AUTOMATIC CONTROLS

Week	Theory		Practical	
	Lecture Day	Topic (Including Assignment/Test)	Practical Day	Topic
Unit-I : Introduction to Control Systems and their Applications				
1st	1	Introduction to Control Systems and types of Control Systems with Block Diagrams		NA
	2	Performance Analysis and Applications of Control Systems - Concept of Machine Tool Control, Boiler Control		
	3	Engine Governing, Aerospace Control, Active Vibration Control		
	4	Representation of Processes and Control Elements - Mathematical Modeling and Block Diagram Representation		
2nd	5	Problems and solutions		NA.
	6	Comparison Elements		
	7	Representation of Feedback Control systems - Block Diagram & Transfer Function Representation		
	8	Problem and solutions		
3rd	9	Problem and solutions		NA.
	10	Representation of Temperature Control System and Signal Flow Graphs.		
	11	Problem and solutions		
	12	Problem and solutions		
Unit-II : Types of Controllers				
4th	13	Introduction and Types of Control Actions		NA
	14	Hydraulic Controllers		
	15	Electronic Controllers		
	16	Pneumatic Controllers		
Unit-III : Transient and Steady State Response				
5th	17	Time Domain Representation		NA
	18	Laplace Transform Representation		
	19	Problems and solutions		
	20	System with Proportional Control		
6th	21	Proportional - cum - Derivative Control		NA
	22	Proportional - cum - Integral Control		
	23	Error Constants		
	24	**Assignment I**		
7th		**1st Minor Test**		
Unit-IV : Frequency Response Analysis				
8th	25	Closed and Open Loop Transfer Function		NA
	26	Polar Plots , Rectangular Plots , Nichols Plots		
	27	Equivalent Unity Feedback Systems		
	28	Problems and solutions		

Unit-V : Stability of Control Systems				
9th	29	Characteristic Equation and Routh's Criterion		NA
	30	Problems and solutions		
	31	Gain and Phase Margins		
	32	Problems and solutions		
Unit-VI : Root Locus Method				
10th	33	Introduction, Root Loci of a Second Order System		NA
	34	Rules for Drawing Forms of Root Loci		
	35	Relation between Root Locus Locations and Transient Response, Parametric Variations		
	36	Problems and solutions		
Unit-VII : Digital Control System				
11th	37	Introduction and Representation of Sampled Signal		NA
	38	Hold Device, Pulse Transfer Function		
	39	Block Diagrams and Transient Response		
	40	Problem and solutions		
12th	41	Routh's Stability Criterion		NA
	42	Root Locus Method		
	43	Nyquists Criterion		
	44	Problems and solutions		
Unit- VIII : State Space Analysis of Control System				
13th	45	Introduction to State Space analysis		NA
	46	Generalized State Equation		
	47	Techniques for deriving System State- Space Equations		
	48	Transfer Function from State equations		
14th	**2nd Minor Test**			
15th	49	Solution of State Vector Differential Equation		NA
	50	Discrete Systems		
	51	Problems and solutions		
	52	**Assignment II**		

MEASUREMENTS&INSTRUMENTATION&MEASUREMENT S&INSTRUMENTATION LAB

Week	Theory		Practical	
	Lecture Day	Topic (Including Assignment/Test)	Practical Day	Topic
Unit I Instruments and Their Representation				
1st	1	Brief Introduction	1	Discuss with students about measurements and instrumentation in daily life and what they measure from childhood to this age.
	2	Typical Applications of Instrument Systems		
	3	Functional Elements of a Measurement System		
	4	Classification of Instruments, Standards and Calibration.		
Unit II Static and Dynamic characteristics of Instruments				
2nd	5	Introduction, Accuracy, Precision	2	To Study various Temperature Measuring Instruments and to Estimate their Response times.
	6	Resolution, Threshold, Sensitivity		
	7	Linearity,Hysteresis, Dead Band		
	8	Problems and solutions.		
3rd	9	Backlash, Drift	3	To study the working of Bourdon Pressure Gauge and to check the calibration of the gauge in a dead-weight pressure gauge calibration set up.
	10	Formulation of Differential Equations for Dynamic Performance-Zero Order, First Order and Second order systems		
	11	Response of First and Second Order Systems to Step, Ramp, Impulse and Harmonic Functions		
	12	Problems and solutions.		
Unit III Transducer Elements				
4th	13	Introduction, Analog and Digital Transducers, Electromechanical; Potentiometric, Inductive Self Generating and Non-Self Generating Types	4	To study a Linear Variable Differential Transformer (LVDT) and use it in a simple experimental set up to measure a small displacement.
	14	Electromagnetic, Electrodynamic, Eddy Current, Magnetostrictive, Variable Inductance		
	15	Linearly Variable Differential Transformer, Variable Capacitance		
	16	Piezo-Electric Transducer and Associated Circuits, Unbonded and Bonded Resistance Strain Gages. Strain Gage Bridge circuits		
5th	17	Single Double and Four Active Arm Bridge Arrangements, Temperature Compensation, Balancing and Calibration	5	To study the characteristics of a pneumatic displacement gauge.
	18	Ionisation Transducers, Mechano Electronic Transducers, Opto-Electrical Transducers, Photo Conductive Transducers, Photo Volatic Transducers, Digital Transducers		
	19	Frequency Domain Transducer, Vibrating String Transducer, Binary codes, Digital Encoders		
	20	Problems and solutions.		
Unit IV Intermediate, Indicating and Recording Elements				
6th	21	Introduction Amplifiers, Mechanical, Hydraulic, Pneumatic, Optical, Electrical Amplifying elements,	6	To measure load (tensile/compressive) using load cell on a tutor.
	22	Compensators, Differentiating and Integrating Elements, Filters		
	23	Classification of Filters, A-D and D-A Converters		
	24	Problems and solutions.		
7th		**1st Minor Test**		

8th	25	Digital Voltmeters (DVMs), Cathode Ray Oscillo scopes (CROs)	7	To measure torque of a rotating shaft using torsion meter/strain gauge torque transducer.
	26	Galvanometric Recorders, Magnetic Tape recorders, Data Acquisition Systems, Data Display and Storage		
	27	Problems and Solutions		
	28	Assignment 1		
Unit-V Motion, Force and Torque Measurement				
9th	29	Introduction, Relative motion Measuring Devices	8	To measure the speed of a motor shaft with the help of non-contact type pick-ups (magnetic or photoelectric).
	30	Electromechanical, Optical, Photo Electric, Moire-Fringe, Pneumatic		
	31	Absolute Motion Devices, Seismic Devices, Spring Mass & Force Balance Type		
	32	Problems and Solutions		
10th	33	Calibration, Hydraulic Load Cell, Pneumatic Load Cell	9	**Internal Vivo-Vice-1**
	34	Elastic Force Devices, Separation of Force Components		
	35	Electro Mechanical Methods, Strain Gage, Torque Transducer, Toque Meter		
	36	Problems and Solutions		
Unit- :VI Pressure and Flow Measurement				
11th	37	Introduction Moderate Pressure Measurement, Monometers	10	To measure the stress & strain using strain gauges mounted on simply supported beam/cantilever beam.
	38	Elastic Transducer, Dynamic Effects of Connecting Tubing, High Pressure Transducer		
	39	Low Pressure Measurement, Calibration and Testing, Quantity Meters, Positive Displacement meter		
	40	Problems and Solutions		
12th	41	Flow Rate Meters, Variable Head Meters, Variable Area Meters, Rotameters	11	Measurement experiments based on apparatus aviable in electrical department.
	42	Pitot-Static Tube Meter, Drag Force Flow Meter, Turbine Flow Meter		
	43	Electronic Flow Meter, Electro Magnetic Flow meter. Hot-Wire Anemometer		
	44	Problems and Solutions		
Unit-VII Temperature Measurement				
13th	45	Introduction, Measurement of Temperature, Non Electrical Methods – Solid Rod Thermometer, Bimetallic Thermometer, Liquidin- Glass thermometer, Pressure Thermometer	12	Measurement experiment based on apparatus aviable in other departments
	46	Electrical Methods – Electrical Resistance Thermometers, Semiconductor Resistance Sensors (Thermistors), Thermo–Electric Sensors		
	47	Thermocouple Materials, Radiation Methods (Pyrometry), Total Radiation Pyrometer, Selective Radiation Pyrometer		
	48	Problems and Solutions		
14th	2nd **Minor Test**			
Unit-VIII Basic Statistical Concepts				
15th	49	Types of Measured Quantities (Discrete and Continuous), Central Tendency of Data, Mode, Median, Arithmetic Mean	13	**Internal Vivo-Vice-2**
	50	Best Estimate of true Value of Data, Measures of Dispersion, Range, Mean Deviation, Variance, Standard Deviation, Normal Distribution		
	51	Central Limit Theorem, Significance Test, Method of Least Squares, Graphical Representation and Curve Fitting of Data		
	52	Assignment-II		

MACHINE DESIGN II / ME 304 E

Week	Theory		Practical	
	Lecture Day	Topic (Including Assignment/Test)		No Practicle Topics
Unit-I : DESIGN OF PRODUCTION				
1st	1	Erogonomic		
	2	Value engineering considerations in DESIGN		
	3	Role of processing in design,		
	4	Design considerations for casting,		
2nd	5	Different types of fluctuating		
	6	variable stresses		
	7	Fatigue strength considering stress concentration factor,		
	8	Problem and solutions		
3rd	11	Surface factor		
	12	Size factor		
	13	Reliability factor		
	14	Problem and solutions		
4th	15	Variable stresses using Goodman		
	16	Soderberg's Criterion,		
	17	Fatigue design using Miner's equation		
	18	Poblem and solutions		
Unit-II : SHAFTS				
5th	19	INTRODUCTION ABOUT SHAFTS		
	20	Detailed design of shafts for static		
	21	Dynamic Loading		
	22	Problem and solutions		
6th	23	Rigidity		
	24	Deflection consideration.		
	25	Problem and solutions		
	26	Problem and solutions		
7th		**1st Minor Test**		
		UNIT -111 : SPRINGS		
8th	27	Types of Springs		
	28	Design for helical springs against tension and their uses		
	29	Problem and solutions		
	30	Assignment 1		
9th AND 10th	31	Compression and fluctuating loads,		
	32	Design of leaf springs,		
	33	Surging phenomenon in springs		
	34	Problem and solutions		
	35	Problem and solutions		
	36	Design Problem of springs		

	37	Problem and solutions		
	38	Problem and solutions		
Unit- :IV BEARINGS AND JOURNAL BEARINGS				
11th	39	Design of pivot		
	40	Collar bearing		
	41	Selection of ball and roller bearing based on static		
	42	Problem and solutions		
12th	43	Dynamic load carrying capacity using load-life relationship		
	44	Selection of Bearings from manufacturer's catalogue,		
	45	Problem and solutions		
	46	Presentation		
13th	47	Types of lubrication		
	48	Boundary,		
	49	Mixed and hydrodynamic lubrication,		
	50	Problem and solutions		
14th	**2nd Minor Test**			
	UNIT : V GEARS			
15th	51	Design of spur,		
	52	Helical,BEVEL GEAR		
	53	Problem and solutions		
	54	Assignment-II		

HEAT TRANSFER AND HEAT TRANSFER LAB

Week	Theory		Practical	
	Lecture Day	Topic (Including Assignment/Test)	Practical Day	Topic
1st	1	Definition of Heat Transfer	1	To determine the thermal conductivity of a metallic rod
	2	Reversible and irreversible processes, Modes of heat flow		
	3	Combined heat transfer system and law of energy conservation		
	4	Steady State Heat Conduction		
2nd	5	Conduction equation in polar and spherical co-ordinate systems	2	To determine the thermal conductivity of an insulating power.
	6	Steady State Conduction with Heat Generation		
	7	Introduction, 1 – D heat		
	8	conduction with heat sources		
3rd	9	Fin effectiveness	3	To determine the thermal conductivity of a solid by the guarded hot plate method.
	10	2-D heat conduction,		
	11	Transient Heat Conduction		
	12	Systems with negligible internal resistance		
4th	13	cylinders, spheres convective	4	To find the effectiveness of a pin fin in a rectangular duct natural convective condition and plot temperature distribution along its length.
	14	convective boundary conditions		
	15	Convection Introduction		
	16	Forced convection		
5th	17	Equation of continuity	5	To find the effectiveness of a pin fin in a rectangular duct under forced convective Andplottemperature distribution along its length.
	18	Momentum and energy equations		
	19	results for flow over a flat plate		
	20	flow through tube		
6th	**1st MINOR TEST**			
7th	21	Assignment 1		
	22	Empirical relations for free convection from vertical and horizontal planes	6	To determine the surface heat transfer coefficient for a heated vertical tube under natural convection and plot the variation of local heat transfer coefficient along the length of the tube. Also compare the results with those of the correlation.
	23	The Stephen-Boltzmann law		
	24	The black body radiation		
8th	25	Heat Exchangers Introduction	8	To measure the emmisivity of the gray body (plate) at different temperature and plot the variation of emmisivity with surface temperature.
	26	Classification Heat Exchanger		
	27	Performance variables		
	28	Analysis of a parallel/counter flow heat		
	9th week	2ND MINOR TEST		
10th	29	Heat Transfer with Change of Phase	9	**Internal Vivo-Vice-1**
	30	Laminar film condensation on a vertical plate		
	31	Drop-wise condensation		
	32	Boiling regimes		