Semester 5

B. Tech 3rd year(5th Semester) Mechatronics

Course No.	Course Title	Teaching Schedule				Allotment Marks				Duration of Exam
		L	T	P	Total	Sessional	Theory	Practical	Total	
MT-301	Communications	3	1	-	4	50	100	-	150	3
MT-303	Signal Processing	3	1	-	4	50	100	-	150	3
MT-305	Digital & Embedded Softw. (RT sys) 1	3	1	-	4	50	100	-	150	3
MT-307	Engineering Mathematics Apps 1	3	1	-	4	50	100	-	150	3
MT-309	Production Technology-1	3	1	-	4	50	100	-	150	3
MT-311	Organizational Management	3	1	-	4	50	100	-	150	3
MT-313	Signal Processing Lab	-	-	3	3	25	-	25	50	3
MT-315	Digital & Embedded Softw. (RT sys) 1 Lab	-	-	2	2	25	-	25	50	3
MT-317	Communications Lab	-	-	2	2	50	-	50	100	3
MT-319	Practical Training Report	-	-	-	-	50	-	-	50	3
	Total	18	6	7	31	450	600	100	1150	

Students are allowed to use single memory, non-programmable scientific calculator during examination.

MT – 301

Communications

L	T	P
3	1	-

Sessional: 50 Marks
Theory: 100 Marks
Total: 150 Marks
Exam Duration: 3 Hours

Unit-1

NOISE: Classification of Noise, Various sources of Noise, Methods of Noise Calculation in networks and inter connected networks. Addition of noise due to several sources; noise in amplifiers in cascade, noise in reactive circuits, Noise figure, its calculation and measurement. Noise temperature, Mathematical representation of random noise, narrow band noise and its representation. Transmission of noise through linear systems, signal to noise ratio, noise bandwidth.

Unit-2

Analog Modulation techniques Information source, encoder, transmitter, channel/medium, receiver, decoder and information sink. Need for modulation, Baseband and Pass band signals, Amplitude Double side band with Carrier (DSB-C), Double side band without Carrier,Single Side Band Modulation, DSB-SC, DSB-C, SSB Modulators and Demodulators, Vestigial Side Band (VSB), Quadrature Amplitude Modulator, Frequency Modulation. Radio Transmitter and Receiver.

Unit-3

Digital Data transmission, Line coding review, Pulse shaping, Scrambling, PCM.Method of generation and detection of coherent & non-coherent binary ASK, FSK & PSK Pulse Modulation Digital Transmission of Analog Signals: Sampling Theorem and its applications, Pulse Amplitude Modulation (PAM), Pulse Width Modulation, Pulse Position Modulation. Their generation and Demodulation., Pulse Code Modulation (PCM), Frequency Division Multiplexing, Time Division Multiplexing ,Line Coding and their Power Spectral density and Code Division Multiplexing.

Unit-4

Optical Fibre communications and Noises in Communication systems Basic Block Diagram, Advantages & Disadvantages of Optical Fiber Communication, Ray Theory, Electromagnetic Mode Theory, Step Index Fiber, Graded Index Fiber, Attenuation- Bending Loses, Scattering, Absorption, Dispersion. Application of optical fibers, Noise in communications, performance comparisons in the presence of noise, Noise in Amplitude Modulation: Analysis ,Signal to Noise Ratio, Figure of Merit, Noise in Frequency Modulation: Pre emphasis ,De Emphasis and SNR Improvement, Phase Locked Loops .

Text Books:-

1. Haykin S., Mohr M., 2006, An Introduction to Analog and Digital Communications, 2nd Ed, Wiley, ISBN: 978-0-471-43222-7
2. Haykin S., 2009, Communication Systems, International Student Version, 5th Ed, Wiley, ISBN: 978-0-470-16996-4
3. Otung I., 2001, Communication Engineering Principles, Palgrave Macmillan, ISBN: 9780333775226
4. Proakis J. G., Salehi M., Bauch G., 2004, Contemporary Communication Ssytems Using MATLAB, 2nd Edition, Thomson Boos/Cole, ISBN: 97805344061

Note:-

Examination :- The Examiners will set eight questions, taking two from each unit. The students are required to attempt five questions in all selecting at least one from each unit. All questions will carry equal marks.

Assignment :- Assignment based upon learning outcomes, as mention below, will be set by lecturer where the student will be required to achieve the LO's as mentioned below. The assessment of assignment will be done based upon the learning made by the student.

Learning outcomes(LO's)

1) Explain analogue and digital communication principles and systems.	Knowledge & Understanding
2) Apply appropriate analytical techniques to critically evaluate communication Processes and systems.	Analysis
3) Use equipment and simulation models and the analytical skills to critically. Evaluate results and relate them to theory.	Application
4) Communicate ideas effectively.	Communication

MT - 303

Signal Processing

L	T	P
3	1	-

Sessional: 50 Marks
Theory: 100 Marks
Total: 150 Marks
Exam Duration: 3 Hours

UNIT-I

Introduction to signal and its types: Deterministic and Stochastic, periodic and a periodic, impulse functional sequences, analog and discrete, singular functions. Signal representation in terms of singular functions, orthogonal functions and their use in signal representation. Fourier series, Fourier and Laplace Transform, its properties.Convolution threorem, geometrical interpretation and application. introduction to z- transform and inverse z transform, some basic operation in z transforms, initial value theorem and final value theorem.

UNIT-II

Signal representation Correlations and Convolution : time domain representation, frequency domain representation, concept of angular frequency, time period and angular period, continues time representation and discrete time representation of signals, different types of representation of signals, trigonometric representation and exponential representation, rectangular representation and vector representation, phasor diagram representation on digital signals, time shifting of a signal, time scaling of signal, differentiation and integration of the signal, properties of these operation, convolution and correlation of two digital signals, difference between convolution and correlation.

UNIT-III

Sampling, Quantization, A/D Conversion: Need of sampling and what is the basic condition for perfect sampling, sampling theorem, different sampling techniques, sample and hold circuit, flat top sampling, Nyquist criterion and its significance, quantization and concept of step size, some drawback of working with analog signal and benefits of digital signals, conversion of analog signal to digital signal, minimizing the quantization error. Quantization and its significance, effect of quantization on analog to digital signal conversion, step size, quantization error and signal to quantization noise.

UNIT-IV

Probability concepts: random variable, pdf, cdf, moments, distributions, correlation functions.
Characterization of stochastic signals.
System modeling in terms of differential, equations, state variables, difference equations and transfer functions.
Linear time invariant system properties, elementary idea of response determination to deterministic and stochastic signals. Concept of impulse response.

TEXT BOOKS:

1. Andreas A., 2005, Digital Signal Processing: Signals, Systems and Filters, McGraw-Hill, ISBN: 9780071454247.
2. Benoit B., 2005, Fundamentals of Signals and Systems, Course Technology, ISBN: 9781584503811 .
3. Ingle V. K., Proakis J. G., 2007, Digital Signal Processing Using MATLAB, 2nd Edition, Cengage Learning, ISBN-13: 9780495073116.
4. Roberts M. J., 2004, Signals and Systems Analysis of Signals Through Linear Systems, 1st Edition, McGraw Hill, ISBN-13: 9780072930443.

Note:-

Examination :- The Examiners will set eight questions, taking two from each unit. The students are required to attempt five questions in all selecting at least one from each unit. All questions will carry equal marks.

Assignment :- Assignment based upon learning outcomes, as mention below, will be set by lecturer where the student will be required to achieve the LO's as mentioned below. The assessment of assignment will be done based upon the learning made by the student.

Learning outcomes(LO's)

1) Demonstrate a critical understanding of analogue and digital signal representation and processing techniques.	Knowledge & Understanding
2) Apply appropriate analytical techniques to critically evaluate signals and their Processing.	Analysis
3) Use equipment and simulation models and the analytical skills to critically evaluate results and relate them to theory.	Application
4) Communicate ideas effectively.	Communication

MT - 305

Digital and Embedded Softw.(RT sys) 1

L	T	P
3	1	-

Sessional: 50 Marks
Theory: 100 Marks
Total: 150 Marks
Exam Duration: 3 Hours

UNIT-I

Evolution of Microprocessors and computers, CISC versus RISC, Applications of Microprocessors. Introduction to Embedded System Technology.

Intel 8085 Microprocessor: Architecture-Functions ofvarious blocks and signals, Pin Description, Addressing modes, Instruction set, Simple programs and Basic timingdiagrams.

UNIT-II

8085 Assembly Language Programming, Subroutines, Look up Tables, Time Delays.

Intel 8086 Microprocessor: Architecture, EU, BIU, register set, memory segmentation and physical address computation.

UNIT III

Intel 8086 Pin Description, Minimum Mode and Maximum mode CPU module and its timing diagrams. Reset and Clock generation using 8284, Wait State.

8086 Instruction Format, Addressing Modes, Instruction Set, Assembler Directives. Comparison of 8085 and 8086.

UNIT IV

Writing Assembly Language Programs for 8086, Time Delays, Procedures and Macros.

Memory Devices, Address Decoding Techniques, Interfacing DRAM, Intel's 8255 – Description and interfacing with 8086. Interfacing ADC and DAC. Interfacing Keypad.

Text/Reference Books

1.Microprocessor Architecture, Programming & Applications with 8085 : Ramesh S Gaonkar; Wiley Eastern Ltd
2.D.V.Hall , Microprocessors and Interfacing , McGraw Hill 2nd Edition.

3.J Uffenbeck , The 8086/8088 family , (PHI).

4. Dr K.V.K.K..Prasad,Embedded /Real-Time systems :Concepts ,Design &Programming.,DreamTech Publishers.,2004

Note:-

Examination :-The Examiners will set eight questions, taking two from each unit. The students are required to attempt five questions in all selecting at least one from each unit. All questions will carry equal marks.

Assignment :- Assignment based upon learning outcomes, as mention below, will be set by lecturer where the student will be required to achieve the LO's as mentioned below. The assessment of assignment will be done based upon the learning made by the student.

Learning outcomes(LO's)

1. Explain the hardware design of a simple microprocessor based product.	Application and Problem Solving
2. Design and develop an assembly language program.	Application and Problem Solving

Engineering Mathematics Apps 1

MT-307

L	T	P
3	1	-

Sessional: 50 Marks
Theory: 100 Marks
Total: 150 Marks
Exam Duration: 3 Hours

UNIT – I

Continuity and Differentiability: Introduction, Continuity, Differentiability, Exponential and Logarithmic Functions, Logarithmic Differentiation,

Derivatives of Functions in Parametric Forms, Second Order Derivative, Mean Value Theorem.

UNIT-II

Application of Derivatives: Introduction, Rate of Change of Quantities, Increasing and Decreasing Functions, Tangents and Normals.

UNIT-III

Integrals: Introduction, Integration as an Inverse Process of Differentiation, Methods of Integration, Integrals of some Particular Functions, Integration by Partial Fractions, Integration by Parts.

Definite Integral, Fundamental Theorem of Calculus, Evaluation of Definite Integrals by Substitution, Properties of Definite Integrals.

UNIT-IV

Application of Integrals: Introduction, Area under Simple Curves, Area between Two Curves.

Reduction Formulae: RF of nth order trigonometric functions ($\sin^n x$, $\cos^n x$, $\tan^n x$ and their multiplication with x^n)

Text Book

1. Higher Engg. Mathematics : B.S. Grewal
2. Advanced Engg. Mathematics : E. Kreyzig
3. Golden Integral Calculus: N.P. Bali

Reference Book

1. Engg. Mathematics Vol. II: S.S. Sastry; Prentice Hall of India.

Note:-

Examination :- The Examiners will set eight questions, taking two from each unit. The students are required to attempt five questions in all selecting at least one from each unit. All questions will carry equal marks.

Assignment :- Assignment based upon learning outcomes, as mention below, will be set by lecturer where the student will be required to achieve the LO's as mentioned below. The assessment of assignment will be done based upon the learning made by the student.

Learning outcomes(LO's)

1) Understand about Integrals and Reduction Formulae
2) Understand about Differentiation and its applications

Production Technology – 1

MT-309

L	T	P
3	1	-

Sessional: 50 Marks
Theory: 100 Marks
Total: 150 Marks
Exam Duration: 3 Hours

UNIT I Metal cutting & Tool life

Basic tool geometry, single point tool nomenclature, chips-various types and their characteristics, mechanism of chip formation, theoretical and experimental determination of shear angle, orthogonal and oblique metal cutting, metal cutting theories, relationship of velocities, forces and power consumption.
Effect of operating parameters life tool geometry, cutting speed, feed depth of out, coolant, materials etc on forces temp. tool life, surface finish etc., tool life relationship, tailor equation of tool life , tool material and mechanism.

UNIT II Economics of metal machining & Multi edged tools

Element of machining cost, tooling economics, machines economics and optimization. Broach tools-types materials and applications, geometry of twist drills, thrust torque and power calculation in drills, form tools-application.

UNIT III Jigs and Fixtures & Tool Layout for Capstans and Turrets

Tool engineering, types of tools, usefulness, principles of lactation, locating and clamping devices, Jigs bushes, drilling Jigs, milling fixtures, turning fixtures, boring and broaching fixtures, different materials for Jigs and fixtures, economic of jigs and fixtures.
Types of turret lathes, main parts, work holding equipment, standard equipment and tools, machine operations, advantages of turret lathes, tool layout, bar stock feeding mechanism,

UNIT IV Metrology

Measurements, linear and angular simple measuring instruments various clampers, screw gauge, sine bar, auto- collimator, comparator-mechanical, electrical, optical, surface finish and its measurement, micro and macro deviation, factors influencing surface finish and evaluation of surface finish.

Suggested reading:

1. Manufacturing science: Ghosh and Malik, E.W. Press
2. Principles of metal cutting: Sen and Bhattacharya, New Central Book.
3. Metal cutting principles: Shaw, MIT Press Cambridge
4. Manufacturing analysis: Cook, Adisson-Wesley
5. Modern machining processes: Pandey and Shan, Tata McGraw Hill Publications

Note:-

Examination :- The Examiners will set eight questions, taking two from each unit. The students are required to attempt five questions in all selecting at least one from each unit. All questions will carry equal marks.

Assignment :- Assignment based upon learning outcomes, as mention below, will be set by lecturer where the student will be required to achieve the LO's as mentioned below. The assessment of assignment will be done based upon the learning made by the student.

Learning outcomes(LO's)

1) Understand basic Metal cutting process & Tool life and metal forming operations.
2) Understand economics of metal machining.
3) Understand geometry of multi edged tools.
4) Understand and learn different measuring instruments.

MT-311

Organizational Management

L	T	P	
3	1	-	**Sessional: 50 Marks** **Theory: 100 Marks** **Total: 150 Marks** **Exam Duration: 3 Hours**

UNIT -1

Overview of Management:

Understanding of the management terminologies. A general management overview and assessment briefing. Students will recognize the role of management in organization. The different roles of management and the functions of management Planning Organizing Staffing Leading Controlling

UNIT –II

Nature of Organization:

Formation and Classification of Organizations. Basic forms of organization, their role and structure in the economy. Types of organization: sole proprietorship, partnership, joint venture and corporation. Control: To describe the control process, types of control and control as a management function

UNIT–III

Management Theory and Practice:

An overall understanding of organizational theory. To fully appreciate the different classification of organization. From the era of scientific management to Contingency theory. Motivation: To describe the role of motivation in management. To describe the different theories of management relating to motivation Theories of leadership. Different types of structure of organization

UNIT IV

Planning and Decision Making:

Students will be able to learn the types of planning and the overall planning process. The nature of Managerial Decision making, effective decision making and overcoming barriers to making decisions. Planning for recruitment and people composition. Use of budgets for planning and control

TEXT BOOKS:

Stephen P. Robbins and Mary Coulter, (2002), Management; Int. Ed., Prentice-Hall
Kathryn K. Bartol and David C. Martin, (1998), Management; Int. Edition, McGraw-Hill

REFERNCE BOOKS:

Jones G.R., George J.M., Hill C.W.L., (2000), Contemporary Management; 2nd Ed. McGraw-Hill
Davis, D, (1997) The Art of Managing Finance; Third Edition; McGraw-Hill
Drucker P. (1999). Innovation and Entrepreneurship. Butterworth

Note:-

Examination:- The Examiners will set eight questions, taking two from each unit. The students are required to attempt five questions in all selecting at least one from each unit. All questions will carry equal marks.

MT - 313
Signal Processing Lab

L	T	P
-	-	3

Sessional : 25Marks
Practical : 25 Marks
Total: 50 Marks
Duration of Exam: 3 Hrs

NOTE:

1. At least ten experiments/ jobs are to be performed/ prepared by students in the semester.

2. At least 8 experiments/ jobs should be performed/ prepared from the below list, remaining 2 may either be performed/ prepared from the above list or designed & set by the concerned institution as per the scope of the syllabus of Signal Processing and facilities available in the institute.

3. For Learning outcomes refer to Signal Processing (MT-303).

LIST OF EXPERIMENTS

1. Introduction to MATLAB and to generate different type of signals.
2. Write a MATLAB script to find average value, root mean square value, mean square value of a given signal.
3. Write a MATLAB script to find average power of a given signal.
4. Write a MATLAB script to find energy of a given signal.
5. Write a MATLAB script to find commutation of even and odd symmetries in a signal with algebraic operations.
6. Write a MATLAB script to find signal parameters (amplitude-scaling, time-scaling and time-shifting).
7. Write a MATLAB script to find different operations on a given sequence.
8. Write a MATLAB script to obtain sampling and find out sample rate.
9. Write a MATLAB script to find out quantization of a given signal.
10. Write a MATLAB script to obtain linear convolution of two signals.
11. Write a MATLAB script to obtain circular convolution of two signals.
12. Write a MATLAB script to obtain correlation of two signals.
13. Write a MATLAB script to find Z-transform of a given sequence.

TEXT BOOKS:

1. Andreas A., 2005, Digital Signal Processing: Signals, Systems and Filters, McGraw-Hill, ISBN: 9780071454247.
2. Benoit B., 2005, Fundamentals of Signals and Systems, Course Technology, ISBN: 9781584503811 .
3. Ingle V. K., Proakis J. G., 2007, Digital Signal Processing Using MATLAB, 2nd Edition, Cengage Learning, ISBN-13: 9780495073116.
4. Roberts M. J., 2004, Signals and Systems Analysis of Signals Through Linear Systems, 1st Edition, McGraw Hill, ISBN-13: 9780072930443.

MT - 315

Digital and Embedded Software(RT sys) 1 Lab

L	T	P
-	-	2

Sessional: 25 Marks
Practical: 25 Marks
Total: 50 Marks
Duration of Exam: 3 Hrs

NOTE:

1. At least ten experiments/ jobs are to be performed/ prepared by students in the semester.

2. At least 8 experiments/ jobs should be performed/ prepared from the below list, remaining 2 may either be performed/ prepared from the above list or designed & set by the concerned institution as per the scope of the syllabus of Digital and Embedded Software 1 and facilities available in the institute.

3. For Learning outcomes refer to Digital and Embedded Software 1 (MT-305).

List Of Experiments

1. Familiarization with 8085 trainer kit.

2. Write an Assembly Language Program for the Addition of two 8-bit numbers.

   (a) without carry

   (b) with carry

3. Write an Assembly Language Program for the Subtraction of two 8-bit numbers.

4. Write an Assembly Language Program for calculating the smallest number in a string.

5. Write an Assembly Language Program to arrange a set of given numbers in ascending order.

6. Write a program to generate a delay of 2 msec in 8085 Microprocessor.

7. Familiarization of 8086 trainer kit.

8. Write an Assembly Language Program for the subtraction of two 16-bit numbers.

9. Write an Assembly Language Program for arranging a string in descending order.

10. Write an Assembly Language Program for generating Fibonacci Series.

11. Write an Assembly Language Program for calculating the largest number in a string.

12. Write a program to generate a delay of 10 msec in 8086 microprocessor.

This laboratory also involves the practical implementation of real life challenges using 8051/68hc11. Here problem is described along with necessary flow chart and block diagram. Students are required to integrate software and hardware and provide a suitable solution. The technique used by one student for finding the solution cannot be used by others. So by this way multiple solutions of the same problem can be achieved.

Text/Reference Books

1. Microprocessor Architecture, Programming & Applications with 8085 : Ramesh S Gaonkar; Wiley Eastern Ltd

2. D.V.Hall , Microprocessors and Interfacing , McGraw Hill 2nd Edition.

3. J Uffenbeck , The 8086/8088 family , (PHI).

4. Dr K.V.K.K..Prasad, Embedded /Real-Time systems :Concepts ,Design &Programming., DreamTech Publishers.,2004

MT - 317

Communications lab

L	T	P
-	-	2

Sessional: 50 Marks
Practical : 50 Marks
Total: 100 Marks
Duration of Exam: 3 Hrs

NOTE:

1. At least ten experiments/ jobs are to be performed/ prepared by students in the semester.

2. At least 8 experiments/ jobs should be performed/ prepared from the below list, remaining two may either be performed/ prepared from the above list or designed & set by the concerned institution as per the scope of the syllabus of Communications and facilities available in the institute.

3. For Learning outcomes refer to Communications (MT-301).

List of Experiment

1.To Study the AM modulation Techniques

2.To Study the FM modulation Techniques

3. To Study the ASK modulation/Demodulation Techniques.

4. To Study the FSK modulation/Demodulation Techniques

5. To Study the PSK modulation/Demodulation Techniques

6. To Study the PCM modulation Techniques

7. To Study Numerical Aperture in optical fiber communication system.

8. To Study FDM and TDM modulation Techniques

Text Books:-

1. Haykin S., Mohr M., 2006, An Introduction to Analog and Digital Communications, 2nd Ed, Wiley, ISBN: 978-0-471-43222-7
2. Haykin S., 2009, Communication Systems, International Student Version, 5th Ed, Wiley, ISBN: 978-0-470-16996-4

3. Otung I., 2001, Communication Engineering Principles, Palgrave Macmillan, ISBN: 9780333775226
4. Proakis J. G., Salehi M., Bauch G., 2004, Contemporary Communication Ssytems Using MATLAB, 2nd Edition, Thomson Boos/Cole, ISBN: 97805344061

Practical Training Report

MT 319

L	Total	Sessional : 50 marks
-	-	Duration of Exams. : 03 hours

Student will submit summer training (about 8 weeks' industrial training) report for his/her assessment.