B. Tech 2nd year (3rd Semester) Mechatronics

Course No.	Course Title	Teaching Schedule				Allotment Marks				Duration of Exam
		L	T	P	Total	Sessional	Theory	Practical	Total	
MT - 201	Digital Electronics	3	1	-	4	50	100	-	150	3
MT – 203	Essential Mechanics & Fluids	3	1	-	4	50	100	-	150	3
MT – 205	Instrumentation and Measurements	3	1	-	4	50	100	-	150	3
MT – 207	Mathematical Foundations for Engineers	3	1	-	4	50	100	-	150	3
HUM-201 E/ MATH-201E	Basics of Economics & Management/ Mathematics IIIrd	3	1	-	4	50	100	-	150	3
MT – 209	Theory of Machines-I	3	1	-	4	50	100	-	150	3
MT – 211	Digital Electronics Lab	-	-	2	2	25	-	25	50	3
MT – 213	Instrumentation and Measurements Lab	-	-	2	2	25	-	25	50	3
MT – 215	Essential Mechanics & Fluids Lab	-	-	2	2	25	-	25	50	3
MT - 217	Theory of Machines-I lab	-	-	3	3	50	-	50	100	3
	Total	18	6	9	33	425	600	125	1150	

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

B. Tech 2nd year(4th Semester) Mechatronics

Course No.	Course Title	Teaching Schedule				Allotment Marks				Duration of Exam
		L	T	P	Total	Sessional	Theory	Practical	Total	
MT – 202	Computer Aided Design and Manufacturing	3	1	-	4	50	100	-	150	3
MT – 204	Electronic Principles	3	1	-	4	50	100	-	150	3
MT – 206	Design Basics	3	1	-	4	50	100	-	150	3
MT – 208	Software for Engineers	3	1	-	4	50	100	-	150	3
HUM-201 E/ MATH-201E	Basics of Economics & Management/ Mathematics IIIrd	3	1	-	4	50	100	-	150	3
MT – 210	Theory of Machines-II	3	1	-	4	50	100	-	150	3
MT – 212	Electronic Principles Lab	-	-	2	2	25	-	25	50	3
MT – 214	Software for Engineers Lab	-	-	2	2	25	-	25	50	3
MT – 216	Computer Aided Design and Manufacturing Lab	-	-	2	2	25	-	25	50	3
MT- 218	Theory of Machines-II lab	-	-	2	2	50	-	50	100	3
	Total	18	6	8	32	425	600	125	1150	

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

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.

B. Tech 3rd year(6th Semester) Mechatronics

Course No.	Course Title	Teaching Schedule				Allotment Marks				Duration of Exam
		L	T	P	Total	Sessional	Theory	Practical	Total	
MT-302	Applications of Control	3	1	-	4	50	100	-	150	3
MT-304	Digital & Embedded Softw. (RT sys) 2	3	1	-	4	50	100	-	150	3
MT-306	Engineering Mathematics Apps 2	3	1	-	4	50	100	-	150	3
MT-308	Pneumatic And Hydraulic Instrumentation	3	1	-	4	50	100	-	150	3
MT-310	Production Technology-II	3	1	-	4	50	100	-	150	3
HUT-302E	Fundamentals of management	3	1	-	4	50	100	-	150	3
MT-312	Production Technology-II lab	-	-	3	3	50	-	50	100	3
MT-314	Digital & Embedded Softw. (RT sys) 2 Lab	-	-	2	2	25	-	25	50	3
MT-316	Applications of Control Lab	-	-	2	2	50	-	50	100	3
	Total	18	6	7	31	425	600	125	1150	

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

B. Tech 4th year (7th Semester) Mechatronics

Course No	Course Title	Teaching Schedule				Allotment Marks				Duration of Exam
		L	T	P	Total	Sessional	Theory	Practical	Total	
MT-401	Digital Signal Processing	3	1	-	4	50	100	-	150	3
MT-403	Systems Engineering	3	1	-	4	50	100	-	150	3
	Elective 1*	3	1	-	4	50	100	-	150	3
	Elective II*	3	1	-	4	50	100	-	150	3
MT-405	Sensors and Actuators	3	1	-	4	25	100	-	125	3
MT-407	Digital Signal Processing Lab	-	-	3	3	25	-	25	50	3
MT-409	The Professional Engineer (Project 1)	2	-	3	5	100	-	100	200	3
MT-411	Sensors and Actuators lab	-	-	3	3	25	-	25	50	3
MT-413	Seminar	2	-	-	2	25	-	-	25	
MT-415	In Plant Training report	-	-	-	-	125	-	-	125	
	Total	19	5	9	33	525	500	150	1175	

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

ELECTIVE – I

1. MT 417 Advanced Manufacturing Technology
2. MT 419 Finite Element Method
3. MT 421 Applied Numerical Techniques and Computer Programming
4. MT 423 Advanced Microprocessor

ELECTIVE – II

1. MT 425 Renewable Energy Resources
2. MT 427 Computational Fluid Dynamics
3. MT 429 Mechatronics Engineering
4. MT 431 Antenna & Wave Propagation

B. Tech 4th year (8th Semester) Mechatronics

Course No.	Course Title	Teaching Schedule				Allotment Marks				Duration of Exam
		L	T	P	Total	Sessional	Theory	Practical	Total	
MT-402	Data Communication Systems	3	1	-	4	50	100	-	150	3
MT-404	Digital System Design	3	1	-	4	50	100	-	150	3
MT-406	Sound and Noise Control	3	1	-	4	50	100	-	150	3
	Elective III*	3	1	-	4	50	100	-	150	3
	Elective IV*	3	1	-	4	50	100	-	150	3
MT-408	Data Communication Systems Lab	-	-	3	3	25	-	25	50	3
MT-410	The Professional Engineer (Project 2)	-	-	9	9	100	-	100	200	3
MT-412	Digital System Design lab	-	-	3	3	25	-	25	50	3
MT-414	Comprehensive viva	-	-	-	-	50	-	-	50	
MT-416	General Fitness and Professional aptitude (viva-voce)	-	-	-	-	-	-	75	75	
	Total	15	5	15	35	450	500	225	1175	

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

ELECTIVE - III

1. MT 418 Non Conventional Manufacturing
2. MT 420 Industrial Robotics
3. MT 422 Manufacturing Management
4. MT 424 Fuzzy Logic & Neural Networks

ELECTIVE - IV

1. MT 426 Management Information System
2. MT 428 Automatic controls
3. MT 430 Digital Image Processing
4. MT 432 Digital Hardware Design

Semester 3

MT-201

Digital Electronics

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

UNIT 1

FUNDAMENTALS OF DIGITAL TECHNIQUES: Digital signal, logic gates: AND. OR, NOT. NAND. NOR- EX-OR, EX-NOR, Boolean algebra. Review of Number systems. Binary codes: BCD, Excess-3. Gray codes. COMBINATIONAL DESIGN USING GATES: Design using gates. Karnaugh map and Quine Mcluskey methods of simplification.

UNIT 2

COMBINATIONAL DESIGN USING MST DEVICES Multiplexers and Demultiplexers and their use as logic elements. Decoders. Adders / Subtracters. BCD arithmetic Circuits. Encoders. Decoders / Drivers for display devices.

SEQUENTIAL CIRCUITS: Flip Flops: S-R- J-K. T. D, master-slave, Conversion of one flip-flop to another flip flop, excitation table, edge triggered- shift registers, its types: SISO, PISO,PIPO,SIPO. Counters. Asynchronous and Synchronous Ring counters and Johnson Counter, Design of Synchronous and Asynchronous sequential circuits.

UNIT 3

DIGITAL LOGIC FAMILIES: Switching mode operation of p-n junction, bipolar and MOS-devices. Bipolar logic families: RTL, DTL, DCTL. HTL, TTL, ECL, MOS, and CMOS logic families. Tristate logic. Interfacing of CMOS and TTL families.

UNIT 4

A/D AND D/A CONVERTERS: Sample and hold circuit, weighted resistor and R -2 R ladder D/A Converters, specifications for D/A converters. A/D converters: Quantization, parallel -comparator, successive approximation, counting type. Dual-slope ADC, specifications of ADCs. PROGRAMMABLE LOGIC DEVICES: ROM, PLA. PAL, Introduction to FPGA and CPLDs.

TEXT BOOK: 1. Modem Digital Electronics (Edition III): R. P. Jain; TMH

REFERENCE BOOKS: 1. Digital Integrated Electronics: Taub & Schilling: MGH 2. Digital Principles and Applications: Malvino & Leach: McGraw Hill. 3. Digital Design: Morris Mano: PHI,

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. Solve a range of problems in electronics choosing an appropriate solution procedure and making use of the underlying concepts and principles	Application, Knowledge & Understanding
2. Interpret qualitative and quantitative data relating to electronics practical work and Communicate the results of the work by written reports and presentations, Incorporating structured coherent argument	Knowledge, Understanding, Reflection and Team working

MT-203

Essential Mechanics & Fluids

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

Unit 1

Simple stresses & strains : Concept & types of Stresses and strains, Polson's ratio, stresses and strain in simple and compound bars under axial loading, stress strain diagrams, Hooks law, elastic constants & their relationships, temperature stress & strain in simple & compound bars under axial loading, Numerical.

Compound stresses & strains: Concept of surface and volumetric strains, two dimensional stress system, conjugate shear stress at a point on a plane, principle stresses & strains and principal- planes, Mohr's circle of stresses, Numerical.

Unit II

Shear Force & Bending Moments : Definitions, SF & BM diagrams for cantilevers, simply supported beams with or without over-hang and calculation of maximum BM & SF and the point of contraflexture under (i) concentrated loads, (ii) uniformly distributed loads over whole span or a part of it, (iii)combination of concentrated loads and uniformly distributed loads, (iv) uniformly varying loads and (v) application of moments, relation between the rate of loading, the shear force and the bending moments, Problems.

Torsion of circular Members : Torsion of thin circular tube, Solid and hollow circular shafts, tapered shaft, stepped shaft & composite circular shafts, combined bending and torsion, equivalent torque, effect of end thrust. Numerical.

Unit III

Fluid Properties and Fluid Statics: Concept of fluid and flow, ideal and real fluids, continuum concept, properties of fluids, Newtonian and non-Newtonian fluids. Pascal's law, hydrostatic equation, hydrostatic forces on plane and curved surfaces, stability of floating and submerged bodies, relative equilibrium. Problems. Fluid Kinematics: Eulerian and Lagrangian description of fluid flow; stream, streak and path lines; types of flows, flow rate and continuity equation, differential equation of continuity in cylindrical and polar coordinates, rotation, vorticity and circulation, stream and potential functions, flow net. Problems.

Unit IV

Fluid Dynamics: Concept of system and control volume, Euler's equation, Bernoulli's equation, venturimeter, orifices, orificemeter, mouthpieces, kinetic and momentum correction factors, Impulse momentum relationship and its applications. Problems.Potential Flow:

Uniform and vortex flow, flow past a Rankin half body, source, sink, source-sink pair and doublet, flow past a cylinder with and without circulation. Problems.

TEXT BOOKS

1. Ramamurtham.S and Narayanan.R, "*Strength of material"*, Dhanpat Rai Pvt. Ltd., New Delhi, 2001.
2. Bansal.R.K, "*Strength of Material"*, Lakshmi publications Pvt. Ltd., New Delhi, 1996.
3. Kumar.K.L, "*Engineering Fluid Mechanics"*, Eurasla publishers Home Ltd., New Delhi, 1995.
4. Bansal.R.K, "*Fluid Mechanics and Hydraulic Machines"* , Laxmi publications (P) Ltd., New Delhi, 1995.
5. Popov.E.P, "*Mechanics of Materials"*, Prentice Hall, 1982.
6. Timoshenko.S.P and Gere .M.J, "*Mechanics of Materials"*, C.B.S. publishers, 1986.

REFERENCES

1. Ferdinand P. Beer and Russell Johnston.E, "*Mechanics of Materials"*, SI metric Edition McGraw Hill, 1992
2. Srinath.L.N, "*Advanced Mechanics of Solids",*Tata McGraw Hill Ltd., New Delhi.
3. Ramamurthan.S, "*Fluid Mechanics and Hydraulics"*, Dhanpat Rai and Sons, Delhi, 1988.
4. Fox R.W and Mc. Donald .A.T, "*Introduction to fluid Mechanics"*, 5th Ed. John Wiley and Sons, 1999.

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 and estimate the stresses and deformation in solid bodies under the action of forces.
2. Understand and estimate the shear force and bending moment in different types of beams under the action of different types of loads.
3. Understand and estimate the displacement and stresses in deformable bodies under the action of forces and torque.
4. Understand the concepts and to solve problems in fluid statics, fluid kinematics and incompressible fluid dynamics.

MT - 205

Instrumentation and Measurements

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

UNIT-I:

MEASUREMENT AND ASSOCIATED ERRORS: Methods of Measurement, Classifications of instruments, Errors in measurements and their analysis.

MEASUREMENT OF LOW, MEDIUM AND HIGH RESISTANCES: Wheat stone bridge, Carey-Foster Bridge, Kelvin double bridge, Measurement of Insulation resistance.

UNIT-II:

MEASUREMENT OF INDUCTANCES AND CAPACITANCES: A-C BRIDGES: Maxwell Inductance bridge. Maxwell Inductance Capacitance Bridge, Anderson's Bridge, Hay's Bridge, De-Sauty's Bridge, Schering's bridge and Wein's bridge.

INDICATING AND RECORDING DEVICES: Analog voltmeters, X-Y recorder, D.C Crompton's potentiometer, Oscillographs, Cathode - Ray Oscilloscopes, Energy Meter. Magnetic Measurements: Ballistic Galvanometers, Flux Meter, B-H Loop.

UNIT-III:

ELECTRONIC INSTRUMENTS: Wave analyzer, Distortion meter: Q-meter, CRO: Lissojous Pattern, CRT, Op-Amp circuits.

DIGITAL MEASUREMENTS:Concept of digital measurements,Comparison between analog type and digital display methods, digital voltmeter, frequency meter, spectrum analyzer.

UNIT-IV:

TRANSDUCERS: Classification of Transducers and their signal conditioning, Measurement

of displacement, velocity and acceleration (translational and rotational), force, torque, vibration and shock. Measurement of pressure, flow, temperature and liquid level. Measurement of pH, conductivity, viscosity and humidity.

DATA ACQUISITION SYSTEMS: Elements of data acquisition systems, Analog to Digital and Digital to Analog converters, Analog and Digital Data Acquisition Systems, Interfacing of transducers, Multiplexing, Telemetry.

TEXT BOOK: A Course in Electrical and Electronics Measurements and Instrumentation: A.K. Sawhney; Dhanpat Rai & Sons.

REFERENCE BOOKS: 1. Electronics Instrumentation and Measurement Techniques: Cooper W.D & Helfrick A.D.; PHI 2. Doeblin E.O., Measurement Systems: Application & Design, Mc Graw Hill.

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. Describe the basic principles of instrumentations and measurements associated with Engineering, design and the general technology applications.	Knowledge & Understanding
2. Use and calibrate common sensors and instruments.	Application & Enquiry
3. Select an appropriate sensor/s and instrument/s for the task under consideration.	Team Working

Mathematical Foundations For Engineers

MT-207

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

UNIT – I

Principle of Mathematical Induction:
Process of the proof by induction, motivating the application of the method by looking at natural numbers as the least inductive subset of real numbers. The principle of mathematical induction and simple applications.

Sets :
Sets and their representations. Empty set. Finite and Infinite sets.Equal sets.Subsets.Subsets of a set of real numbers especially intervals (with notations). Power set. Universal set. Venn diagrams. Union and Intersection of sets. Difference of sets. Complement of a set. Properties of Complement Sets.

UNIT-II

Binomial Theorem: Statement and proof of the binomial theorem for positive integral indices. General and middle term in binomial expansion, simple applications.

Sequence and Series: Sequence and Series. Arithmetic Progression (A. P.). Arithmetic Mean (A.M.) Geometric Progression (G.P.), general term of a G.P., sum of first n terms of a G.P., infinite G.P. and its sum, geometric mean (G.M.), relation between A.M. and G.M.

UNIT-III

Mathematical Reasoning: Mathematically acceptable statements. Connecting words/ phrases - consolidating the understanding of "if and only if (necessary and sufficient) condition", "implies", "and/or", "implied by", "and", "or", "there exists" and their use through variety of examples related to real life and Mathematics.

Validating the statements involving the connecting words, Difference between contradiction, converse and contrapositive.

UNIT-IV

Statistics: Measures of position - mean, median, mode,

Measure of dispersion - range, inter-quartile range, variance, standard deviation, Measure of skewness

Text Book

1. Foundation Mathematics, A. Croft and R. Davidson, Addison-Wesley 1997, ISBN: 0201178044
2. Discrete Mathematics for Computer Scientists, J. Truss, Addison-Wesley 1999, ISBN: 0201360616

Reference Book

1. Advanced Engg. Mathematics : E. Kreyzig
2. Higher Engg. Mathematics : B.S. Grewal

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 Binomial Theorem, PMI and Sets
2) Understand about Mathematical Reasoning & Statistics

MATHEMATICS - III
MATH-201E

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

UNIT – I

Fourier Series : Euler's Formulae, Conditions for Fourier expansions, Fourier expansion of functions having points of discontinuity, change of interval, Odd & even functions, Half-range series.

Fourier Transforms : Fourier integrals, Fourier transforms, Fourier cosine and sine transforms. Properties of Fourier transforms, Convolution theorem, Perseval's identity, Relation between Fourier and Laplace transforms, Fourier transforms of the derivatives of a function, Application to boundary value problems.

UNIT-II

Functions of a Complex Variables : Functions of a complex variable, Exponential function, Trigonometric, Hyperbolic and Logarithmic functions, limit and continuity of a function, Differentiability and analyticity.

Cauchy-Riemann equations, Necessary and sufficient conditions for a function to be analytic, Polar form of the Cauchy-Riemann equations, Harmonic functions, Application to flow problems, Conformal transformation, Standard transformations (Translation, Magnification & rotation, inversion & reflection, Bilinear).

UNIT-III

Probability Distributions : Probability, Baye's theorem, Discrete & Continuous probability distributions, Moment generating function, Probability generating function, Properties and applications of Binomial, Poisson and normal distributions.

UNIT-IV

Linear Programming : Linear programming problems formulation, Solution of Linear Programming Problem using Graphical method, Simplex Method, Dual-Simplex Method.

Text Book

3. Higher Engg. Mathematics : B.S. Grewal
4. Advanced Engg. Mathematics : E. Kreyzig

Reference Book

1. Complex variables and Applications : R.V. Churchil; Mc. Graw Hill
2. Engg. Mathematics Vol. II: S.S. Sastry; Prentice Hall of India.
3. Operation Research : H.A. Taha
4. Probability and statistics for Engineer : Johnson. PHI.

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 Fourier Transforms and series and Probability Distributions.
2) Understand about Functions of a Complex Variables and Linear Programming.

THEORY OF MACHINES-I
MT 209

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

UNIT I

Kinematics, introduction to analysis and 1, Kinematics' pairs, Degree of freedom, Dynamitic chain mechanism, Machine, Four-bar chain, inversions, Single and double slider crank chain, Quick return mechanisms, Introduction to function generation, Path generation and rigid bodied guidance.

Velocity determination; Relative velocity methods, Instantaneous center method Acceleration determination, Kennedy's Space cent rode and body cent rode,

UNIT II

Centripetal and tangential accelerations, Acceleration determination by graphical method using velocity polygons, Cariole's component of acceleration, Klein's and other constructions.

Introduction, Velocity and Acceleration of a Particle Moving with Simple Harmonic Motion, Differential Equation of Simple Harmonic Motion, Terms Used in Simple Harmonic Motion, Simple Pendulum, Laws of Simple Pendulum, Closely-coiled Helical Spring. Compound Pendulum, Centre of Percussion, Bifilar Suspension, Trifilar Suspension (Torsional Pendulum).

UNIT III

Pantograph, straight-line motion mechanisms (Peculiar, Hart, Scott Russell, Grasshopper, Watt, Kemp's Tchybishev, Parallel linkages) Indicator mechanisms (Simplex Crosby, Thomson, etc) Automobile steering gears (Davis and Ackerman), Hooks joint (universal coupling), Double hooks joints.

Types of friction, Laws of dry friction, Motion along inclined plane Screw threads, Wedge, Pivots and collars, Plate and cone clutches, Antifriction bearings, friction circle and friction axis, bearings and lubrication. Motion along inclined plane and screws, Pivots and Collars Thrust Bearings lubrication

UNIT IV

Types of cams and followers, various motions of the follower, Construction of cam profiles, Analysis for velocities and accelerations of tangent and circular arc cams with roller and flat –faced followers.

Open and crossed belt drives, velocity ratio, slip , material for belts, crowning of pulleys, law of belting, types of pulleys, length of belts ratio of tensions, centrifugal tension, power transmitted by belts and ropes, initial tension, creep, chain drive, chain length, classification of chains

Suggested reading:

1. Theory of machines: S. S. Rattan, Tata McGraw Hill Publications
2. Theory of Mechanism and Machines: Jagdish Lal, Metropolitan Book Co.
3. Mechanism synthesis and analysis: A.H. Soni, McGraw Hill Publications.
4. Mechanism: J.S. Beggs.
5. Mechanics of Machines: P.Black, Pergamon Press.
6. Theory of Machines: P.L.Ballaney, Khanna Publisher.

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 Velocity determination
2) Understand about Pantograph, straight-line motion mechanisms
3) Understand about Types of cams and followers and various motions

MT-211

Digital Electronics Lab

L	T	P	
-	-	2	

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

List of Experiment

Note:- Student will be required to perform total of 10 experiment. 7 experiments will be from the below given list and 3 experiments will be designed based upon the curriculum.

- For Learning outcomes refer to Digital Electronics (MT-201).

1. Familiarization with Digital Trainer Kit and associated equipment.
2. Verify Truth Table of TTL gates AND, OR, NOT, NAND, NOR, EX-OR, EX-NOR.
3. Design and realize a given function using K-Maps and verify its performance.
4. To verify the operation of Multiplexer and Demultiplexer.
5. To verify the operation of Comparator.
6. To verify the truth table of S-R, J-K, T, D Flip-flops.
7. To verify the operation of Bi-directional shift register.
8. To design and verify the operation of 3-bit asynchronous counter.
9. To design and verify the operation of synchronous Up/down counter using J-K flipflops & drive a seven-segment display using the same
10. To design and verify the operation of asynchronous Decade counter.
11. Study of TTL logic family characteristics.
12. Study of Encoder and Decoder.
13. Study of BCD to 7 segment Decoder.

MT - 213

Instrumentation and Measurement Lab

L	T	P	
-	-	2	**Sessional: 25 Marks**
			Practical: 25 Marks
			Total: 50 Marks
			Duration of Exam:3 Hrs

Note:- Student will be required to perform total of 10 experiment. 9 experiments will be from the below given list and 1 experiments will be designed based upon the curriculum.

- For Learning outcomes refer to Instrumentation and Measurement (MT-205).

List of Experiments

1. To measure the unknown Inductance in terms of capacitance and resistance by using Maxwell's Inductance bridge.
2. To measure unknown Inductance using Hay's bridge.
3. To measure unknown capacitance of small capacitors by using Schering's bridge.
4. To measure 3-phase power with 2-Wattmeter method for balanced and unbalanced bridge.
5. To measure unknown capacitance using De-Sauty's bridge.
6. To measure unknown frequency using Wein's frequency bridge.
7. To measure unknown low resistance by Kelvin's Double bridge.
8. To test the soil resistance using Meggar (Ohm meter).
9. To calibrate Energy meter using standard Energy meter.
10. To plot the B-H curve of different magnetic materials.
11. To calibrate the Voltmeter using Crompton Potentiometer.
12. To convert the Voltmeter into Ammeter using Potentiometer.
13. Insulation testing of cables using Digital Insulation Tester.

MT - 215

Essential Mechanics and Fluids Lab

L	T	P	Sessional: 25 Marks
-	-	2	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 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 Essential Mechanics and Fluids and facilities available in the institute.

3. For Learning outcomes refer to Essential Mechanics and Fluids (MT-203).

LIST OF EXPERIMENTS

1. To perform Torsion test on mild steel specimen
2. To perform tensile test in ductile and brittle materials and to draw stress-strain curve and to determine various mechanical properties.
3. To perform any one hardness test (Rockwell, Brinell & Vicker's test) and determine hardness of materials.
4. To perform compression test on C.I. and to determine ultimate compressive strength.
5. A simply supported beam is carrying point loads, Uniformly distributed load and uniformly varying loads. Draw the SFD and BMD for the beam.
6. To find the moment of inertia of fly wheel.
7. To compare the actual value of pressure with calculated value with centre of pressure apparatus.
8. To determine the hydrostatic force on a curved surface under partial submerge and full submerge condition.
9. To perform Charpy and Izod impact test on steel specimen
10. To perform Double shear test on steel specimen
11. To perform Compression test on brick
12. Determination of coefficient of discharge of orifice meter
13. Determination of coefficient of discharge of venturi meter
14. Major losses in pipe flow
15. Verification of Bernoulli's theorem
16. Minor losses - expansion and contraction losses in pipes

THEORY OF MACHINES-I LAB.

MT 217

L	T	P	
-	-	3	**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 7 experiments/ jobs should be performed/ prepared from the below list, remaining three may either be performed/ prepared from the above list or designed & set by the concerned institution as per the scope of the syllabus of Kinematics of Machine and facilities available in the institute.

3. For Learning outcomes refer to Theory of Machine (MT-209).

List of experiments

1. To determine the modulus of rigidity of the material of a closed coil helical spring and the stiffness of a spring
2. To determine the value of coefficient of friction for a given pair of surfaces using friction apparatus
3. To determine the modulus of rigidity of horizontal shaft
4. To determine experimentally the ratio of the cutting time to idle time (cutting stroke to idle stroke) of the crank and slotted lever (QRM)/ Whitworth and compare the result to theoretical values plot the following
    a. θ v/s X (displacement of slider).
    b. θ v/s velocity.
    c. θ v/s Acceleration and to compare the values of velocities
    (Take angles θ =45˚, 90˚, 135˚, 225˚, 270˚ &335˚, ω = 1 rad/s)
5. To determine the value of coefficient of friction between the screw and nut of the jack, while:
    a. Raising the load
    b. Lowering the load
6. To draw experimentally a curve of the follower-displacement v/s cam-angle. Differentiate the above curve to get velocity and acceleration plot and compare the values with those obtained analytically.
7. To determine the coefficient of friction between belt and pulley and plot a graph between $\log_{10} T_1/T_2$ v/s, θ.
8. To determine the displacement, velocities, & accelerations of the driven shaft of a Hooke's joint for a constant speed of the driver shaft.
9. Study of bifilar and trifilar suspension system
10. Study of the inversions of the single slider crank mechanism.
11. To verify the law of moment using Bell- crank lever.

Semester 4

MT - 202

Computer Aided Design and Manufacturing

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

PURPOSE

To expose the learner to the fundamentals of CAD/CAM and the concepts and techniques used in CAD and CAM.

INSTRUCTIONAL OBJECTIVES

1. Understand the fundamentals of CAD/CAM
2. Understand the graphics display techniques in 2D/3D view of various mechanical components.
3. Create solid modeling of various components.

UNIT I

INTRODUCTION TO CAD/CAM

Fundamentals of CAD / CAM, product cycle and CAD/CAM, Basic components of CIM, Distributed communication system, Computer networks for manufacturing, Role of computer in CAD/CAM. Benefits of CAD/CAM. Concurrent Engineering, Design for Manufacturability

UNIT II

SOLID MODELING AND GRAPHICS SYSTEM

Geometric modeling - wire frame, Surface and Solid models - CSG and B-Rep techniques - Wire frame versus Solid modeling - Introduction the software Configuration of Graphics System, Functions of Graphics Packages, Graphic standards - Introduction to Finite Element Analysis.

UNIT III

CNC MACHINES

Basic principles of numerical control; Methods of coding, Computer Numerical Control (CNC) System, Machine Structure, drive system, CNC programming, Machining centre, CNC Tooling. Direct Numerical control (DNC), Adaptive control machining systems: Adaptive control optimization, Adaptive control constraints.

UNIT IV

COMPUTER AIDED PLANNING SYSTEMS

Principle of computer integrated manufacturing, Approaches to Computer aided Process Planning (CAPP) - Generative and Retrieval CAPP systems, benefits of CAPP, Material Requirement Planning (MRP), mechanism of MRP, Capacity Planning, Computer integrated production planning and control, Shop floor control.

Suggested Reading:

TEXT BOOKS

1. Sadhu Singh. "*Computer Aided Design and Manufacturing*", Khanna Publishers, New Delhi, 1998.
2. Ibrahim Zeid, CAD/CAM, "*Theory and Practice"*, Tata McGraw Hill Ed, 1998.
3. David F. Rogers and Alan Adams. J, "*Mathematical Elements for Computer Graphics*", McGraw - Hill Publishing Company International Edition, 1990.
4. William M. Newman, Robert F.Sproull, "*Principles of Interactive Computer Graphics*", McGraw-Hill International Book Company, 1984.
5. Groover and Zimmers, CAD/CAM; "*Computer Aided Design and Manufacturing, Prentice*" Hall of India, New Delhi, 1994.
6. Groover.M.P, "*Automation Production systems and Computer Integrated Manufacturing, Prentice*" - Hall of India Pvt. Ltd., New Delhi, 1996.

REFERENCES

1. Paul G. Ranky, "*Computer Integrated Manufacture, Prentice*" – Hall International, UK, 1986.
2. Radha Krishnan.P and Kothandaraman.C.P, "*Comuter Graphics and Design*", Dhanpat Rai and sons, New Delhi, 1991.
3. Radha Krishnan.P and Subramanian.S, "*CAD/CAM/CIM*", Wiley Eastern Ltd, New Age International Ltd., 1994

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) Apply basic draughting /layout techniques.	Application
2) Use a 3d cad package.	Application
3) Demonstrate a knowledge of concept of manufacturing techniques and Assemblies.	Knowledge & Understanding
4) Apply basic modelling techniques.	Application
5) Use a range of visual, oral and written presentation techniques.	Communication Team working

MT-204

Electronic Principles

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

UNIT-I

P-N JUNCTION DIODE: - P-N junction and its characteristics, the load line concept, Applications: half-wave and full-wave rectifiers, capacitor-filter circuit, clipping and clamping circuits. Special Diodes: Zener diode, Schottky barrier diode, Varactor diode, Photodiode, Light emitting diode

REGULATED POWER SUPPLIES: - Concept of DC Power supply, line and load regulations, three terminal IC regulators, SMPS.

UNIT-II

TRANSISTORS: - Review of BJT and its characteristics, variation of operating point and stability. Transistor as amplifier, small signal equivalent circuit and Hybrid pi model, Emitter follower, Miller's theorem, R-C coupled amplifier, Multistage amplifier. Transistor Biasing: fixed bias, emitter bias with and without emitter resistance, limitations on BJT'S (at high frequency), Large signal model: Ebers-Moll Model. Large Signal Amplifier: Class A and Class B.

UNIT-III

FEEDBACK OSCILLATORS AND POWER AMPLIFIERS: - basic principles and types of feedback in amplifiers. Effect of feedback, Sinusoidal Oscillators: Use of positive feedback, Barkhausen's criterion, Different oscillator circuits-tuned collector, Hartley Colpitts, phase shift,Wien's bridge, and crystal oscillator.

MULTIVIBRATORS: Concept of multi-vibrator: astable, monostable, and bistable and their applications, IC555.

UNIT-IV

FIELD EFFECT TRANSISTORS: - JFET, pinch-off voltage, Volt-ampere characteristics, small signal model, MOSFET-Enhancement & Depletion mode, V-MOSFET, MOSFET amplifiers: C-S Amplifiers, C-D Amplifiers, C-D Amplifier. Biasing of JFETS and MOSFETS.

TEXT BOOKS:

1. Integrated Electronics: Millman & Halkias; Mc Graw Hill. 2. Electronic circuit analysis and design (Second Edition): D.A. Neamen; TMH

REFERENCE BOOKS:

1. Electronics Principles: Malvino; Mc Graw Hill. 2. Electronics circuits: Donald L. Schilling & Charles Belove: Mc Graw Hill. 3. Electronics Devices & Circuits: Boylestad & Nashelsky; Pearson.

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. Solve a range of problems in electronic principles choosing an appropriate solution Procedure and making use of the underlying concepts and principles	Enquiry, Knowledge & Understanding
2. Interpret qualitative and quantitative data in electronic principles relating to Practical work and communicate the results of the work by written reports and Presentations, incorporating structured coherent argument	Application and Team working

MT-206

Design Basics

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

UNIT I

Kinematics of simple vibrating motion, Simple harmonic motions, Vectorial representation of harmonic motion. Degree of freedom, Equations of motions, general solution of free vibration, Phase plane method

Damped free vibration, undamped and damped forced vibrations, Vibrating isolation, Vibrating instruments.

UNIT II

Undamped free vibration ,Principle modes , Influence coefficients, Coordinate coupling, Orthogonality, Vibration absorbers.

Geometric method, Stability of equilibrium points, Method of harmonic balance.

Influence coefficients, Dunkerleys equation, Matrix iteration, Holzer method, Rayleigh method, and Rayleigh-Ritz method.

Unit III

Bending & shear Stresses in Beams: Bending stresses in beams with derivation & application to beams of circular, rectangular, I,T and channel sections, composite beams, shear stresses in beams with derivation combined bending torsion & axial loading of beams. Numericals.

Columns & Struts: Column under axial load, concept of instability and buckling, slenderness ratio, derivation of Eulers formulae for the elastic buckling load, Eulers, Rankine, Gordom's formulae Johnson's empirical formula for axial loading columns and their applications, eccentric compression of a short strut of rectangular & circular sections, Numerical.

Unit IV

Slope & Deflection : Relationship between bending moment, slope & deflection, Mohr's theorem, moment area method, method of integration, Macaulay's method, calculations for slope and deflection of (i) cantilevers and (ii) simply supported beams with or without overhang under concentrated load, Uniformly distributed loads or combination of concentrated and uniformly distributed loads, Numerical.

Fixed Beams: Deflections, reactions and fixing moments with SF & BM calculations & diagrams for fixed beams under (I) concentrated loads, (ii) uniformly distributed load and (iii) a combination of concentrated loads & uniformly distributed load.

REFERENCE AND TEXT BOOKS: -

- Mechanical vibration - By G.K. Grover; Nemchand Chand and Sons
- Mechanical Vibration – By Thomson; Prentice Hall
- Mechanical Vibration - By Den Hartog; Mc Graw Hill
- Introductory course to mechanical vibrations – By Rao and Gupta; Wiley Eastern
- Strength of Materials – G.H.Ryder, Third Edition in SI Units 1969 Macmillan, India.
- Mechanics of Materials – (Metric Edition) : Ferdinand P. Beer and E. Russel Johnston,
  Jr. Second Edition, McGraw Hill.
    - Book of Solid Mechanics – Kazmi, Tata Mc Graw Hill
- Strength of Materials – D.S. Bedi - S. Chand & Co. Ltd.
- Advanced Mechanics of Solids and Structures – N. Krishan Raju and D.R.Gururaje-Narosa Publishing House.
- Strength of Materials – Andrew Pytel and Fredinand L. Singer Fourth Edition, Int. Student Ed. Addison – Wesley Longman.

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) Solve a range of statistics, dynamics and/or kinematics problems and make use of the Underlying concepts and principles	Enquiry, Knowledge & Understanding
2) Interpret qualitative and quantitative data relating to practical work and Communicate the results of the work by written reports, incorporating structured Coherent argument	Application and Team working

MT - 208

Software for Engineers

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

Unit-I

Overview of C Language: C Fundamental : Introduction to C, character set, identifiers, keywords, data types, constants, variable, user defined data types, arithmetic, unary, relational, logical, assignment and conditional operators & expression. Basic structure of a C program. Data I/O statement: single character I/O, formatted I/O, string I/O functions

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Unit-II

Control Structure: Control Statement: sequencing, alteration (if-else, switch, break, continue, go to, iteration, while, do-while, for) and nested loops

Pointers and Structures: Pointers: Character pointers, pointer to arrays, array of pointers. Structure and Unions: Defining and processing structure, Unions Preprocessor Directives

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Unit-III

Functions : Defining and accessing a function, passing arguments to a function, specifying arguments data types, function prototypes, recursion. Storage Classes- Automatic, External, Static, Register.

Unit –IV

Maple: Solving problems of linear algebra **,**vectors Matrices, Determinants, Cayley Hamilton theorem, root of an algebraic equation , partial fraction, differential equation of single and higher order,

Text Book:

1. Byron Gottfried , "Programming with C, Second edition, Schaum' s outline series" TMH

References:

1. Tenenbaum, Y. Lanhghsam and A. J. Augenstein, "Data Structures Using C and C++", Prentice Hall of India, 1990.
2. B.W. Kerrighan and D.M.Richie, " The C programming language", 2nd edition, PHI

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 an understanding of an algebraic mathematical package	Knowledge & Understanding
2. Use an algebraic mathematical package to solve problems analytically and Numerically.	Analysis, Application Problem solving
3. Use a programming language.	Application, Knowledge & Understanding Problem solving

BASICS OF INDUSTRIAL SOCIOLOGY, ECONOMICS & MANAGEMENT

HUM – 201 E
L T P
3 1 -

Sessional : 50
Theory : 100
Total : 150
Duration of Exam. : 3 Hrs.

UNIT-I

Meaning of social change, nature of social change, theories of social change. The direction of social change, the causes of social change, the process of social change. Factors of social change – the technological factors, the cultural factors, effects of technology on major social institutions, social need of status system, social relations in industry.

UNIT-II

Meaning of Industrial Economic, Production Function, its types, Least Cost Combination, Law of Variable Proportion, Laws of Return – Increasing, Constant & Diminishing. Fixed & variable costs in short run & long run, opportunity costs, relation between AC & MC, U-shaped short run AC Curve. Price & Output Determination under Monopoly in short run & long run. Price Discrimination, Price Determination under Discriminating Monopoly. Comparison between Monopoly & Perfect Competition.

UNIT – III

Meaning of Management, Characteristics of Management, Management Vs. Administration, Management – Art, Science & Profession, Fayol's Principles of Management.Personnel Management – Meaning & Functions, Manpower – Process of Manpower Planning, Recruitment & Selection – Selection Procedure. Training – Objectives & Types of Training, Various Methods of Training. Labour Legislation in India – Main provisions of Industrial disputes Act 1947;

UNIT – IV

Marketing Management – Definition & Meaning, Scope of Marketing Management, Marketing Research – Meaning, Objectives. Purchasing Management – Meaning & Objectives, Purchase Procedure, Inventory Control Techniques. Financial Management – Introduction, Objectives of Financial decisions, Sources of Finance.

Note : Eight questions are to be set taking two from each unit. The students are required to attempt five questions in all, taking at least one from each unit.

TEXT BOOKS :

1. "Modern Economic Theory" Dewett, K.K., S. Chand & Co.
2. "Economic Analysis" K.P. Sundharam & E.N. Sundharam (Sultan Chand & Sons).
3. "Micro Economic Theory" M.L. Jhingan (Konark Publishers Pvt. Ltd.).
4. "Principles of Economics" M.L. Seth (Lakshmi Narain Aggarwal Educational Publishers – Agra).
5. "An Introduction to Sociology", D.R. Sachdeva & Vidya Bhusan.
6. "Society – An Introductory Analysis", R.M. Maclver Charles H. Page.
7. "Principles and Practices of Management : R.S. Gupta; B.D. Sharma; N.S. Bhalla; Kalyani.

REFERENCE BOOKS

1. "Organization and Management : R.D. Aggarwal, Tata McGraw Hill.
2. Business Organization and Management : M.C. Shukla

Theory of Machines-II
MT –210

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

UNIT I

Types of gears, terminology, condition for correct gearing, cyclical and involutes profiles of gear teeth, pressure angle, path of contact, arc of contact, Interference, undercutting, minimum number of teeth, number of pairs of teeth in contact, helical, spiral, worm and worm gear, bevel gear. Gear trains; simple, compound, reverted, and epicyclical, Solution of gear trains, sun and planet gear, bevel epicyclical gear, compound epicyclical gear, pre-selective gear box, differential of automobile, torque in gear taints.

UNIT II

Types of brakes, friction brakes, external shoe brakes, band brakes, band and block brakes, internal expanding shoe brake, dynamometers; absorption, and tensional. Types of governors; watt, Porter, Proell, spring loaded centrifugal, Inertia, Sensitiveness, Stability, Isochronism's, Hunting, Effort and power of governor, controlling force, Static and dynamic balancing of rotating parts, balancing of I. C. Engines, balancing of multi-cylinder engine; V-engines and radial engines, balancing of machines.

UNIT III

Gyroscope, Gyroscopic couple and its effect on craft, naval ships during steering, pinching and rolling, Stability of an automobile (2-wheeers), Introduction, open and closed lop control, terms related to automatic control, error detector, actuator, amplification, transducers, lag in responses, damping, block diagrams, system with viscous damped output, transfer functions, relationship between open –loop and closed loop transfer function.

UNIT IV

Introduction, Terms Used in Vibratory Motion, Types of Vibratory Motion, Types of free Vibrations, Natural frequency of free Longitudinal Vibrations, Natural frequency of free Transverse Vibrations, Effect of Inertia of the Constraint in Longitudinal and Transverse Vibrations, Natural frequency of free Transverse Vibrations Due to a Point Load Acting Over a Simply Supported Shaft, Natural frequency of free Transverse Vibrations Due to Uniformly Distributed Load Over a Simply Supported Shaft, Natural frequency of free Transverse Vibrations of a Shaft fixed at Both Ends and Carrying a Uniformly Distributed Load, Natural frequency of free Transverse Vibrations for a Shaft Subjected to a Number of Point Loads.

Suggested reading:

1. Theory of machines: S. S. Rattan, Tata McGraw Hill Publications.
2. Theory of Mechanism and Machines: Jagdish Lal, Metropolitan Book Co.
3. Mechanism synthesis and analysis: A.H. Soni, McGraw Hill Publications.

4. Mechanism: J.S. Beggs.
5. Mechanics of Machines: P.Black, Pergamon Press.
6. Theory of Machines: P.L.Ballaney, Khanna Publisher

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 the uses of gear trains and brake, governors.
2) Understand and learn use of Gyroscope.
3) Understand and learn balancing of IC engines.
4) Understand vibrations (transverse and longitudinal)

MT-212

Electronic Principles Lab

L	T	P	Sessional: 25 Marks
-	-	2	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 7 experiments/ jobs should be performed/ prepared from the below list, remaining three may either be performed/ prepared from the above list or designed & set by the concerned institution as per the scope of the syllabus of Electronic Principles and facilities available in the institute.

3. For Learning outcomes refer to Electronic Principles (MT-204).

List of Experiment

1. Measurement & study of P-N junction diode-I-V and C-V characteristics.
2. Study of Half-wave and Full-wave rectifier.
3. Measurement and study of solar cell –I-V characteristics.
4. Study of Active filters.
5. Study of diode as Clipper and Clamper.
6. Study of Zener diode as Voltage Regulator.
7. Measurement and study of Input and Output characteristics of a BJT.
8. Study of CE amplifier-Current & Power gains and Input, Output Impedances.
9. To study the frequency response of RC coupled amplifier.
10. Measurement and study of Output characteristics of JFET.
11. Measurement and study of Output characteristics of MOSFET.
12. Study of SCR/Thyristor characteristics.
13. Study of UJT characteristics.
14. Study of Push-Pull amplifier.

MT - 214

Software for Engineers 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 7 experiments/ jobs should be performed/ prepared from the below list, remaining three may either be performed/ prepared from the above list or designed & set by the concerned institution as per the scope of the syllabus of Software for Engineers and facilities available in the institute.
3. For Learning outcomes refer to Software for Engineers (MT-208).

List of Experiment

1. Determinant of matrix, Rank of matrix
2. Eigen value &vector of matrix. Ad joint and inverse of matrix.
3. Characteristic and minimal polynomial of matrix.
4. Plot the graph in 2D and 3d of any function.
5. Solve algebraic equation
6. Find mean, median mode of given data set.
7. Find variance and standard deviation of given data set.

Text Book:

1. Byron Gottfried , "Programming with C, Second edition, Schaum' s outline series" TMH

References:

1. Tenenbaum, Y. Lanhghsam and A. J. Augenstein, "Data Structures Using C and C++", Prentice Hall of India, 1990.
2. B.W. Kerrighan and D.M.Richie, " The C programming language", 2nd edition, PHI

MT-216

Computer Aided Design and Manufacturing Lab

L	T	P	
-	-	2	**Sessional: 25 Marks**
			Practical : 25 Marks
			Total: 50 Marks
			Duration of Exam: 3 Hrs

PURPOSE

To provide hands on experience on geometric modeling, assembling and drafting using computers and also on part programming.

INSTRUCTIONAL OBJECTIVES

1. Draw various views of a component assembly.
2. Model the components.
3. Assemble the components.
4. Manufacture small components using CNC lathe and mill.

NOTE:

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

2. For Learning outcomes refer to **Computer Aided Design and Manufacturing** (MT-202).

List of Experiments/ jobs

CAD LABORATORY

1. Computer Aided Drafting of Machine Elements Orthographic views - Isometric Views - Sectional views. Dimensioning - Annotations - symbols - welding - surface finish - threads. Text - Bill of Materials - Title Block. Script writing.
2. **Exercise:** Knuckle joint, Gib and Cotter Joint, Screw jack, Footstep bearing, Isometric views with their orthographic views.
3. Geometric modeling of machine components Protrusion - cut - sweep – draft and loft - Modify /edit pattern - Transformation - Boolean operation
4. **Exercise:** Individual parts of universal joint - Flange coupling - Piston and Connecting rod. (Using a popular commercial package)
5. Design any ten entities/machine parts (e.g. Plumber block, Steam stop valve, tail stock, drill machine, universal testing machine, screw jack, bench vice, press die assembly, clamp assembly, flywheel, surface grinder, bevel gear, rack and pinion gear) in 2D and 3D with PRO-E design software/ any other suitable software.
6. Assemble the designed entities/machine parts (e.g. Plumber block, Steam stop valve, tail stock, drill machine, universal testing machine, screw jack, bench vice, press die assembly, clamp assembly, flywheel, surface grinder, bevel gear, rack and pinion gear) to understand the assembly operations in design software.

CAM LABORATORY

1. Manual programming for CNC machines using standard G and M codes CNC Lathe - Part programming for Turning, Facing, Chamfering, Step turning, Taper turning circular interpolation. CNC Milling machine - Part programming for PTP motions, Line motions, Contour motions, Pocketing - Circular, Rectangular and Mirror commands.
2. Part programming using fixed / canned cycles. Drilling, Peck Drilling, Boring, Tapping, Thread cutting
3. Simulation of Tool Path for different operations
4. Machining of small components using CNC Lathe and CNC Milling Machine
5. To study the characteristic features of CNC machine.

6. Part programming (in word address format) experiment for turning operation (including operations such as grooving and threading) and running on CNC machine.

7. Part programming (in word address format or ATP) experiment for drilling operation (point to point) and running on CNC machine.

Recommended books:

1. Engineering Drawing with CAD Applications, D Ostrowsky, 1997, ISBN: 0340706023
2. CADCAM Theory and Practice, I Zeid, 1991, ISBN 0-07-072857-7
3. Pro/Engineer Wildfire, Louis Gary Lamit, 2003, ISBN 0534400833
4. Pro/ENGINEER Wildfire for Designers, Sham Tickoo, Cadcim Technologies, 2003, ISBN 0966353765

Theory of Machines-II lab
MT 218

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 7 experiments/ jobs should be performed/ prepared from the below list, remaining three may either be performed/ prepared from the above list or designed & set by the concerned institution as per the scope of the syllabus of Dynamics of Machine and facilities available in the institute.

3. For Learning outcomes refer to Theory of Machines-II (MT-210).

LIST OF EXPERIMENT

1. To determine experimentally, the moment of inertia of a flywheel and axle compare with theoretical values.
2. To find out critical speed experimentally and to compare the whirling speed of a shaft with theoretical values.
3. To find experimentally the Gyroscopic couple on motorized gyroscope and compare with applied couple.
4. To calculate the torque on a planet carrier and torque on internal gear using epicyclic gear train and holding torque apparatus.
5. To study the different types of centrifugal and inertia governors and demonstrate any one.
6. To study the automatic transmission unit.
7. To study the differential types of brakes.

Semester 5

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	Sessional: 50 Marks
3	1	-	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	Sessional: 50 Marks
3	1	-	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	Sessional: 50 Marks
3	1	-	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	Sessional : 25Marks
-	-	3	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	Sessional: 25 Marks
-	-	2	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.

Semester 6

MT - 302

Applications of Control

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

Unit 1

INTRODUCTION

Concepts of Control Systems- classifications of control system and their differences. Different examples of control systems. Modeling of typical elements of a servo mechanism (motor, gearbox, amplifier and sensors). Block diagram reduction and Signal flow graph algebra. .

Unit II

TIME RESPONSE ANALYSIS

Standard test signals - Time response of first order and second order systems. Steady state response: Steady state errors and error constants. Effect of addition of poles and zeros to transfer functions. Responses with P, PI and PID Controllers

Unit III

STABILITY ANALYSIS

Concepts of Stabiltiy -S-plane and frequency response analysis-gain and phase margins. Routh Stability Criterion-Necessary and sufficient condition of stability-special cases. Root Locus Technique: The root locus concept - construction of root loci-effects. Frequency response analysis - Bode plots – GM and PM -Stability Analysis from Bode Plots. Nyquist Plots: Nyquist Stability Criterion, Assessment of relative stability. Compensation techniques –classifications-Lag, Lead and Lag lead compensator.

Unit IV

STATE SPACE ANALYSIS OF CONTINUOUS SYSTEMS

Concepts of state, state variables and state model, derivation of state models from block diagrams- State space representations– Solutions of state equations. Concepts of Controllability and Observability.

TEXT BOOKS:

1. Linear control system with MATLAB Applications- B.S Manke, Khanna Publishers

2. Automatic Control Systems 8th edition– by B. C. Kuo 2003– John Wiley and son's.,

3. Control Systems Engineering – by I. J. Nagrath and M. Gopal, New Age International

(P) Limited, Publishers, 2nd edition.

REFERENCE BOOKS:

1. Modern Control Engineering – by Katsuhiko Ogata – Prentice Hall of India Pvt. Ltd., 3rd edition, 1998.

2. Control Systems Engg. by NISE 3rd Edition – John Wiley

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. Derive theoretical models for the study of engineering control systems.	Knowledge & Understanding
2. Improve on an undamped control system in order for it to exhibit a stable response.	Enquiry and Problem Solving
3. Investigate and report upon the use of control in improving a system's response.	Communication

MT - 304

Digital and Embedded Softw. (RT sys) 2

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

UNIT-1

Introduction to Microcontroller: -Evaluation of Microcontrollers. Classification of Microcontroller – On the basis of architecture andinstruction set.Embedded processor.Comparison between Microprocessor and Microcontrollers.A brief history of 8051.Overview of 8051 microcontroller family.Block Diagram and Architecture of 8051. Pin Description of 8051 microcontroller.

UNIT-2

Assembly and C programming of Microcontroller :- 8051 Instruction Format,Addressing modes, Data transfer instructions. Logical operations, Arithmetic operations, looping, jumpand call instructions, Time Delay programming. SFR (Special Function Registers).Development of different programs.Data types and Time Delays in 8051 C. Logic and Arithmetic operation in C.

UNIT-3

8051 Internal Architecture: - I/O port programming. Serial communication using 8051.Counter andTimers programming.Different modes of timer.Serial data input / output,Setting Baud Rate.Interrupt Programming –timer interrupts, external hardware interrupts, serial communication interrupt, priority interrupt. External memory interfacing.

UNIT-4

Interfacing of microcontroller:-Microcontroller based seven segment numeric displays.Microcontroller interfacing with keypad, Microcontroller based D/A& A/D converters andMicrocontroller based LCD display.Motor interfacing with microcontroller 8051.

TEXT BOOKS

1. The 8051 Microcontroller And Embedded Systems Using Assembly And C: Muhammad Ali Mazidi.
2. The 8051 Microcontroller: Kenneth J. Ayala

REFERENCE BOOKS

1. The 8051 Microcontroller: Mackenzie
2. 8051 Microcontroller: Internals, Instructions, Programming & Interfacing: GhoshalSubrata

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. Extend C programming to interface to microcontroller hardware(electro/mechanical).	Analysis, Application and Problem Solving
2. Understand the connection between C and the embedded engineering product.	Analysis, Application and Problem Solving
3. Apply the development cycle of embedded system design to an engineering application.	Analysis, Application and Problem Solving

Engineering Mathematics Apps 2

MT-306

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

UNIT – I

Trignometric Functions: Positive and negative angles. Measuring angles in radians and in degrees and conversion from one measure to another. Definition of trigonometric functions with the help of unit circle. Truth of the identity basic trigonometric identities, for all angles. Signs of trigonometric functions.
Expressing sum and difference of trigonometric angles and their simple applications.

UNIT-II

Trignometric Identities & Equations: Identities related to multiple trigonometric angles. General solution of trigonometric equations.

Inverse Trigonometric Functions: Introduction, Basic Concepts, Properties of Inverse Trigonometric Functions.

UNIT-III

Numerical solution of Differential Equation: Introduction, Taylor's series method, Euler's and Modified Euler's method, RungeKutta Method, Milne's Predictor and Corrector Method, Picard's Method of Successive Approximation, .ABM Method

UNIT-IV

Three Dimensional Geometry: Introduction, Direction Cosines and Direction Ratios of a Line, Equation of a line in space, Angle between two lines, shortest distance between two lines.

Plane, Co-planarity of Two lines, Angle between two planes, Distance of a Point from a Plane, Angle between a line and a plane.

Text Book

1. Higher Engg. Mathematics : B.S. Grewal
2. Advanced Engg. Mathematics : E. Kreyzig

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 Trignometry and inverse trigonometric functions
2) Understand about numerical methods and Introduction to 3D

Pneumatic And Hydraulic Instrumentation

MT-308

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

UNIT – I

Introduction: Basic requirement for Pneumatic System, Servicing compressed air: Air compressors, air treatment stages, pressure regulation(FRL unit) Introduction to hydraulic system comparison of pneumatic & hydraulic system.

UNIT – II

Pneumatic & hydraulic Actuators, cylinders Spring, spring less, spring with positioner piston & motor actuators, electro pneumatic actuators, cylinder lubrication, cylinder with sensors, hydraulic actuators, control valves types of control valves, basic pneumatic circuits.

UNIT – III

Timing & sequence diagram : Cylinder sequencing hydraulic & pneumatic Accessories pneumatic telemetry systems: Pneumatic temperature & pressure transmitters their working & applications, electrical control in pneumatic circuit. Introduction to PLC, architecture of PLC , Programming of PLC.

UNIT – IV

Pneumatic & Hydraulic Controllers(P,PI,PID),P&ID diagrams, converters :I/P,P/I, Pneumatic Relay, Pneumatic Sensors Flapper nozzle assembly. Maintenance & troubleshooting of pneumatic & hydraulic systems. Introduction to Mechatronics & its approach.

TEXT BOOKS:

1. Process Control Instrumentation Technology, C. D. Johnson ,PHI, 2002
2. Computer based Industrial Control, Krishankant PHI,2004
3. Pneumatic & Hydraulic, Andrew Parr PHI, 1999.

REFERENCE BOOKS:

1. Process Industrial Instruments & Control Handbook D.Considine , McGraw Hill ,1993.
2. Instrument Engineers Handbook ,B.G liptak ,BH Publication ,1999.

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 basic elements of Pneumatic System and hydraulic Actuators
2) Understand about Timing & sequence diagram.
3) Learn about Pneumatic & Hydraulic Controllers(P,PI,PID).

Production Technology-II
MT-310

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

UNIT I

Kinematics of Machine Tools.

Drives in machine tools for rotation movement, stepped and step less drives, mechanical and hydraulic drives, Individual and group drives, selection of extreme values of spindle speed on a lathe, principle of stepped regulation, Layout of spindle speeds. A.P., G.P. and Logarithmic progressions, Kinematics advantage of G. P. for gear box design, selection of common ratio, Number of steps in a given speed range, design of all geared head stock.

UNIT II

Gear manufacturing and layout for Automatics

Classification of gear production methods, gear generation, gear hobbling gear shaping, gear finishing methods; shaving, burnishing grinding, Lapping gear shaping, gear finishing methods; shaving, burnishing grinding, honing.

Automatic lathes, classification of automatic machines, setting up of automatics, tooling layout and operation sheet, cam design, tool layout of automatic screw machine, programmed automatic lathes, bar stock feeding.

UNIT III

Unconventional Machining Processes & Press Working Tools

Need for unconventional processes, Ultrasonic machining, electrochemical machining, electrochemical grinding, Laser beam machining their process parameters, principle of metal removal, applications advantages and limitations.

Introduction, classifications of presses and dies, hear, action in die cutting operations, center of pressure, mathematical calculation of center of pressure, clearances, cutting forces, punch dimensioning.

UNIT-IV

Machine Tools Vibration and Dynamometry

Introduction, effects of vibration no-machine tools, cutting conditions, work piece and tools life, source of vibration, machine tool chatter, Need for measuring forces, basic requirements of measuring techniques, design requirements of dynamometers, 3-divisional turning dynamometer and its calibration, drill dynamometers.

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 Kinematics of Machine Tools and tool layout of automatics
2) Understand Unconventional Machining Processes & Press Working Tools.
3) Understand Machine Tools Vibration and Dynamometry.

FUNDAMENTALS OF MANAGEMENT

HUT-302E

L	T	P	
3	1	-	

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

UNIT-I Financial Management

Introduction of Financial Management Objectives of Financial Decisions, Status and duties of Financial Executives Financial Planning – Tools of financial planning Management of working capital Factors affecting requirements of working capital. Sources of finance Use of financial ratios for analyzing performance of company

UNIT-II Personnel Management

Personnel Management – Meaning, Nature and Importance; Functions of Personnel Management – (a) Managerial Functions and (b) Operative functions Job Analysis: Meaning and Importance; Process of Job Analysis; Job Description and Job specification. Job rotation and Job enlargement, Job enrichment, Human Resource Development-Meaning and concept

UNIT-III Production Management

Production Management: Definition and Objectives
Plant location: Ideal plant location. Factors affecting plant location.
Plant Layout: Ideal plant layout, factors affecting plant layout
Work Measurement: Meaning, Objectives and Essentials of work measurement. Production Control: Meaning and importance of production control and steps involved in production control Inventory management, ABC analysis, Economic order quantity, Just in Time

UNIT-IV Marketing Management

Nature, scope and importance of marketing management. Modern Marketing concepts. Role of marketing in economic development. Marketing Mix. Marketing Information System Meaning, nature and scope of International Marketing Supply chain management

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.

Text Books:

Financial Management, IM Pandey, Vikas Publishing House Pvt Ltd

Marketing Management, Philip Kotler, Kevin Lane Keller, Abraham Koshy, Mithileshwar Jha, Pearson Education Inc.

Human Resource Management: Text and Cases, K.Aswathapa Tata McGraw Hill, New Delhi,

Chunawalla & Patel Production and Operations Management, Himalaya Publishing House

Production Technology-II Lab
MT-312

L	T	P	
-	-	3	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 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 Production Technology 2 and facilities available in the institute.
3. For Learning outcomes refer to Production Technology 2 (MT-310).

List of Experiments:

Introduction to milling machines its types functions applications etc.

1. Practice of slab milling on milling machine.
2. Practice of slotting on milling machine.
3. To cut gear teeth on milling machine using dividing head.
4. Introduction to gear hobber, demonstration of gear hobbing and practice.
5. Introduction to various grinding wheels and demonstration on the surface grinder.
6. Introduction to tool and cutter grinder and dynamometer.
7. Study the constructional detail and working of CNC lathes Trainer.
8. To carry out welding using TIG/MIG welding set.
9. Introduction, demonstration & practice on profile projector & gauges.
10. To make a component on lathe machine using copy turning attachment.
11. To cut external threads on a lathe.
12. To cut multi slots on a shaper machine.
13. To perform drilling and Boring operation on a Component.

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

MT - 314

Digital And Embedded Softw. (RT sys) 2 Lab

L	T	P	Sessional: 25 Marks
-	-	2	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 -2 and facilities available in the institute.

3. For Learning outcomes refer to Digital And Embedded Software -2 (MT-304).

1. Introduction to microcontroller and interfacing modules.
2. To interface the seven segment display with microcontroller 8051.
3. To create a series of moving lights using 8051 on LEDs.
4. To interface the stepper motor with microcontroller.
5. To display the digital output of ADC on 16*2 LCD Module.
6. To display character 'A' on 8*8 LED Matrix.
7. To display the data and time on LCD Module.
8. To switch on and off relay by using keys.
9. To interface the DC motor using H-Bridge.
10. To interface a keypad with microcontroller.

This laboratory 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. Most important the technique used by one student cannot be used by others. So by this way multiple solutions of the same problem can be achieved.

REFERENCE BOOKS

1. The 8051 Microcontroller: Mackenzie
2. 8051 Microcontroller: Internals, Instructions, Programming & Interfacing: Ghoshal Subrata

MT - 316

Applications of Control 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 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 Applications of Control and facilities available in the institute.

3. For Learning outcomes refer to Applications of Control (MT-302).

LIST OF EXPERIMENTS

MATLAB based experiments

1. For the second order systems below, find ξ_n, T_s, T_p, T_r, % overshoot, and plot the step response using MATLAB.

$$T(s) = \frac{130}{s^2 + 15s + 130}$$

2. A plant to be controlled is described by a transfer function

$$T(s) = \frac{s + 5}{s^2 + 7s + 25}$$

Obtain the root locus plot using MATLAB.

3. Write a program in MATLAB to obtain the Nyquist plots for the following transfer function for k = 30.

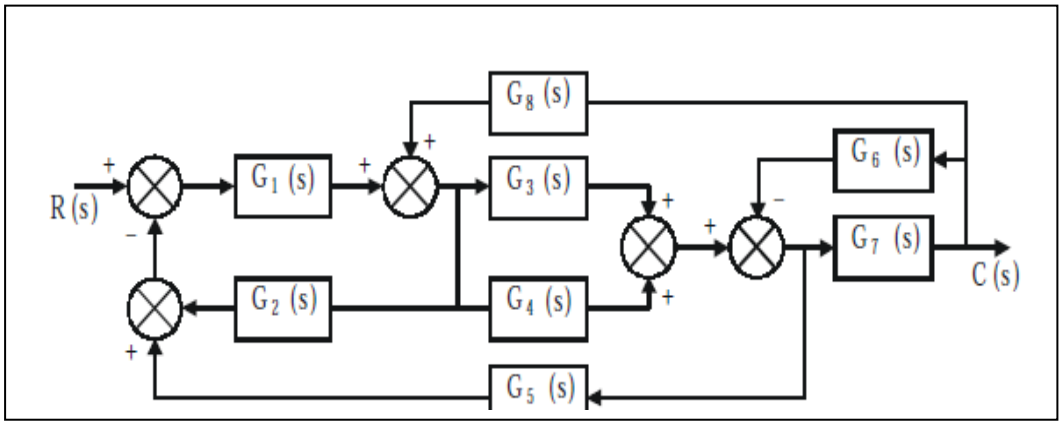
$$G(s) = \frac{k(s+1)(s+3+7i)(s+3-7i)}{(s+1)(s+3)(s+3+7i)(s+3-7i)}$$

4. A PID controller is given by

$$G_c(s) = 29.125\frac{(s+0.57)^2}{s}$$

Draw a Bode diagram of the controller using MATLAB.

5. Reduce the system shown below to a single transfer function, T(s) = C(s)/R(s) using MATLAB.



The transfer functions are given as

$$G1(s) = \frac{1}{s+7}$$

$$G2(s) = \frac{1}{s^2+3s+5}$$

$$G3(s) = \frac{1}{s+8}$$

$$G4(s) = \frac{1}{s}$$

$$G5(s) = \frac{7}{s+3}$$

$$G6(s) = \frac{1}{s^2+7s+5}$$

$$G7(s) = \frac{5}{s+5}$$

$$G8(s) = \frac{1}{s+9}$$

Hardware based experiments

1. DC SPEED CONTROL SYSTEM

(a) To study D.C. speed control system on open loop and close loop.
(b) To study of Transient performance, another time signal is added at the input of control Circuit.
(c) To study how eddy current breaking is being disturbance rejected by close and open loop.

2. DC MOTOR POSITION CONTROL

(a) To study of potentiometer displacement constant on D.C. motor position control.
(b) To study of D. C. position control through continuous command.
(c) To study of D.C. position control through step command.
(d) To study of D.C. position control through Dynamic response.

3. SYNCHRO TRANSMITTER / RECEIVER

(a) To study of Synchro Transmitter in term of Position v/s Phase and voltage magnitude with respect to Rotor Voltage Magnitude/Phase.
(b) To study of remote position indication system using synchro transmitter/receiver.

4. PID CONTROLLER

(a) To observe open loop performance of building block and calibration of PID Controls.
(b) To study P, PI and PID controller with type 0 system with delay.
(c) To study P, PI and PID controller with type 1 system.

5. LEAD LAG COMPENSATOR

(a) To study the open loop response on compensator.

(b) Close loop transient response.

REFERENCE BOOKS:

1. Modern Control Engineering – by Katsuhiko Ogata – Prentice Hall of India Pvt. Ltd., 3rd edition, 1998.

2. Control Systems Engg. by NISE 3rd Edition – John Wiley

Semester 7

MT-401
Digital Signal Processing

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

UNIT – I:

DISCRETE TRANSFORMS: Z- transform and its properties, Inversion of Z-transform, One sided Ztransform and solution of differential equations. Analysis of LTI systems in Z-domain, causality, stability, schur-cohn stability test; relationship between Z-transform and Fourier transform. Frequency selective filters; all pass filters, minimum-phase, maximum-phase and mixed-phase systems. Frequency domain sampling and DFT; properties of DFT, Linear filtering using DFT, Frequency analysis of signals using DFT, radix 2, radix-4, goertzel algorithm, Chirp Z-transform, applications of FFT algorithm, computation of DFT of real sequences. Quantization effects in computation of DFT.

UNIT – II:

IMPLEMENTATION OF DISCRETE TIME SYSTEMS: Direct form, cascade form, frequency sampling and lattice structures for FIR systems. Direct forms, transposed form, cascade form parallel form. Lattice and lattice ladder structures for IIR systems. State space structures Quantization of filter co-efficient structures for all pass filters.

UNIT – III:

DESIGN OF FIR FILTERS: Characteristics of practical frequency selective filters. Filters design specifications peak pass band ripple, minimum stop band attenuation. Four types of FIR filters Design of FIR filters using windows. Kaiser window method comparison of design methods for FIR filters Gibbs phenomenon, design of FIR filters by frequency sampling method, design of optimum equiripple FIR filters, alternation theorem.

UNIT – IV:

DESIGN OF IIR FILTERS: Design of IIR filters from analog filters, Design by approximation of derivatives, Impulse invariance method bilinear transformation method characteristics of Butterworth, Chebyshev, and Elliptical analog filters and design of IIR filters, Frequency transformation, least square methods, design of IIR filters in frequency domain.

Suggested Books:

1. John G. Proakis, Digital Signal Processing, PHI

2. S. K. Mitra, Digital Signal Processing , TMH
3. Rabiner and Gold, Digital Signal Processing, PHI
4. Salivahan, Digital Signal Processing , TMH
5. Digital Signal Processing: Alon V. Oppenhelm;PHI

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 systematic knowledge and understanding of key aspects and Concepts o f digital signal processing techniques, devices and architectures.	Knowledge & Understanding
2) Apply and extend appropriate analytical techniques to signal processing Processes and critically evaluate the outcomes.	Analysis
3) Use of simulation software and the key analytical skills and understanding to Evaluate arguments and assumptions in relating results to theory.	Application
4) Communicate ideas effectively.	Communication

MT - 403

Systems Engineering

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

UNIT-I

System, its objectives, quality, optimization and reliability**,** different types of problems: Importance, value, timing, accountability, and Organizational structure in the systems with its definition and environment, multi-objective analysis: Multi-Objective Decision Analysis (MODA) and trade-offs,

UNIT-II

Multidisciplinary Design Optimization (MDO), Trade space Exploration, Design structure matrices, System Dynamics, parameters for optimization of system and planning and analysis with mathematical optimization techniques, simulation techniques to understand system modeling using Monte Carlo Simulation Method

UNIT-III

Shortest path problem including Project Evaluation and Review Technique / Critical Path Method, Allocation of scarce resources: Assignment using Hungarian Method, Decision analysis with the help of decision trees, Dynamic programming and numerical on Dynamic programming

UNIT-IV

Advanced problems of Project Evaluation and Review Technique/Critical Path Method, IDEF and IDEF0-14 techniques, different dimensions of quality of the system and its assurance with control charts: R and $\bar{x}$ -charts and standards, TQM with its stages: inspection, quality control, quality assurance and TQM and Taguchi methods, reliabilities of the system in context with design and analysis. Explanation of Reliability with three tests: failure-terminated, time-terminated and sequential.

Text Books/ Reference Books

- Systems Engineering - An Introduction, J Boardman, 1990, Prentice Hall, ISBN: 0-13-504424-3
- Systems Engineering and Analysis, BS Blackford and WJ Fabrycky, 1990, Prentice Hall, ISBN: 0-13-880840-6

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) Specify problems and design generic frameworks requiring systems solutions.	Application Knowledge & Understanding
2) Use systems optimisation techniques in industrial and societal environments.	Application
3) Use decision making and problem solving tools including statistical techniques in Contextual situations.	Problem solving
4) Critically appraise systems engineering in context.	Knowledge & Understanding Reflection

MT-405
Sensors and Actuators

L	T	P	Sessional: 25 Marks
3	1	-	Theory: 100 Marks
			Total: 125 Marks
			Exam Duration: 3 Hours

UNIT I - INTRODUCTION AND DISPLACEMENT MEASUREMENT

Sensors - Basic requirements of a sensors- Classification of sensors- Static and Dynamic characteristics of sensors- Displacement Sensors- Linear and Rotary displacement sensors- Potentiometer, Capacitive and Inductive type displacement sensor- position sensors- Optical encoder, Photoelectric sensor, Hall Effect Sensor.

UNIT II - MEASUREMENT OF PROXIMITY, FORCE AND PRESSURE

Eddy current proximity sensor- Inductive Proximity sensor- Capacitive Proximity sensor - Pneumatic Proximity sensors- Proximity Switches- Contact and Noncontact type – Strain Gauge – Diaphragm Pressure Sensor- Capsule Pressure sensors- Bellows Pressure Sensor- Bourdon tube pressure sensor- Piezoelectric Sensor- Tactile sensor.

UNIT III - MEASUREMENT OF VELOCITY, FLOW AND LEVEL

Tachogenerator - Pyroelectric sensors - Ultrasonic sensor – Resistive sensor- Pitot tube – Orificeplate - flow nozzle- Venturi tubes – Rotameter- Electromagnetic flow meter. Float level sensor- Pressure level sensor- Variable capacitance sensor.

UNIT IV - MEASUREMENT OF TEMPERATURE, MOTION AND LIGHT SENSORS

Thermocouples- Thermistors -Thermodiodes - Thermotransistors- Bimetallic Strip- Resistance Temperature Detector- Infrared Thermography. Vibrometer and accelerometer- seismic accelerometer. Photoresistors -Photodiodes - Phototranistors- Photocondutors.

UNIT V - MICRO SENSORS AND ACTUATORS

Micro Sensors: Principles and examples, Force and pressure micro sensors, position and speed micro sensors, acceleration micro sensors, chemical sensors, biosensors, temperature micro sensors and flow micro sensors. Micro Actuators: Actuation principle, shape memory effects-one way, two way and pseudo elasticity. Types of micro actuators- Electrostatic, Magnetic, Fluidic, Inverse piezoeffect, other principles.

TEXT BOOKS

1. Sawhney.A.K, *"Course in Mechanical Measurements and Instrumentation"*, Dhanpat Rai and Sons, 1997.
2. Patranabis.D, "*Sensors and Transducers"*, Wheeler publisher, 1994.
3. Sergej Fatikow and Ulrich Rembold, *Microsystem "Technology and Microbotics"* First edition, Springer -Verlag NEwyork, Inc, 1997.
4. Gupta.I.C, "*A Text book of Engineering Metrology"*, Dhanpat Rai and Sons, 1996.
5. *"ASTE Hand Book of Industries Metrology"*, Prentice Hall of India, 1992.

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) To Understand the basic concepts of sensors.
2) To study about the various sensors types based on their applications.
3) To study about the micro level sensors and actuators.

MT - 407
Digital Signal Processing 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 Signal Processing and facilities available in the institute.

3. For Learning outcomes refer to Digital Signal Processing (MT-401).

LIST OF EXPERIMENTS

1. Define a function to compute DTFT of a finite length signal. Plot the magnitude and phase plots using subplots. Use this function to obtain DTFT of a 21 point triangular pulse over the domain 10<n<10: Plot the results over -1t<w<1t.
2. Write a program to plot the following functions: a)impulse function b)unit step c)unit ramp d) exponential e) sinusoidal
3. Verify the Symmetry, time shifting and modulating properties of DTFT with a rectangular pulse of length 21.
4 Study the aliasing effect by using a Sinusoidal Signal. Show the plots of' continuous time Signal. Sampled Signal and reconstructed signals by using subplot.
5. Study different window functions available in signal processing toolbox and their Controlling parameters.
6. Write a program to plot real, imaginary phase and magnitude of exponential function.
7 Verify the properties of Discrete Fourier Transform (DFT).
8 Write a program to find the convolution of two sequences using in built convolution function
9 Study of Digital Signal Processing Kit (TMSI ADSP)
10. Implementation of FlR/digital filter using DSP Kit.

TEXT BOOKS

1. Digital Signal Processing A Practical Approach, Emmanuel Ifeachor & Barrie Jervis, 2001, Prentice Hall, ISBN: 0201569199
2. Linear System s and Signal, B. P. Lathi, Berkeley Cam bridge Press, 1992, ISBN: 0941413349.
3. Signal Analysis and Signal Processing, Philip Denbeigh, 1998, Addison Wesley, ISBN:0201178605.
4. Principles of Signals and System s, Fred Taylor, 1994, McGraw Hill, ISBN: 0079111718.

MT - 409

The Professional Engineer (Project 1)

L	T	P	Sessional: 100 Marks
2	-	3	Practical: 100 Marks
			Total :- 200 Marks
			Duration of exam: 03 hrs

Unit-1

Ethics-scope and issues in the engineering sector: What are research ethics, Importance of research ethics, Plagiarism Avoidance, Referencing and citation

Unit 2

Project Management and Scheduling Techniques: Planning Activities, Estimating the time requirements of a project, Project Milestones, Project Quality, Project Management, Gantt Chart, Pert Chart, COCOMO model, Function Point Analysis,

Unit 3

Research Methodologies: Designing a Research Programme, Research Approaches, Quantitative Methods, Qualitative Methods.

Data Gathering Methods: Questionnaire, Interview, Focus Groups, Observation, Studying Documentation

Unit 4

Abstract and Literature Review: Writing an abstract, Structure of a Literature Review, Guidelines for writing a literature review, Identifying a good literature review and a bad literature review, Literature searching techniques and sources.

Text Books

1. Research Methodology: Methods and Techniques- C R Kothari
2. Project Management: Planning and Control Techniques- Rory Burke

Reference Books

1. Research Methodology- R. Panneerselvam

Note: Students will have to submit a preparatory report for a proposed project, including literature survey, data gathering methods, ethical assessment, project plan and resources and a logbook detailing background work, sources and reflective comment on the work undertaken.

MT-411

Sensors and Actuators lab

L	T	P	
-	-	3	**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 5 experiments/ jobs should be performed/ prepared from the below list, remaining 5 may either be performed/ prepared from the above list or designed & set by the concerned institution as per the scope of the syllabus of Sensors and Actuators and facilities available in the institute.
3. For Learning outcomes refer to Sensors and Actuators (MT-405).

LIST OF EXPERIMENTS

Characteristics of

1. Displacement sensors
a. LVDT
b. RVDT
2. Position sensors
a. Potentiometer
b. Synchro and resolver
c. Rotary encoders – absolute and incremental
3. Speed sensors
a. Tachogenerator
b. Hall effect sensor
4. Force and pressure sensors
a. Strain gauge
b. Load cell
5. Torque sensors
a. Load cell
b. Hall effect sensors
c. Stroboscope
6. Proximity and range sensors
a. Infra red sensors
b. SONAR
c. Inductive, Capacitive, Magnetic and Optical Proximity Sensors
7. Temperature Sensors
a. Thermocouple
b. Resistance Temperature detectors
c. Thermistors
d. IC Temperature sensors
8. Flow measurement
a. Venturimeter
b. Hot wire anemometer

9. Vibration measurement using Accelerometer

10. Miscellaneous measurements

LIST OF EXPERIMENTS

1. Stepper motors (Unipolar and Bipolar)– Modes of operation

2. DC motor characteristics (Armature controlled and BLDC)

3. DC Servo motor characteristics

4. Characteristics of Solenoids and relays

5. Electro pneumatic actuators – Linear and rotary (full and limited rotation)

6. Exercises involving mechanical drives (gear trains, lead screw and ball

screw, belt drives etc.,)

TEXT BOOKS

1. Sawhney.A.K, *"Course in Mechanical Measurements and Instrumentation"*, Dhanpat Rai and Sons, 1997.

2. Patranabis.D, "*Sensors and Transducers"*, Wheeler publisher, 1994.

3. Sergej Fatikow and Ulrich Rembold, *Microsystem "Technology and Microbotics"* First edition, Springer -Verlag NEwyork, Inc, 1997.

4. Gupta.I.C, "*A Text book of Engineering Metrology"*, Dhanpat Rai and Sons, 1996.

5. *"ASTE Hand Book of Industries Metrology"*, Prentice Hall of India, 1992.

Seminar
MT – 413

P/D	Total	Sessional: 25
2	2	

Student will give a talk on some technical topics.

Note: The seminar will continue in eighth semester and will be evaluated in eighth semester.

In Plant Training Report
MT – 415

L	T	P/D	Total
	-	-	

Sessional: 125 marks

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

Advanced Manufacturing Technology
MT 417

L	T	P
3	1	-

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

UNIT I

Hot machining, Machining of Plastics, Unit heads, Plastics cooling, electro forming, Surface Cleaning and Surface Treatments, Surface Coatings, Paint Coating and Slushing, Adhesive Bonds, Adhesive Bond Joints, Adhesives, Surface Coating for Tooling, Graphite Mould Coating, Vacuum Mould Process.

Introduction, Types of Composites materials, Agglomerated Materials, Reinforced materials, Laminates, Surface Coated Materials, Production of Composite Structures, Fabrication of particulate composite Structures, Fabrication of reinforced Composite, Fabrication of Laminates, Machining, Cutting and Joining of Composites.

UNIT II

Introduction, Polymers, Polymerization, Addition of Polymers, Plastics, Types of plastics, Properties of Plastics, Processing of Thermoplastic Plastics, Injection Moulding, Extrusion Process, Sheet forming processes, Processing of Thermosetting Plastics, Compression Moulding, Transfer Moulding, Casting of Plastics, Machining of plastics, other processing methods of plastics

Introduction, casting, thread chasing, Thread Rolling, Die Threading and Tapping, Thread Milling, Thread Measurement and Inspection

UNIT III

Theoretical basis of metal forming, classification of metal forming processes, cold forming, hot working, Warm working, Effect of variables on metal forming processes, Methods of analysis of manufacturing processes, Open Die forging, Rolling Power Rolling, Drawing, Extrusion.

UNIT IV

Introduction, Product Application, Limitation of Die Casting, Die Casting Machines, Molten metal Injection systems, I lot chamber machines, Cold chamber machines, Die casting Design, Design of Die casting Dies, Types of Die casting Dies, Die design, Die material, Die Manufacture, Die Lubrication and Coating, Preheating of Dies, Vacuum Die Casting, Recent trends In Die Casting Process.

Quality Control, CMM, Application of AI in CAD/CAM/CIM., Reverse Engineering, Rapid Prototyping and Tooling.

Reference and Text Books:

1. Principles of Manufacturing
   - By J.S.Campbell, Tata McGraw-Hill
2. Production Engineering Sciences
   - By Pandey and Sinh Standard Pub.
3. A text book of Production Technology
   - By P.C. Sharma S.Chand & Company.
4. Manufacturing Materials and Processes
   - By Lindberg Prentice Hall
5. A text book of Production Engineering
   - By P.C. Sharma S.Chand & Company.
6. Manufacturing Technology
   - Radhakrishnan,Scitech
7. Manufacturing Science
   - A.Ghosh, East-West 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.

Finite Element Method
MT 419

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

UNIT I

Basic Concept, Historical background, Engineering applications, general description, Comparison with other methods.

Need for weighted-integral forms, relevant" mathematical concepts and formulae, weak formulation of boundary value problems, variational methods, Rayleigh-Ritz method, and weighted residual approach.

UNIT II

Model boundary value problem, finite element discretization, element shapes, sizes and node locations, interpolation functions, derivation of element equations, connectivity, boundary conditions, FEM solution, post-processing, compatibility and completeness requirements, convergence criteria, higher order and isoparametric elements, natural coordinates, Langrange and Hermite polynomials.

UNIT III

External and internal equilibrium equations, one-dimensional stress-strain relations, plane stress and strain problems, axis-symmetric and three dimensional stress-strain problems, strain displacement relations, boundary conditions, compatibility equations, computer programs.

UNIT IV

Weighted residual methods: Galerkin FE formulation – axially loaded bar – heat flow in a bar. Isoparametric formulation: Natural coordinates – linear and quadratic bar element – linear triangle and plane bilinear elements for scalar fields – jacobian matrix – element matrices - Gauss quadrature – requirements for isoparametric elements – accuracy and mesh distortion. Advanced topics: Introduction to non-linear and dynamic finite element procedures, error estimation, coupled problems (only brief details are needed).

Reference and Text Books:

1. The Finite Element Method
   - By Zienkiewicz, Tata McGraw
2. The Finite Element Method for Engineers
   -By Huebner, John Wiley
3. An Introduction to the Finite Element Method
   -By J.N.Reddy, McGraw Hill

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.

Applied Numerical Techniques and Computer Programming
MT 421

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

Unit I

Interpolation and Curve Fitting : Lagrangian Polynomials, Divided differences, Interpolating with a cubic spline, Bezier Curves and B-Spline Curves, Polynomial approximation of surfaces, Least Square approximations, Flow Chart for Computer Programmes.

Unit II

Solving Non-Linear Equations: Bisection Method, Linear Interpolation Methods, Newton's Methods, Muller's Methods, Fixed-point Iteration Method, Flow Chart for Computer Programmes.

Solving Sets of Equations: The Elimination Method, Gauss and Gauss Jordan Methods, Other Direct Methods, Iterative Methods, The Relaxation Methods, Flow Chart for Computer Programmes.

Unit III

Numerical Differentiation and Integration: Derivatives from difference tables. High Order Derivative, Extra-polation Techniques. The Trapezoidal Rule, Simpson's Rules. Flow Chart for Computer Programmes.

Numerical Solution of Ordinary Differential Equations:The Taylor-Series Method, Euler and modified Euler methods,Range-Kutta methods,Miline's Method.The adams-Moulton method, Convergence Criteria, Errors and error Propagation. Flow Chart for Computer Programmes.

Unit IV

Numerical Solution of Ordinary and Partial Differential Equations Taylor series method, Euler and modified Euler method, Runge Kutta methods, Milne's method, Finite differences approximations of partial derivatives,Solution of Laplace equation(Elliptic)by standard5–point formula, solution of one dimensional heat equation(Parabolic)by Bender-Schmidt method, crank–Nicolson method, Solution of one dimensional wave equation(Hyperbolic) by iterative method.

Text Books :

1. Applied Numerical Analysis by Curtis f. Gerald and Patrick O. Wheatley – Published by Addison Wesley.
2. Introductory Methods of Numerical Methods – S.S. Sastry, PHI, New Delhi.
3. Numerical Method : E. Balagurusamy ,Tata McGraw Hill Publication.

Reference Books :

1. MATHEMATICA – A system for doing mathematics by Computer by Wolfram, Stephen – Published by Addition – Wesley.
2. Applied Numerical Methods by Camahan, Brice,Et.al, Published by Wiley, York.

3. Numerical Solution of partial differential equations by Smith, G.D. Published by Oxford University Press London.
4. Iterative Methods for the solution of Equations by J.F. Traub – Published by Prentice Hall.
5. Numerical Methods in Engineering and Science by B.S. Grewal- Published by Khanna Publishers.
6. Numerical Methods in Engineering by M.G. Salvadori and M.L. Baron- Published by Prentice Hall 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.

MT - 423

Advanced Microprocessor

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

UNIT-I

INTEL'S X86 FAMILY :Introduction, Register set, data formats, addressing modes, interrupts, memory hierarchy, pipelining, segmentation, paging, real and virtual mode execution, protection mechanism, task management.

UNIT-II

ARCHITECTURE OF INTEL X86 F AMIL Y :CPU block diagrams, Pin diagrams and internal descriptions of -80286.386,486 and Pentium. Instruction formats. Intel X86 Instruction set. Assembler directives.

UNIT-III

ARITHMETIC CO-PROCESSORS: Data formats; 80287 architecture - Pin diagram, internal architecture, status register, control register; tag register. Instruction set - data transfer, arithmetic, comparison, transcendental operations, constant operations and control instructions. Interfacing 80287 with 80286 Programming examples.

UNIT-IV

HIGHER- CO-PROCESSORS : Introduction to 80387,80487, pentium processors

NOTE: The question paper shall have eight questions in all organized into four sections, each section having two questions from each of the four units. The candidate shall have to attempt five questions in all , selecting at least one question tram each unit.

Suggested Books:

Daniel Tabak, Advanced Microprocessors (2nd cd) Mc Graw Hill Pub. Barry B.Brey,

The Intel Microprocessors (4'" ed) PHI Pub. , DV-Hall, Microprocessors & Interfacing (2nd ed) Mc Graw Hill Pub.

Renewable Energy Resources

MT - 425

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

UNIT-I

Direct energy conversion, description, working principle, magneto hydrodynamic systems (MHD), thermoelectric generators, thermionic generator, fuel cells, solar cells, EMF generated, power output, losses and efficiency, applications, hydrogen conversion and storage systems.

UNIT-II

Extraterrestrial solar radiation, components of radiation, geometry of earth and sun, geometry of collector arid the solar beam, effects of earth's atmosphere, measurements of solar radiation, calculation of heat balance for a solar collector, type of water heaters, selective surfaces, crop heaters, space heating, space cooling, water desalination, solar ponds, solar concentrators, electric power system, problems.

Introduction, the silicon p-n junction, photon absorption solar radiation input, photovoltaic circuit properties and loads, limits to cell efficiency, solar cell construction type and adaptations of photovoltaic, other types of photoelectric and thermo electric generation, problems.

UNIT III

Principles of hydro power, assessing the resource for small installations, an impulse turbine, reaction turbines, hydro electric systems, the hydraulic rain pump, wind turbine types and terms, linear momentum and basic theory, dynamic matching, steam tube theory, characteristics of the wind, power extraction by a turbine, electricity generation, mechanical power, problems.

Introduction, tropic level photosynthesis, photosynthesis at the plant level, thermodynamic considerations, photosynthesis, molecularlevel photosynthesis, synthetic photosynthesis, bio fuel classification, bio-mass production for energy farming, direct combustion for heat, pyrolysis (destructive distillation), alcoholic fermentation, anaerobic digestion for bio-gas, agrochemical fuel extractions, problems.

UNIT IV

Introduction, wave motion, wave energy and power,wave patterns, devices, the causes of tides, enhancement of tides flow power, tidal range power, world range power sites, problems.

Principles of Ocean Thermal Energy Conversion (OTEC), heal exchangers, pumping requirements, other practical considerations, introduction to geothermal energy, geophysics, dry rock and hot aquifer analysis, harnessing geothermal resources, problems.

Text Books:

1. Renewable Energy Rsources by John W. Twidell and Anthony D. Weir, published by E.& F. N. Spon Ltd. London.
2. Non-Conventional energy sources by Rai G D, Khanna Publishers, New Delhi

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.

Computational Fluid Dynamics

MT - 427

L	T	P	
3	1	-	

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

UNIT I

Methods of prediction: comparison of experimental investigation Vs theoretical calculation; Mathematical description of physical phenomena; significance of governing differential equations; the general form of governing differential equation.

Classification of problems: Physical classification: Equilibrium problems and Marching problems; Mathematical classification: Elliptic, parabolic and hyperbolic partial differential equations; Nature of co-ordinates; one way and two-way co-ordinates; Proper choice of co-ordinates.

UNIT II

The concept of discretisation; Finite differences; Taylor series formulation; Finite difference discretisation of ordinary and partial derivatives; Truncation error, round-off error, discretisation error; Consistency and stability of numerical schemes; Variation formulation; Method of weighted Residuals, control volume formulation.

UNIT III

Steady one- dimensional Conduction, The inter-face conductivity, Non linearity, Source-Term Linearization, Types of Boundary Conditions. Unsteady one-dimensional Conduction: Explicit, Crank-Nicolson and Fully Implicit scheme's Discretisation of two and three-dimensional problems, Stability analysis.

UNIT IV

Introduction to finite volume method – regular finite volume – approximations in the discretization technique – discretization procedure – semi-explicit method – implementation of boundary conditions (only elementary theory and no direct problems).

Reference and Text Books:

1. Computational Fluid Dynamics
   - By Anderson, McGraw-Hill
2. Numerical Heat Transfer and fluid flow
   - By Patankar, McGraw-Hill

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.

Mechatronics Engineering

MT- 429

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

UNIT I

What is Mechatronics? A measurement system with its constituent elements, open and closed loop systems, sequential controllers, micro processor based controllers, the Mechatronics approach.

A review of displacement, position velocity, motion, force fluid pressure, liquid flow, liquid level, temperature, light sensors/along with performance terminology, selection of sensors, input data by switches, Signal Conditioning Processes, Inverting Amplifiers, Non Inverting Amplifiers, Summing, Integrating, Differential, Logarithmic Amplifiers, Comparators, Amplifiers Error, Filtering, Wheatstone Bridge, Temperature Compensation, Thermocouple Compensation, Modeling of Mechanical systems and Simulations

UNIT II

Pneumatic and hydraulic systems, directional control valves, valve symbols, pressure control valves, cylinder sequencing, process control valves, rotary actuators, mechanical systems - types of motion, kinematic chains, cams, gear trains, Ratchet & Pawl, belt and chain drives, bearings, mechanical aspects of motor selection, electrical systems, mechanical and solid state switches, solenoids, D.C. & A.C moto4rs, stepper motors, problems.

UNITIII

Electrical Actuation Systems: Switching Devices, Mechanical Switches – SPST, SPDT, DPDT, Debouncing keypads; Relays, Solid State Switches, Diodes, Thyristors, Transistors, Solenoid Type Devices: Solenoid Operated Hydraulic and Pneumatic Valves, Control of DC Motors, Permanent Magnet DC Motors, Bush less Permanent Magnet DC Motors, AC Motors and speed controls, Stepper Motors and Controls, Servo Motors.

System Interfacing and data acquisition:

Data acquisition systems, Data loggers, SCADA, Interfacing requirements, Buffers, Darlington Pair, Handshaking, Serial and Parallel Port Interfacing, Peripheral Interface Adapters, Analog to Digital Conversion, Digital To Analog Conversion, Sample and Hold Amplifiers, Multiplexers, Time Division Multiplexing, Digital Signal Processing, Pulse Modulation, Component Interconnection and Impedance Matching, Interfacing Motor drives. Electrical power supply and protection.

UNIT IV

A review of number systems and logic gates, Boolean algebra, Karnaugh maps, sequential logic basic structure of programmable logic controllers, input/output processing, programming mnemonics; timest, internal relays and counters, master and jump controls, data handling, analog input/output, selection of a PLC, PROBLEMS.

Control, microcomputer structure, micro-controllers, applications, programming languages,

instruction sets, assembly language programs, subroutines, Why C Language? A review of program structure, branches, loops, arrays, pointers, examples of programs, interfacing, input/output, interface requirements. Peripheral interface adapters, serial communication interface, examples of interfacing, problems.

Text Book:

1. Mechatronics by W. Bolton, published by Addition Wesley.
2. Nitaigour Premchand Mahalik, Mechatronics principles, concepts and applications, Tata Mc Graw Hill.
3. Joji P, Pneumatic Controls, Wiley.
4. Dan Necsulescu, Mechatronics, Pearson
5. David g Alciatore, Michael B Histand, "Introduction to Mechatronics and measurement systems", Mc Graw Hill Education.
6. A Smaili, F Mrad, "Mechatronics – Integrated Technologies for Intelligent Machines, Oxford Higher Education.
7. Nitaigour Premchand Mahalik, "Mechatronics Principles, Concepts & Application", Tata McGraw Hill Publishing Co.Ltd., 2003.

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.

Antenna & Wave Propagation

MT- 431

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

UNIT I :

Basic Principle: Scalar & vector potential for electric & magnetic components, Retardation, retarded vector potential relation between scalar & vector potential current element.

Basic Antennas: Half wave dipole, quarter wave mono pole, short dipole, calculation of radiation resistance, effective length & pointing vector. Current distribution: Linear current & sinusoidal distribution.

UNIT II :

Antenna Parameter: Solid angle, radiation intensity, directive gain directivity, power gain, beam width: HPBW, FNBW, band width, Q factor resonance in antenna, antenna as a transmission line, antenna as active component, antenna temp. Radiation pattern, Eplane H plane, efficiency. Effective aperture, scattering aperture, loss aperture, directivity, polarization. Transmission between two Antenna, Reciprocity theorem application of Reciprocity theorem.

Low Freq Antennas: Monopole, folded, loop antenna, biconical antenna, yagiuda antenna: different antenna used for A.M & FM transmission. VHF & LHF antennas, Resonant Antennas & non-resonant antenna, design parameter of different Antenna.

UNIT III :

Microwave Antenna: Parabolic Antenna, Lens Antenna, horn Antenna, Antenna used for tracking & antenna used for satellite communication. E-plane horn, H-Plane horn circulars Horn, pyramidal Horn.

Radio Wave Propagation: Different technique for radio wave propagation: Ground wave propagation, space wave, sky wave, duct propagation, troposcatter.

UNIT IV :

Ionosphere propagation: Skip distance, LUF, MUF, Critical freq, Variation of refractive index with height, effect of earth magnetize field on ionospheres propagation, calculation of refractive index dielectric constant & Conductivity for ionospheres. Ionospheres abnormalities.

Antenna Array: Multiplication of Pattern, Significance of Antenna Array, Broadside, End fired, Uniform, Parasitic feed in Antenna Array, Calculation of Directivity & B.W for Antenna array. Increased directed directive end fired array. Tapering of Array: Binomial Array, Techepbyshe.

References:

1. Jordan Balmian:- Electromagnetic Field Theory (PHI)
2. Kraus Antenna & Wave propagation (Mc Graw Hill)
3. Antenna & Wave propagation by K.D.Prasad (Satya Prakashan)
4. Collin R.E :- Antenna & Wave Propagation (TMH)

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.

Semester 8

MT - 402

Data Communication Systems

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

Unit 1

Information Theory Concepts: Information source, encoder, transmitter, channel/medium, receiver, decoder and information sink. Information sources, DMS, Entropy, Types of channels, Channel capacity, Capacity of AWGN channels. Conditional and Joint Entropy, Relationship among different entropies,

Source Encoding Techniques- Shannon-Fano coding, Huffman minimum redundancy coding, Conditional and Joint Entropy, Relationship among different entropies, Source coding techniques- Shannon-Fano coding, Huffman minimum redundancy coding.

Unit 2

Flow & Error Control Techniques: Generation and detection of coded signals, Types of Error control strategies-Forward error correction & ARQ, Transmission errors-random and burst error; Error detection methods- Parity checking, Checksum error detection& Cyclic redundancy check. Classification of error control codes-Block code, Convolution code.

Unit 3

Digital Modulation Techniques: ASK,BPSK BFSK,QPSK, MSK , Error probability in BPSK and BFSK,MSK, Error probability in MSK, PCM, Probability of error in PCM system, calculation of signal-to-noise ratio. Classification of noise, calculation of Noise temperature, signal to noise ratio &Noise figure, Performance of receiver in presence of AWGN.

Unit 4

Cellular systems: mobile radio. Overview of communication networks, mobile communications, Cellular Concept, Frequency Reuse, Multiple access technologies TDM, FDM CDMA and OFDM. Trunking and Grade of Service, Cell Splitting and Sectoring, Doppler Spread, Multipath Fading.

Text /Reference Books:

1. F. M. Reza, Information Theory, McGraw Hill.
2. D.C.Aggarwal, Satellite Communications, Khanna Publishers.
3. Theodore S.Rappaport, Wireless Communications Principles and Practice, IEEE Press, Prentice Hall.
4. Simon Haykin, Communication systems, John Wiley & Sons.
5. Sanjay Sharma, Communication Systems, Kataria Sons.

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 systematic understanding of data communication techniques and Systems.	Knowledge & Understanding
2) Apply appropriate analytical techniques to critically evaluate communication Processes and systems.	Analysis
3) Use simulation models and the key analytical skills to critically evaluate results And relate them to theory.	Application
4) Communicate ideas effectively.	Communication

MT - 404
Digital System Design

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

UNIT-I

DESIGN FOR: Testability, Estimating Digital System Reliability, Transmission lines, Reflections and Transmissions,

COMBINATIONAL CIRCUIT DESIGN: Timing hazards, Static hazards using Maps, Dynamic hazards, Designing hazards free circuits, Barrel shifter design, Simple Floating point encoder

UNIT-II

CLOCKED SYNCHRONOUS STATE MACHINE ANALYSIS: Clocked Synchronous state Machine Design, Designing state machine using state diagram, State machine synthesis using transition lists , State machine design examples, Decomposing State machine, feedback Sequential Circuits, feedback Sequential Circuit design

UNIT-III

SYNCHRONOUS DESIGN METHODOLOGY: Synchronous system structure, Impediment to Synchronous Design, Synchronizer failure and Meta-stability .

UNIT-IV

Finite State Machine, PLD, and FPGA : Finite State Machine: Describe the sequential behavior using a FSM, Example of FSM, Convert a finite state machine to a Controller: a sequential circuit having a register and combinational logic, analytical modeling of Moore and Mealy machine, Introducing Key Symbols used in PLD Design, Programmable Read Only Memory (PROM), Programmable Logic Arrays (PLA), Programmable Array Logic (PAL) or Generic Array Logic (GAL).

TEXT BOOKS:

1. Digital Logic, Applications and Design, J. M. Yarbrough (1997) West Publishing, ISBN 0-314-06675-6.
2. Contemporary Logic Design, R. H. Katz (1994) Benjamin/Cummings, ISBN 0-805-32703-7.

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) design and implement small scale, medium scale and programmable logic devices Applying logic minimisation techniques using boolean algebra, karnaugh maps, function Generators and quine-mccluskey algorithm.	Analysis and Application
2) design digital systems using synchronous sequential logic to implement moore & mealy Type state controllers applying state & logic minimisation techniques using state Reduction & state allocation methods.	Analysis and Application Knowledge & Understanding
3) demonstrate an understanding of advanced logic implementation using fpgas and vhdl Programming language.	Knowledge & Understanding Learning

MT - 406

Sound and Noise Control

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

UNIT-I

Review of sound propagation theory and terminology: Introduction, sound waves, speed of sound waves, amplitude and intensity of sound waves, decibels, sound intensity levels, sound propagation, sound measurement, frequency and frequency bands, complex noise patterns and octave bands, acoustics, psycho acoustics, thresh hold of hearing, loudness, pitch, masking, frequency weighting, types of noises, Noise control: administrative control, engineering control, personal protective devices, employee responsibility, management responsibility, advantages and disadvantages of different protective devices, Physiology of hearing, hearing conservation, problems of noise pollution, impact of noise on human, impact of noise on vegetation, impact of noise on animals, impact of noise on property.

UNIT-II

The human ear, sound measurement, Effect of noise on hearing, mechanism of hearing and Hearing Damage Potential to sound energy, effects of noise on hearing: Non-auditory and Auditory effects, Methods of measuring sound, block diagram of sound level meter, Working of sound level meter, Basic parameters of sound, properties of sound, principle of superposition, interference and diffraction.

UNIT-III

Noise and vibration: whole body vibration, controlling vibration risks, control measures, hand arm vibrations, ways to reduce vibrations, active vibration control, passive vibration control, industrial noise control. Effects of noise on task performance, Community reaction to noise and the likely effects of introducing a new noise source to a community environment, concept of soundscape..

UNIT-IV

Legal criteria regulations and international standards relating to sound and noise control using ISO(1999) and Occupational Safety and Health Administration (OSHA), beneficial and diagnostic aspects of sound measurements and control, audiometric test, standard threshold shift, benefits of taking audiometric test.

Text Books/ Reference Books

- L Bernak and I Ver (1992) Noise and Vibration Control Engine e ring: Principle s and Applications,John Wily, ISBN 0-471-61751-2
- D A Bies (2002), Engine e ring Noise Control, Spoon press, ISBN 0-419-20430-X
- B S Smith, R J Peters and S Owe n (1996), Acoustics and Noise Control, Addision-Wesley, ISBN058088646

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) Use a so und pressure level meter to obtain measurements in a noisy environment, And will be able to critically interpret results.	Knowledge & Understanding
2) Using mathematical modelling, predict so und pressure levels and community Reaction to noise in arrange of circumstances, making due allowance for the Surrounding surfaces and their acoustic properties, and critically appraise the Limitations of their predictions.	Application Knowledge & Understanding
3) Propose and/or implement noise control procedures in a problem situation Through a real 'case study' and present the results of their work.	Application Enquiry

MT - 408

Data Communication System lab

L	T	P	Sessional Work: 25 Marks
-	-	2	Examination: 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 Data Communication System and facilities available in the institute.

3. For Learning outcomes refer to Data Communication System (MT-402).

List of Experiments

1. Simple Mathematical operations using MATLAB.
2. Write a program using MATLAB to implement Sampling theorem for all Nyquist conditions.
3. Write a program using MATLAB to compute self information content of message with given probability of occurrence & also compute entropy of the given source.
4. Write a program using MATLAB to compute joint, marginal & conditional entropies from given joint probability matrix & verify the relation between them.
5. Write a program using MATLAB to plot BER curves for BPSK, QPSK & QAM digital modulation techniques.
6. Write a program using MATLAB to plot Time division multiplexed & demultiplexed signal.
7. Write a program using MATLAB to implement BPSK modulation technique in communication systems.
8. To detect & correct single bit error in linear block codes using inbuilt functions
9. To transmit a multiplexed output of different frequency message signals through a Single channel using TDM system and recover back the original message signals on kit.
10. To convert an analog signal into a pulse digital signal using PCM system and to convert the digital signal into analog signal using PCM demodulation system on kit.
11. To modulate & demodulate signal using BPSK technique on kit.

Text /Reference Books:

1. F. M. Reza, Information Theory, McGraw Hill.
2. D.C.Aggarwal, Satellite Communications, Khanna Publishers.
3. Theodore S.Rappaport, Wireless Communications Principles and Practice, IEEE Press, Prentice Hall.
4. Simon Haykin, Communication systems, John Wiley & Sons.
5. Sanjay Sharma, Communication Systems, Kataria Sons.

The Professional Engineer (Project-2)
MT 410

L	T	P/D	Total	
-	-	9	9	

Theory : 100 marks
Sessional : 100 marks
Duration of Exams. : 3 hrs

The student is expected to finish the remaining portion of the project.

The project will be practical and investigative, requiring the student to investigate the existing background, theories and knowledge as applied to a problem in the design and/or operation of an existing or new process or product. By practical measurement, design, implementation and above all, creativity, the student will arrive at a solution based on sound engineering principles. The project will be integrative, deploying and extending the range of skills and knowledge previously and concurrently developed.

MT - 412
Digital System Design Lab

L	T	P	Sessional: 25 Marks
-	-	3	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 Systems and facilities available in the institute.

3. For Learning outcomes refer to Digital Systems (MT-404).

LIST OF EXPERIMENTS

1. Introduction to demonstrate and understand the VHDL.
2. Write a VHDL script to understand the basic gate realization.
3. Write a VHDL script to understand the more gate realization using behavioral modeling.
4. Write a VHDL script to understand the gates realization using structural modeling.
5. Write a VHDL script to understand the gates realization using dataflow modeling.
6. Write a VHDL script to design the adders.
7. Write a VHDL script to design the subtractor.
8. Write a VHDL script to design the multiplexer and demultiplexer.
9. Write a VHDL script to design the encoder and decoder.
10. Write a VHDL script to design the flip-flops.
11. Write a VHDL script to design the registers and counters.
12. Write a VHDL script to design the Finite State Machine.
13. Introduction to demonstrate and understand the Field Programmable Gate Arrays.

TEXT BOOKS:

1. Digital Logic, Applications and Design, J. M. Yarbrough (1997) West Publishing, ISBN 0-314-06675-6.
2. Contemporary Logic Design, R. H. Katz (1994) Benjamin/Cummings, ISBN 0-805-32703-7.

Non-Conventional Manufacturing
MT 418

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

UNIT I

Unconventional machining processes, Rapid prototyping processes, their classification, considerations in process selection.

Ultrasonic Machining

Elements of process, design of cutting tool, metal removal mechanism, effect of parameters, economic considerations, limitations and applications, surface finish.

UNIT II

Electrochemical Machining

Elements of process, process chemistry, metal removal mechanism, tool design, accuracy, surface finish and work material characteristics, economics advantages, limitations and applications, Electrochemical grinding, debarring and honing, Chemical machining.

Electric Discharge Machining

Principle and mechanism of metal removal, generators, electrode feed control, electrode material, tool electrode design, EDM wire cutting, surface finish, accuracy and applications.

UNIT III

Jet Machining

Principal and metal removal mechanism of abrasive and water jet machining, process variables, design of nozzle, advantages, limitations and applications.

Plasma arc machining, Electron beam machining, laser beam machining, their principles and metal removal mechanism, process parameters, advantages and limitations, applications.

UNIT IV

Laser Beam Machining

Laser Beam Machining Process, principles, pumping processes, emission types-beam control. Applications Ultrasonic Machining Process-working principles-types of transducersconcentrators- nodal point clamping-feed mechanism-metal removal rate- Process Parameters, Applications

Reference and Text Books:

1. Modern machining processes -By P.C. Pandey and M.S. Shan, 1 Ml I.
2. Machining Science -By Ghosh and Mallik, Affiliated East West
3. Nontraditional Manufacturing processes -By G.F. Benedict, Maicel Dekker.
4. Advanced Methods of Machining -By J.A. McGeongh, Chapman and Hall.
5. Electrochemical Machining of Metals -By Rurnyantsev & Davydov, Mir Pub.
6. Rapid prototyping: Principles and applications in Manufacturing
7. *A Text Book: of Production Engineering*, P.C.Sharma,

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.

Industrial Robotics
MT 420

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

UNIT I

Automation and robots, Robot classification, Applications, Robot specifications.
Dot and Cross products, Coordinate frames, , Homogeneous coordinates, Link Coordinates, The arm equation, Five-axis articulated robot (Rhino XR-3), Four-axis SCARA robot (Adept One), Six-axis articulated robot (Intelledex 660).

UNIT II

The Inverse kinematics problem, General properties of solutions, Tool Configuration, Inverse kinematics of Five-axis articulated robot (Rhino XR- 3), Inverse Kinematics of Four-axis SCARA robot (Adept One), inverse kinematics of Six- axis articulated robot (Intelledex 660), and Inverse kinematics of a three-axis planar articulated robot, a robotic work cell.

Workspace analysis, Work envelope of a five-axis articulated robot (Rhino XR-3), Work envelope of a four-axis SCARA robot (Adept One), Workspace fixtures, The pick and place operations, Continuous path motion, Interpolated motion, Straight line motion.

UNIT III

The tool configuration and Jacobean matrix, Joint space singularities, Generalized inverses, Resolved motion rate controls, rate control of redundant robots, rate control using {1)-inverses, The manipulator Jacobean, Induced joint torque and forces.
Lagrange's equation, Kinetic and potential energy, Generalized force, Lagrange-Euler dynamic model, Dynamic model of a two-axis planner articulated robot, Dynamic model of a three-axis SCARA robot, Direct and inverse dynamics, Recursive Newton-Euler formulation, Dynamic model of a one-axis robot (inverted pendulum).

UNIT IV

The control problem, State equations, Constant solutions, Linear feedback systems, Single axis PID control, PD gravity control, Computed torque control, Variable structure control

image representation, template matching, polyhedral objects, shape analysis, Segmentation, Iterative processing, Perspective transformations, Structured Illumination, Camera Calibration.
Task level programming, Uncertainty, Configuration space, Gross motion planning, Grasp Planning, Fine motion planning, Simulation of planar motion.

Reference and Text Books:

1. Industrial Robotics - By M.P. Groover, McGraw Hill
2. Industrial Robotics and Automation - By S.R.Deb Tata McGraw Hill

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.

MANUFACTURING MANAGEMENT
MT 422

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

Unit I

Manufacturing Systems Designs: Definition, Systems, Subsystems, Systems Approach Fundamentals, Systems Approach for designing, Manufacturing Systems, Systematic Layout Planning (SLP), Computerized Plant Layout-CRAFT, ALDEP, CORELAP, Assembly Line balancing, Problems and solutions of assembly lines, Group Technology & Cellular Systems, Classification & Grouping, overview of FMS. Strategic consideration for comparison of various systems.

Manufacturing Systems Economics: Concept of time value of money, Preparation of time profile of project, Single payment, Equal Series payment, various machine and project selection & evaluation techniques: Payback period, Present worth, Equivalent annual cost, Cost- benefit ratio, Evaluation for both equal & unequal life. Depreciation concept various methods-straight line, declining balance, Sum of the digits, Sinking fund.

Unit II

New Product Development (NPD): Product Development, Customer Need, Strategies for New Product Development, Product life cycle, Product status. Corporate Design Strategies, Japanese Approach to NPD. PUGH total Design approach, PAHL & BEITZ Approach, Project Approach, Cross functional Integration –Design, manufacturing, Marketing, Concurrent Engineering, Modular Design, Standardization Value Engineering & Analysis.

Manufacturing Planning & Control Systems: Overview of Aggregate Planning Models, Linear Decision Rules, Management Coefficient, Direct Search Methods, Master Production Schedule, Modular Bill and Materials, Capacity planning & control, language, medium range, short range capacity planning, Toyota Production System, Just- in Time (JIT), Manufacturing –Philosophy, Elements, KANBAN, effects on layout, workers & vendors, optimized production technology (OPT).

Unit III

Forecasting Methods: Forecasting Framework, Forecasting cost and accuracy, Forecasting Uses and Methods – Delphi, Exponential Smoothing, Forecasting Errors – MAD, Regression Methods-Linear Model for single & multiple variables, Brief idea of computerized forecasting systems.

Material Requirements Planning (MRP): Definition of MRP systems. MRP versus Order point, MRP Elements, Types of MRP – MRP I & II. Structured Bill of Materials. Regenerative & Net change MRP, Operating an MRP, Integration of Production & Inventory Control.

Unit IV

Value Engineering: Origin of Value Engineering, Meaning of value, value analysis and value engineering, uses of value engineering, when to apply value analysis, reason of unnecessary cost, difference between value analysis and other cost reduction techniques, steps in value analysis. Phases and constituents elements of each phase. FAST technique, Ten commandments(principles of value analysis) of value engineering

Text books:

1. Operations management – Schoroeder, Mc Graw Hill International
2. Industrial Engineering and production management – Martand Telsang, S. Chand & Company, New Delhi.
3. Production operations management – chary, TMH, New Delhi.

Reference books:

1. Production Operations Management – Adam & Ebert, PHI, New Delhi
2. Operational Management –Monks, Mcgraw Hill, Int.
3. Production & Operations Management – I. Hill, Prentice Hall Int.
4. Production Planning & Inventory Control – Narasimham etal, PHI, New Delhi
5. Production & Operation Management- Panneerselvam, PHI, New Delhi
6. Managing for Total Quality-Logothetis, PHI, New Delhi
7. Concept of Reliability Engineering –L.S. Srinath, Affiliated East West.
8. Revolutionizing Product Development – Wheelwright & Clark, Free press.
9. Management In Engineering – Freeman-Ball & Balkwill, PHI, New Delhi.
10. Production & operations management – Martinich, John Wiely , New Delhi.
11. The goal by Eliyahu M. Goldratt & Jeff Cox, Productivity Press India Ltd,, Bangalore
12. Toyota Production System by Taichi Ohno, Productivity Press India Ltd, Bangalore

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.

Fuzzy Logic and Neural Networks
MT 424

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

UNIT I

Neural Networks: Fundamental of neural network, overview of biological Neuro-system, Mathematical Models of Neurons, ANN architecture, Learning Methods, Learning Paradigms-Supervised, Unsupervised and reinforcement Learning, ANN training Algorithms-perceptions, Training rules, Delta, Back Propagation Algorithm, Multilayer Perceptron Model, Radial Basis functions, Hopfield Networks, Associative Memories, Applications of Artificial Neural Networks.

UNIT-II

Fuzzy sets: Introduction to Fuzzy Logic, Classical and Fuzzy Sets: Overview of Classical Sets, Operations on Fuzzy Sets: Compliment, Intersections, Unions, Combinations of Operations, Extension principle and fuzzy relations Fuzzy Logic: Fuzzification and defuzzification, Membership Function, Linguistic Variables, Linguistic hedges, Fuzzy rules and reasoning, lamda cut-sets. Arithmetic operations on Fuzzy numbers.

UNIT-III

Fuzzy Inference System: Fuzzy Modeling, Mamdani Fuzzy model, TSK Fuzzy model, Fuzzy Controller, Industrial Applications.
Introduction of Neuro-Fuzzy Systems, Architecture of Neuro Fuzzy Networks, Hybrid learning algorithms, Neuro-fuzzy Control.

UNIT-IV

Introduction to Evolutionary Techniques: Genetic Algorithm, Basic Concepts, Flow Chart of GA, Genetic representations (Encoding), Initialization and Selection, Genetic Operators, Mutation, Generational Cycle, Convergence of GA and Applications.

References:

1. James A. Anderson " Introduction to Neural Networks", Prentice Hall India.

2. H.J. Zimmermann " Fuzzy set theory & its Applications ", Allied Publishers Ltd.

3. Nil Junbong " Fuzzy Neural Control Principles & Algorithm", PHI.

4. N.K. Bose " Neural Network Fundamental with Graphics ", TATA McGraw Hill.

5. Klir George J. " Fuzzy sets and Fuzzy Logic Theory and Applications", PHI.

6. J.M Zurada , “ Introduction to Artificial Neural Network” , Jaico Publishers

7. S. Rajasekaran, “Neural Network, Fuzzy Logic and Genetic Algorithms”, PHI Learning India 2011

8. S. N. Sivanandam, S.N. Deepa, “Principles of Soft Computing”, Wiley 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.

Management Information System
MT 426

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

UNIT I

Concept of Management Information System, types of systems, Quality of information, value of information, Needs of information by different levels of management, Integrates system, Data and Information, factors influencing MIS and characteristics of MIS, Technology and Structure of MIS, role of Management Information System in decision making, concept of Distributed Data bases, Decision Support System: Concept, components, and classification of MIS, process of constructing a Decision Support System, concept of group decision support system

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UNIT II

Use of Management Information System for strategic advantage, Role of Information System for strategy, Role of Management Information System to break business barriers, Business Process Reengineering (BPR), Use of Management Information System for improvements in business performance and quality and enhancing quality of products and services

UNIT III

System Development Methodologies, Planning for Management Information System, Detailed design of Management Information System, Analysis and design of Information System, Assessment of hardware and software, System development life cycle, Testing of system, Methods of conversion, Documentation. Decision Making Systems and Modeling, Sensitivity Analysis, Simulation, Operations Research Technique

UNIT IV

Implementation Strategies for MIS, Enterprise Resource Planning, Executive Information System, Implementation of Executive Information System , Customer Relationship Management, Artificial Intelligence, Virtual Reality, Fuzzy logic, Neural Network. Challenges in implementation of MIS

Text Books:

1.. Management Information System by W.S. JawadeKar - Tata McGraw Hill.
2.. Brien, James, Management Information System, Tata McGraw Hill, Delhi.
3.. Kanter, J., Management Information System, PHI, Delhi
4.. Stair, Principles of Management System, Thomson Learning, Bombay.

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.

Automatic Controls
MT 428

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

Unit I

Introduction And Applications: Types of control systems ; Typical Block Diagram :Performance Analysis; Applications – Machine Tool Control, Boiler Control, Engine Governing, Aerospace Control, Active Vibration Control; Representation of Processes & Control Elements – Mathematical Modeling, Block Diagram Representation, Representation of Systems or Processes, Comparison Elements; Representation of Feedback Control systems
– Block Diagram & Transfer Function Representation, Representation of a Temperature, Control System, Signal Flow Graphs, Problems. Types Of Controllers: Introduction: Types of Control Action; Hydraulic Controllers; Electronic Controllers; Pneumatic Controllers; Problems.

Unit II

Transient And Steady State Response: Time Domain Representation; Laplace Transform, Representation; System with Proportional Control; Proportional – cum – Derivative control; Proportional – cum – Integral Control; Error Constants; Frequency Response Analysis: Introduction; Closed and Open Loop Transfer Function; Polar Plots; Rectangular Plots; Nichols Plots: Equivalent Unity Feed Back Systems; Problems.

Unit III

Stability Of Control Systems: Introduction; Characteristic Equation; Routh's Criterion; Nyquists Criterion, Gain & Phase Margins, Root Locus Method: Introduction; Root Ioci of a Second Order System; General Case; Rules for Drawing Forms of Root Ioci; Relation between Root Locus Locations and Transient Response; Parametric Variation; Problems.

Unit IV

Introduction – Concepts of state, state variables and state model– State model of linear systems– system realization - State space representation using physical, phase and canonical variables - diagonal canonical form-Jordan canonical form diagonalization- Time domain solution of state equation-State transition matrix - Laplace transform solution of state equations - Derivation of transfer function from the state model - Controllability and Observability; Basics of state feedback controllers and observers.

Text Books:

1. Theory & Applications of Automatic Controls by B.C. Nakra, Published by New Age International Pvt. Ltd. Publishers, New Delhi 1998.
2. Modern Control Engg. By Ugata, Prentice Hall of India, New Delhi.
3. Norman S Nise, "Control Systems Engineering", 5th edition, Wiley publications, 2009.
4. Madan Gopal andNagrath.I.J, "Control Systems Engineering", 5th edition, New Age International, 2011.
5. Benjamin C Kuo andFarid Golnaraghi, "Automatic Control Systems", 8th edition, Wiley Publications, 2007.

Reference Books:

1. Automatic Control Systems by Kuo' Published by Prentice Hall of India, New Delhi.
2. Control System Engineering, I. J. Nagrath and M. Gopal, New Age International limited.

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.

Digital Image Processing
MT 430

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

UNIT I:

DIGITAL IMAGE FUNDAMENTALS: Introduction, image model, sampling and Quantization, relationship between pixels, imaging geometry, photographic film, discrete, Fourier transform, properties of two dimensional Fourier transform, fast Fourier transform.

UNIT II:

IMAGE ENHANCEMENT AND COMPRESSION: Enhancement by point processing, spatial filtering and enhancement in the frequency domain, pseudo color image processing, image compression models, error free compression, image compression standards.

UNIT III:

IMAGE RESTORATIONS: Degradation, models, diagonalizations of matrices, inverse filtering, interactive estorations, geometric transformations.
IMAGE SEGMENTATION: Detection of discontinuities, edge linking and boundary detection, thresholding, region orienting segmentation.

UNIT IV:

REPRESENTATIONS AND RECOGNITION: Representations schemes, boundary descriptors, regional descriptors, morphology, recognition and interpretation, basics.

TEXT BOOKS

1. Rafael c. Gonzalez and Richard E. Woods, digital image processing, Addison Wesley publishing company, 1987

REFERENCES

1. William K. Pratt, digital image processing, John Wiley and sons, 1978
2. Jain, Fundamentals of digital image processing, PHI, 1996
3. Barrie W. Jervis , “digital signal processing (Pearson education India)
4. Prokis, “ digital signal processing” (PHI)

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.

Digital Hardware Design
MT 432

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

UNIT I: Combination Circuit Design: Adders Substractor, BCD Adder code converters, 7-segment display, designing using multiplexer, demultiplexer, decoder, encoder. Design of two level NAND only and NOR only networks, Design of multilevel NAND only NOR gate networks.

UNIT II: Synchronous Sequential ckt Design: Flip-flop, FSM. Sequence detector, party checker & Detector and different applicator of sequential ckts, state table state diagram. Moose & mealy sequential ckt with state diagram reduction of state table using merger graph method & moose method, computing M/C, limitation & capabilities of seq. Ckt.

UNIT III: Asynchronous Sequential ckt. : FSM, Racer, state table & flow table diagram, compatibility chart state assignment in Asynchronous ckt.

UNIT IV Iterative networks: iterative networks, design of parity checker, comparator, design of pattern detector, state machine design with SM charts, state machine charts, derivation of SM charts, memories: read only memory, ROM applications, Read write memories, static RAM, Dyanmic RAM, Structure and Timings.

References:
1. Z.Kohavi by Switching & System (McGraw Hill)
2. R.P.Jain By Digital Electronics & Microprocessor (McGraw Hill)
3. W.Fletcher :- An Engineering Approach to Electronic Design (PHI)
4. Floyd: - Digital Fundamentals (UBS)
5. Morris Mano:- Digital Logic &Computer Design(PHI)

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.