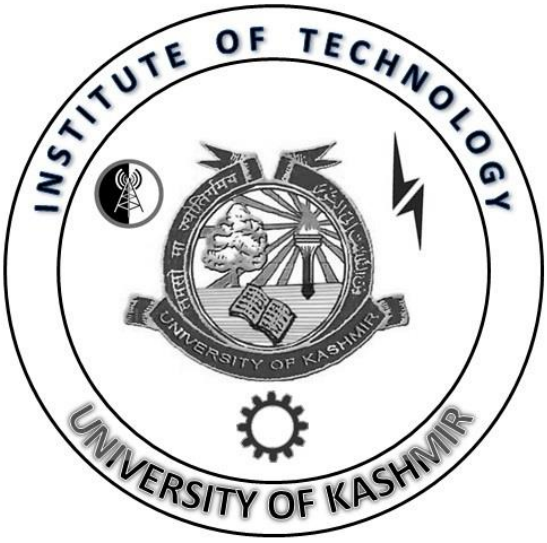
SYLLABUS

FOR

B.TECH. PROGRAMME

IN

MECHANICAL ENGINEERING



INSTITUTE OF TECHNOLOGY
ZAKURA CAMPUS
UNIVERSITY OF KASHMIR
SRINAGAR J&K, 190006

COURSE STRUCTURE FOR
B.Tech1st Semester Mechanical
AT UNIVERSITY OF KASHMIR

COURSE STRUCTURE FOR
B.Tech 5th Semester Mechanical
AT UNIVERSITY OF KASHMIR

Course Code	Course Title	Teaching Periods per week			Credits
		L	T	P	
MEE- 5117	Theory of Machines -II	3	1	0	4
MEE- 5217	Machine Design- I	3	1	0	4
MTH 5317	Mathematics -IV	2	1	0	3
ECE- 5417	Industrial Electronics	2	1	0	3
MEE- 5517	Heat Transfer	2	1	0	3
MEE- 5617	Industrial Engineering-I	3	1	0	4
MEE- 5117L	Theory of Machines II-Lab.	0	0	2	1
MEE- 5417L	Industrial Electronics Lab	0	0	2	1
MEE- 5517L	Heat Transfer Lab	0	0	2	1
MEE- 5617L	Industrial Engineering Lab	0	0	2	1
	Total	**15**	**6**	**8**	**25**

MEE-5117

Theory of Machines-II

UNIT I

Harmonic motion: periodic motion, vibration terminology, complex method of representing harmonic vibration, Fourier series and harmonic analysis, mathematical modeling for vibrations springs in series and parallel, differential equation of motion, solution of differential equation, torsional vibrations, various types of damping, dry friction and coulomb damping, structural damping, free vibration with and without viscous damping,logarithmic decrement,energy methods.

UNIT II

Forced harmonic vibration: rotating unbalance, support motion, vibration isolation, energy dissipated by damping, equivalent viscous damping, structural damping, vibration measuring instruments, impulse excitation, arbitrary excitation, Laplace transform formulation, pulse excitation and rise time, shock response spectrum, shock isolation.

UNIT III

Normal mode analysis: initial conditions, coordinate coupling, forced harmonic vibration, vibration absorbers and vibration dampers, generalized coordinates, natural frequencies and mode shapes (Eigen values and Eigen vectors), modal analysis, continuous systems,critical speed of a light shaft without damping, and with damping, critical speed of shaft having multiple discs, secondary critical speed, critical speed of a light cantilever shaft, balancing of engines.

Text Book:

1. Grover, G. K. “Mechanical Vibrations, 7th edition, Nem Chand and Bros, New Delhi, India 1996.

Reference Books:

1. Meirovitch, “Elements of vibration analysis,” *2nd edition, McGraw Hill,* 1998.
2. Thomson, W. T., “Theory of Vibrations with applications” *5th edition, Pearson Education, 2004.*

MEE-5217

Machine Design-I

UNIT I

Introduction: Design considerations,codes and standards, various types of loading in mechanical systems, stress concentration, S-N diagram, low cycle fatigue, high cycle fatigue, endurance limit, endurance limit modifying factors, size effect, surface effect, fluctuating stresses, Goodman and Soderberg relationship, stresses due to combined loading, cumulative fatigue damage, modified Goodman diagrams, Gerber equation.

UNIT II

Shafts, keys and couplings: Torsion of shafts, design for strength and rigidity with steady loading, ASME & BIS codes for design of transmission shafting, shafts under fluctuating loads and combined loads, keys, types of keys, design of keys and design of splines, couplings, rigid and flexible couplings, flange coupling, bush and pin type coupling.

UNIT III

Riveted joints: Types, failures of riveted joints, joint efficiency, boiler joints, tank and structural joints, riveted brackets, welded joints: Types, strength of butt and fillet welds, eccentrically loaded welded joints, power screws: Mechanics of power screw, stresses in power screws, efficiency and self- locking, design of power screw, design of Screw Jack, cotter and knuckle joints: Design of cotter and knuckle joints

Text Books:

1. Ullman D.G., “The Mechanical Design process”, *3rd edition, McGraw Hill*, 2009.
2. Mott, R.L, “Machine Elements in Mechanical Design”, *4th edition, Prentice Hall*, Singapore, 2005.
3. Shigley, J.E., Mischke, C. Brown T., “Standard Hand book of Machine Design" *McGraw Hill*.

Reference Books:

1. Shigley, J.E., “Hand Book of Machine Design”, *McGraw Hill*, 2004.

MTH-5317

Mathematics-IV

UNIT I

Special functions: Solution of series, Legendres functions, Rodriguess formula, generating functions for Legendres, polynomials and recurrence formulae, Bessel's functions, recurrence formulae and Bessel's functions of integral order.

UNIT II

Numerical solution of partial differential equation's: Finite difference approximation of partial derivatives, solution of Laplace equations, solution of one dimensional heat flow equation by Crank Nicolson method.

UNIT III

Advanced statistics: Testing hypothesis, null hypothesis, errors, level of significance, test of significance, confidence limits, test of significance of large samples, sampling distribution of the proportions, estimation of the parameters of the population, comparison of large samples, T distribution, testing for difference between means of two small samples, Chi-square distribution.

Text Books:-

1.B.S.Grewal, "Higher Engineering Mathematics"2008.
2. H.K Das, "Advanced Engineering,Mathematics"2012.

ECE-5417

Industrial Electronics

UNIT I

Introduction to semi-conductors: Intrinsic & extrinsic semiconductors, transport mechanism of charge carriers, electrical properties, P-N Junction diode, characteristic of diode capacitances, application of diode, diode as a switch, different types of diode and their applications.

UNIT II

BJT's: Types, operations and characteristics, CE, CB, CC configurations, transistor circuits, transistor as an amplifier, transistor as a switch, operational amplifier basis, OP-amp as ineverting and non-inverting amplifier and its applications.

UNIT III

Oscillators: Barkhausan's C and different types of oscillators, modulation, amplitude modulation, frequency modulation, types of modulators, power electronics circuits, SCR, diac, triac,regulated power supplies, electronic welding.

Text Book:

1. Millman, J., Halkias, Ch.C., "Basic Electronics", *Tata McGraw Hill*, New Delhi, 1998.

MEE-5517

Heat Transfer

UNIT I

Introduction: Modes of heat transfer, Fourier's law of heat conduction, thermal conductivity of solids, liquids and gases, combined heat transfer problems, one dimensional steady heat conduction, thermal resistance, thermal diffusivity, general three dimensional heat conduction equation in cartesian, cylindrical and spherical coordinates, heat conduction with heat generation, fins, two dimensional steady state heat conduction through plane wall, unsteady heat conduction with negligible internal temperature gradients, spheres, cylinders and cubes heat conduction when internal temperature gradients are not negligible, sphere, long cylinder and large slab, heat flow in semi infinite solids, with periodic change in surface temperature.

UNIT II

Fundamentals of convection: Mechanism of natural and forced convection, local and average heat transfer coefficient, concept of velocity & thermal boundary layers, forced convection: Dimensionless numbers and their physical significance, empirical correlations for external & internal flow for both laminar and turbulent flows, natural convection**:** Introduction, dimensionless numbers and their physical significance, empirical correlations for natural convection.

UNIT III

Radiation: Thermal radiation, black and gray surfaces, radiation laws, heat transfer by radiation between black and gray surface shape factors, heat transfer by radiation between two surfaces, heat transfer in presence of reradiating surfaces, radiation shields, heat exchangers: Classification and applications, heat exchanger analysis – LMTD for parallel and counter flow heat exchanger, effectiveness– NTU method for parallel and counter flow heat exchanger, introduction to cross flow heat exchanger, LMTD correction factor, design criteria for heat exchanger, introduction to heat pipe.

Text Books:

1. Incropera, F.P., "Fundamentals of Heat and Mass Transfer ", *John Wiley*, 2005.
2. Kreith F., Bohn, "Principles of Heat Transfer", *Cengage publishers*, 2006.
3. Holman, J.P., "Heat Transfer", *McGraw Hill*,2009.

Reference Book:

1. Bejan, A., "Heat Transfer", *John Wiley*, 1998.

MEE-5617

Industrial Engineering-I

UNIT I

Concept of industrial productivity: Introduction and significance of Industrial engineering with brief explanation of its techniques, functions of industrial engineering, definitions and explanation of productivity with significance in industries, productivity measurements, factors affecting productivity, basic work content and excess work content, industrial applications to calculate total and partial productivities, introduction to work study and its basic procedures, definitions and concept of work study with examples, human factor in the application of work study, factors for selecting the work study, ergonomics,scope and objectives of ergonomics, application of human factors in engineering work place design, etc.

UNIT II

Introduction to method study and the selection of jobs: Record, examine and develop, objectives and basic procedure of method study, recording techniques (process charts (PC), and diagrams),outline PC, Flow process charts, two hand process charts, MAC, simo chart, flow diagram, string diagram, cycle graph, chronocycle graph, travel chart, define, install and maintain, the principles of motion economy.

UNIT III

Work measurement and its applications: Time study, work sampling, rating and their methods, breaking the jobs into elements, types of elements, allowances and their calculations, calculation of standard time, examples of time study, PMT systems, synthetic data, various applications and examples.

Text Book:

1. Barnes, R.L., "Motion and Time Study, Design & Measurement of Work" *7th edition, John Wiley & Sons*, New York, 1980.

Reference Books:

1. International Labor Office, Geneva, "Introduction to Work Study" *4th Edition,* Geneva, 1985.
2. Currie R.M, "Work study", *ELBS & Pitman,* London, 1977.
3. Mundel, M.E., "Motion and Time Study", *5th Edition, Prentice Hall*, Englewood Cliff, New York, 1978.

MEE-5117L

Theory of Machines-II Lab

Experiments to be conducted

1. Determine the time period of a simple pendulum. Verify that the time period is independent of the mass of the bob.
2. Determine the radius of gyration of a compound pendulum.
3. Determine the radius of gyration of a given bar by using a Bifilar suspension.
4. Study the undamped free vibration of an equivalent spring mass system.
5. Study the forced vibration of an equivalent spring mass system.
6. Study the torsional vibration of a single rotor shaft system.
7. Determine the frequency response function of an equivalent spring- mass- dashpot system.
8. Pressure profile measurement on journal bearing.

MEE-5417L

Industrial Electronics Lab

Experiments to be conducted

1. Study of CRO measurement of voltage, frequency and phase of a give n waveform.
2. To obtain diode characteristics.
3. a) To assemble a half wave and a full wave rectifier and to study their performance. b) To suppress the ripple using RC filter.
4. To obtain Zener diode characteristics and to use Zener diode as a voltage regulator.
5. To assemble and observe the performance of clipping and clamping circuits.
6. To obtain transistor characteristics in the following configurations: i) Common base. ii) Common emitter.
7. To assemble a CE amplifier and observe the performance.
8. To assemble a differential amplifier and obtain in CMRR circuits .
9. To study different application of OP AMPS.

• OP – AMP as an inverting amplifier.
• OP – AMP as a Non inverting amplifier.
• OP – AMP as an integrator.
• OPAMP as a differentiator.

10. To study the performance of a voltage regulator IC chip.

MEE-5517L

Heat Transfer Lab

Experiments to be conducted

1. Determination of fin efficiency and effectiveness of a pin fin in forced convection and natural convection.
2. Determination of thermal conductivity of a plate by two slab guarded hot plate method.
3. Determination of thermal conductivity of pipe insulation and insulation powder.
4. Determination of thermal conductivity of a liquid by the guarded hot plate method.
5. Determination of thermal conductivity of a good conductor of heat (metal rod).
6. Determination of overall resistance of a composite wall.
7. Determination of heat transfer coefficient in forced convection through a horizontal tube.
8. Determination of heat transfer coefficient for heat vertical cylinder in natural convection.
9. Determination of LMTD and NTU in parallel flow and counter flow heat exchanger.
10. Determination of Stefan Boltzmann's constant.
11. Determination of emissivity.

MEE-5617L

Industrial Engineering –I Lab

Experiments to be conducted

1. Ergonomic design study (present/proposed/new) of a product, equipment or work environment (human- machine interface).
2. To assembly a product (electrical holder, etc.), record the cycle time and draw learning curve of the operator performing the assembly.
3. Draw out line process chart and two hand flow process charts for the assembly performed in experiment no. 2, and analyze the present method and also suggest improved method/s.
4. Study and draw of flow process charts (some suitable assembly operation).
5. Study and draw multi activity chart of a suitable method and propose better method/s.(Man and machine).
6. Study suitable movements/travel of man, material or equipment, and draw string diagram, travel chart and flow diagrams.
7. To calculate the standard time of a suitable job, using predetermined time standard techniques.