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

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Teaching Periods per week</th>
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<tr>
<td>MEE- 5117</td>
<td>Theory of Machines -II</td>
<td>3 1 0</td>
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<tr>
<td>MEE- 5217</td>
<td>Machine Design- I</td>
<td>3 1 0</td>
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<td>MTH 5317</td>
<td>Mathematics -IV</td>
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<td>ECE- 5417</td>
<td>Industrial Electronics</td>
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<td>MEE- 5517</td>
<td>Heat Transfer</td>
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<td>MEE- 5617</td>
<td>Industrial Engineering- I</td>
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<td>MEE- 5117L</td>
<td>Theory of Machines II-Lab.</td>
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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:

Reference Books:
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:

Reference Books:
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

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:-
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 inverting 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:
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

Text Books:

Reference Book:
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:

Reference Books:
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 given 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 applications 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.
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.