SYLLABUS

FOR

B.TECH. PROGRAMME

IN

MECHANICAL ENGINEERING

INSTITUTE OF TECHNOLOGY

ZAKURA CAMPUS

UNIVERSITY OF KASHMIR

SRINAGAR J&K, 190006

COURSESTRUCTUREFOR
B.Tech7thSemesterMechanical
ATUNIVERSITYOFKASHMIR

CourseCode	CourseTitle	Teaching Periods per week			Credits
		L	T	P	
MEE-7117	HydraulicMachinery	2	1	0	3
MEE-7217	AutomaticControl	2	1	0	3
MEE- 7317	Industrial Engineering-II	2	1	0	3
MEE- 7417	Applied Thermodynamics- II	2	1	0	3
MEE- 7517	Computer Applications in Mech. Engineering. (CAME)	2	1	0	3
MEE-7317L	Industrial Engineering-IILab.	0	0	2	1
MEE-7517L	CAME Lab.	0	0	2	1
MEE- 7617	Final Year Project	0	0	10	5
MEE- 7717	Practical Training & Professional	0	0	6	3
	Total	**10**	**5**	**20**	**25**

MEE-7117

Hydraulic Machinery

UNIT I

Force due to a jet on a curved plate, velocity diagram for axial and radial flow turbineblades, work output and efficiency, pelton turbine, main components nozzle and jet diameters, mean diameter of pelton runner, jet ratio, minimum number of buckets, work done, power developed and turbine efficiencies, governing of impulse turbines.

UNIT II

Reaction turbine, francis turbine, main components, design of spiral casing guide vanes, runner and number of runner blades, types of francis runners, kaplan turbine, velocity diagram power and efficiency calculations, draft tube, cavitation factor, governing of reaction turbines, principles of similarity: unit and specific quantities, performance characteristics.

UNIT III

Rotodynamic pumps, classification, centrifugal pumps, specific speed, velocity diagrams, heads, power and efficiency, special features of propeller and mixed flow pumps, positive displacement pumps, reciprocating pump, indicator diagram, effect of friction and acceleration, theory of air vessel, selection of water turbines, hydro-electric power plants, hydraulic coupling, torque converter and dynamometer,hydraulic power transmission.

Text Book:

1. Massey, B.S., "Mechanics of Fluid", *6th Edition, Van Nostrand Reinhold co*., 1968.
2. Jagdish, L., "Hydraulic Machines including Fluidics", *Metropolitan Books co. Pvt. Ltd*., 1997

Reference Books:

1. Guthrie, Brown, "Hydroelectric Engineering Practice, *CBS Publishers,* New Delhi, 1993.
2. Douglas, Gasiorek, Swaffield, "Fluid Mechanics*", Pearson Education*, 2007.

MEE-7217

Automatic Control

UNIT I

Introduction: Concept of automatic control, open loop and closed loop systems, servomechanism, block diagram, transfer function, representation of control components and systems,translation and rotational mechanical components, electrical components series and parallel combinations, comparators for rotational and linear motions, integrating devices, hydraulic servomotor, temperature control systems, speed control systems.

UNIT II

System response: First and second order systems, response to step, pulse, ramp and sinusoidal inputs, systems with distance velocity lag, modes of controls, proportional control, proportional pulse reset control, proportional pulse rate control, proportional reset rate control, two position control,controller mechanism: pneumatic, hydraulic and electric controllers, general principles and circuits for generating various control actions.

UNIT III

Control system analysis: Transient response of simple control systems, stability of control systems, Routh's criterion,frequency response analysis, polar, rectangular and logarithmic plots, experimental determination of frequency response, Bode and Nyquist stability criteria, gain and phase margins, root locus plots of simple transfer function, transient response from root locus, electronic analogue computers: elements of analogue computers, solution of simple differential equations.

Text Books:

1. Ogata, K., "Modern Control Engineering", *Prentice Hall of India, 3rd edition*, New Delhi,1997

Reference Books:

1. Raven, F., "Automatic Control*," McGraw Hill Int*.,1999

MEE-7317

Industrial Engineering-II

UNIT I

Factory organization: Introduction to plant organization, principles of organizational structure, organization charts, types of organizations, developing an organization structure, results of good organization, informal organization, advantages and disadvantages,location and layout analysis: introduction to Facility location problems, factors affecting the plant location, break even analyses and their application, subjective, qualitative and semi-quantitative techniques of facility location, single facility location problem, mini max location problem, gravity problem and their applications, line balancing, introduction to facility layout and their objectives, classification of layouts with advantages and disadvantages of each, layout design procedures(CRAFT ,CORELAP, ALDEP), material handling systems, make or buy decisions, planning and control of batch production, characteristics of batch production, determination of batch size, minimum cost batch size, maximum profit batch size, sequencing and scheduling for batch production, line of balance technique.

UNIT II

Inspection and quality control: Concept and definition of quality, concepts of inspection and quality control, objectives of inspection, function of inspection and their types, concept of Statistical Quality Control (SQC), process variation, sampling inspection, concepts and types of control charts, acceptance sampling, application of control charts and sampling plans.

UNIT III

Materials management and inventory control: Integrated materials management and their components, functions and objectives of material management, introduction and concepts of inventory management, purchase model with instantaneous replenishment and without shortage, manufacturing model without shortages, purchase model with shortages, manufacturing model with shortages, probabilistic inventory concepts with lead time, selective inventory management- ABC , FSN, VED analyses.

Text Book:

1. Everett, E.A., Ronald J.E, “Production and Operations Management” Prentice Hall of India, 5th edition, New Delhi, 2001.

Reference Books:

1. Claude, S.G., “Management for Business & Industry” *Prentice Hall of India*, New Delhi, 2000.
2. Everett, E.A., Ronald J.E, “Production and Operations Management”, *Prentice Hall of India*, 5th Edition, New Delhi, 2001.

3. Grant, E.L; Leavenworth R.S, “Statistical Quality Control”, *Tata McGraw Hill*, 7th Edition,New Delhi, 1996.
4. Apple, J.M, “Plant Layout & Material Handling”, *John Wiley & Sons*, New York, Maynard, 1996.

MEE-7417

Applied Thermodynamics-II

UNIT I

Gas dynamics: Definitions and basic relations, energy equation, rate equations for a control volume, iso-entropic flow with variable area, wave motion, flow with normal shock waves, flow in constant area ducts with friction, flow in constant area ducts with heat transfer, centrifugal compressor, energy transfer in compressors and turbines, Euler's equation, principles parts and description of centrifugal compressor, impeller diameter, number of blades, velocity diagram, slip, factor work input, factor pressure coefficient, compressor efficiency.

UNIT II

Axial flow compressor: Stage velocity diagram, stage pressure ratio and number of stages, degree of reaction blade and stage efficiency, polytropic and isentropic efficiency surging,gas turbines, ideal gas turbine cycle, condition for maximum output, actual gas turbine cycles, reheating and regeneration velocity diagram for a stage, stage pressure ratio and number of staged polytropic efficiency, isoentropic efficiency, jet propulsion, turbojet cycle, net thrust, specific thrust, thermal efficiency of turbojet engine, propulsive efficiency, effect of forward speed.

UNIT III

Applications of refrigeration and air-conditioning: thermal principles for refrigeration, vapor compression system, reversed Carnot cycle, survey of refrigerants, designation of refrigerants, selection of refrigerants, thermodynamic requirements, multistage compression, multi-evaporator system, cascade systems, systems practices for multistage systems, reciprocating compressors, rotary screw compressors, vane compressors, centrifugal compressors, condensers, heat transfer in condensers, evaporators, heat transfer in evaporators, extended surface evaporator, cooling and dehumidifying coils, automatic or constant-pressure expansion valve, psychometric properties, wet bulb temperature, psychometric chart, mixing process.

Text Book:

1. Cohen H, Rogers G.F.C.,"Gas turbine Theory", *Pearson Education,* , 2001.
2. Yahya, S.M., "Fundamentals of Compressible flow", *New Age India*, Place, 2002.
3. Arora C.P., "Refrigeration and Airconditioning", *McGraw Hill*, New Delhi, 1990.

Reference Books:

1. Stoeker,W.F., "Refrigeration and Air conditioning", *McGraw Hill*, 1990.
2. Shapiro A.H., "The Dynamics and Thermodynamics of Compressible Fluid Flow", *Ronald Press*, 1953.

MEE-7517

Computer Applications in Mechanical Engineering

UNIT I

Overview of C++: flow charts, computer languages, constants and variables, arithmetic expressions,input/ output, control and the do and for statements, introduction to programming. types of errors,computational algorithms and computer arithmetic, iterative methods, solution of equations, bisection method, Regula-falsi method, Newton Raphson method,solution of linear system of equations: Gauss elimination, Gauss-Jordan, Gauss-Siedel method, LU decomposition.

UNIT II

Interpolation and approximation of functions: Newtons forward formula (equal and unequal intervals) curve fitting (straight line, nonlinear, exponential) differentiation, integration (Simpson's rule, Weddle's) and program.

UNIT III

Numerical solution of ordinary different equations: Runge-Kutta methods, types of PDEs, boundary value problems, solution of parabolic PDEs using finite differences and program, examples to be taken from mechanical engineering applications.

Text Book:

1. Sastry,S. " Numerical Methods", *Prentice Hall of India*, New Delhi.

Reference Books:

1. Lafore , G, "C++ Programming", *Galgotia publishers*,New Delhi, 2001.
2. Veerarajan, " Numerical Methods", *Tata Mc-GrawHill*, New Delhi, 2000.

MEE-7317L

Industrial Engineering –II Lab

Experiments to be conducted

1. To study the layout of a shop in an organization and draw existing and proposed layouts.
2. To measure the variable characteristics (diameter of pins, with micrometer) and prepare a frequency histogram, calculate values of X bar and sigma.
3. Verify that when random samples are taken from a lot with a certain percentage of defective, same %age lands to appear in random sampling by using Shewart's kit.
4. Simulate an inspection situation with the help of a Schewhart's bowl and plot X bar, and R charts using computed data.
5. To conduct Process capability study of a machine tool and to specify the tolerances for a job.
6. To verify the theorem "the standard deviation of the sum of any number of independent variables is the square root of the sum of the squares of the SDs of the independent variable, determine statistically, the permissible tolerance of mating components, when the tolerance of the assembly is given.
7. To draw control chart for percent defectives after inspecting a sample and sorting out the defective units.

MEE-7517L

CAME Lab

Experiments to be conducted

Develop programme and algorithm for:

1. Bisection method.
2. Regula - Falsi method.
3. Newton Raphson method.
4. Gauss Elimination method.
5. Gauss Jordon method.
6. Gauss Seidel method.
7. Integration by trapezoidal method.
8. Integration by Simpson rule (1/3 and 3/8).
9. Solution of ordinary differential equations and Partial differential equations by

a) R.K methods.

b) Solution of Parabolic partial differential equation.