Seminar courses shall also be evaluated on the basis of above grades.
- The grading system is defined at the end of the Scheme of Studies and Examinations.

SEMESTER – IV

Course No.	Course Title	Teaching Schedule			Marks			Credits			Duration of Exam.
		L	T	P	Sess	Exam	Total	Sess	Exam	Total	
MESP-602	Seminar-II	0	0	2	50	-	50	2	-	2	-
MESP-604	Dissertation	0	0	26	100	500	600	4	20	24	3
Total		0	0	28	150	500	650	6	20	26	

Note:

- The sessionals of Dissertation shall be evaluated on the basis of grades i.e. A, A (-), B, B (-), C, C (-), D & F
- The Dissertation shall be evaluated by an examination Committee consisting of the Head of Electronics & Communication Engineering Department, Dissertation supervisor and one external examiner. The evaluation shall be based on the above grades.
- The grading system is defined at the end of the Scheme of Studies and Examinations.

M.D. UNIVERSITY, ROHTAK (HARYANA)
SCHEME OF GRADING SYSTEM (I TO IV SEMESTERS)

M.E. in Signal Processing

The grade awarded to the student in any particular course will be based on his/her performance in class work, sessionals tests, tutorial tests, home assignments, laboratory work, viva-voce examination, main examination etc.

The letter grades that can be awarded and their equivalent grade points are listed below:

Grade	Grade Points	Description of Performance
A	10	Outstanding
A(-)	09	Excellent
B	08	Very Good
B(-)	07	Good
C	06	Average
C(-)	05	Below Average
D	04	Marginal
F	0	Very Poor

The Grade Point Average (GPA) or Semester Grade Point Average (SGPA) or Cumulative Grade Point Average (CGPA) will be calculated as follows:

$$GPA = \frac{\sum (Number\ of\ Credit \times Grade\ Point\ s)}{\sum Number\ of\ Credits}$$

Where, \sum Implies summation of the bracketed terms, as applicable for the semester (s).

A student who is awarded 'F' Grade in a course shall be required to repeat this course and his/her GPA will be recomputed with the fresh grade points obtained. To convert the percentage of marks into the relative grade point, following guidelines may be allowed:

1. All students pursuing a particular ME Course in all the Engineering Colleges affiliated with M.D. University, Rohtak will form a single group. The answer books of this group will be examined by the same examiner in a particular subject to maintain uniformity of awards.
2. As the grading system is the relative one, the grades will be so awarded that their distribution follows the normal distribution curve. However, the 'A' grade may not be awarded in case the absolute marks scored are less than 90 percent.
3. While awarding any of the above grades, fractional percentage equal to or more than 0.5 percent will be rounded off to 1.0 percent while that less than 0.5 percent shall be treated as 0.0 percent.
4. In case a candidate with 'F' grade reappears & improves his/her grade in subsequent exam (s), he/she will be awarded to grade one level lower than the grade he/she actually had obtained. For example, if a student obtains 'B' (-) grade in a course in the second attempt as per the above guidelines, he/she will be finally awarded 'C' grade. Therefore, the grade point corresponding to 'C' grade shall be applicable in the SGPA/CGPA calculations by the University.
5. If a student fails to attend the regular classes of a semester or he/she fails to appear in the semester examination in any one or more subjects for any reasons, he/she shall be required to repeat that semester or course (s) next time in regular semester.

COURSE PROFILE
M.E. in SIGNAL PROCESSING

SEMESTER - I

MESP-501	Signal Theory
MESP-503	Digital Communication and Information system
MESP-505	Microprocessor and its application
EET-601	Digital Signal Processing
EMT-509	Numerical Techniques
MESP-507	Microprocessor Lab
MESP-509	Digital Signal Processing Lab

SEMESTER – II

EET-603	Embedded Systems & its Applications
MESP-502	Digital System Design
MESP-504	Advanced Signal Processing
MESP-506	Analog MOS Integrated Circuits for Signal Processing
MESP	Elective I
MESP-508	Digital System Design Lab
MESP-510	Advance Signal Processing Lab

SEMESTER – III

MESP-601	General & Special Purpose Digital Signal Processors
MESP-603	Statistical Signal Processing
MESP	Elective II
MESP-605	Seminar-I
MESP-607	Dissertation (Phase-I)
MESP-609	DSP Processors & Application Lab.
MESP-611	Statistical Signal processing Lab.

SEMESTER – IV

MESP-602	Seminar-II
MESP-604	Dissertation

SEMESTER – I

MESP-501 SIGNAL THEORY

L	T	P	Exam	Marks	Credits
4	-	-	: 100	4	
			Sessional	: 50	2
			Total	: 150	6
			Duration of exam	: 3hrs	

UNIT-1	Probability, Joint and Conditional Probability, Independent Events, Random Variable: Random Variable Concept, Distribution Function, Density Function, Gaussian Random variable, Other distribution and Density Examples, Conditional Distribution and Density Functions.
UNIT-2	Operations on one Random Variable: Expectation, Moments, Functions that give Moments, Transformation of a Random Variable, Multiple Random Variable; Vector Random Variable, Joint Distribution and its Properties, Conditional Distribution and Density, Statistical Independence, Distribution and Density of a Sum of Random Variables, Central Limit Theorem.
UNIT-3	Operations on Multiple Random Variables: Expected Value of a function of Random variables, Joint Characteristic Functions, Joint Gaussian Random variables, Transformations of Multiple Random variables, Linear Transformation of Gaussian Random variables, Sampling and Estimation: Estimation of Mean, Power, and Variance
UNIT-4	Random Process – Temporal Characteristics: The Random Process Concept, Stationarity and Independence, Correlation Functions, Measurement of Correlation Functions, Gaussian Random processes, Complex Random Processes
UNIT-5	Random Processes – Spectral Characteristics: Power Density Spectrum, Cross-Power Density Spectrum and their properties, Relationship between power Spectrum and autocorrelation function, Relationship between Cross-Power Spectrum and Cross-Correlation Function, Power Spectrums for Discrete Time Processes and Sequences, White and Colored Noise.
UNIT-6	Linear Systems with Random Inputs: Random Signal Response of Linear Systems, Spectral Characteristics of System Response, Noise Bandwidth, Discrete Time Systems: A/D Conversion, D/A Conversion.
UNIT-7	Modeling of Noise Sources: Receiver Noise Sources, Effective Noise Temperature, Incremental Modeling of Noisy Networks: Available Power Gain, Effective Input Noise temperature, Spot Noise Figures, Modeling of practical Noisy Networks: Average Noise Figures, Average Noise temperatures

Reference Books:

1. Probability, Random Variables and Random Signal Principles
Payton Z. Peebles, JR
4th edition, Mc-Graw Hill 2000
2. A Papoulis and S.U. Pillai Probability, Random Variables and Stochastic Processes
4th Edition McGraw Hill 2002
3. H. Stark and J.W. Woods, Probability and Random Processes with Application to Signal Processing
Prentice Hall 2002.

Note:

1. In the semester examination the examiner will set 8 questions in all, covering the entire syllabus and students will be required to attempt only 5 questions.
2. Use of the scientific calculator will be allowed in the examination. However programmable calculator and cellular phone will not be allowed.
3. The scheme of awarding the Grades to a student in the course will be supplied by the university to the examiner of Answer Books.

MESP-503 DIGITAL COMMUNICATION & INFORMATION THEORY

L	T	P	Exam	Marks	Credits
4	-	-	Sessional	: 100	4
			Total	: 50	2
			Duration of exam	: 150	6
				: 3hrs	

UNIT-1	Signals & classification, Fourier series and Fourier transform, autocorrelation and cross correlation, cross correlation of energy and power signal. Rayleigh energy theorem, probability theory, Gaussian Process.
UNIT -2	Noise: Sources of noise, signal to noise ratio, noise figure, noise temperature, Sampling theorem.
UNIT -3	Waveform Coding Techniques: Quantization, Pulse Code Modulation (PCM), PCM generator and Receiver, Companding in PCM, Delta Modulation, Adaptive Delta Modulation, Differential PCM, Comparison of Digital Pulse Modulation Method.
UNIT -4	Digital Modulation Techniques: Introduction, ASK, PSK, FSK, MSK, QPSK, BPSK, Detection of Binary Modulation Techniques in the presence of noise, error probability in ASK, PSK, FSK
UNIT -5	Information Theory: Concept of information and Entropy, Shannon Theorem, Channel Capacity Self Information, Discrete and Continuous Entropy, Mutual and Joint information, Redundancy
UNIT -6	Coding Theory; Source encoding & Channel encoding, Error detection and Correction, Various Codes for channel coding, Rate Distortion Functions.
UNIT -7	Error Control Code: Introduction to Block coding and Optimal Decoding, Binary Hamming Code, Structure of Linear Code, Decoding of Linear Block Code, Reed Muler Code, Structure of Cyclic Code, Bose Chaudhary Hocquenghem (BCH) codes, Cyclic Hamming Code

Reference books:

1. J. G. Proakis: Digital communication, Tata McGraw-hill (TMH) Publication, 3rd edition, 1990.
2. Bernard Sklar: Digital communications: Fundamentals and applications, PHI, 2003.
3. Simon Hawkins: Communication System, John Wiley, 3rd edition, 2004.
4. S.G.Wilson: Digital Modulation and Coding, PHI, 1996.

Note:

1. In the semester examination the examiner will set 8 questions in all, covering the entire syllabus and students will be required to attempt only 5 questions.
2. Use of the scientific calculator will be allowed in the examination. However programmable calculator and cellular phone will not be allowed.
3. The scheme of awarding the Grades to a student in the course will be supplied by the university to the examiner of Answer Books.

MESP-505 MICROPROCESSOR & ITS APPLICATIONS

L	T	P	Exam	Marks	Credits
4	-	-	Sessional	: 100	4
			Total	: 50	2
			Duration of exam	: 150	6
				: 3hrs	
UNIT -1			Microcomputer hardware: Microprocessor, architecture, system bus, memory organization, I/O, addressing modes, instruction types.		
UNIT -2			Interrupts, timing and machine cycles, peripheral interfacing – DMA controller, CRT controller-8275, floppy disk interface and floppy disk controller-8272.		
UNIT -3			Process control computer systems – process control languages, types of computers – main frames, minicomputers, microcomputers, performance evaluation techniques.		
UNIT- 4			Microprocessor and microcomputer selection :Matching processors and applications, defining the application, software requirements, memory requirements, interfaces, coprocessor, future needs and expandability, power requirements, maintenance, cost effective design.		
UNIT -5			Development Tools: Development systems for micros, software tools, logic analyzer, cross assemblers, compilers, and simulators.		
UNIT- 6			Data Communication: Information coding, asynchronous and synchronous data communication, data communication standards – RS232C and RS485, USART, IEEE-488 GPIB.		
UNIT -7			Applications: Stepper motor interface, temperature controller with an analog and digital computer using a temperature sensor, microprocessor based speed-monitoring unit of DC motor, frequency measurement.		

Reference Books:

1. Rafiqzaman: Microprocessor- Microprocessors and Microcomputer-Based System Design, CRC Press, 1990.
2. Slater: Microprocessor based design: A Comprehensive Guide to Effective Hardware Design, PHI, 2002.
3. A.P. Mathur: Introduction to Microprocessors, TMH, 1997.
4. Bray – Intel Microprocessor 8086/8088: Architecture, Programming and interfacing, PHI.
5. S. Ghoshal: Microprocessor Based System Design, Macmilan, 2000.

Note:

1. In the semester examination the examiner will set 8 questions in all, covering the entire syllabus and students will be required to attempt only 5 questions.
2. Use of the scientific calculator will be allowed in the examination. However programmable calculator and cellular phone will not be allowed.
3. The scheme of awarding the Grades to a student in the course will be supplied by the university to the examiner of Answer Books.

EET-601 DIGITAL SIGNAL PROCESSING

L	T	P		Exam	Marks	Credits
4	-	-		Sessional	: 100	4
				Total	: 50	2
				Duration of exam	: 150	6
					: 3hrs	
UNIT-1	Discrete time signals and systems: Introduction, discrete-time signals: sequences i.e. basic sequences and operations, discrete time systems, memory-less systems, linear time invariant systems, causality, stability properties of linear time- invariant systems, frequency-domain representation of discrete-time signals and systems.					
UNIT-2	Representation of sequences by Fourier transforms. Symmetry properties and Theorems of Fourier transform, discrete-time random signals.					
UNIT-3	Z-Transforms: Introduction, properties of Z-transform, region of convergence, inverse Z-transform-partial fraction expansion, power series expansion. Application of Z-transform, system function, poles and Zeros.					
UNIT-4	Structures of digital filters: Basic structures of Infinite Impulse Response (IIR) and Finite Impulse Response (FIR) Filters--direct form, cascade form, parallel form, feedback in IIR system, transposed forms Design of FIR and IIR filters using all standard procedures.					
UNIT-5	Frequency transformations: Frequency transformations in the analog and digital domain. Discrete Fourier Transform (DFT): Properties of DFT, linear convolution using DFT, computation of DFT using fast Fourier Transform (FFT).					
UNIT-6	Errors in Digital filtering: Errors resulting from rounding and truncation, round-off effects in digital filters. Finite word length effects in digital filter.					
UNIT-7	Multirate Digital Signal processing (MDSP): Sampling rate conversion, multistage implementation of sampling rate conversion, application of multi rate DSP for design of phase shifters, narrow band low pass filters, Quadrature Mirror Filters, digital filter banks.					
UNIT-8	Hardware implementation of DSP: Introduction to DSP processor, architecture of DSP processors. DSP Devices: Von Neumann model, Harvard architecture.					

Reference Books:

1. Digital signal processing: Alan V. Oppenheim, Ronald W. Schafer PHI 1998
2. Digital signal processing: Sanjit K. Mitra TMH, 2002
3. Digital Signal Processing: Proakis, PHI, 2002

Note:

1. In the semester examination the examiner will set 8 questions in all, covering the entire syllabus and students will be required to attempt only 5 questions.
2. Use of the scientific calculator will be allowed in the examination. However programmable calculator and cellular phone will not be allowed.
3. The scheme of awarding the Grades to a student in the course will be supplied by the university to the examiner of Answer Books.

EMT-509 NUMERICAL TECHNIQUES

L	T	P	Exam	Marks	Credits
4	-	-	Sessional	: 100	4
			Total	: 50	2
			Duration of exam	: 150	6
				: 3hrs	
UNIT-1	Linear equations- Matrix theory, solution of general linear system of equations, existence & uniqueness of solution, Echelon form of matrix, Gauss-elimination method for homogeneous & non-homogeneous systems of linear equations.				
UNIT-2	Gauss-Jordan methods, round off errors, I, II conditioned matrices Eigen value & Eigen vectors, Unitary, Hermitian & normal matrices.				
UNIT-3	Non-linear equations-Bisection methods, Linear interpolation methods, Newton's method, Muller's method, Bairstow's methods for the quadratic factors, other methods for the polynomials.				
UNIT-4	Interpolation problems-Lagrangian polynomial, Divided differences, Interpolating with cubic spline, Bexier curves and B-spline curves, polynomial approximation of the surfaces, least square method.				
UNIT-5	Differentiation & integration-derivatives from difference table, higher order derivatives, Extrapolation techniques, Integration formulas-Simpson's rule, Trapezoidal rule, Gaussian quadrature, Adaptive integration, multiple integrals.				
UNIT-6	Solution of ordinary differential equation – modified Euler methods, Milne's methods Adam's moulton method, Convergence criteria, Errors & error propagation, Comparison of different methods.				
UNIT-7	Boundary value problems:- shooting methods, Rayleigh-Ritz, collocation and Galerkin methods, characteristic value problem, Eigen values by iteration and QR method, application of Eigen values.				
UNIT-8	Solution of partial differential equation – Laplace's equations on a rectangular region, iterative method for the Laplace equation, Poisson equation, A.D.I method, Solution of parabolic differential equation by Crank – Nicholson method, Theta method, Solution of wave equation by Finite differences, Wave equation in two dimensions.				

Reference Books:

1. Kreyszig, Erwin, "Advanced Engineering Mathematics" John 1999.
2. Greenberg, Mchale. D "Advanced Engineering Mathematics" Second Edition Pearson, 1998.
3. Jain, R.K. & Iyengar, S.R.K. "Advanced Engineering Mathematics" Narosa 2002.
4. Gerald Curts F & Wheatley, Patrick O, Applied Numerical Analysis" 5th Ed. Wesley 1998.
5. Jain, M.K. Iyengar, S.R.K. & Jain R.K. "Numerical Methods for scientific & Engineering Computation". New Age 1993

Note:

1. In the semester examination the examiner will set 8 questions in all, covering the entire syllabus and students will be required to attempt only 5 questions.
2. Use of the scientific calculator will be allowed in the examination. However programmable calculator and cellular phone will not be allowed.
3. The scheme of awarding the Grades to a student in the course will be supplied by the university to the examiner of Answer Books.

MESP-507 MICROPROCESSOR LAB

L	T	P	Exam	Marks	Credits
-	-	3	Sessional	: 50	2
			Total	: 100	4
			Duration of exam	: 3 hrs.	

LIST OF EXPERIMENTS:

1. Familiarization with architecture and operation of single board microcomputer.
2. Performing mathematical and logical operations on a single board microcomputer.
3. Familiarization with DEBUG program and its commands to execute and debug Assembly Language Programs (ALP).
4. Write a program for a 16 bit processor to
 - (a) Find the largest number in a data array.
 - (b) Find the smallest number in a data array.
5. Write a program for a 16 bit processor to find the sum of a series of 16 bit numbers.
6. Write a program for speed control of DC series motor.
7. Design a microprocessor based temperature monitoring unit.
8. Write a program for a traffic light control with emergency control using Interrupts.
9. Familiarization with architecture and operation of an 8 bit Microcontroller.
10. Write an ALP to generate 10 KHz square wave.
11. Write an ALP to interface Microprocessor and LCD display.
12. Write an ALP to interface one microcontroller with other using serial communication.

Note: At least ten experiments have to be performed in the semester. At least seven experiments should be performed from the above list. Remaining three experiments may either be performed from the above list or designed and set by the concerned institution as per the scope of the syllabus.

MESP-509 DIGITAL SIGNAL PROCESSING LAB

L	T	P			Marks	Credits
-	-	3		Exam	: 50	2
				Sessional	: 50	2
				Total	: 100	4
				Duration of exam	: 3 hrs.	

LIST OF EXPERIMENTS USING MATLAB:

1. Write a Program for generation of unit impulse, unit step, ramp, exponential, sinusoidal and cosine sequence.
2. Write a Program for computing inverse Z-transform of a rational transfer function.
3. Write a Program for linear convolution
4. Write a Program for plotting the frequency response of first order system.
5. Write a Program for computing Discrete Fourier Transform (DFT).
6. Design a Butterworth Low pass IIR filter using Bilinear Z-transform method.
7. Design FIR Low pass filter and High pass filter using Rectangular window.
8. Transform an analog filter in to a digital filter using Impulse Invariant method.
9. Design a Chebyshev Low pass filter.
10. Design FIR low pass filter using Kaiser Window.
11. Determine the execution time of the FFT function.
12. Demonstrate the effectiveness of high-speed convolution FFT algorithm

Note: At least ten experiments have to be performed in the semester. At least seven experiments should be performed from the above list. Remaining three experiments may either be performed from the above list or designed and set by the concerned institution as per the scope of the syllabus.

SEMESTER-II

EET-603 EMBEDDED SYSTEMS & APPLICATIONS

L	T	P	Exam	Marks	Credits
4	-	-	Exam	: 100	4
			Sessional	: 50	2
			Total	: 150	6
			Duration of exam	: 3hrs	
UNIT-1			Introduction to embedded system, Categories of embedded systems, Hardware Architecture, CPU, Processor Architecture interrupts, CISC & RISC, Memory, I/O devices, DMA, ADC & DAC, Serial Peripheral integrate, inter – integrated circuits bus-TCP/IP protocol		
UNIT-2			Software architecture, services provided by an operating system, architecture of embedded operating system, categories of embedded operating system		
UNIT-3			Process of embedded system development, waterfall model, requirements engineering, Design tradeoffs, co-design, Hardware design, Software design, Implementation, Integration & Testing, Configuration Management. Managing embedded-system development projects		
UNIT-4			Communication Interfaces, RS-232/UART, RS-422/485, IEEE 1394, USB, Ethernet, wireless interfaces, IEEE 802.11, Bluetooth.		
UNIT-5			Representative embedded systems, Digital Thermometer, Handheld Computer, GPS Navigation System, Internet Phone, Software – defined Radio, smart cards, RF tags,		
UNIT-6			Embedded operating system, features of O/S, POSIX, Difference in various O/S, Embedded NT, Windows XP Embedded and embedded Linux		

Reference Books:

1. Embedded System by Dr. K.V.K.K. Prasad, Dreamtech Press, 2005.
2. Embedded System and applications by Raj Kamal, TMS, 2002

Note:

1. In the semester examination the examiner will set 8 questions in all, covering the entire syllabus and students will be required to attempt only 5 questions.
2. Use of the scientific calculator will be allowed in the examination. However programmable calculator and cellular phone will not be allowed.
3. The scheme of awarding the Grades to a student in the course will be supplied by the university to the examiner of Answer Books.

MESP-502 DIGITAL SYSTEM DESIGN

L	T	P	Exam	Marks	Credits
4	-	-	Sessional	: 100	4
			Total	: 50	2
			Duration of exam	: 150	6
				: 3hrs	
UNIT 1	Introduction to computer added design: Hardware Description language (HDL), VHSIC Hardware Description Language (VHDL), Data Objects, Data Types, Operators.				
UNIT 2	Introduction to Modeling: Entity Declaration, Architecture Body, Behavioral Flow Modeling, Structural Modeling and Data flow modeling.				
UNIT 3	VHDL models of combinational and sequential circuits, memory implementation of Boolean function, code converter, ALU.				
UNIT 4	Hardware & software firmware consideration in designing control units for arithmetic logical processors, I/O Processor with different methods of the data handling, electronics switching, process interface design.				
UNIT 5	Programmable Logic Arrays (PLA) and designing with PLA, PAL, FPGA				
UNIT 6	Approaches to Sequential analysis and design: State Diagram, Analysis of Sequential Synchronous circuits, Design steps for Sequential Synchronous Circuits, State Reduction, Design of output Decoders, Counters, Shift Registers and Memory.				
UNIT 7	Asynchronous Finite State Machines: Scope, Asynchronous Analysis, Design of Asynchronous Machines, Cycles and Races, Plotting and Reading the Excitation Map, Essential Hazards Map Entered Variable (MEV), MEV approaches to Asynchronous Design.				

Reference Books:

1. Fletcher: Engineering approach to digital design, PHI, 1993.
2. Bhasker: A VHDL Primer, Pearson Education, Prentice Hall PTR, 2006.
3. Mano: Digital logic and computer design, PHI, 1994
4. Wakerly Digital Design: Principles and practices, Pearson Education, 2005.
5. D. Smith: HDL Chip Design, Doon Publications 1996.

Note:

1. In the semester examination the examiner will set 8 questions in all, covering the entire syllabus and students will be required to attempt only 5 questions.
2. Use of the scientific calculator will be allowed in the examination. However programmable calculator and cellular phone will not be allowed.
3. The scheme of awarding the Grades to a student in the course will be supplied by the university to the examiner of Answer Books.

MESP-504 ADVANCE SIGNAL PROCESSING

L	T	P	Exam	Marks	Credits
4	-	-	Sessional	: 50	2
			Total	: 150	6
			Duration of exam	: 3hrs	

UNIT 1	Digital Filter Structures: FIR digital filter structures; Direct form, Cascade form, Frequency Sampling structures, Lattice structure, IIR digital filter structure; Direct form, Cascade realization, Parallel realization, Lattice-Ladder filter structure.
UNIT 2	Design of FIR filters: Concept of Linear Phase, Design of Linear Phase FIR filters using Windows, Design of FIR filter using Frequency sampling methods, Design of FIR differentiators.
UNIT 3	Design of IIR filters: Design of IIR filters using Bilinear transformation method, Design of IIR filter using Impulse Invariant method.
UNIT 4	Quantization of Filter Coefficients: Coefficient quantization effects in FIR and IIR filters, Round-off effects in digital filters, Statistical characterization of quantization effects.
UNIT 5	Sampling and Reconstruction of Signals: Representation of Band Pass signal, Sampling of Band Pass signal, A/D conversion, Sample and Hold, Quantization and Coding, Analysis of quantization error, White Noise model of quantization error, oversampling A/D converters, Sigma-Delta A/D converter.
UNIT 6	Multirate Digital Signal Processing: Decimation by a factor D, Interpolation by a factor I, Sampling Rate conversion by a rational factor I/D, Multistage Implementation of Sampling Rate conversion, Sampling Rate conversion by an arbitrary factor; First Order approximation, Second Order approximation

Reference Books:

1. Proakis, John G., Dimitris G. Manolakis, and D. Sharma: Digital Signal Processing, Principles, Algorithms, and Applications, Pearson Education, 2006
2. Digital Signal processing, A Practical Approach, Emmanuel C. Ifeachor, Barrie W Jervis, Pearson education, 2002
3. Mitra Sanjit.K: Digital Signal Processing a computer Based approach, Tata McGraw-Hill, 2001

Note:

1. In the semester examination the examiner will set 8 questions in all, covering the entire syllabus and students will be required to attempt only 5 questions.
2. Use of the scientific calculator will be allowed in the examination. However programmable calculator and cellular phone will not be allowed.
3. The scheme of awarding the Grades to a student in the course will be supplied by the university to the examiner of Answer Books.

MESP-506 ANALOG MOS INTEGRATED CIRCUITS FOR SIGNAL PROCESSING

L	T	P	Exam	Marks	Credits
4	-	-	: 100		4
			Sessional	: 50	2
			Total	: 150	6
			Duration of exam	: 3hrs	

UNIT 1	Overview of MOS technology, analog signal processing, basic MOS semiconductor fabrication process -PN junction, resistor, capacitor.
UNIT 2	Use of Device models in circuit analysis: MOS models, Bipolar models, monolithic resistors and capacitors.
UNIT 3	Analog CMOS sub circuit: MOS switch, CMOS current source, current mirrors - Wilson, cascade.
UNIT 4	Digital to analog and Analog to digital conversion: Medium speed, High speed.
UNIT 5	Switched capacitor circuit, switch capacitor amplifier, switched capacitor Integrator, Z domain or first order and second order switched capacitor circuit.
UNIT 6	Non-filtering applications of switched capacitor circuits; gain stage, programmable–capacitor arrays, switched-capacitor rectifiers, detectors, oscillators, application in signal processing.

Reference Books:

1. Allen: CMOS analog circuit design, Oxford University press, 2002.
2. Schaumann: Design of analog filters, Oxford University press, 2001
3. Warner and Grung: MOSFET Theory and Design, Oxford University Press, 1999.
4. Gregorian and Temes: Analog MOS integrated Circuits for Signal Processing, John Wiley, 1986.

Note:

1. In the semester examination the examiner will set 8 questions in all, covering the entire syllabus and students will be required to attempt only 5 questions.
2. Use of the scientific calculator will be allowed in the examination. However programmable calculator and cellular phone will not be allowed.
3. The scheme of awarding the Grades to a student in the course will be supplied by the university to the examiner of Answer Books.

ELECTIVE-I

MESP-520 WIRELESS COMMUNICATION

L	T	P	Exam	Marks	Credits
4	-	-	Sessional	: 100	4
			Total	: 50	2
			Duration of exam	: 150	6
				: 3hrs	

UNIT-1	Introduction to wireless communication system, various generation wireless networks, cellular concepts, interface and system capacity, trunking and grade of service improving converge and capacity in cellular system.
UNIT-2	Fading and mobile characteristics representation, small scale fading, frequency selective fading, fading effect due to Doppler spread, coherence BW and coherence time, Rayleigh fading distribution, Ricean fading, Nakagami distribution, level crossing.
UNIT-3	Diversity, coding and equalization
UNIT-4	Modulation techniques for mobile radio, pulse shaping techniques, linear modulation techniques, constant envelope modulation, spread spectrum modulation techniques, rake receiver.
UNIT-5	Multiple Access (MA) techniques for wireless communication; FDMA, TDMA, CDMA, spectral effect of multiple access Schemes.
UNIT-6	GSM services and features, Architecture, frame structure, GSM channel, signal processing in GSM.
UNIT-7	Design parameters at base and mobile unit, Antenna configurations, Noise, power and field strength.

Reference Books:

1. T.S Rappaport: Wireless Communications, Prentice Hall, 1996.
2. Mobile Communications Design Fundamentals, 2nd Edition, William C.Y. Lee, John Wiley, February 1993.
3. Gordon L. Stuber: Principles of Mobile communication, Kluwer Academic, 2nd Edition., 2001.
4. W. Stallings: Wireless Command Network, PHI, 2003.
5. J. Schiller: Mobile Communication, Addison Wesley, 2002.
6. D.J. Goodman: Wireless Personal Communication Systems, Addison Wesley 1997.

Note:

1. In the semester examination the examiner will set 8 questions in all, covering the entire syllabus and students will be required to attempt only 5 questions.
2. Use of the scientific calculator will be allowed in the examination. However programmable calculator and cellular phone will not be allowed.
3. The scheme of awarding the Grades to a student in the course will be supplied by the university to the examiner of Answer Books.
4. Any one Elective course shall be offered from above list (MESP-520, EET-510, and MESP-522) and will be finalized by HOD, depending on the availability of the expertise as well as the faculty strength in the department. The choice of the students for any elective shall not be a binding for the department to offer it.

EET-510 ARTIFICIAL INTELLIGENCE

L	T	P	Exam	Marks	Credits
4	-	-	: 100	4	
			: 50	2	
			: 150	6	
			Duration of exam : 3hrs		
UNIT 1	Predicate Calculus in AI: Introduction, the Propositional calculus, The Predicate calculus, Expressions using interference Rules, knowledge representation through predicate calculus.				
UNIT-2	Structures And Strategies for State Space Search: Introduction, Graph, Theory, Strategies for State Space Search, Heuristic Search, Algorithms for Heuristic Search, Admissibility, Monotonicity and Informedness, Game Playing (minimax) using Heuristic, Back Tracking Strategies, Graph Search Strategies, Heuristic Graph Search.				
UNIT-3	Control Strategies of State Space Search: Introduction, Recursion-Based Search, Pattern-Directed Search Production Systems.				
UNIT-4	Knowledge Representation: Issues in Knowledge Representation, A Brief illustration of AI Representational systems, Knowledge representation using Predicate logic, Semantics Net, Concept of Frames, Meta knowledge.				
UNIT-5	Rule Based Systems: A forward deduction system, backward deduction system, combination of forward and backward system, Control Knowledge for Rule Based Deduction Systems.				
UNIT-6	Artificial Neural Networks: Introduction, different learning laws and architectures, learning through error back propagation, Radial Basis function, Neural computing model – Hopfield net, Boltzman Machine.				
UNIT-7	Uncertainty Handling: Bayesian networks, Dempster-Shafer theory, certainty factors, introduction to Fuzzy Logic.				
UNIT-8	Expert Systems: Introduction, Architecture of expert system, knowledge acquisition and representation methods in expert systems, few applications of expert systems. Prolog Programming: An introduction and brief overview of the language.				

Reference Books

1. George Luger, "Artificial Intelligence: Structure and Strategies for complex problem solving", Pearson Education, 2004.
2. Iven Bratko, "Prolog: Programming for artificial intelligence" Person Education., Addison Wesley, 2000.
3. Nils J. Nilsson, "Artificial Intelligence: A New synthesis, Harcart Asia Pvt. Ltd., 1998.
4. "Artificial Intelligence": by S.V. Kataipoulos
5. Masound, Yazani, "Artificial Intelligence", Intellect, 1986.
6. "Introduction to ANN" by Jack., M. Zwadu

Note:

1. In the semester examination the examiner will set 8 questions in all, covering the entire syllabus and students will be required to attempt only 5 questions.
2. Use of the scientific calculator will be allowed in the examination. However programmable calculator and cellular phone will not be allowed.
3. The scheme of awarding the Grades to a student in the course will be supplied by the university to the examiner of Answer Books.
4. Any one Elective course shall be offered from above list (MESP-520, EET-510, and MESP-522) and will be finalized by HOD, depending on the availability of the expertise as well as the faculty strength in the department. The choice of the students for any elective shall not be a binding for the department to offer it.

MESP-522 OPTICAL FIBER COMMUNICATION SYSTEMS

L	T	P	Exam	Marks	Credits
4	-	-	Sessional	: 100	4
			Total	: 50	2
			Duration of exam	: 150	6
				: 3hrs	

UNIT 1	Overview of Optical Communication Systems.
UNIT 2	Review of Optics: Wave Theory of Light, Reflection/Refraction of plane waves, Fresnel's Formulas, Interface, Diffraction, Optical Coherence, Polarization of Light.
UNIT 3	Propagation of light in Fibers: Concepts of modes and single mode fibers, Dispersion and attenuation in Fibers, Comparison of different types of Fibers and optical choice of Fibers.
UNIT 4	Optical Wave Guide: Planar Conducting waveguides, planar dielectric wave guides, optical fiber wave guides
UNIT 5	Optical Sources and transmitters: LED, semiconductor lasers and their characteristics
UNIT-6	Optical detectors and receivers: Photo detectors and their characteristics, receiver design, noise and sensitivity issues.
UNIT-7	System Design: Selection of detectors based on speed, sensitivity and signal to noise ratio, determination of crucial parameters for basic optical devices, translate design requirement into system parameters, optical link design, power and noise budget, jitter / rise time budget.

Reference Books:

1. Govind P. Aggarwal: Fiber Optic Communication System, 3rd Edition, John Wiley Publication., 1989.
2. Joseph C. Palais: Fiber Optic Communication, 4th Edition, PHI, 2005.
3. R. Ramaswami and K.N.Swarajan,, "Optical Networks: a Practical Perspective" , Morgan Kaufmann Publishers, 1998.
4. J.Gowar: Optical Fiber Communication System, PHI, 1995
5. G.Keiser: Optical fiber communication, Tata McGraw Hill, 2000.
6. J.M Senior: Optical fiber Communication Principles and Practice, PHI, 1992

Note:

- 1 In the semester examination the examiner will set 8 questions in all, covering the entire syllabus and students will be required to attempt only 5 questions.
- 2 Use of the scientific calculator will be allowed in the examination. However programmable calculator and cellular phone will not be allowed.
- 3 The scheme of awarding the Grades to a student in the course will be supplied by the university to the examiner of Answer Books.
- 4 Any one Elective course shall be offered from above list (MESP-520, EET-510, and MESP-522) and will be finalized by HOD, depending on the availability of the expertise as well as the faculty strength in the department. The choice of the students for any elective shall not be a binding for the department to offer it.

MESP-508 DIGITAL SYSTEM DESIGN LAB

L	T	P	Exam	Marks	Credits
-	-	3	Sessional	: 50	2
			Total	: 100	4
			Duration of exam	: 3 hrs.	

1. Write VHDL code for 3 to 8 priority encoder.
2. Write structural code for 16:1 multiplexer.
3. Write VHDL code of full adder using two half adder.
4. Write VHDL code of BCD to 7 segment code converter using Data Style of modeling.
5. Design a three bit up/down counter using T flip flop.
6. Design a four bit synchronous counter with parallel load using T and D flip flops.
7. Write Behavioral VHDL code for module-12 up counter with synchronous reset.
8. Write VHDL Code for left to right shift registers with enable pin.
9. Create an entity that represents 3 to 8 binary encoder using two instances of 2 to 4 entity.
10. Design four bit comparator using Behavioral and Structural type of modeling.
11. Design an ALU capable of performing arithmetic and logical operations.
12. Design a module-6 counter which counts in the sequence 0,1,2,3,4,5,0,1, the counter counts the clock pulse if its enable pin is equal to 1

Note: At least ten experiments have to be performed in the semester. At least seven experiments should be performed from the above list. Remaining three experiments may either be performed from the above list or designed and set by the concerned institution as per the scope of the syllabus.

MESP-510 ADVANCE SIGNAL PROCESSING LAB

L	T	P		
-	-	3		
			Exam	Marks Credits
			Sessional	: 50 2
			Total	: 50 2
			Duration of exam	: 100 4
				: 3 hrs.

LIST OF EXPERIMENTS USING MATLAB

1. Implement a Cascade and Parallel form realization of IIR Filter and write a MATLAB Program to convert Cascade and Parallel form to direct form.
2. Write a MATLAB program that converts a direct form FIR filter structure to Frequency Sampling form FIR.
3. Implement a Lattice/Ladder IIR filter using MATLAB.
4. Implement a Lattice form realization of FIR filter.
5. Simulate the effect of coefficient quantization on the frequency response of a direct form IIR digital filter.
6. Simulate the effect of coefficient quantization on the frequency response of a Direct form FIR digital filter.
7. Calculate output noise variance due to input quantization of a digital filter (Partial – Fraction Approach)
8. Compute output round-off noise variance of a 4th order digital filter.
9. Design a digital FIR low pass filter using Window Techniques.
10. Design a Low Pass, Discrete time filter with Butterworth Characteristic using Bilinear Transformation method and Impulse Invariant Method.
11. Write a MATLAB program to generate a discrete time equivalent of the signal. Interpolate the discrete time signal and Decimate the output of interpolator.
12. Operation of a Sigma-Delta A/D converter for a sinusoidal input using MATLAB.

Note: At least ten experiments have to be performed in the semester. At least seven experiments should be performed from the above list. Remaining three experiments may either be performed from the above list or designed and set by the concerned institution as per the scope of the syllabus.

SEMESTER – III

MESP-601 GENERAL AND SPECIAL PURPOSE DIGITAL SIGNAL PROCESSORS

L	T	P		Marks	Credits
4	-	-	Exam	: 100	4
			Sessional	: 50	2
			Total	: 150	6
			Duration of exam	: 3hrs	

UNIT 1	Introduction, computer architectures for signal processing, Harvard Architecture, pipelining.
UNIT 2	Hardware multiplier accumulator, special instructions, Replication, on chip memory/cache, extended parallelism – SIMD, VLIW and static superscalar processing.
UNIT 3	General purpose digital signal processors – fixed point DSP's, Architecture of first generation fixed point DSP processors, Architecture of second generation fixed point DSP's, Architecture of third generation fixed point DSP's, Architecture of fourth generation fixed point processors, floating point digital signal processors.
UNIT 4	Selecting digital signal processors – architectural features, execution speed, type of arithmetic, word length, support for development tools, packaging of a DSP, Clock frequency and MIPS rating.
UNIT 5	Implementation of DSP algorithms on general purpose DSP's – FIR digital filtering, IIR digital filtering, FFT processing, multirate processing.
UNIT 6	Special purpose DSP hardware – Basic requirements of special purpose DSP's, hardware digital filters, hardware FFT processors, architecture of hardware FFT processors, double buffering in real time FFT.

Reference books:

1. Emmanuel C. Ifeachor, Barrie W. Jervis, "Digital signal processing – A practical Approach", Second Edition, Pearson Education, 2004.
2. Digital Signal Processing – Principles, Algorithms and applications, by John G. Proakis, Dimitris Manolakis, Pearson Education, 2006.
3. Chassaing R, Horning D.W. "Digital Signal Processing with the TMS320C2S", Wiley Publications, 1990.
4. Digital Signal Processor Applications with Motorola's DSP 56002, Mohammed EL. Sharkawy

Note:

1. In the semester examination the examiner will set 8 questions in all, covering the entire syllabus and students will be required to attempt only 5 questions.
2. Use of the scientific calculator will be allowed in the examination. However programmable calculator and cellular phone will not be allowed.
3. The scheme of awarding the Grades to a student in the course will be supplied by the university to the examiner of Answer Books.

MESP-603 STATISTICAL SIGNAL PROCESSING

L	T	P		Marks	Credits
4	-	-	Exam	: 100	4
			Sessional	: 50	2
			Total	: 150	6
			Duration of exam	: 3hrs	

UNIT-1	Digital Filter design using least-square method: Least Square error criterion in the design of Pole-zero filters, FIR least squares inverse filters.
UNIT-2	Spectral Estimation and Analysis - Non parametric methods: Periodogram, Bartlett and Welch modified periodogram, Blackman-Tukey Methods.
UNIT-3	Spectral estimation and analysis - Parametric methods: wide sense stationary random process, rational power spectra: Auto Regressive (AR) Process, Moving Average (MA) Process, ARMA Process, Relationship between the Filter Parameters and the auto correlation sequence.
UNIT-4	Forward and backward Linear Prediction: Forward Linear Prediction, Backward Linear Prediction, Relationship of an AR process to Linear Prediction: Yule-Walker Method, Levinson-Durbin Algorithm.
UNIT-5	Wiener Filters for Filtering and Prediction: FIR wiener filter, Orthogonality principle in the Linear Mean-square error (MSE) estimation, IIR Wiener Filter.
UNIT-6	Adaptive Algorithms to adjust coefficients of digital filters: Least Mean Square (LMS), Recursive Least Square (RLS) and Kalman Filter Algorithms.

Reference Books:

1. Proakis, John G., Dimitris G. Manolakis, and D. Sharma: Digital Signal Processing, Principles, Algorithms, and Applications, Pearson Education, 2006
2. Vinay K. Ingle and John G. Proakis: Digital Signal Processing Using MATLAB, Brooks/Cole/Thomson Learning, 2001.
3. Digital Signal processing, A Practical Approach, Emmanuel C. Lfeachor, Barrie W Jervis, Pearson education, 2002
4. Mitra Sanjit.K: Digital Signal Processing a computer Based approach, Tata McGraw-Hill,2001.
5. Simon Haykin: Adaptive Filter Theory ,Pearson Education, 2002..
6. B. Widrow & S Stearns: Adaptive Signal Processing, PHL, 1985
7. Dimitris, Manolakis: Statistical and Adaptive Signal Processing, McGraw Hill, 2000.

Note:

1. In the semester examination the examiner will set 8 questions in all, covering the entire syllabus and students will be required to attempt only 5 questions.
2. Use of the scientific calculator will be allowed in the examination. However programmable calculator and cellular phone will not be allowed.
3. The scheme of awarding the Grades to a student in the course will be supplied by the university to the examiner of Answer Books.

ELECTIVE-II

MESP-621 RADAR SYSTEM ANALYSIS & DESIGN

L	T	P	Exam	Marks	Credits
4	-	-	Sessional	: 100	4
			Total	: 50	2
			Duration of exam	: 150	6
				: 3hrs	
UNIT-1	Radar fundamentals : Radar Classifications, Range, Range Resolution, Doppler Frequency Coherence, Radar Equation, Low Pulse Repetition frequency (PRF) Radar Equation, High PRF Radar Equation, Surveillance Radar Equation, Radar Losses, Noise Figure				
UNIT-2	Signal Processing, Discrete Power Spectrum, Windowing Techniques				
UNIT-3	Continuous Wave (CW) and Pulsed Radars: Functional Block Diagram, CW Radar Equation, Frequency Modulation (FM), Linear FM CW Radar Pulsed Radar, Range & Doppler Ambiguities, Resolving Range Ambiguities, Resolving Doppler Ambiguities.				
UNIT-4	Radar Detection : Detection in Presence of Noise, Probability of Fake Alarm, Probability of Detection, Pulse Integration, Detection of Fluctuating Targets, Probability of Detection Calculation				
UNIT-5	Radar Wave propagation : Earth Atmosphere, Refraction, Four-Third Earth Model, Ground Reflection, Pattern Propagation Factor, Diffraction, Atmosphere Attenuation.				
UNIT-6	Clutter and Moving Target Indicator: Clutter Definition, Surface Clutter, Volume Clutter, Clutter Spectrum, Moving Target Indicator-Single Delay Line canceller, Double Delay Line canceller.				
UNIT-7	Radar Antennas: Directivity, Power Gain, Effective aperture, Near and Far Fields, General Arrays, Linear Arrays, Planer Arrays, Array Scan Loss, Conventional Beam Forming				
UNIT-8	Radar Cross Section (RCS): RCS definition, Dependency on Aspect Angle and Frequency RCS Dependence on Polarization, RCS of Simple objects, Simplistic Approach to calculating the RCS of Complex objects				

Reference Books:

1. Bassem R. Mahafza : Radar System Analysis and Design Using MATLAB, Chapman & Hall /CRC Press, 2005
2. Merrill I. Skolnik: Introduction to Radar Systems, Tata McGraw-Hill, 2001
3. Byron Eddie: Radar Principles, Technology, Applications, Pearson Education, 1995

Note:

1. In the semester examination the examiner will set 8 questions in all, covering the entire syllabus and students will be required to attempt only 5 questions.
2. Use of the scientific calculator will be allowed in the examination. However programmable calculator and cellular phone will not be allowed.
3. The scheme of awarding the Grades to a student in the course will be supplied by the university to the examiner of Answer Books.
4. Any one Elective course shall be offered from above list (MESP-621, MESP-623 and MESP-625) and will be finalized by HOD, depending on the availability of the expertise as well as the faculty strength in the department. The choice of the students for any elective shall not be a binding for the department to offer it.

MESP-623 SONAR SIGNAL PROCESSING

L	T	P	Exam	Marks	Credits
4	-	-	Exam	: 100	4
			Sessional	: 50	2
			Total	: 150	6
			Duration of exam	: 3hrs	

UNIT 1	Overview of sonar systems
UNIT 2	Sonar Basics: Propagation of sound in the ocean, noise in the ocean.
UNIT 3	Analysis of Sonar Signals: The sonar equation, signal/noise considerations, Generation of underwater sound, Nonlinear effect of depth
UNIT 4	Detection of Sonar signals: Threshold concept, Various types of detector, Typical problems in detection of sonar signals, Adaptive digital filters, Digital Doppler nullification
UNIT 5	Sonar Array Processing: Conventional beamforming, Adaptive beamforming, Beam Steering
UNIT 6	Sonar Systems Design Implementation: Passive sonar design consideration, Active sonar design consideration

Reference Books:

1. Francois Le Chevalier: Principles of Radar and Sonar Signal Processing, ARTECH House, 2002.
2. R.Urick: Principles of under water sound, McGraw Hill, 1983
3. A.D.Waite: Sonar for Practicing Engineers, 2002.

Note:

1. In the semester examination the examiner will set 8 questions in all, covering the entire syllabus and students will be required to attempt only 5 questions.
2. Use of the scientific calculator will be allowed in the examination. However programmable calculator and cellular phone will not be allowed.
3. The scheme of awarding the Grades to a student in the course will be supplied by the university to the examiner of Answer Books.
4. Any one Elective course shall be offered from above list (MESP-621, MESP-623 and MESP-625) and will be finalized by HOD, depending on the availability of the expertise as well as the faculty strength in the department. The choice of the students for any elective shall not be a binding for the department to offer it.

MESP-625 DIGITAL IMAGE PROCESSING

		Marks	Credits
L T P			
4 - -		Exam : 100	4
		Sessional : 50	2
		Total : 150	6
		Duration of exam : 3hrs	
UNIT-1	Introduction: Elements of Digital Image Processing Systems, Image Acquisition, Storage, Processing Communication Display.		
UNIT-2	Digital Image Fundamentals: Visual Perception, simple image models, concept of uniform and nonuniform sampling and quantization, Relationships between pixels-neighbors of pixel, connectivity labeling of connected components. Relations, equivalence and Transitive closure, Distance measures, Arithmetic/Logic operation, Imaging geometry Basic and perspective transformation stereo imaging.		
UNIT-3	Image Transforms: Discrete Fourier transform, 2-D Fourier Transforms and its properties. Fast Fourier transform and its uses. Walsh, Hadamard Discrete cosine, Heir and slant transforms hostelling their algorithms and computer implementations.		
UNIT-4	Image Enhancement: Spatial and frequency domain methods point processing, intensity transformation, Histogram processing image substation and Averaging spatial filtering, LP, HP and homo-morphic felling, generation of spatial marks, Color image processing.		
UNIT-5	Image Restoration: Degradation model, digitalization of circulate and block circulate metrics, Algebraic approved invoice filtering, wiener filter, constrained least square restoration, Interactive restoration in spatial domain geometric transformation.		
UNIT-6	Image Compression: Redundancy models, error free compression, Lossy compression, Image compression standards.		
UNIT-7	Image Segmentation: Detection of Discontinuity, Edge detection, Boundary detection, Thresholding, Regional oriented segmentation use of motion in segmentation.		
UNIT-8	Representation and Description: Image analysis, Pattern and their classes, Decision theoretical methods, Structural methods, Interpretation.		

Reference Books:

1. Anil K Jain, "Fundamentals of Digital Image Processing", PHI Edition 1997.
2. Refael C. Gonzalez, Richard E. Woods, and Steven L. Eddins, "Digital Image Processing using MATLAB", Pearson Education, 2004.
3. Keenneth R Castleman, "Digital Image Processing", Pearson Education, 1995.
4. Refael C. Gonzalez and Richard E. Woods, "Digital Image Processing", Pearson Education, 2002.

Note:

1. In the semester examination the examiner will set 8 questions in all, covering the entire syllabus and students will be required to attempt only 5 questions.
2. Use of the scientific calculator will be allowed in the examination. However programmable calculator and cellular phone will not be allowed.
3. The scheme of awarding the Grades to a student in the course will be supplied by the university to the examiner of Answer Books.

MESP-605 SEMINAR-I

L	T	P	Exam	Marks	Credits
0	0	2	: 0		0
			Sessional	: 50	2
			Total	: 50	2

The student has to undertake extensive literature survey on a topic with the approval of the Supervisor appointed by Head of The Department for this purpose.

Extensive search of print, audio, video materials, internet surfing is to be carried out by the student. He/She has to give a seminar on his/her work. Evaluation will be based on continuous monitoring of his/her work during the semester, by his/her supervisor and the report on seminar evaluation by committee appointed by the Head of the Department.

Committee will award the sessional grades out of A, A(-), B, B(-), C, C(-), D & F.



MESP-607 DISSERTATION (PHASE – I)

L	T	P	Exam	Marks	Credits
0	0	6	Exam	: 0	0
			Sessional	: 100	4
			Total	: 100	4

Every student will carry out dissertation under the supervision of a Supervisor(s). The topic shall be approved by a committee constituted by the Head of the department.

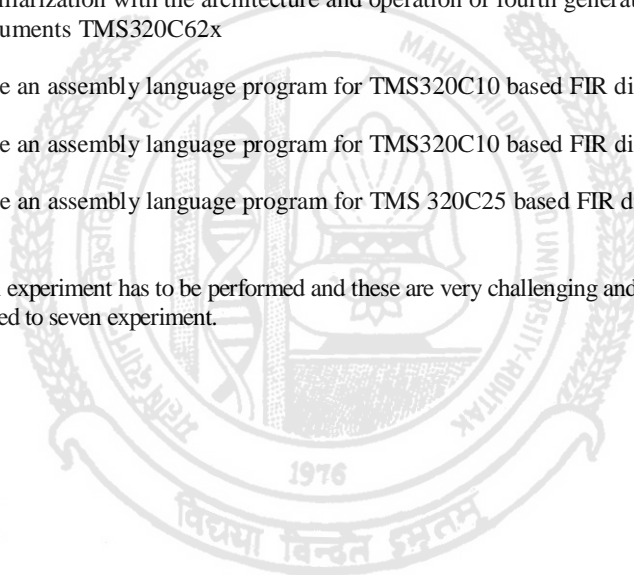
Every student will be required to give two seminars, first at the beginning of dissertation (Phase-I) to present the scope of the work and to finalize the topic, and second toward the end of the semester, presenting the work carried out by him/her during the semester. The committee will screen both the presentation so as to award the sessional grades out of A, A(-), B, B(-), C, C(-), D & F.



L	T	P	Exam	Marks	Credits
-	-	3	Sessional	: 50	2
			Total	: 100	4
			Duration of exam	: 3 hrs.	

- EXPT. 1 Familiarization with the architecture and operation of first generation fixed point DSP Texas Instruments TMS320C10.
- EXPT. 2 Familiarization with the architecture and operation of second generation fixed point DSP Texas Instruments TMS320C50.
- EXPT. 3 Familiarization with the architecture and operation of third generation fixed point DSP Texas Instruments TMS320C54x.
- EXPT. 4 Familiarization with the architecture and operation of fourth generation fixed point DSP Texas Instruments TMS320C62x
- EXPT. 5 Write an assembly language program for TMS320C10 based FIR digital notch filter.
- EXPT. 6 Write an assembly language program for TMS320C10 based FIR digital band pass filter.
- EXPT. 7 Write an assembly language program for TMS 320C25 based FIR digital notch filter.

Note: Each experiment has to be performed and these are very challenging and difficult experiments, so we limited to seven experiment.



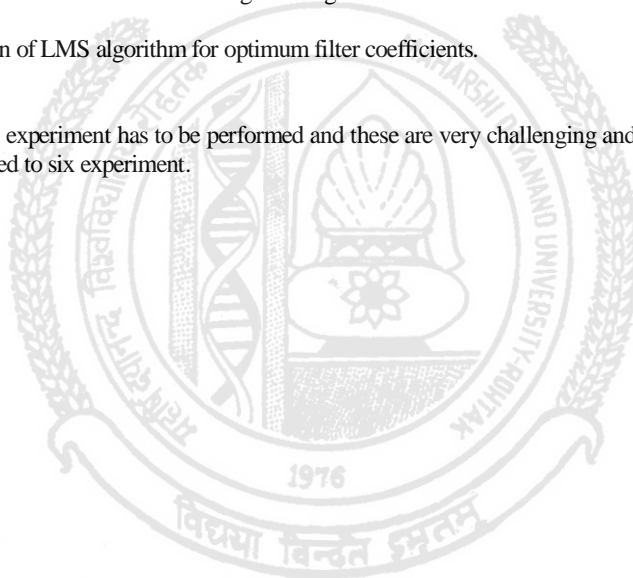
MESP-611 STATISTICAL SIGNAL PROCESSING LAB

L	T	P	Exam	Marks	Credits
-	-	3	: 50	50	2
			Sessional	: 50	2
			Total	: 100	4
			Duration of exam	: 3 hrs.	

LIST OF EXPERIMENTS USING MATLAB

1. Using MATLAB find the signal energy or power of the signals.
2. Plot correlograms in MATLAB.
3. Periodogram of a signal containing two Sinusoidal components corrupted with White noise using MATLAB.
4. Power Spectrum estimate of a random signal using Bartlett Method.
5. Power Spectrum estimate of a random signal using Welch Method.
6. Implementation of LMS algorithm for optimum filter coefficients.

Note: Each experiment has to be performed and these are very challenging and difficult experiments, so we limited to six experiment.



SEMESTER – IV

MESP-602 SEMINAR – II

L T P
0 0 2

Exam : 0 0
Sessional : 50 2
Total : 50 2

The student has to undertake extensive literature survey on a topic with the approval of the Supervisor appointed by Head of The Department for this purpose.

Extensive search of print, audio, video materials, internet surfing is to be carried out by the student. He/She has to give a seminar on his/her work. Evaluation will be based on continuous monitoring of his/her work during the semester, by his/her supervisor and the report on seminar evaluation by committee appointed by the Head of the Department.

Committee will award the sessional grades out of A, A(-), B, B(-), C, C(-), D & F.



MESP-604 DISSERTATION

L	T	P	Exam	Marks	Credits
0	0	26	Sessional	: 500	20
			Total	: 100	4
			Duration of Exam.	: 600	24
				: 3 Hours	

The dissertation Phase-I will be continued as dissertation in IV semester.

At the end of the semester every student will be required to submit three copies of his/her Master Dissertation to the office of the ECE-department. Out of these one copy will be kept for department records and one copy shall be for the supervisor. Third copy of the Dissertation will be sent to the external examiner by mail by the department upon receipt of intimation of the examiner from the M.D. University. Dissertation will be evaluated by a committee consisting of Head of the Department, Dissertation supervisor and one external examiner.

The external examiner shall be appointed by the University from a panel of examiners submitted by the respective Head of the Department to the Chairman, Board of Studies (B.O.S.). In case the external examiner so appointed by the University does not respond to the offer, the Chairman, B.O.S. may be empowered to appoint the next external examiner from the panel of examiners already submitted.

The student will defend his/her Dissertation before this committee and the committee will award one of the grades out of A, A(-), B, B(-), C, C(-), D, & F.

