**Curriculum and Scheme for combined First and Second Semesters B. TECH**  
*(Effective from 2006 admissions)*

<table>
<thead>
<tr>
<th>Code</th>
<th>Subject</th>
<th>Hrs / week</th>
<th>Sessional Marks</th>
<th>University Exam</th>
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<tr>
<td>2K6 EN101</td>
<td>Engineering Mathematics I</td>
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<td>Engineering Graphics</td>
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<td>Basic Civil Engineering</td>
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<td>Basic Mechanical Engineering</td>
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<td>Basic Electrical Engineering</td>
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<td>2K6 EN109</td>
<td>Basic Electronics and Computer Engineering</td>
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<td>Basic Engineering Laboratory (Surveying, Fitting, Carpentry, Foundry, Smithy, Welding &amp; Sheet metal)</td>
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<td>2K6 EN111 P</td>
<td>Basic Electrical &amp; Electronics Work shop (Wiring, Soldering &amp; Study of Basic Computer Hardware)</td>
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|            |                                                   |      |      |      | 550 | 900  |
Module I: Ordinary differential equations (16 hours)
A brief review of the method of solutions first order equations - Separable, homogeneous and linear types
– Exact equations - Orthogonal trajectories – General linear second order equations - homogeneous linear
equation of the second order with constant coefficients – Fundamental system of solutions – Method of
variation of parameters – Cauchy’s equation.

Module II: Laplace transforms (17 hours)
Gamma and Beta functions – Definition and simple properties – Laplace transform - Inverse transform –
Laplace transform of derivatives and integrals – Shifting theorems – Differentiation and integration of
transforms - Transforms of unit step function and impulse function – Transforms of periodic functions –
Solutions of ordinary differential equations using Laplace transforms.

Module III: Vector differential calculus (18 hours)
Functions of more than one variable – Idea of partial differentiation – Euler’s theorem for homogeneous
functions – Chain rule of partial differentiation – Application in errors and approximations. Vector function
of single variable – Differentiation of vector functions – Scalar and vector fields – Gradient of a scalar field
– Divergence and curl of vector fields – Their physical meanings – Relation between the vector differential
operators.

Module IV: Fourier series and harmonic analysis (15 hours)
Periodic functions – Trigonometric series – Euler formulae – Even and odd functions - Functions having
arbitrary period – Half range expansions – Numerical method for determining Fourier coefficients -
Harmonic analysis

Reference Books:
1. Piskunov N. , Differential and Integral calculus, MIR Publishers
3. B. S Grewal. , Higher Engineering Mathematics, Khanna publishers
5. Thomas G,B. , Calculus and Analytic Geometry, Addison Wesley
6. Spigel. , Vector analysis, Schume series, Mc Grawhill
7. Sastry S. S. Engineering Mathematics, Prentice Hall of India

University Examination Pattern
Q I – 8 short answer type questions of 5 marks, 2 from each module.
Q II - 2 questions (covering entire module) of 15 marks each from module I with choice to answer any one.
Q III - 2 questions (covering entire module) of 15 marks each from module II with choice to answer any one.
Q IV - 2 questions (covering entire module) of 15 marks each from module III with choice to answer any one.
Q V - 2 questions (covering entire module) of 15 marks each from module IV with choice to answer any one.

Marks Distribution
Tests (min: 2) – 30 marks
Assignment (min: 2) – 15 marks
Attendance – 5 marks
Total – 50 marks
Module I (11 hours)


Module II (11 hours)

Quantum Mechanics - Newtonian Mechanics and quantum mechanics – Uncertainty principle - The wave functions – Shrodinger wave equation for free particle – Potentials in Shrodinger equation – Time independent Shrodinger equation - Time dependent Shrodinger equation - Expectation values – Derivation of Shrodinger equation - Application – Particle in a box ( motion in one dimension)NMR and ESR – Basic principles of Nuclear Magnetic Resonance (NMR) and Electron Spin Resonance (ESR) – Experimental Method for detection of NMR and ESR – Applications

Module III (11 hours)


Module IV (13 hours)


Reference Books:
3. A. S. Vasudeva S “ Modern Engineering Physics”, S. Chand
**University Examination Pattern**

Q I – 8 short answer type questions of 5 marks, 2 from each module.
Q II - 2 questions (covering entire module) of 15 marks each from module I with choice to answer any one.
Q III - 2 questions (covering entire module) of 15 marks each from module II with choice to answer any one.
Q IV - 2 questions (covering entire module) of 15 marks each from module III with choice to answer any one.
Q V - 2 questions (covering entire module) of 15 marks each from module IV with choice to answer any one.

**Marks Distribution**

Tests (min: 2) – 30 marks
Assignment (min: 2) – 15 marks
Attendance – 5 marks
Total – 50 marks
Module I High Polymers & Lubricants (13 hours)

Module II Electrochemistry (11 hours)

Module III Corrosion (11 hours)

Module IV Fuels & Environmental Pollution: (11 hours)

Reference Books

**University Examination Pattern**

Q I – 8 short answer type questions of 5 marks, 2 from each module.
Q II - 2 questions (covering entire module) of 15 marks each from module I with choice to answer any one.
Q III - 2 questions (covering entire module) of 15 marks each from module II with choice to answer any one.
Q IV - 2 questions (covering entire module) of 15 marks each from module III with choice to answer any one.
Q V - 2 questions (covering entire module) of 15 marks each from module IV with choice to answer any one.

**Marks Distribution**

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<td>Tests (min: 2)</td>
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<td>Attendance</td>
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<td>Total</td>
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</table>
Module I (15 hours)
Principles of statics – Free body diagrams – Coplanar forces and Force systems – Resultant and equilibrium conditions for concurrent, parallel and general system of forces – Solution of problems by scalar approach. Introduction to vector approach (Application to simple problems only) – Concurrent forces in space – Resultant – Equilibrium of a particle in space – Non - concurrent forces in space - Resultant of force systems.

Module II (17 hours)

Module III (17 hours)
Introduction to structural mechanics – Different types of supports, loads and beams – Reactions at supports. Shear force and Bending moment in beams – Shear force and bending moment diagrams for cantilever and simply supported beams (only for concentrated and uniformly distributed load cases). Plane trusses – Types of trusses (Perfect, Deficient and Redundant trusses) – Analysis of trusses - Method of joints - Method of sections.

Module IV (17 hours)

Text Books

Reference Books

University Examination Pattern
Q I – 8 short answer type questions of 5 marks, 2 from each module.
Q II - 2 questions (covering entire module) of 15 marks each from module I with choice to answer any one.
Q III - 2 questions (covering entire module) of 15 marks each from module II with choice to answer any one.
Q IV - 2 questions (covering entire module) of 15 marks each from module III with choice to answer any one.
Q V - 2 questions (covering entire module) of 15 marks each from module IV with choice to answer any one.

**Marks Distribution**

Tests (min: 2) – 30 marks  
Assignment (min: 2) – 15 marks  
Attendance – 5 marks  
Total – 50 marks
Module 0 (12 hours - 2 drawing exercise) (No questions in the university exam; questions should be included in the class test)
Introduction to engineering graphics - drawing instruments and their uses - types of lines - lettering - dimensioning - BIS code of practice for engineering drawing - construction of conics, spirals, cycloids, involutes and helix.

Module I (14 hours - 2 drawing exercises)
Introduction to orthographic projection. Projection of points - projection of lines - parallel to one plane and inclined to the other - lines inclined to both the planes - true length and inclination with reference planes - traces. Trapezoidal and rotating line method. Projections of planes.

Module II (14 hours - 2 drawing exercises)
Orthographic projection of solids in simple position - projections of frustum and truncated solids - projection of solids with axis inclined to one or both the planes - projections on auxiliary planes - primary and secondary auxiliary projections - projections of solids in combination.

Module III (18 hours - 3 drawing exercises)
Sections of solids by horizontal, vertical or inclined planes - true shape of section. Development of surface of solids, sectional solids, solids having hole. Intersection of surfaces - intersection of prism in prism, cylinder in cylinder and cylinder in cone.

Module IV (14 hours - 2 drawing exercises)
Introduction to isometric projection - isometric scale - isometric view - isometric projections of solids, frustums & truncated solids and their combinations. Conversion of pictorial projection to orthographic projection.

Module V (16 hours - 3 drawing exercises)

Note: All drawing exercises mentioned above are for class work. Additional exercises wherever necessary may be given as home assignments.

Reference Books:
Sessional Marks:
- Drawing exercises: 20 marks
- Class tests (min: 2): 25 marks
- Attendance: 5 marks
- Total marks: 50 marks

University examination pattern:
Q1 - Two questions from Module I with choice to answer any one.
Q2 - Two questions from Module II with choice to answer any one
Q3 - Two questions from Module III with choice to answer any one
Q4 - Two questions from Module IV with choice to answer any one
Q5 - Two questions from Module V with choice to answer any one

Each question carries 20 marks.
MODULE I (16 hours)
Measurement of distance - Direct measurement – tape & chain only - Ranging out survey lines - Taking measurement of a sloping ground - Errors - Tape correction problems. Leveling instruments (Dumpy level, Tilting level and Auto levels). Leveling staff(folding type only) - How to make measurements - temporary adjustment, holding the staff, reading the staff, principles of levelling - recording measurements in the field book - deduction of level - height of collimation method only, examples. Introduction to Total station. (Description only) - Linear and angular measurements using total station, Brief description of contour maps.

MODULE II (14 hours)
Selection of site for buildings - types of buildings - Components of buildings. Exposure to various building byelaws. Fire resistance characteristics of buildings - General classification as per National Building Code - Earth quake Zoning - Disaster mitigation methods

MODULE III (18 hours)

MODULE IV (18 hours)

Reference Books:

University Examination Pattern
Q I – 8 short answer type questions of 5 marks, 2 from each module.
Q II - 2 questions (covering entire module) of 15 marks each from module I with choice to answer any one.
Q III - 2 questions (covering entire module) of 15 marks each from module II with choice to answer any one.
Q IV - 2 questions (covering entire module) of 15 marks each from module III with choice to answer any one.
Q V - 2 questions (covering entire module) of 15 marks each from module IV with choice to answer any one.

**Marks Distribution**
- Tests (min: 2) – 30 marks
- Assignment (min: 2) – 15 marks
- Attendance – 5 marks
- Total – 50 marks
Module I (18 hours)
Thermodynamics: Definitions and basic concepts - systems, properties, state, process and cycle - work and heat - thermodynamic equilibrium, Zeroth law of thermodynamics, concepts of temperature and temperature scales, first law of thermodynamics, concepts of internal energy and enthalpy, second law of thermodynamics - Clausius and Kelvin - Planck statements, concept of entropy, thermodynamic processes - constant volume, constant pressure, adiabatic, isentropic, polytropic processes - P - V and T - S diagrams. (Simple problems only)

Module II (18 hours)

Module III (16 hours)

Module IV (14 hours)
Classification of manufacturing processes –elementary ideas with simple sketches of moulding, sand casting, die casting, forging, rolling, extrusion, wire drawing, punching and blanking, stamping, coining, surfacing, welding, soldering and brazing. Production machines - elementary ideas with simple sketches of centre lathe, milling machine, drilling machine, grinding machine and shaper - basic machining operations - Concepts of CNC machining systems.

Reference Books:
5. K. Venugopal, Basic Mechanical Engineering, New Age International (P) Ltd.

Text Books:

University Examination Pattern
Q I – 8 short answer type questions of 5 marks, 2 from each module.
Q II - 2 questions (covering entire module) of 15 marks each from module I with choice to answer any one.
Q III - 2 questions (covering entire module) of 15 marks each from module II with choice to answer any one.
Q IV - 2 questions (covering entire module) of 15 marks each from module III with choice to answer any one.
Q V - 2 questions (covering entire module) of 15 marks each from module IV with choice to answer any one.

**Marks Distribution**
Tests (min: 2) – 30 marks
Assignment (min: 2) – 15 marks
Attendance – 5 marks
Total – 50 marks
Module I (16 hours)

Generation, Transmission and Distribution of electric power


Module II (17 hours)

Transformers and Electrical machines


Module III (17 hours)

Utilization of Electric power


Module IV (16 hours)

Instrumentation


Text Books


Reference Books


University Examination Pattern

Q I – 8 short answer type questions of 5 marks, 2 from each module.
Q II - 2 questions (covering entire module) of 15 marks each from module I with choice to answer any one.
Q III - 2 questions (covering entire module) of 15 marks each from module II with choice to answer any one.
Q IV - 2 questions (covering entire module) of 15 marks each from module III with choice to answer any one.
Q V - 2 questions (covering entire module) of 15 marks each from module IV with choice to answer any one.

**Marks Distribution**
- Tests (min: 2) – 30 marks
- Assignment (min: 2) – 15 marks
- Attendance – 5 marks
- Total – 50 marks
Module I: INTRODUCTION TO ELECTRONIC COMPONENTS AND DEVICES (16 hours)

Module II: PRINCIPLES OF ELECTRONIC COMMUNICATION ENGINEERING (17 hours)
Analog modulation - Different types - AM,FM,PM – principles and comparison. Block diagram of AM and FM Transmitters and superhetrodyne receiver (brief explanation only). Principle of TV systems: interlaced scanning, general simplified block diagram of TV Transmitter and receiver, Yagi antenna, Basic principles of cable TV.
Principles of pulsed RADAR: Block diagram, application. Satellite communication - Concept of Geostationary satellites - simplified block diagram of earth station, Transmitter, Receiver. Block diagram of optical communication systems, Concept of optical fibre, source (LED), detector (phototransistor), advantage of optical communication.
Frequency bands in microwave communication and their uses, simplified block diagram of microwave link. Basic principles of cellular communication, concepts of cells - Frequency reusage, advantage of cellular communication.

Module III: INTRODUCTION TO COMPUTERS, TROUBLESHOOTING AND MAINTANANCE (16 hours)

Module IV: COMPUTER PROGRAMMING & NETWORK FUNDAMENTALS (17 hours)

Reference Books:
2. Kumar, “Communication Engineering” mesh Publication New Delhi
PART A
Q I – 4 short answer type questions of 5 marks, 2 from each module.
Q II - 2 questions (covering entire module) of 15 marks each from module I with choice to answer any one.
Q III - 2 questions (covering entire module) of 15 marks each from module II with choice to answer any one.

PART B
Q IV– 4 short answer type questions of 5 marks, 2 from each module.
Q V - 2 questions (covering entire module) of 15 marks each from module III with choice to answer any one.
Q VI - 2 questions (covering entire module) of 15 marks each from module IV with choice to answer any one.

Marks Distribution
Tests (min: 2)  – 30 marks
Assignment (min: 2)  – 15 marks
Attendance  – 5 marks
Total  – 50 marks
2K6 EN110 P: BASIC ENGINEERING LABORATORY
(2 hrs/week)

Part – A. Mechanical Engineering Workshops

Fitting Practice (10 Hours)
Study of metal cutting and measuring tools. Fabrication Exercises involving cutting and chiseling.

Welding (5 Hours)
Study of arc and gas welding equipments. Exercises involving preparation of lap and butt joints.

Carpentry (10 Hours)
Wood and its processing - measuring and marking tools. Wood working hand tools - Wood working machinery. Preparation of joints like dove tail, mortise & tenon.

Sheet metal practice (5 Hours)
Study of machines and tools used in sheet metal work.
Development and fabrication of simple sheet metal components like cylindrical dish, rectangular duct.

Foundry (5 Hours)
Study of foundry tool appliances. Preparation of sand for sand molding, making green sand molds for simple objects. Demonstration of melting, pouring and production of casting.

Smithy (5 Hours)

Part – B Civil Engineering Workshop

Surveying (10 Hours)
Chain survey - Traversing and plotting of details. Plane Table Surveying - method of radiation, intersection and traversing. Leveling – Fly leveling.

Sessional Requirements
Total Attendance : 5 marks

Part - A Mechanical Engineering Workshops
Workshop Practical and Record : 25 marks
Test : 10 marks

Part – B Civil Engineering Workshop
Workshop Practical and Record : 5 marks
Test : 5 marks
Total : 50 marks
2K6 EN111P BASIC ELECTRICAL AND ELECTRONICS WORKSHOP

(2 Hrs / week)

A. Electrical Wiring (total 15 hours)
   a) Familiarization of various types of service mains - wiring and installations – accessories and household electrical appliances.
   c) Wiring practices of a circuit to control:
      i. one lamp by SPST switch
      ii. two lamps by SPST switch.
      iii. two lamps in series and parallel
      iv. stair case wiring
   d) Familiarization of various parts and assembling of Electrical Motors and wiring practices of connecting a 3 phase – 1 phase motor with starter.

B. Electronics Workshop (total 15 hours)
   1. Familiarization of various Electronic components such as resistors, capacitors, transformers, inductors, diodes, transistors and IC’s
   3. Assembling and soldering practice of common emitter amplifier circuits.
   4. Assembling a timer circuit using IC555, phase shift oscillator using transistor and op - amp and JK flip - flop using NAND gates on the bread board.

C. Computer hardware Lab (total 20 hours)
   1. Identification of components / cards – PC assembling from components.
   2. Installation of motherboard, processor, memory and child hard disk.
   3. Installation of peripherals such as FDD and a CD drive.
   4. BIOS setup.
   5. Preparation of HDD for installation – formatting partitioning and basics of file system.
   6. Installation of different operating systems and managing application software.
   7. Troubleshooting of standard PC.

Sessional Requirements
Total Attendance : 5 marks
Workshop Practical and Record : 10 marks each for A, B and C
Test : 5 marks each for A, B and C
Total : 50 marks
**SCHEME AND SYLLABUS OF PHYSICAL EDUCATION, HEALTH AND FITNESS**

**Introductory Lectures**

Unit 1. Health and Fitness: Modern concept of health and fitness, meaning, scope, need and importance of health, fitness and wellness

Unit II. Exercise and Fitness: Means and methods of developing fitness. Importance of physical activities and exercises in developing and maintaining good health, Physical fitness and well being.

Unit III. Sports and Physical education: Meaning and scope, role and importance of sports and games in the development of physical fitness and personality. Social values of sports. Rules of major games.

**Practical Sessions**

(All classes will be conducted after the normal working hours of the college)

50 sessions of minimum 1 hour duration each are envisaged (including Theory and Practical). The student can opt for one of the following activities in line with the specific programme/schedule announced by the faculty.

Athletics, Badminton, Basketball, Cricket, Football, General Fitness, Hockey, Kabaddi, Table Tennis, Ball Badminton, Archery, Volley ball, Yoga (not all activities may be offered in a particular semester. More disciplines will be offered based on the availability of infrastructure and expertise.)

In addition, health and fitness assessment such as Height, Weight, Resting Pulse Rate and Blood Pressure will be carried out.

**Objective**

a) Basically to inculcate awareness of health, general fitness and attitude to voluntary physical involvement.

b) To promote learning of basic skills in sports activities and secondarily to pave the way for mastering some of the skills through continued future involvement.

**Scheme of assessment**

The student will be continuously assessed on his performance on the field of play. There will not be minimum mark for pass or fail. Total 50 marks will be given assessing their attendance, regularity, punctuality and performance for 50 hours of activity from 1st semester to 7th semester.
KANNUR UNIVERSITY
FACULTY OF ENGINEERING

Curricula, Scheme of Examinations & Syllabi for B.Tech Degree Programme (III-IV Semesters) in MECHANICAL ENGINEERING
With effect from 2007 Admissions

THIRD SEMESTER

<table>
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<tr>
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FOURTH SEMESTER

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Module I:

Module II:

Module III:
*Vector Integral Calculus:* Evaluation of line integral, surface integral and volume integrals – Line integrals independent of the path, conservative force fields, scalar potential- Green’s theorem- Gauss’ divergence theorem- Stoke’s theorem (proof of these not required).

Module IV:
*Vector Spaces:* subspaces–linear dependence and independence–bases and dimension-linear transformations -sums, products and inverse of linear transformations.

References:

Sessional work assessment
Assignments 2x10 = 20
2 tests 2x15 = 30
Total marks = 50

University examination pattern
Q I - 8 short type questions of 5 marks, 2 from each module
Q II - 2 questions A and B of 15 marks from module I with choice to answer any one
Q III - 2 questions A and B of 15 marks from module II with choice to answer any one
Q IV - 2 questions A and B of 15 marks from module III with choice to answer any one
Q V - 2 questions A and B of 15 marks from module IV with choice to answer any one
2K6ME 302 : COMPUTER PROGRAMMING

3 hours lecture and 1 hour tutorial per week

Module I (15 hours)
*Overview of C* – Variables, Expressions and assignments, Lexical Elements, Fundamental Data Types, Operators *Control Statements* – if, switch-case, for , while, do, goto, break, switch *Functions* - Parameter passing, scope rules, recursion

Module II (12 hours)

Module III (13 hours)
*Overview of Java Language* - Constants, Variables and Data Types, Operators and Expressions *Control Structures* – Decision Making, Branching and Looping, *Object Oriented Programming* – Concept of Classes, Objects and Methods, Benefits Java and OOP - Polymorphism and Overriding of methods, Inheritance

Module IV (12 hours)
Arrays and Strings, Interfaces, Multiple Inheritance, Packages – Putting Classes together – Managing Errors and Exceptions – Applet Programming and Graphics Programming (Basics only) – Managing Input/Output Files in Java

**Text books**

**Reference books**
2. Eckel, Bruce., *Thinking in Java*, 2nd Ed, Pearson Education

**Sessional work assessment**

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<th>Assignment</th>
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**University examination pattern**

Q I  - 8 short type questions of 5 marks, 2 from each module
Q II - 2 questions A and B of 15 marks from module I with choice to answer any one
Q III - 2 questions A and B of 15 marks from module II with choice to answer any one
Q IV - 2 questions A and B of 15 marks from module III with choice to answer any one
Q V  - 2 questions A and B of 15 marks from module IV with choice to answer any one
Module I (13 hours)

Module II (13 hours)
Torsion - torsion of circular elastic bars - statically indeterminate problems - torsion of inelastic circular bars - axial force, shear force and bending moment - diagrammatic conventions for supports and loading, axial force, shear force and bending moment diagrams - shear force and bending moments by integration and by singularity functions

Module III (13 hours)
Bending stresses in beams - bending stresses in beams - shear flow - shearing stress formulae for beams - inelastic bending of beams - deflection of beams - direct integration method - singularity functions - superposition techniques - moment area method - conjugate beam ideas - elementary treatment of statically indeterminate beams - fixed and continuous beams

Module IV (13 hours)
Transformation of stresses and strains (two-dimensional case only) - equations of transformation - principal stresses - mohr's circles of stress and strain - strain rosettes - compound stresses - superposition and its limitations - eccentrically loaded members - columns - theory of columns - buckling theory - Euler's formula - effect of end conditions - eccentric loads and secant formula

Text book

Reference books
2. Shames I.H., Introduction to Solid Mechanics, Prentice Hall of India

Sessional work assessment
Assignments 2x10 = 20
2 tests 2x15 = 30
Total marks = 50

University examination pattern
Q I - 8 short type questions of 5 marks, 2 from each module
Q II - 2 questions A and B of 15 marks from module I with choice to answer any one
Q III - 2 questions A and B of 15 marks from module II with choice to answer any one
Q IV - 2 questions A and B of 15 marks from module III with choice to answer any one
Q V - 2 questions A and B of 15 marks from module IV with choice to answer any one
Module I (12 hours)

**DC Generators**  EMF equation - Armature reaction - Power flow diagram voltage build up- Internal and external characteristics - Control of terminal voltage

**DC Motors:**  Back EMF - Torque and speed equations - Power flow diagram - Losses - components-efficiency - Performance characteristics - Starting method using 3 point starter - Speed control.

Module II (14 hours)

**Transformers:** Ideal and real transformer - Equivalent circuit - Phasor diagram - Losses - efficiency and regulation - All day efficiency - OC and SC tests - Auto transformers - Voltage and current relationships - Saving of copper - Three phase transformers - Star and Delta connections.

3 phase induction motors  -Production of torque - slip and frequency of rotor current -  torque slip characteristics - no-load and blocked rotor tests - equivalent circuit -losses and power flow.

Module III (13 hours)

Starting methods for three phase induction motors - direct on line starting - auto transformer starting - star delta starting - rotor resistance starting

**Alternators**  - Voltage regulation – predetermination - EMF method - MMF method - Synchronizing with 3 phase mains

Control of Permanent magnet stepper motors

Module IV (13 hours)

**Electrical drives:** advantages of electrical drives - parts of electrical drives - choice of electric drives - status of DC and AC drives - dynamics of electric drives' - fundamental torque equations - multi-quadrant operation - equivalent values of drive parameters - components of load torque - nature and classification of load torque.

Electrical drives: power semiconductor device- SCR - symbol and characteristics - input-output characteristic of AC to DC, AC to AC and DC to DC converters (no derivation) - three phase induction motor drives - stator voltage control and slip power recovery scheme.

**Text books**
1. A Text Book of Electrical Technology- B.L. Thereja, A.K. Thereja for Module 1-3
2. Dubey et.al, Thyristorised power controllers, Narosa publications. for Module 4

**Reference books**
### Sessional work assessment

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<tr>
<th>Category</th>
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<td>Assignments</td>
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### University examination pattern

- **Q I** - 8 short type questions of 5 marks, 2 from each module
- **Q II** - 2 questions A and B of 15 marks from module I with choice to answer any one
- **Q III** - 2 questions A and B of 15 marks from module II with choice to answer any one
- **Q IV** - 2 questions A and B of 15 marks from module III with choice to answer any one
- **Q V** - 2 questions A and B of 15 marks from module IV with choice to answer any one
2K6 ME 305 FLUID MECHANICS

3 hours lecture and 1 hour tutorial per week

Module 1 (15 hrs)

Introduction and basic concepts-distinction between fluids and solids – Application areas of fluid mechanics-Classification of fluid flows-system and control volume. Properties of fluids-Continuum-density and specific gravity-vapour pressure and cavitation-viscosity-surface tension and capillary effects -Pressure -Variation of pressure in a stationary fluid- Manometers.


Module 2 (14 hrs)

Mass, Bernoullis and Energy equations-Static, Dynamic and Stagnation Pressures-limitation on the use of Bernoulli equation-Hydraulic grade line and Energy grade line-Applications of Bernoulli equation-Flow rate and velocity measurements-Pitot tube and Pitot static probes- Obstruction flow meters-Orifice, Venturi and Nozzle meters-Flow in Pipes- Laminar and turbulent flows- Hagen-Poiseuille equation-Darcy-Weisbach equation-Minor losses-Moody’s Chart

Module 3 (12 hrs)


Module 4 (11 hrs)

Introduction to boundary layer-The boundary layer approximation-boundary layer equations- displacement thickness- momentum thickness-Blasius solution for flow over a flat plate-Momentum integral equation-Flow over bodies- Drag and Lift- Drag and lift coefficients- Friction and pressure drag-Flow separation.

Text book

Reference books
3. Fluid Mechanics and its applications- Gupta V. and Gupta S., Wiley Eastern
4. Introduction to Fluid Mechanics- Fox and Mc Donald- John Wiley and Sons

Sessional work assessment
Assignments 2x10 = 20
2 tests 2x15 = 30
Total marks = 50

University examination pattern
Q I - 8 short type questions of 5 marks, 2 from each module
Q II - 2 questions A and B of 15 marks from module I with choice to answer any one
Q III - 2 questions A and B of 15 marks from module II with choice to answer any one
Q IV - 2 questions A and B of 15 marks from module III with choice to answer any one
Q V - 2 questions A and B of 15 marks from module IV with choice to answer any one
Module I (10 Hours)

Module II (15 Hours)

Module III (15 Hours)
Phase diagrams - cooling curves - types equilibrium diagrams - phase diagrams of Cu-Ni, Bi-Cd, Pb-Sn; and Fe-C - Important reactions - pertaining to phase diagrams. Liver Rule

Module IV (12 Hours)
Steels - high alloy steels - tool steels - stainless steels - uses of steels
Cast iron - classifications - structure - applications
Copper alloys and their uses
Aluminium alloys and their uses
Materials with medical applications
Ceramic materials - classification and their uses composites and glasses

Text Book:
1. R.K. Rajput, Material Science and Engineering, S.K. Khataria and sons

Reference books:
1. Shackle Ford JF., Material science for Engineers - Prentice hall
5. Prof. Kodgire , Material Science & Metallurgy — Everest publications

Sessional work assessment
Assignments 2x10 = 20
2 tests 2x15 = 30
Total marks = 50

University examination pattern
1. Q I - 8 short type questions of 5 marks, 2 from each module
2. Q II - 2 questions A and B of 15 marks from module I with choice to answer any one
3. Q III - 2 questions A and B of 15 marks from module II with choice to answer any one
4. Q IV - 2 questions A and B of 15 marks from module III with choice to answer any one
5. Q V - 2 questions A and B of 15 marks from module IV with choice to answer any one
Study of plumbing tools and pipe fittings - measurement of metacentric height and radius of gyration of floating bodies - measurement of viscosity of fluids - study of discharge measuring instruments - measurement of pressure and velocity

Calibration of venturi meter - orifice meter - notches and weirs - nozzle meters & Rota meters - pipe friction - minor losses in pipes - verification of Bernoulli’s theorem - demonstration of laminar and turbulent flow in pipes - critical velocity - forces on curved and plane surfaces

Evaluation of the performance of turbines - main and operating characteristics - Muschel’s curves - performance of pumping and other machinery like centrifugal pumps - reciprocating pumps - gear pumps - hydraulic ram and torque

**Sessional work assessment**

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University evaluation will be for 100 marks of which 70 marks are allotted for writing the procedure/formulae/sample calculation details, preparing the circuit diagram/algorithm/flow chart, conduct of experiment, tabulation, plotting of required graphs, results, inference etc., as per the requirement of the lab experiments. 20 marks for the viva-voce and 10 marks for the lab record.

Note: Duly certified lab record must be submitted at the time of examination
1. Standard tension test on mild steel using Universal Testing Machine and suitable extensometers
2. Stress - strain characteristics of brittle materials - cast iron
3. Double shear test on mild steel specimens
4. Torsion test on mild steel/brass specimens
5. Spring test - open and closed coiled springs - determination of spring stiffness and modulus of rigidity
6. Determination of modulus of rigidity of wires
7. Impact test - Izod and Charpy
8. Hardness tests - Brinnell hardness, Rockwell hardness (B S C scales), Rockwell superficial hardness (N & T scales) & Vickers hardness
9. Bending test on beams
10. Fatigue testing - study of testing machine
11. Photo elastic method of stress measurements (two dimensional problems)

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University evaluation will be for 100 marks of which 70 marks are allotted for writing the procedure/formulae/sample calculation details, preparing the circuit diagram/algorithm/flow chart, conduct of experiment, tabulation, plotting of required graphs, results, inference etc., as per the requirement of the lab experiments. 20 marks for the viva-voce and 10 marks for the lab record.

Note: Duly certified lab record must be submitted at the time of examination.
Module I: (13 hours)
Complex analytic functions and conformal mapping: Complex functions – limits, derivative, analytic function- Cauchy-Riemann equations- elementary complex functions such as powers, exponential function, logarithmic, trigonometric and hyperbolic functions- Conformal mapping – Linear fractional transformations- mapping by elementary functions

Module II: (13 hours)
Complex integration: Line integral, Cauchy’s integral theorem - Cauchy’s integral formula – Taylor’s series, Laurent series – residue theorem – evaluation of real integrals using integration around unit circle, around semicircle, integrating contours having poles on the real axis

Module III: (13 hours)
Jointly Distributed Random Variables: Joint distribution functions, independent random variables, covariance and variance of sums of random variables, joint probability distribution functions of random variables, conditional probability and conditional expectations. Curve fitting: Method of least squares, correlation and regression, line of regression.

Module IV: (13 hours)
Vibrating strings: One dimensional wave equation – D’ Alembert’s solution – solution by method of separation of variables One dimensional heat equation - solution of the equation by the method of separation of variable Solutions of Laplace’s equation over a rectangular region and a circular region by the method of separation of variable

Reference books

Sessional work assessment
Assignments 2x10 = 20
2 tests 2x15 = 30
Total marks = 50

University examination pattern
Q I - 8 short type questions of 5 marks, 2 from each module
Q II - 2 questions A and B of 15 marks from module I with choice to answer any one
Q III - 2 questions A and B of 15 marks from module II with choice to answer any one
Q IV - 2 questions A and B of 15 marks from module III with choice to answer any one
Q V - 2 questions A and B of 15 marks from module IV with choice to answer any one
Module I (20 hours)

**Functional English Grammar:** Sentence Analysis - Basic Patterns - Noun Group, Verbal Group, and Adverbial Group - Tenses - Conditionals - Active and Passive Voice - Reported Speech

Module II (14 hours)

**Technical Communication**
2. Barriers to effective communication – improper encoding, bypassing inter-cultural differences etc.
3. Organization in technical communication – spatial, chronological etc.
4. Style in technical communication - objectivity, accuracy, brevity, clarity etc.
5. Technical reports – types and format

**Professional Ethics:** 1. Ethics in Engineering, copyright – IPR - patents

Module III (10 hours)

**Humanities, Science and Technology**
1. Importance of humanities to technology, Education and Society
2. Relevance of a scientific temper
3. Relation between science, society and culture – the views of modern thinkers
4. The development of science and technology in society – science and technology in ancient Greece and India – the contribution of the Arabs to science and technology – recent advances in Indian science.

Reference books
2. Pennyor, Grammar Practice Activities, Cambridge University Press
5. Vesilind; Engineering, Ethics and the Environment, Cambridge University Press
6. Larson E; History of Inventions, Thompson Press India Ltd.
9. Encyclopedia Britannica, History of Science, History of Technology
10. Subrayappan; History of Science in India, National Academy of Science, India

Sessional work assessment
- Assignments 2x10 = 20
- 2 tests 2x15 = 30
- Total marks 50

University examination pattern
- Q I  - 10 short type questions of 2 marks, from Module 1
- Q II - 10 questions of 5 marks, from module II and III for writing short notes with choice to answer any seven
- Q III - 2 questions A and B of 15 marks from module I for writing essay with choice to answer any one
- Q IV - 2 questions A and B of 15 marks from module II for writing essay with choice to answer any one
- Q V  - 2 questions A and B of 15 marks from module III for writing essay with choice to answer any one
Module I (13 hours)
Thermodynamics systems—Description of systems—properties—states, processes and cycles—Thermodynamic equilibrium—forms of energy—equations of state for gasses—compressibility factor—VT, PV, PT, Diagrams pure substances, properties of steam—Temperature and Zeroth law of thermodynamics—Various temperature scale—Temperature measuring instruments.

Module II (13 hours)
First law of thermodynamics—concept of heat and work—First law applied to cyclic processes and Non-cyclic processes—definition of stored energy—open system—general and steady flow—application of first law assess performance.

Module III (13 hours)
Second law of thermodynamics—thermal energy reservoirs—Kelvin—Planck and Clausius statements and their equivalence—Reversible and Irreversible processes—Reversible cycle—Carnot corollaries—thermodynamic temperature scale—Clausius inequality—concept of entropy—calculation of entropy changes from the Tds equations—availability—reversible work and irreversibility—increase of entropy principle—Helmholtz and Gibbs functions.

Module IV (13 hours)
Thermodynamic property relations—Maxwells equations—Clapeyron equation—general relations for internal energy, enthalpy and entropy in terms of p,v,T and specific heats—the Joule Thomson coefficient ∆h, ∆u and ∆s of real gases—mixtures of gases—analysis—Gibbs-Dalton model—Properties gas mixtures based on Dalton model.

Text Book:-

Reference Books:-
3) P K Nag , Engineering Thermodynamics ,Tata Mc Graw Hill
4) J.P Holman –Thermodynamics Mc Graw Hill

Sessional work assessment
Assignments 2x10 = 20
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Total marks = 50

University examination pattern
Q I  -  8 short type questions of 5 marks, 2 from each module
Q II - 2 questions A and B of 15 marks from module I with choice to answer any one
Q III - 2 questions A and B of 15 marks from module II with choice to answer any one
Q IV - 2 questions A and B of 15 marks from module III with choice to answer any one
Q V - 2 questions A and B of 15 marks from module IV with choice to answer any one
Module I: Conventional machining operations (12 hours)

Module II: Non-conventional machining operations (14 hours)

Module III: Metal fabrication techniques (12 hours)

Module IV: Manufacturing processes of non-metals (14 hours)

Text Books
3. Callister Jr, William D “Material Science and Engineering – An Introduction” Wiley India Pvt Ltd.

Sessional work assessment
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University examination pattern
Q I - 8 short type questions of 5 marks, 2 from each module
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Q IV - 2 questions A and B of 15 marks from module III with choice to answer any one
Q V - 2 questions A and B of 15 marks from module IV with choice to answer any one
Module I (13 hrs.)
Classification of fluid machines, stage, stator, rotor- Cylindrical co-ordinate system- integral form of continuity, momentum and energy equations, Concept of relative velocity, velocity vector equation, velocity triangle- Performance indices like power and efficiency, Flow of fluid over flat plate and curved surfaces, fixed and moving, propulsion of ships, rockets and missiles. Dimensional analysis: Rayleigh’s method and Buckingham’s pi theorem- Principles of modeling and similitude as applied to fluid mechanics problems.

Module II (13 hrs.)
Hydraulic Turbine: Hydro-electric power plant, components, surge tank, fore bay, Classification of turbines on various criteria, Pelton turbine, work and efficiency, conditions for optimum performance, Francis and Kaplan turbine components, Euler’s turbine equation, work done and efficiency, Draft tube theory, function and efficiency, Cavitation in turbine, turbine setting, Model testing, Derivation of dimensionless numbers, Specific and unit quantities, specific speed, Testing of turbine, characteristic curves, selection criteria, Governing of turbine.

MODULE III (13 hrs.)
Rotodynamic pumps: whirling of fluid, vortex motion-free and forced vortex, spiral flow, features of rotodynamic and positive displacement pumps. Centrifugal Pump: Working Principle, Classification of centrifugal pump, Volute pump, Turbine pump, Heads, work done by impeller, efficiencies, Pressure rise in impeller, pressure recovery, Head-discharge curve, effect of various losses, Comparison of forward, radial and backward curved blades, surging, Priming of Pump, Cavitation and separation in pump. Model analysis, specific speed, characteristic curves, slurry pump, deep well pump.

MODULE IV (13 hrs.)
Reciprocating Pump: Working principle, single and double acting pump, piston and plunger pumps, multicylinder pumps, Duplex and Triplex pumps. Indicator diagram, effect of acceleration and friction, work done, efficiency, slip, function of air vessel, work saved by fitting air vessel, separation in reciprocating pump, comparison with centrifugal pump, working principle of axial and radial piston pumps, vane pump and gear pump.


REFERENCES:

Sessional work assessment
| Assignments | 2x10 = 20 |
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| Total marks | = 50 |

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Q IV - 2 questions A and B of 15 marks from module III with choice to answer any one
Q V - 2 questions A and B of 15 marks from module IV with choice to answer any one
Module I (8 hours) (Two drawing exercises)


Module II (16 Hours) (five drawing exercises)


Module III (20 hours) (six drawing exercises)


Module IV (8 hours) (Two drawing exercises)


Reference Books:
2) Machine Drawing by N.D. Butt Panchal
3) Machine Drawing P S Gill S.K.Kataria & sons

Sessional work assessment
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Total marks = 50

University examination pattern
Q I - 8 short type questions of 5 marks, 2 from each module
Q II - 2 questions A and B of 15 marks from module I with choice to answer any one
Q III - 2 questions A and B of 15 marks from module II with choice to answer any one
Q IV - 2 questions A and B of 15 marks from module III with choice to answer any one
Q V - 2 questions A and B of 15 marks from module IV with choice to answer any one
Classifications of machine tools and machining processes - specification of machine tool; power source; centre lathe - general features, parts and functions - machining on centre lathe - cutting tools - materials, types, grinding; cutting variables - selection of speeds, feeds and depth of cut - use of cutting fluids - methods of holding work - lathe operations - turning, thread cutting, drilling, boring, reaming, profile turning, knurling; tolerance and surface finish - CNC machine tools

**Exercises**
Jobs on centre lathe requiring simple turning, taper turning, knurling, boring and thread cutting

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University evaluation will be for 100 marks of which 70 marks are allotted for writing the procedure/formulae/sample calculation details, preparing the circuit diagram/algorithm/flow chart, conduct of experiment, tabulation, plotting of required graphs, results, inference etc., as per the requirement of the lab experiments. 20 marks for the viva-voce and 10 marks for the lab record.
Note: Duly certified lab record must be submitted at the time of examination
1. a) Determination of voltage-current relation of a linear resistance and incandescent lamp  
   b) measurement of high and low resistance using voltmeter and ammeter  
2. R, L and C series and parallel circuits: measurement of voltage-current relation and verification by  
   calculation - plotting the instantaneous power against time  
3. Calibration of the single phase energy meter by direct loading at various power factors  
4. Measurement of power in the three phase circuit using single, two and three wattmeters for balanced  
   load and for three and four wire system  
5. Determination of the equivalent circuit of transformer by open and short circuit test - calculation of  
   efficiency and regulation at various loads and power factors.  
6. Determination of the regulation of alternator by emf and mmf methods  
7. Starting the cage induction motor using star-delta switch and plotting the performance characteristics  
8. Conducting the no load and blocked rotor test on cage induction motor - determining equivalent circuit  
   and calculating torque-slip characteristics  
9. a) Plotting OCC of DC shunt generator at rated speed - determining the critical resistance. b)  
   Conducting load test on DC shunt generator and plotting external characteristics - deducing internal  
   characteristics  
10. Conducting load test on DC series motor and plotting the performance characteristics  
11. Study of single phase capacitor start and capacitor run induction motors - plotting speed - voltage  
   relation of single phase fan motor

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University evaluation will be for 100 marks of which 70 marks are allotted for writing the  
procedure/formulae/sample calculation details, preparing the circuit diagram/algorithm/flow chart, conduct  
of experiment, tabulation, plotting of required graphs, results, inference etc., as per the requirement of the  
lab experiments, 20 marks for the viva-voce and 10 marks for the lab record.  
Note: Duly certified lab record must be submitted at the time of examination.
KANNUR UNIVERSITY

FACULTY OF ENGINEERING

Curricula, Scheme of Examinations & Syllabus for
Semesters V & VI of B.Tech. Degree Programme in
MECHANICAL ENGINEERING

with effect from 2007 Admissions
### FIFTH SEMESTER

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<td>Environmental Engineering and Disaster Management</td>
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**Elective I**

**ELECTIVE-1**

- 2K6 ME 606(A): Numerical Methods
- 2K6 ME 606(B): Mechatronics
- 2K6 ME 606(C): CNC Programming
- 2K6 ME 606(D): Tool Engineering and Design
- 2K6 ME 606(E): Vibration and Noise Control
Module I: Probability distributions (13 hours)
Random variables-Probability distributions - binomial distribution –Poisson distribution-
normal distribution –Mean, variance and Moment generating function -Poisson process -
chebyshev’s theorem- Geometric Distribution-Uniform Distribution, Gamma distribution,
Beta Distribution, Exponential Distribution and Hyper-Geometric Distributions.

Module II: Statistical inference (13 hours)
Population and Sample-Sampling Distributions of Mean and Variance-Point Estimation-
Interval Estimation -Null Hypotheses and Significance tests-Hypotheses concerning one
mean- Confidence Intervals of mean and variance -Estimation of Variances-Hypotheses
concerning one variance-Hypotheses concerning two variance- Chi square test as test of
goodness of fit.

Module III (Series solutions of differential equations (13 hours)
Power series method of solving ordinary differential equations - series solution of Bessel's
equation – Recurrence formula for Jn(x)-expansions for J0 and J1 – value of J_{1/2}- generating
function for Jn(x) - Orthogonality of Bessel functions - Legendre’s equation – series
solution of legendary’s differential equation -Rodrigues formula-Legendre Polynomials –
Generating function for Pn(x)- Recurrence formulae for Pn(x) -Orthogonality of Legendre
polynomials

Module IV Quadratic forms and Fourier transforms (13 hours)
Quadratic forms - Matrix associated with a quadratic form - Technique of Diagonalization
using row and column transformations on the matrix - Definite, Semidefinite and Indefinite
forms - their identification using the Eigen values of the matrix of the quadratic form.
Fourier Transform-Properties of Fourier Transforms-Linearity property-Change of scale
property-shifting properties –Modulation property-Transform of the Derivative-simple
problems-Fourier Cosine transform-Fourier Sine Transform.
Text Book
1. Johnson RA, Miller & Freund’s Probability and Statistics for Engineers, Prentice Hall of India (For Module I and II only)

Reference Books
4. Dr.B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers

University Examination Pattern
Q I – 8 short answer type questions of 5 marks, 2 from each module.
Q II- 2 questions of 15 marks each from module I with choice to answer any one.
Q III- 2 questions of 15 marks each from module II with choice to answer any one.
Q IV- 2 questions of 15 marks each from module III with choice to answer any one.
Q V- 2 questions of 15 marks each from module IV with choice to answer any one.

Sessional Work Assessment
Tests (2X15) – 30 marks
Assignments (2X10) – 20 marks
Total – 50 marks
MODULE I (12 HOURS)

Multidisciplinary nature of Environmental studies – Definition – scope and importance – need for public awareness

Natural resources – renewable and non-renewable resources – natural resources – forest resources - water resources

Mineral resources – food resources – energy resources – Land resources – use, overuse and misuse of these resources with appropriate case studies to substantiate – effect on the environment – role of individual in conservation of natural resources – equitable use of resources for sustainable lifestyle.

MODULE II (12 HOURS)

Ecosystem – concept – structure and function – producers, consumers & decomposers – energy flow in the ecosystem- Ecological successive food chains - food webs ( all in brief)

**MODULE III (13 HOURS)**

Environmental Pollution – Definition – causes - effects and control measures of: Air Pollution – water Pollution – soil Pollution – marine Pollution – noise Pollution – thermal Pollution – Nuclear hazards.


**MODULE IV (10 HOURS)**


FIELD WORK (5 HOURS)

- Visit to a local area to document environmental assets – river / forest / grassland / hill / mountain
- Visit to local polluted site – urban / rural / industrial / agricultural
- Study of common plants, insects , birds
- Study of simple ecosystems – pond , river , hill slopes , etc.

University Examination Pattern

Q I – 8 short answer type questions of 5 marks, 2 from each module.
Q II- 2 questions of 15 marks each from module I with choice to answer any one.
Q III- 2 questions of 15 marks each from module II with choice to answer any one.
Q IV- 2 questions of 15 marks each from module III with choice to answer any one.
Q V- 2 questions of 15 marks each from module IV with choice to answer any one.

Sessional Work Assessment

Tests (2X15) – 30 marks
Assignments (2X10) – 20 marks
Total – 50 marks

Text book

4. S. Deswal & A . Deswal, A Basic Course in Environmental Studies, Dhanpat Rai & Co

Reference Books

2. Bharucha erach, Biodiversity of India, Mapin Publishing Pvt.Ltd.,
6. Hawkins R.E. Encyclopediaof Indian Natural History, Bombay Natural History Society ,
Module I (13 hours)

Module II (13 hours)

Module III (14 hours)

Module IV (12 hours)
Text Book

Reference Books:
2. S.S Rattan, Theory of Machines, Tata Mc Graw Hill.
3. V.P. Singh, Theory of Machines, Dhanpat Rai and Co.

University Examination Pattern
Q I – 8 short answer type questions of 5 marks, 2 from each module.
Q II- 2 questions of 15 marks each from module I with choice to answer any one.
Q III- 2 questions of 15 marks each from module II with choice to answer any one.
Q IV- 2 questions of 15 marks each from module III with choice to answer any one.
Q V- 2 questions of 15 marks each from module IV with choice to answer any one.

Sessional Work Assessment
Tests (2X15) – 30 marks
Assignments (2X10) – 20 marks
Total – 50 marks
Module I (14 hours)

**Internal combustion engines** - classification - four stroke and two stroke engines - spark ignition and compression ignition engines - valve timing diagram - thermodynamic analysis of air standard cycles - Otto, diesel and duel combustion cycles - engine testing - performance and characteristics of constant speed and variable speed engines - heat balance test - Morse test - retardation test - actual engine cycles - effect of dissociation - variable specific heats and heat losses - scavenging - objectives - effects and methods

Module II (13 hours)

**Systems and components of IC engines** - fuel systems - ignition systems - cooling - starting - lubrication - governing of IC engines - supercharging of SI and CI engines - turbocharging - exhaust emissions of IC engines - alternate potential engines - free piston engine - Wankel engine and stratified charged engine - automotive transmission system and its components

Module III (12 hours)

**Combustion in IC engines** - flame propagation - normal and abnormal combustion - detonation - pre ignition - after burning - HUCR - fuel rating - additives in petrol - combustion chambers of SI engines - combustion in CI engines - phase of normal combustion - diesel knock - effect of engine variables on diesel knock - cetane number - additives in diesel - combustion chambers of CI engines

Module IV (13 hours)

Text Book and References

University Examination Pattern
Q I – 8 short answer type questions of 5 marks, 2 from each module.
Q II- 2 questions of 15 marks each from module I with choice to answer any one.
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Q IV- 2 questions of 15 marks each from module III with choice to answer any one.
Q V- 2 questions of 15 marks each from module IV with choice to answer any one.

Sessional Work Assessment
Tests (2X15) – 30 marks
Assignments (2X10) – 20 marks
Total – 50 marks
Module I (13 hours)
Fundamentals of CAD: Introduction: Design Process: Application of computers in design: Creating manufacturing database: benefits of CAD. Computer Hardware; Graphic input devices; display devices; Graphics output devices; Central processing unit (CPU) Geometric modelling- wireframe and solid modelling, engineering analysis-FEM, design review and evaluation, automated drafting, design data base, softwares used in CAD, data exchange between CAD and CAM. Fundamentals of CAM: Definition of automation, levels of automation, high volume discrete parts production, Detroit type of automation, transfer machines, analysis of automated flow lines, assembly machines, flow line balancing, line balancing.

Module II (14 hours)
NC/CNC Machine Tools; NC machine tools- basic components, coordinate systems; features of NC machine tools. Computer Numerical Control: basic theory of numerical control, advantages of NC, open and closed loop system, information flow and control theory, classification of CNC machine tools, position control and continuous path control, principles of displacement measurement, digital linear and rotary displacement transducer, analog displacement measuring system. CNC part programming: Manual programming, work piece modelling and computer aided part programming, canned cycles, Computer assisted Part Programming languages, programming in APT.

Module III (13 hours)

Module IV (12 hours)
benefits of CAPP. Types of CAPP systems, machinability data selection systems in CAPP. CAE, CIM, FMS, computer integrated manufacturing

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<thead>
<tr>
<th>Text Book and References</th>
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<tbody>
<tr>
<td>1. Groover &amp; Zimmers “CAD/CAM” PHI</td>
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<td>2. Rdhakrishnan “CAD/CAM”</td>
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<tr>
<td>4. Mechatronics : HMT (TMH)</td>
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<td>5. CNC Programming made easy: B.K.Jha, Vikas Publishing House</td>
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<td>Total – 50 marks</td>
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</tbody>
</table>
MODULE I (13 hours)

**Basic Concepts of Machine Tools:** General requirements of machine tools- tool- work motions on lathe, milling, drilling, shaping, slotting, planing and grinding machines- cutting speeds and feeds- estimation of machining time.

**Kinematics of Machine Tools:** Selection of range of speeds and feeds- layout of speeds- graphical representation of speed and structure diagram- ray diagram for machine tool gear boxes

**Machine Tool Drive:** Stepped and step less regulation of speeds- feed and speed mechanisms in lathe, milling and drilling machines- gauging of components.

MODULE II (13 hours)

**Cutting Tools:** Geometry of cutting tools and tool nomenclature- single point and multipoint cutting tools- tools used for turning, milling, drilling and broaching- tool materials and their properties- grinding wheels and their selection. Production Lathes: Turret lathes- tools and attachments- operations and tools layout- automatic screw machine

**Metal Cutting:** Mechanics of chip formation- types of chips- orthogonal and oblique cutting- velocity relationships- cutting forces and factors affecting cutting forces- cutting force and power analysis- thermal aspects of machining- cutting fluids and their selection.

MODULE III (13 hours)

**Machinability and Tool Life:** Tool wear and tool life- tool life equations- tool life specifications and criteria- effect of machining parameters on tool life- variables affecting machinability -Economics of machining: Selection of optimum machining conditions- machine law and tool law

**Jigs and fixtures:** Basic principles- elements of jigs and fixtures- design principles common to jigs and fixtures.

MODULE IV (13 hours)

Press working: Different types of presses- principles of operation and selection- computation of capacities tonnage- center of pressure- cutting operations- shear action in die cutting operations- compound and progressive dies
### Text Book and References

1. HMT, Production Technology, Tata McGraw Hill
5. ASTME, Fundamentals of Tool Design, Prentice Hall of India

### University Examination Pattern

**Q I –** 8 short answer type questions of 5 marks, 2 from each module.

**Q II –** 2 questions of 15 marks each from module I with choice to answer any one.

**Q III –** 2 questions of 15 marks each from module II with choice to answer any one.

**Q IV –** 2 questions of 15 marks each from module III with choice to answer any one.

**Q V –** 2 questions of 15 marks each from module IV with choice to answer any one.

### Sessional Work Assessment

- **Tests (2X15)** – 30 marks
- **Assignments (2X10)** – 20 marks
- **Total** – 50 marks

Exercises:

1. Multi-start thread
2. Square thread
3. Eccentric turning
4. Exercise on limits and fits
5. Internal thread
6. Spur gear
7. Helical gear by simple and differential indexing
8. Surface, slot and keyway milling
9. Shaper exercise on cube with V-groove, slot and guide ways
10. Grinding
11. Tool grinding

Text Books and References

1. HMT, Production Technology, Tata McGraw Hill
2. ASTME, Tool Engineer’s Handbook
   Rao R.V., Metal Cutting and Machine Tools, S K Kataria & Sons

Sessional Work Assessment

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<tr>
<td>1.</td>
<td>Study of systems and components of petrol and diesel engines</td>
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<td>2.</td>
<td>Study of automotive parts</td>
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<td>3.</td>
<td>Study of air compressors, blower and fan</td>
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<td>4.</td>
<td>Study of boilers and turbines</td>
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<td>5.</td>
<td>Performance test on refrigeration plant</td>
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<td>6.</td>
<td>Performance test on air conditioning plant</td>
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<td>7.</td>
<td>Performance test on boilers</td>
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<tr>
<td>8.</td>
<td>Determination of flash and fire points of oils</td>
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<td>9.</td>
<td>Determination of viscosity of oils</td>
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<td>10.</td>
<td>Determination of calorific value of fuels</td>
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<td>11.</td>
<td>Valve timing diagram on petrol and diesel engines</td>
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<td>12.</td>
<td>Load test on single cylinder four stroke diesel engine</td>
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<td>Load test on twin cylinder four stroke diesel engine</td>
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<td>14.</td>
<td>Load test on four cylinder four stroke diesel engine</td>
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<td>15.</td>
<td>Load test on single cylinder four stroke petrol engine</td>
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<td>Load test on twin cylinder four stroke petrol engine</td>
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<td>17.</td>
<td>Load test on four cylinder four stroke petrol engine</td>
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<td>18.</td>
<td>Load test on two stroke petrol engine</td>
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<td>19.</td>
<td>Heat balance test on petrol engine</td>
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<td>20.</td>
<td>Heat balance test on diesel engine</td>
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<td>21.</td>
<td>Cooling curve test on petrol engine</td>
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<td>22.</td>
<td>Cooling curve test on diesel engine</td>
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<td>23.</td>
<td>Morse test on petrol engine</td>
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<td>24.</td>
<td>Morse test on diesel engine</td>
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<td>25.</td>
<td>Retardation test on diesel engine</td>
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<td>26.</td>
<td>Retardation test on petrol engine</td>
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<td>27.</td>
<td>Variable speed test on petrol engine</td>
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<td>28.</td>
<td>Variable speed test on diesel engine</td>
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<td>29.</td>
<td>Performance test on rotary air compressor</td>
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<td>30.</td>
<td>Performance test on air blower</td>
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12 experiments should be done as a minimum depending up on the lab facility.
Text Book and References

Sessional Work Assessment
Laboratory practical and record – 35 marks
Tests – 15 marks
Total – 50 marks
Module 1 (12 hours)

Module II (14 hours)

Module III (14 hours)

Module IV (12 hours)
Text Book and References

1. Varshney R.L & Maheshwari K.L, Managerial Economics, S Chand & company Ltd.
3. Dewett K.K, Modern Economic Theory, S Chand & Company Ltd.
   Benga T.R & Sharma S.C, Industrial Organisation And Engineering Economics,
8. Joel Dean, Managerial Economics, Prentice – Hall of India Pvt. Ltd.

University Examination Pattern

Q I –  8 short answer type questions of 5 marks, 2 from each module.
Q II-  2 questions of 15 marks each from module I with choice to answer any one.
Q III- 2 questions of 15 marks each from module II with choice to answer any one.
Q IV- 2 questions of 15 marks each from module III with choice to answer any one.
Q V-  2 questions of 15 marks each from module IV with choice to answer any one.

Sessional Work Assessment

Tests  (2X15) – 30 marks
Assignments (2X10) – 20 marks
Total – 50 marks
Module I (13 hours)

Module II (13 hours)

Module III (13 hours)

Module IV (13 hours)
### Text Book

### References
1. S.S Rattan, Theory of Machines, Tata Mc Graw Hill.
2. V.P. Singh, Theory of Machines, Dhanpat Rai and Co..
4. Leonard Meirovitch, Elements of vibration analysis, Mc Graw Hill

### University Examination Pattern
Q I – 8 short answer type questions of 5 marks, 2 from each module.
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Module I (16 hrs)

Module 2 (12 hrs)

Module 3 (12 hrs)

Module 4 (12 hrs)
## Text Book and References


## University Examination Pattern

Q I – 8 short answer type questions of 5 marks, 2 from each module.
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## Sessional Work Assessment

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Module I (13 hours)
Computer technology - introduction - CPU - types of memory - input/output devices - computer programming - operating the computer system - mini/micro computers and programmable controllers - computer aided design - fundamentals of CAD - the design process - application of computers for design - manufacturing data base - computer graphics - software configuration - constructing the geometry - transformations - data base structure and content - wire frame and solid models

Module II (13 hours)
Numerical control - basic components of NC systems - NC coordinate systems - motion control system - application of numerical control - NC part programming - punched tape - tape coding and format - manual part programming - computer assisted part programming - APT language - NC programming with interactive graphics

Module III (13 hours)
Manufacturing systems - development of manufacturing system - components of FMS - FMS work station - Job coding and classification - group technology - benefits of FMS - tools and tooling - machining centres - head indexers - pallets - fixtures - work handling equipments - system storage - automated guided vehicles - industrial robots - programming of robots - assembly & inspection

Module IV (13 hours)
Flexible manufacturing system management - FMS control software - manning of FMS - tool management - controlling precision - simulation and analysis of FMS - approaches to modelling for FMS - network simulation - simulation procedure - FMS design - economics of FMS - artificial intelligence
Text Book and References


University Examination Pattern

Q I – 8 short answer type questions of 5 marks, 2 from each module.
Q II- 2 questions of 15 marks each from module I with choice to answer any one.
Q III- 2 questions of 15 marks each from module II with choice to answer any one.
Q IV- 2 questions of 15 marks each from module III with choice to answer any one.
Q V- 2 questions of 15 marks each from module IV with choice to answer any one.

Sessional Work Assessment

Tests (2X15) – 30 marks
Assignments (2X10) – 20 marks
Total – 50 marks
### Module I: Linear algebra (13 hours)
Vectors - vector space and Euclidean space - vector operations - matrix operations - unit vector - sum vector - linear dependence - bases - spanning set - rank - simultaneous equations - basic solutions - point sets - lines and hyper planes - linear inequalities - convex sets - extreme points - fundamental theorem of linear programming

### Module II: Linear programming (13 hours)
Statement of the LP problem - slack and surplus variables - basic feasible solutions - reduction of a feasible solution to basic feasible solution - artificial variables - optimality conditions - unbounded solutions - Charnes’ M method - two phase method - degeneracy - duality

### Module III: Transportation, assignment and game problems (13 hours)
Transportation problem - coefficient matrix and its properties - basic set of column vectors - linear combination of basic vectors - tableau format - stepping stone algorithm - UV method - inequality constraints - degeneracy in transportation problems - assignment problem as a maximally degenerate transportation problem - König’s method - rectangular zero sum games - von Neuman’s theorem - saddle points - pure and mixed strategies - formulation of the primal and dual LP problem for fixed strategies - dominance - graphical solutions

### Module IV: Queuing theory (13 hours)
Basic structure of queuing models - exponential and Poisson distributions - birth and death processes - queuing models based on Poisson inputs and exponential service times - basic model with constant arrival rate and service rate - finite queue - limited source queue models involving non-exponential distributions - single service model with Poisson arrival and any service time distribution - Poisson arrival with constant service time - Poisson arrival and Erlang service times - priority disciplines - dynamic programming - Bellman’s principle of optimality - formulation and solution of simple problems

### Text Book
1. Hadley G, Linear Programming, Addison Wesley
References
2. Wagner, Principles of Operations Research, Prentice Hall of India

University Examination Pattern
Q I – 8 short answer type questions of 5 marks, 2 from each module.
Q II- 2 questions of 15 marks each from module I with choice to answer any one.
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Q IV- 2 questions of 15 marks each from module III with choice to answer any one.
Q V- 2 questions of 15 marks each from module IV with choice to answer any one.

Sessional Work Assessment
Tests (2X15) – 30 marks
Assignments (2X10) – 20 marks
Total – 50 marks

MODULE II (12 hours). Interpolation Lagrange form of the interpolating polynomial-Newton’s form of the interpolating polynomial- divided differences- finite difference operators- Newton’s forward and backward interpolations- Stirling’s interpolation formulae- errors of interpolation formulae- Cubic spline interpolation-curve fitting- linear regression.

MODULE III: (13 hours)


Text Book
References
1. Bradie Brian, A Friendly Introduction to Numerical Analysis, Pearson Education.

University Examination Pattern
Q I – 8 short answer type questions of 5 marks, 2 from each module.
Q II- 2 questions of 15 marks each from module I with choice to answer any one.
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Q V- 2 questions of 15 marks each from module IV with choice to answer any one.

Sessional Work Assessment
Tests (2X15) – 30 marks
Assignments (2X10) – 20 marks
Total – 50 marks
2K6ME 606(B): MECHATRONICS

MODULE I: (11 hours) Introduction to mechatronics-sensors and transducers-signal conditioning-pneumatic and hydraulic systems-mechanical and electrical systems.

MODULE II: (11 hours) System modeling-mathematical models-mechanical, electrical, fluid and thermal system building blocks-system models-dynamic response of systems-first and second order systems-modeling dynamic systems-systems transfer functions-frequency response-stability.


MODULE IV: (15 hours) Digital circuits-Micro controllers and micro processors-digital logic circuits-micro controller architecture and programming-programmable logic controllers

Text Book

References
2. Krishna Kant, *Computer Based Industrial Control*, Prentice Hall of Indian Private Limited

University Examination Pattern
Q I – 8 short answer type questions of 5 marks, 2 from each module.
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Q III- 2 questions of 15 marks each from module II with choice to answer any one.
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</tbody>
</table>
Module I (13hrs)

**An Introduction to Numerical Control Machinery:** The History of NC, CNC Machines, Input Media, Binary Numbers, Tape Formats, Objectives of Numerical Control, Applications in Industry


**Process Planning and Tool Selection:** Process Planning, Tooling for Numerical Control, Tooling for Hole Operations, Milling Cutters Special Inserted Cutters, Speed and Feeds, Tool Changes, Automatic Tool Changers, Tool Storage, Tool Length and Tool Length Offset

Module II (13hrs)

**Programming Coordinates:** Hole Operations, Milling Operations, Mixing Absolute and Incremental Positioning, Metric Coordinates

**Two Axis Programming:** Introduction, Parts of a CNC Program, Word Address Format, Absolute Positioning, Incremental Positioning, Milling and Drilling Examples

**Three Axis Programming:** Introduction, A Programming Task Using Three Axes, Other G-Codes Used in CNC Programming, Using an Indexer, Programming Examples

**Math for Numerical Control Programming:** Using Trigonometry for Cutter Offsets, Milling and Lathe examples

**Linear and Circular Interpolation:** Linear Interpolation, Circular Interpolation,

**Cutter Diameter Compensation:** Definitions and Codes, Program Example, Special Considerations, Fine Tuning with Cutter Diameter Compensation

Module III (13hrs)

**Do Loops and Subprograms:** Do Loops, Subprograms, Calling a Subprogram, Subroutines for Cutter Diameter Compensation, Nested Loops

**Advanced CNC Features:** Mirror Imaging, Polar Rotation, Helical Interpolation

**The Numerical Control Lathe:** Lathe Bed Design, Axis Movement, Tool holders and Tool Changing, Spindle Speeds, Feed rates, Machine Origin and Work Coordinate Systems, Quick setters
Programming CNC Turning Machines: Machine Reference Point, Diameter vs. Radius Programming, Turning and Facing, Taper Turning, Circular Interpolation, Drilling, Threading

Module IV (13hrs)


The Future of Numerical Control: NC in Prototype and Job Shops, CNC in Manufacturing, Employment Opportunities in NC

Text Book and References
1. Lynch; Computer Numerical Machining, 1992, McGraw-Hill

University Examination Pattern
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Q V- 2 questions of 15 marks each from module IV with choice to answer any one.

Sessional Work Assessment
Tests (2X15) – 30 marks
Assignments (2X10) – 20 marks
Total – 50 marks
MODULE I: (13 hours) Design of chips forming tools

Single point tools-tool geometry-tool materials-milling cutters-drills and reamers-grinding wheels-tipped tools-design of tool holders and boring bars-vibration damping of boring bars-form tools-influence of cutting parameters on cutting force and power-cutting power estimation in turning, milling and drilling.

MODULE II: (13 hours) Press working tools


MODULE III: (13 hours) Design of fixture

Elements of fixture-standard work holding devices-principles of location and clamping-plain and concentric location-clamping elements-quick acting clamps-design and sketching of fixtures for milling of simple components.

MODULE IV: (13 hours) Design of jigs

Jigs for drilling and reaming-types of jigs-guide bushings-indexing jigs-design and sketching of jigs for simple jobs

Text Book and References

1. Kempster M.H.A., "An Introduction to Jig and Tool Design", ELBS
2. ASTME, Fundamentals of Tool Design
7. Cole B., "Tool Design", Taraporevala
### University Examination Pattern

Q I – 8 short answer type questions of 5 marks, 2 from each module.

Q II – 2 questions of 15 marks each from module I with choice to answer any one.

Q III – 2 questions of 15 marks each from module II with choice to answer any one.

Q IV – 2 questions of 15 marks each from module III with choice to answer any one.

Q V – 2 questions of 15 marks each from module IV with choice to answer any one.

### Sessional Work Assessment

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<table>
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<tr>
<td>Tests (2X15)</td>
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<td>Assignments (2X10)</td>
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<td>Total</td>
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</table>
MODULE I: (13 hours)
Introduction to mechanical vibration-free and forced response of single degree of freedom linear systems-Coulomb damping-support excitation-vibration isolation-whirling of shafts-measurement of vibration-accelerometer-seismometer.

MODULE II: (13 hours)

MODULE III: (13 hours)
Vibration of continuous systems-exact methods-boundary value problem-Eigen value problem-axial vibration of rods-bending vibration of bars-Rayleigh’s quotient-response of systems by modal analysis-energy of continuous systems-general elastic waves-formulation and decoupling of equilibrium equations-approximate methods-different methods like Rayleigh’s energy method, Rayleigh-Ritz method and Holzer’s method

MODULE IV: (13 hours)
Self excited vibrations-criterion of stability-instability caused by friction-instability in oil film lubricated bearings-galloping of transmission lines-introduction to nonlinear vibration-introduction to random vibration-stationary random process-probability density functions-auto correlation function-power spectral density function-noise-sound level meter scale-psychological scale-equivalent sound level-noise and loss of hearing-psychological effects of noise-noise exposure limits-noise control-control at the source-control along the path-control at the receive

Text Book
### References

### University Examination Pattern
Q I – 8 short answer type questions of 5 marks, 2 from each module.
Q II- 2 questions of 15 marks each from module I with choice to answer any one.
Q III- 2 questions of 15 marks each from module II with choice to answer any one.
Q IV- 2 questions of 15 marks each from module III with choice to answer any one.
Q V- 2 questions of 15 marks each from module IV with choice to answer any one.

### Sessional Work Assessment
| Tests (2X15) | – | 30 marks |
|Assignments (2X10) | – | 20 marks |
|Total | – | 50 marks |
List of experiments

1. Performance study on parallel flow and counter flow Heat exchanger.
2. Performance study on Shell and tube Heat exchanger.
5. Determination of thermal conductivity of metal rod.
6. Experiment on forced convection heat transfer.
7. Experiment on unsteady state conduction.
8. Experiment on drop wise and film wise condensation.
10. Experiment on natural convection heat transfer.
11. Experiment on boiling heat transfer.
12. Determination of thermal resistance of composite wall
13. Determination of Stefan Boltzman constant.
14. Determination of thermal conductivity of asbestos powder.
15. Determination of effectiveness of fin.

Text Book and References


Sessional Work Assessment

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<tr>
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</table>
2K6 ME 608(P) CAD/CAM/CAE LAB

3 hrs. practicals per week

1. Exercise on solid modeling using available software packages- Concepts of computer aided modeling, design, analysis and manufacturing- Survey of various available software for the above areas– introduction to computer graphics, curves and surface generation, sweep, revolve, loft, extrude, filleting, chamfer, splines etc. Scaling and rotation transformation using commercial solid modeling packages: 2 D drafting and 3 D modeling.

2. Assembly and mechanical design – assembling of various parts and tolerance analysis – synthesis and design of mechanisms - four bar chain, cam and follower, two stroke and four stroke engines – 3D modeling, assembling, animation and analysis using available software packages.


7. concepts of reverse engineering and rapid prototyping technology
Text Book and References


Sessional Work Assessment

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KANNUR UNIVERSITY

FACULTY OF ENGINEERING

Curricula, Scheme of Examinations and Syllabi
for
B.Tech Degree Programme in
MECHANICAL ENGINEERING
V11 and V111 Semesters
With Effect From 2007 Admissions
## SEVENTH SEMESTER

<table>
<thead>
<tr>
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<th>Subject</th>
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<tr>
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<td>Mini Project</td>
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<td>4</td>
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<td>2K6ME 709(P)</td>
<td>Physical Education, Health and Fitness</td>
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### ELECTIVE-11

- 2K6ME 705 (A)  MARKETING MANAGEMENT
- 2K6ME 705 (B)  OPTIMIZATION TECHNIQUES
- 2K6ME 705 (C)  INDUSTRIAL PSYCHOLOGY
- 2K6ME 705 (D)  ADVANCED FLUID MECHANICS
- 2K6ME 705 (E)  MULTIPHASE FLOW
2K6ME 701: METROLOGY AND INSTRUMENTATION
3 hours lecture & 1 hour tutorial per week

Module I (13 hours)


Module II (13 hours)

Uncertainty in “computed quantities” from measured values - estimation of permissible uncertainties of instruments for specific purposes - potentiometer transducer as a zero order instrument - analysis of its loading error - mercury-in-glass thermometer as a first order instrument - step, ramp and frequency response of first order instruments - problems - seismic instrument as a second order instrument - step, terminated ramp, ramp and frequency response of second order instruments - slip gages - assembling the blocks - temperature problems - LVDT - comparators: principle of working of mechanical, electrical, pneumatic comparators - measurement of strain: strain gauge classification - unbonded and bonded strain gauges - gage factor - strain gauge rosettes - selection and installation of bonded gauges - ballast, DC bridges and constant current circuits - temperature compensation – calibration

Module III (13 hours)

Measurement of force: multiple lever system for weighing - strain gauge load cells - temperature sensitivity-ballistic weighing-hydraulic & pneumatic load cells-measurement of torque: water brake Heenan & Froude hydraulic dynamometer - general purpose electric dynamometer - measurement of temperature: pressure thermometers-RTDs-compensation for lead resistance-thermistors - thermocouples - series in parallel connected thermocouples -
materials used and there ranges - pyrometry-infrared pyrometry - air pollution measurement: gas chromatography - Orsat’s apparatus - nuclear instrumentation: Gieger Muller counter - ionisation chamber - scintillation counters

**Module IV (13 hours)**


**Text Books and References**


**Sessional work assessment**

Two assignments = 20
Two tests = 30
Total marks = 50

**University examination pattern**

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions A and B of 15 marks each from module I with choice to answer any one
Q III - 2 questions A and B of 15 marks each from module II with choice to answer any one
Q IV - 2 questions A and B of 15 marks each from module III with choice to answer any one
Q V - 2 questions A and B of 15 marks each from module IV with choice to answer any one
Module I (14 hours)
Management concepts - system concepts of management - management functions - planning - principles of planning - organizing - organization structures - principles of organizing - span of control - delegation - leadership - directing - controlling
Decision making - strategic and tactical decisions - models of decision making - single stage decisions under risk - multi stage decision making - decision trees - decision making under uncertainty - Baye’s decision theory - equally likely - minimax - maximum likelihood - maximin criterion –

Module II (12 hours)
Network techniques - basic concepts - network construction - CPM and PERT networks - algorithm for critical path - slacks and their significance - crashing - network flow problems - the shortest route problem - minimal spanning tree problem - maximal flow in capacitated network

Module III (14 hours)

Module IV (12 hours)
Human resources management - job design - job enrichment - job enlargement - job evaluation - merit rating - wages and incentives - work study - method study - time study - work sampling.
Costing - cost concepts - concept of cost accounting - elements of cost - overhead costs - methods of allocation of overhead costs - depreciation - methods of depreciation - financial management - time value of money - comparison of alternatives - payback period method -
net present value method - internal rate of return method - basics of financial accounting - profit and loss account - balance sheet preparation

**Text books**

**Reference books**

**Sessional work assessment**
Two assignments = 20
Two tests = 30
Total marks = 50

**University examination pattern**
Q I - 8 short type questions of 5 marks each, 2 from each module
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Q IV - 2 questions A and B of 15 marks each from module III with choice to answer any one
Q V - 2 questions A and B of 15 marks each from module IV with choice to answer any one
Module I (13 Hours)

**Introduction to design** - Steps in design process – Design factors – Tolerances & fits – principles of standardization – Codes & standards – Selection of materials

**Introduction to Computer aided design** – Introduction to modeling, drafting, simulation and analysis software packages.

**Stress & Strength considerations of mechanical elements** – Stress concentration theories of failure – Impact load – Fatigue loading – consideration of creep and thermal stresses in design.

Module II (13 Hours)


**Keys** – types of keys and pins – stresses in keys and pins – design of keys – design of cotter and pin joints

**Riveted Joints** – stresses in riveted joints – strength analysis – boiler and tank joints – structural joints

Module III (13 Hours)

**Welded joints** – types of welded joints – stresses in butt and fillet welds – torsion and bending in welded joints – welds subject to fluctuating loads – design of welded machine parts and structural joints.

**Springs** – Stresses in helical springs- deflection of helical springs – extension, compression and torsion springs- design of helical springs for static and fatigue loading – critical frequency of helical springs – stress analysis and design of leaf springs
Module IV (13 Hours)

**Power shafting** – stresses in shafts – design for static loads – reversed bending and steady torsion – design for strength and deflection – design for fatigue loading – critical speed of shafts – stresses in couplings – design of couplings

**Text books:**


**Reference books:**

1. Stegel, Maleev & Hartman, Mechanical Design of Machines, International Book Company
Data hand books (allowed for reference during examinations)


Sessional work assessment

<table>
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Q IV - 2 questions A and B of 15 marks each from module III with choice to answer any one
Q V - 2 questions A and B of 15 marks each from module IV with choice to answer any one
2K6ME 704 POWER PLANT ENGINEERING

3 hours lecture and 1 hour tutorial per week

MODULE I (12 hours)
Steam engineering-temperature entropy diagram-mollier diagram-rankine cycle-modified rankine cycle-reheat and regenerative-binary vapour cycle-steam generators-classifications-cochran boiler-lancashire boiler-cornish boiler-locomotive boiler-babcock and wilcox boiler-stirling boiler-high pressure boilers-boiler mountings and accessories

MODULE II (12 hours)
Steam nozzles-flow through steam nozzles-throat pressure for maximum discharge- effect of friction-super saturated flow-steam turbines-impulse and reaction turbines-velocity diagram-condition for maximum efficiency-compounding-reheat factor-blade height-governing of steam turbines-cogeneration and combined cycle power generation-steam engines-components-compounding-indicator diagram

MODULE III (16 hours)
Thermal power plants-general layout-site selection-fuel handling storage and burning systems-dust and ash handling system-chimney draught-nuclear power plants-classification-components-safety measures-effects of nuclear radiation-nuclear waste disposal-gas turbine power plants-classification-closed open and other systems-hydro electric power plants-combined operation of different power plants-non conventional power generation-solar thermal collection-thermal storage-ocean power-principle of OTEC systems-wind energy-wind turbine-geothermal energy-geothermal electrical power plants-biogas energy-biogas production-design and construction of biogas plants

MODULE IV (12 hours)
Economics of power generation-terms and definitions-estimation of load-load curve-load factor-diversity factor-capacity factor-use factor-economics in plant selection-economics of generation and distribution of power-useful life-tariff for electrical energy-environmental pollution and its control-steam power plant pollutants-control of pollutants-control of particulate matter-control of SO₂-control of NO₂-control of waste water from steam power plants-pollution from nuclear power plants-noise pollution and noise control
Text Book:


Reference Books:

1. Nag, “Power Plant Engineering” TMH
2. Ngpal, “Power Plant Engineering” Khanna
3. Vapat & Scrotski, “Power Station Engineering and Economy” TMH
4. John F Lee, “Power Station Engineering and Economy” TMH

Sessional work Assessment

Two Tests =30
Two Assignments =20
Total Marks =50

University examination pattern

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Q III - 2 questions A and B of 15marks each from module II with choice to answer any one
Q IV - 2 questions A and B of 15marks each from module III with choice to answer any one
Q V - 2 questions A and B of 15marks each from module IV with choice to answer any one
2K6ME 705 (A): MARKETING MANAGEMENT
3 hours lecture & 1 hour tutorial per week

Module I (14 hours)
Introduction to marketing - concept of market and marketing - marketing environment - controllable factors - factors directed by top management - factors directed by marketing - uncontrollable factors - demography, economic conditions, competition, social and cultural forces, political and legal forces, and technology

Module II (14 hours)
Marketing planning - marketing planning process - Boston consultancy group model - marketing mix - marketing mix variables - market segmentation and market targeting - introduction to segmentation - targeting and product positioning

Module III (12 hours)
Marketing research - need and scope - marketing research process - research objectives, developing research plan, collecting information, analysis, and findings - consumer behaviour - factors influencing consumer behaviour - perceived risks - product life cycle - marketing strategies for different stages of product life cycle

Module IV (12 hours)
Marketing communication - marketing mix variables - steps in developing effective communication - identification of target audience - determination of communication objectives - designing the message - selecting the communication channels - promotion mix evaluation - advertising and sales promotion - factors in advertising - sales promotion tools

Text books
Reference books

Sessional work assessment
Two Tests = 30
Two Assignments = 20
Total marks = 50

University examination pattern
Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions A and B of 15 marks each from module I with choice to answer any one
Q III - 2 questions A and B of 15 marks each from module II with choice to answer any one
Q IV - 2 questions A and B of 15 marks each from module III with choice to answer any one
Q V - 2 questions A and B of 15 marks each from module IV with choice to answer any one
2K6ME 705 (B): OPTIMIZATION TECHNIQUES
3 hours lecture and 1 hour tutorial per week

MODULE I: Linear Programming I (14 hours)

MODULE II: Linear Programming II (14 hours)

MODULE III: Non-linear Programming (13 hours)

MODULE IV: Dynamic Programming and Metaheauristics (13 hours)
Introduction to Genetic Algorithm-steps-coding and selection-reproduction-cross over and mutation

Text books and Reference books
3. Hadley G., ‘Linear Programming’, Addison Wesley


**Sessional work assessment**

Two Tests = 30
Two Assignments = 20
Total marks = 50

**University examination pattern**

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Q II - 2 questions A and B of 15 marks each from module I with choice to answer any one
Q III - 2 questions A and B of 15 marks each from module II with choice to answer any one
Q IV - 2 questions A and B of 15 marks each from module III with choice to answer any one
Q V - 2 questions A and B of 15 marks each from module IV with choice to answer any one
Module I (13 hours)
Introduction - psychology as a science - areas of applications - study of individual -
individual differences - study of behavior - stimulus - response behavior - heredity and
environment - human mind - cognition - character - thinking - attention - memory - emotion -
traits - attitude - personality

Module II (13 hours)
Organizational behavior - definition - development - fundamental concept - nature of people -
nature of organization - an organizational behavior system - models - autocratic model -
hybrid model - understanding a social - system social culture - managing communication -
downward, upward and other forms of communication

Module III (13 hours)
Motivation - motivation driver - human needs - behavior modification - goal setting -
expectancy model - comparison models - interpreting motivational models - leadership - path
goal model - style - contingency approach

Module IV (13 hours)
Special topics in industrial psychology - managing group in organization - group and inter
group dynamics - managing change and organizational development - nature planned change -
resistance - characteristic of OD - OD process.

Text books
1 Keith Davis & Newstrom J.W., "Human Behavior At Work", McGraw Hill
   International
   Behavior", John Willy
4 Morgan C.T., King R.A., John Rweisz & John Schoples, "Introduction to
   Psychology", McGraw Hill
5 Blum M.L. & Naylor J.C., Horper & Row, "Industrial Psychology", CBS Publisher
Sessional work assessment
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Total marks = 50

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Q IV - 2 questions A and B of 15 marks each from module III with choice to answer any one
Q V - 2 questions A and B of 15 marks each from module IV with choice to answer any one
MODULE I: (13 hours)
Basic equations of fluid flow: Reynolds transport equation-integral and differential formations-integral form of equations of the continuity-momentum and energy equations-use of integral equation-differential form of these equations-Stoke’s postulates and constitutive equations-Navier-Stokes equations and energy equations for Newtonian fluids.
Non dimensionalisation of the equations of motion and order of magnitude analysis: Choice of characteristic quantities-identification of the non dimensional parameters-classification of flows based on the characteristic Reynolds number-approximate equations for low Re and high Re flows and boundary layer equations-boundary equations.

MODULE II: (13 hours)
Some exact solutions of the Navier-Stokes equations: Couette flows-plane Poisseuille-flow between rotating cylinders-Stokes problems-fully developed flow through circular and non-circular pipes
Approximate solutions: Creeping flow past a sphere-theory of hydrodynamic lubrication-boundary layer on a flat plate-Blassius solution and use of momentum integral equation.

MODULE III: (14 hours)
Introduction to compressible flows: Basic concepts-equations for one dimensional flow through steam tubes-speed of sound and Mach number-qualitative difference between incompressible, subsonic and supersonic flows-characteristic velocities-adiabatic flow ellipse
Isentropic flow through a duct: Criterion for acceleration and deceleration-stagnation quantities-isentropic relations-use of gas tables-operation of nozzles at off design conditions.
Normal shocks in one dimensional flow: Occurrence of shocks-analysis of normal shocks-Prandtl’s equation-Rankine-Hugoniot equation and other normal shock relations-moving shocks.

MODULE IV: (12 hours)
Flow with friction: Fanno lines and Fanno flow relations-effect of friction on properties-choking-isothermal flows.
Flow with heat transfer: Rayleigh lines-effect of heat addition-thermal choking

Text books and Reference books
2. Rathakrishnan E., *Gas Dynamics*, Prentice Hall India

Sessional work assessment
Two Tests = 30
Two Assignments = 20
Total marks = 50

University examination pattern
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Q IV - 2 questions A and B of 15 marks each from module III with choice to answer any one
Q V  - 2 questions A and B of 15 marks each from module IV with choice to answer any one
Module I (13 hours)
Basic equations and empirical correlations for multi-phase flow - flow patterns - identification and classification - flow pattern maps and transition - momentum and energy balance - homogeneous and separated flow models - correlations for use with homogeneous and separated flow models - two phase flow through inclined pipes and singularities - void fraction and slip ratio correlations - influence of pressure gradient - empirical treatment of two phase flow - drift flux model - correlations for bubble, slug and annular flows - pressure losses through enlargements, contractions, orifices, bends and values

Module II (13 hours)
Boiling and multiphase heat transfer - vapour-liquid equilibrium mechanisms - pool boiling convective boiling - heat transfer in partial and fully developed sub-cooled boiling - void fraction and pressure drop in sub-cooled boiling - saturated boiling heat transfer - two phase forced convection laminar and turbulent flow solutions for film heat transfer - empirical equations for film boiling and transition boiling - burnout mechanism and correlations - critical coefficient in nucleate and convective boiling

Module III (13 hours)
Condensation - basic processes of condensation - mechanism of evaporation and condensation - film condensation on a planar surface - dropwise condensation - pressure gradient in condensing systems - methods of improving heat transfer coefficient in condensation

Module IV (13 hours)
Critical multiphase flows - mathematical models - critical flow criterion - compatibility conditions and their physical interpretation - experimental observations - propagation of small disturbances - pressure drop limitation effect - graphical representation of critical flow conditions
Text books
Collier J.G., *Convective Boiling and Condensation*, McGraw Hill

Reference books

Sessional work assessment
Two Tests = 30
Two Assignments = 20
Total marks = 50

University examination pattern
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Q V - 2 questions A and B of 15 marks each from module IV with choice to answer any one
2K6ME 706(P): INSTRUMENTATION LAB

3 hours practicals per week

Study on concepts of measurement, types of errors, accuracy, precision, hysteresis, least square curve fitting, study of Stroboscope, transducers, strain gauges, rotometer, slip gauges and various precision measuring instruments.

List of experiments

1. Calibration of Bourden tube pressure gauge.
2. Calibration of LVDT.
3. Calibration of Thermocouple.
5. Measurement of area by planimeter.
6. Preparation of psychrometric chart.
7. Statistical analysis of data.
10. Temperature measurement by pyrometer.
12. Determination of PH value.
13. Sound level measurement and analysis.
15. Analysis of exhaust gas of I C engines.
16. Velocity measurement by Pitot tube.
17. Flaw measurement using Rotometer.
19. Experiment on strain gauges.

Sessional work assessment

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<td>Total marks</td>
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</table>
This laboratory is expected to expose the students to the latest software packages related to the subjects covered during the course of B.Tech. in Mechanical Engineering. At least two experiments each from the four different modules need to be performed.

**Module 1**
Solving basic mathematical problems such as curve fitting, numerical differentiation & Integration and numerical solution of differential equations using C / C++ / FORTRAN /JAVA / MATLAB.

**Module II**
Modeling and analysis of basic structural engineering problems using software such as ANSYS and NISA.

**Module III**
Modeling and analysis of basic fluid dynamics and heat transfer problems using software such as FLUENT.

**Module IV**
Using discrete event simulation software such as ARENA / SIMULINK for solving production scheduling problems, queuing problems and for network analysis.
Using LINGO / LINDO for solving linear programming problems.

**Sessional work assessment**
Lab Practicals and Record = 35
Tests = 15
Total marks = 50
2K6ME 708(P): MINI PROJECT

4 hours per week

The project work can be a design project, experimental fabrication project or software development project on any of the topics of mechanical engineering interest - it can be allotted as a group project with groups consisting of three or four students.

The assessment of all the mini projects should be done by a committee consisting of three or four faculty members specialised in the various fields of Mechanical Engineering - the students will present their project work before the committee - the relative gradings and group average marks for the various projects will be fixed by the committee - the guide will award the marks for the individual students in the project maintaining the group average - each group will prepare the project report and submit to the department through the guide - the Head Of the Department will certify the copies and keep them in the departmental library.

Sessional work assessment

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2K6ME 709(P): PHYSICAL EDUCATION, HEALTH AND FITNESS

Introductory Lectures
Unit I. Health and Fitness: Modern concept of health and fitness, meaning, scope, need and importance of health, fitness and wellness.
Unit II. Exercise and Fitness: Means and methods of developing fitness. Importance of physical activities and exercises in developing and maintaining good health. Physical fitness and wellness.
Unit III. Sports and Physical education: Meaning and scope, role and importance of sports and games in the development of physical fitness and personality. Social values of sports. Rules of major games.

Practical Sessions
(All classes will be conducted after the normal working hours of the college)
50 sessions of minimum 1 hour duration each are envisaged (including Theory and Practical).
The student can opt for one of the following activities in line with the specific programme / schedule announced by the faculty.
Athletics, Badminton, Basketball, Cricket, Football, General Fitness, Hockey, Kabaddi, Table Tennis, Ball Badminton, Archery, Volley ball, Yoga (not all activities may be offered in a particular semester. More disciplines will be offered based on the availability of infrastructure and expertise).
In addition, health and fitness assessment such as Height, Weight, Resting Pulse Rate, BMI, Blood Pressure, Physical Fitness Tests assessing various motor qualities of each individuals will be carried out (optional - based on request).

Objectives
(a) Basically to inculcate awareness of health, general fitness and attitude to voluntary physical involvement.
(b) To promote learning of basic skills in sports activities and secondarily to pave the way for mastering some of the skills through continued future involvement

Scheme of assessment
The student will be continuously assessed on his performance on the field of play. There will not be minimum mark for pass or fail. Total 50 marks will be given assessing their attendance, regularity, punctuality and performance for 50 hours of activity from 1st semester to 7th semester.
# EIGHTH SEMESTER

<table>
<thead>
<tr>
<th>Code</th>
<th>Subject</th>
<th>Hours/Week</th>
<th>Sess</th>
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<td>Refrigeration and Air conditioning</td>
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Aggregate marks for 8 semesters

|                        | **15** | **5** | **10** | **400** | - | **5400** |

* 25 Marks is allotted for Industrial Training

**ELECTIVE-111**

2K6ME 805(A) : FINITE ELEMENT ANALYSIS

2K6ME 805(B) : NEURAL NETWORKS AND FUZZY LOGIC

2K6ME 805(C) : COMPUTATIONAL FLUID MECHANICS AND HEAT TRANSFER

2K6ME 805(D) : SYSTEM SIMULATION AND MODELING

2K6ME 805(E) : QUALITY ENGINEERING AND MANAGEMENT
2K6ME 801 : GAS DYNAMICS
3 hours lecture & 1 hour tutorial per week

Module 1

Module 11
Equations for compressible, one-dimensional duct flows. Sonic Velocity and Mach Number, Wave Propagation, Equations for Perfect Gases in terms of Mach Number, h-s and T-s Diagrams. Steady one dimensional isentropic flow with area change – Governing equations, effect of area change on flow properties, limiting conditions (choking), governing equation for the isentropic flow of a perfect gas, isentropic flow tables for a perfect gas, effect of area change on the flow properties, the converging nozzle. Effect of varying the back pressure and inlet pressure. Converging diverging or De Laval nozzle

Module 111

Module 1IV
Steady one dimensional adiabatic flow with friction in a constant area duct – governing equations, Fanno line, Fanno line equation for perfect gas, friction parameter, relationship between duct length and Mach number, entropy change caused by friction, effect of friction on flow properties, Fanno line tables.
Steady one dimensional flow with heat transfer in a constant area duct – governing equations, Rayleigh line, intersection of Fanno line and Rayleigh line, Rayleigh line equations for a perfect gas, relationship between heat transfer, stagnation temperature and Mach number, effect of heat transfer on flow properties, Rayleigh line tables.
Text books

Sessional work assessment
Two Tests = 30
Two Assignments = 20
Total marks = 50

University examination pattern
Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions A and B of 15 marks each from module I with choice to answer any one
Q III - 2 questions A and B of 15 marks each from module II with choice to answer any one
Q IV - 2 questions A and B of 15 marks each from module III with choice to answer any one
Q V - 2 questions A and B of 15 marks each from module IV with choice to answer any one
2K6ME 802: REFRIGERATION AND AIR CONDITIONING

3 hours lecture & 1 hour tutorial per week

MODULE I (12 hours)
Introduction to refrigeration-unit of refrigeration-refrigerator and heat pump-coefficient of performance-reversed Carnot cycle-pressure enthalpy diagram-vapour compression refrigeration cycle-analysis of practical vapour compression cycle-non conventional refrigeration systems-thermo electric refrigeration-vortex tube-pulse tube refrigeration-refrigerant mixtures-cooling by adiabatic demagnetization

MODULE II (12 hours)
Steam jet refrigeration-analysis of steam jet refrigeration system-components-advantages and limitations-air refrigeration systems-thermodynamic analysis of bell coleman cycle-application to air craft refrigeration-absorption refrigeration systems-principle and operation of aqua ammonia and lithium-bromide water systems-electrolux system-comparison between vapour compression and absorption systems-introduction to adsorption refrigeration system-MEMS cooling systems

MODULE III (14 hours)

MODULE IV (14 hours)
Psychrometry-psychrometric properties and relations-psychrometric chart-psychrometric processes-summer air conditioning system-winter air conditioning system-year round air conditioning system-central air conditioning system-unitary air conditioning system-direct
expansion system-all water system-all air system-air water system-design procedure for air conditioning systems-estimation of air conditioning load-noise and noise control-refrigeration and air conditioning controls-high pressure and low pressure cutout-high side and low side float valve-flow regulating devices-thermostats-humidstats

**Text Book:**

**Reference Books:**
1. Roy J Doosat, “Principles of Refrigeration.”, Pearson Education
2. C.P Arora, “Refrigeration and Air Conditioning.”, TMH

**Sessional work assessment**
Two tests = 30
Two assignments = 20
Total marks = 50

**University examination pattern**
Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions A and B of 15 marks each from module I with choice to answer any one
Q III - 2 questions A and B of 15 marks each from module II with choice to answer any one
Q IV - 2 questions A and B of 15 marks each from module III with choice to answer any one
Q V - 2 questions A and B of 15 marks each from module IV with choice to answer any one
Module I (13 Hours)

**Design of clutches & brakes** – friction clutches and brakes – uniform pressure and uniform wear assumptions – design of disc and cone types of clutches and brakes – design of external contracting and internal expanding elements – band type clutches and brakes – centrifugal clutches

**Design of belts and chain drives** – belt and chain drives of common types – design of flat and V belt drives Selection of roller chains

Module II (13 Hours)


Module III (13 Hours)


Module IV (13 Hours)

drawings for manufacture of parts with complete specifications including manufacturing details like tolerance – surface finish etc. – computer applications in the preparation for working drawings.

**Text book**

**Reference books**

**Data hand books** (allowed for reference during examinations)

**Sessional work assessment**
Two tests = 30
Two assignments = 20
Total marks = 50

**University examination pattern**
Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions A and B of 15 marks each from module I with choice to answer any one
Q III - 2 questions A and B of 15 marks each from module II with choice to answer any one
Q IV - 2 questions A and B of 15 marks each from module III with choice to answer any one
Q V - 2 questions A and B of 15 marks each from module IV with choice to answer any one
Module I (12 hours)
Supply chain management (SCM) - concept of logistics and SCM - decision phases - design, planning and operation - decision areas - type of supply chain views - flows in supply chain - supply chain and competitive performance - performance measures for SCM - strategic fit - drivers of supply chain

Module II (12 hours)
Sourcing and procurement - sourcing - factors in source selection - vendor rating - qualitative and quantitative methods - purchasing - objectives and procedure - purchasing systems - tender method - computer based systems/EDI - inventory concept - functions of inventory - selective inventory control techniques - structure of inventory problem - costs associated with materials management - relevant costs

Module III (14 hours)
Independent demand items - probabilistic - single order quantities - payoff matrix - incremental analysis - mathematical formulation of discrete and continuous cases - independent demand items - deterministic and dynamic - deterministic inventory models without and with backordering - sensitivity analysis - quantity discount - all units and incremental discounts

Module IV (14 hours)
Independent demand items - probabilistic and dynamic inventory models - Q and P system models - dependent demand items - deterministic models - lot sizing models - lot by lot - EOQ - part period balancing - wagner-whitin method - concept of just-in-time - kanban - introduction to distribution requirement planning
Text books

Reference books
3. Narasimhan S.L., Mcleavy D.W. & Billington P.J., *Production Planning and Inventory Control*, Prentice Hall of India

Sessional work assessment
Two tests = 30
Two assignments = 20
Total marks = 50

University examination pattern
Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions A and B of 15marks each from module I with choice to answer any one
Q III - 2 questions A and B of 15marks each from module II with choice to answer any one
Q IV - 2 questions A and B of 15marks each from module III with choice to answer any one
Q V - 2 questions A and B of 15marks each from module IV with choice to answer any one
Module I (13 hours)

Module II (11 hours)
Finite element analysis of one dimensional problems - procedure - one dimensional elements and interpolation functions - analysis of one dimensional second and fourth order equations - approximation errors in the finite element method - computer implementation

Module III (15 hours)
Finite element analysis of two dimensional problems - two dimensional elements and interpolation functions - second order equations involving a scalar valued function - comments on mesh generation and composition of boundary conditions - analysis of plane elasticity and incompressible fluid flow problems - time dependent problems (transient heat transfer) - isoparametric elements and numerical integration

Module IV (13 hours)
Alternative formulations - least square formulation - mixed formulation - Eigenvalue problems - nonlinear problems - three dimensional elements and interpolation functions - formulation of three dimensional problems (two and three dimensional Navier-Stokes equations - three dimensional heat transfer equations)

Text books
Reference books

Sessional work assessment
Two tests = 30
Two assignments = 20
Total marks = 50

University examination pattern
Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions A and B of 15 marks each from module I with choice to answer any one
Q III - 2 questions A and B of 15 marks each from module II with choice to answer any one
Q IV - 2 questions A and B of 15 marks each from module III with choice to answer any one
Q V - 2 questions A and B of 15 marks each from module IV with choice to answer any one
2K6ME  805(B):  NEURAL NETWORKS & FUZZY LOGIC

3 hours lecture and 1 hour tutorial per week

Module I (13 hours)
**Introduction to artificial neural networks** - biological neurons - Mc Culloch and Pitts models of neuron - types of activation function - network architectures - knowledge representation - learning process - error-correction learning - supervised learning - unsupervised learning - single unit mappings and the perceptron - perceptron convergence theorem (with out proof) - method of steepest descent - least mean square algorithms - adaline/medaline units - multilayer perceptrons - derivation of the back-propagation algorithm

Module II (13 hours)

Module III (13 hours)
**Fuzzy logic** - fuzzy sets - properties - operations on fuzzy sets - fuzzy relations - operations on fuzzy relations - the extension principle - fuzzy measures - membership functions - fuzzification and defuzzification methods - fuzzy controllers - Mamdani and Sugeno types - design parameters - choice of membership functions - fuzzification and defuzzification methods - applications

Module IV (13 hours)
**Introduction to genetic algorithm and hybrid systems** - genetic algorithms - natural evolution - properties - classification - GA features - coding - selection - reproduction - cross over and mutation operators basic GA and structure

**Introduction to Hybrid systems** - concept of neuro-fuzzy and neuro-genetic system
Text books and Reference books
7. Suran Goonatilake & Sukhdev Khebbal (Eds.), “Intelligent Hybrid Systems”, John Wiley

Sessional work assessment
Two tests = 30
Two assignments = 20
Total marks = 50

University examination pattern
Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions of 15 marks each from module I with choice to answer any one
Q III - 2 questions of 15 marks each from module II with choice to answer any one
Q IV - 2 questions of 15 marks each from module III with choice to answer any one
Q V - 2 questions of 15 marks each from module IV with choice to answer any one
Module I (12 hours)
Classification of partial differential equations - system of first and second-order partial differential equations - initial and boundary conditions - finite difference formulations - finite difference equations - finite difference approximation of mixed partial derivatives

Module II (12 hours)
Parabolic partial differential equations - explicit methods - implicit methods - parabolic equations in two-space dimensions - consistency, stability, and error analysis of finite difference equations - artificial viscosity

Module III (12 hours)
Elliptic equations - finite difference formulations - solution algorithms - hyperbolic equations - finite difference formulations - splitting methods - multiple-step method

Module IV (16 hours)
Scalar representation of the navier - stokes equations - model equations - numerical algorithms - incompressible navier - stokes equations - primitive variable and vorticity - stream function formulations - poisson equation for pressure - numerical algorithms - boundary conditions - staggered grid

Text book
Hoffmann Klaus A., "Computational Fluid Dynamics for Engineers - Volume I", Engineering Education System, Wichita

Reference books
Sessional work assessment

Computer run assignments = 20
Two tests = 30
Total = 50

University examination pattern

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions A and B of 15 marks each from module I with choice to answer any one
Q III - 2 questions A and B of 15 marks each from module II with choice to answer any one
Q IV - 2 questions A and B of 15 marks each from module III with choice to answer any one
Q V - 2 questions A and B of 15 marks each from module IV with choice to answer any one
2K6ME 805(D): SYSTEM SIMULATION AND MODELING
3 hours lecture and 1 hour tutorial per week

MODULE I (14 hours)
System concepts-systems and system environment-component of a system-discrete and continuous systems-types of system study-system analysis-system design and system postulation-system models-types of models-system simulation-steps in a simulation study-comparison of simulation and analytical models-Monte Carlo simulation—examples of simulation of single server queuing system and simple inventory systems-concepts in discrete event system simulation-event scheduling/time advance algorithms-modeling world views.

MODULE II (12 hours)

MODULE III (13 hours)

MODULE IV (13 hours)
Simulation modelling and analysis of manufacturing systems-objectives-performance measures-issues in simulation of manufacturing systems-simulation of simple job shop manufacturing systems-introduction to simulation software for manufacturing applications-salient features of simulation languages such as general purpose simulation systems(GPSS),
and simulation language for alternative modelling (SLAM) - salient features of simulators such as WITNESS and Arena.

**Text book**

**Reference books**

**Sessional work assessment**
Two tests = 30
Two assignments = 20
Total marks = 50

**University examination pattern**
Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions A and B of 15 marks each from module I with choice to answer any one
Q III - 2 questions A and B of 15 marks each from module II with choice to answer any one
Q IV - 2 questions A and B of 15 marks each from module III with choice to answer any one
Q V - 2 questions A and B of 15 marks each from module IV with choice to answer any one
Module I (10 hours)
Introduction to the concept of quality - quality control - quality assurance - quality management - quality and total quality - small q and big Q - concept of total quality management - TQM axioms - major contributions of deming, juran and crossby to quality management - enablers for total quality - strategic quality management

Module II (10 hours)

Module III (10 hours)
Customer needs and product quality - market research - product design - quality function deployment - reliability - reliability goals - failure mode, effect, and criticality analysis - design for safety - error proofing design for manufacturability - manufacturing planning for quality - quality responsibilities on the factory floor - total employee involvement and empowerment - benchmarking - continuous improvement strategies - kaizen approach

Module IV (11 hours)
Statistical tools in quality - making predictions using the normal, poisson and binomial probability distributions - statistical process control - control charts for variables - $\overline{X}$, R and $\sigma$ charts - process capability indices - control charts for attributes - P, np, c and u charts

Module V (11 hours)
Acceptance sampling - lot by lot acceptance using single sampling by attributes - OC curve - average outgoing quality and the AOQL - double sampling - multiple and sequential sampling - dodge - romig sampling tables - ATI and AFI - introduction to life testing and reliability
Text books
4. Logothetis N., “Managing for Total Quality”, Prentice Hall of India Private Limited

Sessional work assessment
Two tests = 30
Two assignments = 20
Total marks = 50

University examination pattern
Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions A and B of 15 marks each from module I with choice to answer any one
Q III - 2 questions A and B of 15 marks each from module II with choice to answer any one
Q IV - 2 questions A and B of 15 marks each from module III with choice to answer any one
Q V - 2 questions A and B of 15 marks each from module IV with choice to answer any one
2K6ME  806(P): SEMINAR

4 hours per week

Individual students should be asked to choose a topic in any field of mechanical engineering, preferably from outside the B.Tech syllabus and give a seminar on that topic for about thirty minutes - a committee consisting of at least three faculty members (preferably specialised in different fields of mechanical engineering) will assess the presentation of the seminars and award the marks to the students - each student should be asked to submit two copies of a write up of his seminar talk - one copy should be returned to the student after duly certifying it by the H O D and the other kept in the departmental library

Sessional work assessment

Presentation = 30
Report = 20
Total marks = 50
The project work can be a Modeling and Simulation, Case study, Design or Experiments in the field of Mechanical Engineering. It can be allotted as a group project with groups consisting of 3 to 4 students. The project work started in the seventh semester (mini project) may be continued in this semester - the students should complete the project work in this semester and present it before the assessment committee. The assessment committee will assess the various projects, fix the relative grading and group average marks - the guides will award the marks for the individual students in a project maintaining the group average - each group should submit the copies of the completed project report signed by the guide (in the format prescribed by the department) to the department - the Head Of the Department will certify the copies and return them to the students - one copy will be kept in the departmental library. All students should undergo Industrial Training Programme either by attending a training programme for a minimum of 5 days in a Registered Industry / Research Institute or by visiting at least 5 reputed Industries / Engg Establishments. They have to submit a report of the Industrial Training Programme. A maximum of 25 marks will be awarded for the Industrial Training.

**Sessional work assessment**

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<td>Project Work</td>
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<td>Industrial Training</td>
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<td>Total marks</td>
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There is only university examination for VIVA VOCE - the university will appoint examiners for conducting the viva voce examination - the examiners will ask questions from subjects studied for the B.Tech. Course, Mini Project, Project and Industrial Training and Seminar etc. The relative weightage will be as follows:

<p>| | |</p>
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<td>Subjects</td>
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<td>Mini Project</td>
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<td>Project and Industrial Training</td>
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<td>Seminar</td>
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<td>Total marks</td>
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KANNUR UNIVERSITY

FACULTY OF ENGINEERING

Curricula, Scheme of Examinations and Syllabi
for
B.Tech Degree(Part-Time) Programme in
MECHANICAL ENGINEERING
V11 and V111 Semesters
With Effect From 2007 Admissions
## SEVENTH SEMESTER

<table>
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### ELECTIVE-11

- 2K6PTME 705 (A) MARKETING MANAGEMENT
- 2K6PTME 705 (B) OPTIMIZATION TECHNIQUES
- 2K6PTME 705 (C) INDUSTRIAL PSYCHOLOGY
- 2K6PTME 705 (D) ADVANCED FLUID MECHANICS
- 2K6PTME 705 (E) MULTIPHASE FLOW
Module I (13 hours)

Module II (13 hours)
Uncertainty in “computed quantities” from measured values - estimation of permissible uncertainties of instruments for specific purposes - potentiometer transducer as a zero order instrument - analysis of its loading error - mercury-in-glass thermometer as a first order instrument - step, ramp and frequency response of first order instruments - problems - seismic instrument as a second order instrument - step, terminated ramp, ramp and frequency response of second order instruments - slip gages - assembling the blocks - temperature problems - LVDT - comparators: principle of working of mechanical, electrical, pneumatic comparators - measurement of strain: strain gauge classification - unbonded and bonded strain gauges - gage factor - strain gauge rosettes - selection and installation of bonded gauges - ballast, DC bridges and constant current circuits - temperature compensation – calibration

Module III (13 hours)
Measurement of force: multiple lever system for weighing - strain gauge load cells - temperature sensitivity-ballistic weighing-hydraulic & pneumatic load cells-measurement of torque: water brake Heenan & Froude hydraulic dynamometer - general purpose electric dynamometer - measurement of temperature: pressure thermometers-RTDs-compensation for lead resistance-thermistors - thermocouples - series in parallel connected thermocouples -
materials used and there ranges - pyrometry-infrared pyrometry - air pollution measurement: gas chromatography - Orsat’s apparatus - nuclear instrumentation: Gieger Muller counter - ionisation chamber - scintillation counters

**Module IV (13 hours)**


**Text Books and References**


**Sessional work assessment**

Two assignments = 20
Two tests = 30
Total marks = 50

**University examination pattern**

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions A and B of 15 marks each from module I with choice to answer any one
Q III - 2 questions A and B of 15 marks each from module II with choice to answer any one
Q IV - 2 questions A and B of 15 marks each from module III with choice to answer any one
Q V - 2 questions A and B of 15 marks each from module IV with choice to answer any one
Module I (14 hours)
Management concepts - system concepts of management - management functions - planning - principles of planning - organizing - organization structures - principles of organizing - span of control - delegation - leadership - directing - controlling
Decision making - strategic and tactical decisions - models of decision making - single stage decisions under risk - multi stage decision making - decision trees - decision making under uncertainty - Baye’s decision theory - equally likely - minimax - maximum likelihood - maximin criterion –

Module II (12 hours)
Network techniques - basic concepts - network construction - CPM and PERT networks - algorithm for critical path - slacks and their significance - crashing - network flow problems - the shortest route problem - minimal spanning tree problem - maximal flow in capacitated network

Module III (14 hours)

Module IV (12 hours)
Human resources management - job design - job enrichment - job enlargement - job evaluation - merit rating - wages and incentives - work study - method study - time study - work sampling.
Costing - cost concepts - concept of cost accounting - elements of cost - overhead costs - methods of allocation of overhead costs - depreciation - methods of depreciation - financial
management - time value of money - comparison of alternatives - payback period method -
net present value method - internal rate of return method - basics of financial accounting -
profit and loss account - balance sheet preparation

**Text books**

**Reference books**

**Sessional work assessment**
- Two assignments = 20
- Two tests = 30
- Total marks = 50

**University examination pattern**
- Q I - 8 short type questions of 5 marks each, 2 from each module
- Q II - 2 questions A and B of 15marks each from module I with choice to answer any one
- Q III - 2 questions A and B of 15marks each from module II with choice to answer any one
- Q IV - 2 questions A and B of 15marks each from module III with choice to answer any one
- Q V - 2 questions A and B of 15marks each from module IV with choice to answer any one
Module I (13 Hours)

**Introduction to design** - Steps in design process – Design factors – Tolerances & fits – principles of standardization – Codes & standards – Selection of materials

**Introduction to Computer aided design** – Introduction to modeling, drafting, simulation and analysis software packages.

**Stress & Strength considerations of mechanical elements** – Stress concentration

Theories of failure – Impact load – Fatigue loading – consideration of creep and thermal stresses in design.

Module II (13 Hours)


**Keys** – types of keys and pins – stresses in keys and pins – design of keys – design of cotter and pin joints

**Riveted Joints** – stresses in riveted joints – strength analysis – boiler and tank joints – structural joints

Module III (13 Hours)

**Welded joints** – types of welded joints – stresses in butt and fillet welds – torsion and bending in welded joints- welds subject to fluctuating loads – design of welded machine parts and structural joints.

**Springs** – Stresses in helical springs- deflection of helical springs – extension, compression and torsion springs- design of helical springs for static and fatigue loading – critical frequency of helical springs – stress analysis and design of leaf springs
Module IV (13 Hours)


Text books:


Reference books:

1 Stegel, Maleev & Hartman, Mechanical Design of Machines, International Book Company


5 M F Spotts, T E Shoup, Design of Machine elements, Prentice Hall


Data hand books (allowed for reference during examinations)


Sessional work assessment
Two tests = 30
Two assignments = 20
Total marks = 50

University examination pattern
Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions A and B of 15 marks each from module I with choice to answer any one
Q III - 2 questions A and B of 15 marks each from module II with choice to answer any one
Q IV - 2 questions A and B of 15 marks each from module III with choice to answer any one
Q V - 2 questions A and B of 15 marks each from module IV with choice to answer any one
2K6PTME 704 POWER PLANT ENGINEERING

2 hours lecture per week

MODULE I (12 hours)
Steam engineering-temperature entropy diagram-mollier diagram-rankine cycle-modified rankine cycle-reheat and regenerative-binary vapour cycle-steam generators-classifications-cochran boiler-lancashire boiler-cornish boiler-locomotive boiler-babcock and wilcox boiler-stirling boiler-high pressure boilers-boiler mountings and accessories

MODULE II (12 hours)
Steam nozzles-flow through steam nozzles-throat pressure for maximum discharge- effect of friction-super saturated flow-steam turbines-impulse and reaction turbines-velocity diagram-condition for maximum efficiency-compounding-reheat factor-blade height-governing of steam turbines-cogeneration and combined cycle power generation-steam engines-components-compounding-indicator diagram

MODULE III (16 hours)
Thermal power plants-general layout-site selection-fuel handling storage and burning systems-dust and ash handling system-chimney draught-nuclear power plants-classification-components-safety measures-effects of nuclear radiation-nuclear waste disposal-gas turbine power plants-classification-closed open and other systems-hydro electric power plants-combined operation of different power plants-non conventional power generation-solar thermal collection-thermal storage-ocean power-principle of OTEC systems-wind energy-wind turbine-geothermal energy-geothermal electrical power plants-biogas energy-biogas production-design and construction of biogas plants

MODULE IV (12 hours)
Economics of power generation-terms and definitions-estimation of load-load curve-load factor-diversity factor-capacity factor-use factor-economics in plant selection-economics of generation and distribution of power-useful life-tariff for electrical energy-environmental pollution and its control-steam power plant pollutants-control of pollutants-control of particulate matter-control of SO$_2$- control of NO$_2$-control of waste water from steam power plants-pollution from nuclear power plants-noise pollution and noise control
Text Book:


Reference Books:
1. Nag, “Power Plant Engineering” TMH
2. Ngpal, “Power Plant Engineering” Khanna
3. Vapat & Scrotsky, “Power Station Engineering and Economy” TMH
4. John F Lee, “Power Station Engineering and Economy” TMH

Sessional work Assessment

Two Tests =30
Two Assignments =20
Total Marks =50

University examination pattern
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Q IV - 2 questions A and B of 15 marks each from module III with choice to answer any one
Q V - 2 questions A and B of 15 marks each from module IV with choice to answer any one
Module I (14 hours)
Introduction to marketing - concept of market and marketing - marketing environment - controllable factors - factors directed by top management - factors directed by marketing - uncontrollable factors - demography, economic conditions, competition, social and cultural forces, political and legal forces, and technology

Module II (14 hours)
Marketing planning - marketing planning process - Boston consultancy group model - marketing mix - marketing mix variables - market segmentation and market targeting - introduction to segmentation - targeting and product positioning

Module III (12 hours)
Marketing research - need and scope - marketing research process - research objectives, developing research plan, collecting information, analysis, and findings - consumer behaviour - factors influencing consumer behaviour - perceived risks - product life cycle - marketing strategies for different stages of product life cycle

Module IV (12 hours)
Marketing communication - marketing mix variables - steps in developing effective communication - identification of target audience - determination of communication objectives - designing the message - selecting the communication channels - promotion mix evaluation - advertising and sales promotion - factors in advertising - sales promotion tools

Text books
Reference books
3 Robert, *Marketing Research*, Prentice Hall of India

Sessional work assessment
Two Tests = 30
Two Assignments = 20
Total marks = 50

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Q I - 8 short type questions of 5 marks each, 2 from each module
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Q V - 2 questions A and B of 15 marks each from module IV with choice to answer any one
2K6PTME 705 (B): OPTIMIZATION TECHNIQUES

2 hours lecture per week

**MODULE I:** Linear Programming I (14 hours)

**MODULE II:** Linear Programming II (14 hours)

**MODULE III:** Non-linear Programming (13 hours)

**MODULE IV:** Dynamic Programming and Metaheuristics (13 hours)
Introduction to Genetic Algorithm-steps-coding and selection-reproduction-cross over and mutation

**Text books and Reference books**
3. Hadley G., ‘Linear Programming’, Addison Wesley


**Sessional work assessment**

Two Tests = 30
Two Assignments = 20
Total marks = 50

**University examination pattern**

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions A and B of 15 marks each from module I with choice to answer any one
Q III - 2 questions A and B of 15 marks each from module II with choice to answer any one
Q IV - 2 questions A and B of 15 marks each from module III with choice to answer any one
Q V - 2 questions A and B of 15 marks each from module IV with choice to answer any one
Module I (13 hours)
Introduction - psychology as a science - areas of applications - study of individual - individual differences - study of behavior - stimulus - response behavior - heredity and environment - human mind - cognition - character - thinking - attention - memory - emotion - traits - attitude - personality

Module II (13 hours)
Organizational behavior - definition - development - fundamental concept - nature of people - nature of organization - an organizational behavior system - models - autocratic model - hybrid model - understanding a social - system social culture - managing communication - downward, upward and other forms of communication

Module III (13 hours)
Motivation - motivation driver - human needs - behavior modification - goal setting - expectancy model - comparison models - interpreting motivational models - leadership - path goal model - style - contingency approach

Module IV (13 hours)
Special topics in industrial psychology - managing group in organization - group and inter group dynamics - managing change and organizational development - nature planned change - resistance - characteristic of OD - OD process.

Text books
1 Keith Davis & Newstrom J.W., "Human Behavior At Work", McGraw Hill International
5 Blum M.L. & Naylor J.C., Horper & Row, "Industrial Psychology", CBS Publisher
Sessional work assessment
Two Tests = 30
Two Assignments = 20
Total marks = 50

University examination pattern
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Q III - 2 questions A and B of 15 marks each from module II with choice to answer any one
Q IV - 2 questions A and B of 15 marks each from module III with choice to answer any one
Q V - 2 questions A and B of 15 marks each from module IV with choice to answer any one
MODULE I: (13 hours)
Basic equations of fluid flow: Reynolds transport equation-integral and differential formations-integral form of equations of the continuity-momentum and energy equations-use of integral equation-differential form of these equations-Stoke’s postulates and constitutive equations-Navier-Stokes equations and energy equations for Newtonian fluids.
Non dimensionalisation of the equations of motion and order of magnitude analysis: Choice of characteristic quantities-identification of the non dimensional parameters-classification of flows based on the characteristic Reynolds number-approximate equations for low Re and high Re flows and boundary layer equations-boundary equations.

MODULE II: (13 hours)
Some exact solutions of the Navier-Stokes equations: Couette flows-plane Poisseuille-flow between rotating cylinders-Stokes problems-fully developed flow through circular and non-circular pipes
Approximate solutions: Creeping flow past a sphere-theory of hydrodynamic lubrication-boundary layer on a flat plate-Blassius solution and use of momentum integral equation.

MODULE III: (14 hours)
Introduction to compressible flows: Basic concepts-equations for one dimensional flow through steam tubes-speed of sound and Mach number-qualitative difference between incompressible, subsonic and supersonic flows-characteristic velocities-adiabatic flow ellipse
Isentropic flow through a duct: Criterion for acceleration and deceleration-stagnation quantities-isentropic relations-use of gas tables-operation of nozzles at off design conditions.
Normal shocks in one dimensional flow: Occurrence of shocks-analysis of normal shocks-Prandtl’s equation-Rankine-Hugoniot equation and other normal shock relations-moving shocks.

MODULE IV: (12 hours)
Flow with friction: Fanno lines and Fanno flow relations-effect of friction on properties-choking-isothermal flows.
Flow with heat transfer: Rayleigh lines-effect of heat addition-thermal choking

**Text books and Reference books**

2. Rathakrishnan E., *Gas Dynamics*, Prentice Hall India

**Sessional work assessment**

Two Tests = 30
Two Assignments = 20
Total marks = 50

**University examination pattern**

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Q III - 2 questions A and B of 15 marks each from module II with choice to answer any one
Q IV - 2 questions A and B of 15 marks each from module III with choice to answer any one
Q V - 2 questions A and B of 15 marks each from module IV with choice to answer any one
Module I (13 hours)
Basic equations and empirical correlations for multi-phase flow - flow patterns - identification and classification - flow pattern maps and transition - momentum and energy balance - homogeneous and separated flow models - correlations for use with homogeneous and separated flow models - two phase flow through inclined pipes and singularities - void fraction and slip ratio correlations - influence of pressure gradient - empirical treatment of two phase flow - drift flux model - correlations for bubble, slug and annular flows - pressure losses through enlargements, contractions, orifices, bends and values

Module II (13 hours)
Boiling and multiphase heat transfer - vapour-liquid equilibrium mechanisms - pool boiling convective boiling - heat transfer in partial and fully developed sub-cooled boiling - void fraction and pressure drop in sub-cooled boiling - saturated boiling heat transfer - two phase forced convection laminar and turbulent flow solutions for film heat transfer - empirical equations for film boiling and transition boiling - burnout mechanism and correlations - critical coefficient in nucleate and convective boiling

Module III (13 hours)
Condensation - basic processes of condensation - mechanism of evaporation and condensation - film condensation on a planar surface - dropwise condensation - pressure gradient in condensing systems - methods of improving heat transfer coefficient in condensation

Module IV (13 hours)
Critical multiphase flows - mathematical models - critical flow criterion - compatibility conditions and their physical interpretation - experimental observations - propagation of small disturbances - pressure drop limitation effect - graphical representation of critical flow conditions
Text books
Collier J.G., *Convective Boiling and Condensation*, McGraw Hill

Reference books

Sessional work assessment
Two Tests = 30
Two Assignments = 20
Total marks = 50

University examination pattern
Q I - 8 short type questions of 5 marks each, 2 from each module
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Q III - 2 questions A and B of 15 marks each from module II with choice to answer any one
Q IV - 2 questions A and B of 15 marks each from module III with choice to answer any one
Q V - 2 questions A and B of 15 marks each from module IV with choice to answer any one
Study on concepts of measurement, types of errors, accuracy, precision, hysteresis, least square curve fitting, study of Stroboscope, transducers, strain gauges, rotometer, slip gauges and various precision measuring instruments.

**List of experiments**

1. Calibration of Bourden tube pressure gauge.
2. Calibration of LVDT.
3. Calibration of Thermocouple.
5. Measurement of area by planimeter.
6. Preparation of psychrometric chart.
7. Statistical analysis of data.
10. Temperature measurement by pyrometer.
12. Determination of PH value.
13. Sound level measurement and analysis.
15. Analysis of exhaust gas of I C engines.
16. Velocity measurement by Pitot tube.
17. Flaw measurement using Rotometer.
19. Experiment on strain gauges.

**Sessional work assessment**

<table>
<thead>
<tr>
<th>Component</th>
<th>Marks</th>
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<tbody>
<tr>
<td>Lab Practicals and Record</td>
<td>35</td>
</tr>
<tr>
<td>Tests</td>
<td>15</td>
</tr>
<tr>
<td>Total marks</td>
<td>50</td>
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</tbody>
</table>
2K6PTME 707(P): COMPUTATIONAL LAB

3 hours practicals per week

This laboratory is expected to expose the students to the latest software packages related to the subjects covered during the course of B.Tech. in Mechanical Engineering. At least two experiments each from the four different modules need to be performed.

Module 1
Solving basic mathematical problems such as curve fitting, numerical differentiation & Integration and numerical solution of differential equations using C / C++ / FORTRAN /JAVA / MATLAB.

Module II
Modeling and analysis of basic structural engineering problems using software such as ANSYS and NISA.

Module III
Modeling and analysis of basic fluid dynamics and heat transfer problems using software such as FLUENT.

Module IV
Using discrete event simulation software such as ARENA / SIMULINK for solving production scheduling problems, queuing problems and for network analysis.
Using LINGO / LINDO for solving linear programming problems.

Sessional work assessment
Lab Practicals and Record = 35
Tests = 15
Total marks = 50
2K6PTME 708(P): MINI PROJECT

3 hours per week

The project work can be a design project, experimental fabrication project or software development project on any of the topics of mechanical engineering interest - it can be allotted as a group project with groups consisting of three or four students.

The assessment of all the mini projects should be done by a committee consisting of three or four faculty members specialised in the various fields of Mechanical Engineering - the students will present their project work before the committee - the relative gradings and group average marks for the various projects will be fixed by the committee - the guide will award the marks for the individual students in the project maintaining the group average - each group will prepare the project report and submit to the department through the guide - the Head Of the Department will certify the copies and keep them in the departmental library.

Sessional work assessment

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<table>
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<tbody>
<tr>
<td>Presentation</td>
<td>30</td>
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<tr>
<td>Report</td>
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</tr>
<tr>
<td>Total marks</td>
<td>50</td>
</tr>
</tbody>
</table>
Introductory Lectures

Unit I. Health and Fitness: Modern concept of health and fitness, meaning, scope, need and importance of health, fitness and wellness.

Unit II. Exercise and Fitness: Means and methods of developing fitness. Importance of physical activities and exercises in developing and maintaining good health. Physical fitness and wellness.

Unit III. Sports and Physical education: Meaning and scope, role and importance of sports and games in the development of physical fitness and personality. Social values of sports. Rules of major games.

Practical Sessions

(All classes will be conducted after the normal working hours of the college)

50 sessions of minimum 1 hour duration each are envisaged (including Theory and Practical). The student can opt for one of the following activities in line with the specific programme/schedule announced by the faculty.

Athletics, Badminton, Basketball, Cricket, Football, General Fitness, Hockey, Kabaddi, Table Tennis, Ball Badminton, Archery, Volley ball, Yoga (not all activities may be offered in a particular semester. More disciplines will be offered based on the availability of infrastructure and expertise).

In addition, health and fitness assessment such as Height, Weight, Resting Pulse Rate, BMI, Blood Pressure, Physical Fitness Tests assessing various motor qualities of each individuals will be carried out (optional - based on request).

Objectives

(b) Basically to inculcate awareness of health, general fitness and attitude to voluntary physical involvement.

(b) To promote learning of basic skills in sports activities and secondarily to pave the way for mastering some of the skills through continued future involvement

Scheme of assessment

The student will be continuously assessed on his performance on the field of play. There will not be minimum mark for pass or fail. Total 50 marks will be given assessing their attendance, regularity, punctuality and performance for 50 hours of activity from 1st semester to 7th semester.
# EIGHTH SEMESTER

<table>
<thead>
<tr>
<th>Code</th>
<th>Subject</th>
<th>Hours/Week</th>
<th>Sess</th>
<th>University Exam</th>
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<tr>
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<td>Gas Dynamics</td>
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<td>Refrigeration and Air conditioning</td>
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<td>Machine Design II</td>
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<tr>
<td>2K6PTME 804</td>
<td>Inventory and Supply Chain Management</td>
<td>2</td>
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<td>2K6PTME 805</td>
<td>Elective III</td>
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<td>2K6PTME 806(P)</td>
<td>Seminar</td>
<td>-</td>
<td>-</td>
<td>3</td>
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<tr>
<td>2K6PTME 807(P)</td>
<td>Project and Industrial Training</td>
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<td>-</td>
<td>3</td>
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<tr>
<td>2K6PTME 808(P)</td>
<td>Viva Voce</td>
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**TOTAL**

**Aggregate marks for 8 semesters**

\[
\text{=8300} \\
\text{2900} \quad \text{5400}
\]

* 25 Marks is allotted for Industrial Training

**ELECTIVE-111**

2K6PTME 805(A) : FINITE ELEMENT ANALYSIS

2K6PTME 805(B) : NEURAL NETWORKS AND FUZZY LOGIC

2K6PTME 805(C) : COMPUTATIONAL FLUID MECHANICS AND HEAT TRANSFER

2K6PTME 805(D) : SYSTEM SIMULATION AND MODELING

2K6PTME 805(E) : QUALITY ENGINEERING AND MANAGEMENT
Module 1

Module 11
Equations for compressible, one-dimensional duct flows. Sonic Velocity and Mach Number, Wave Propagation, Equations for Perfect Gases in terms of Mach Number, h-s and T-s Diagrams. Steady one dimensional isentropic flow with area change – Governing equations, effect of area change on flow properties, limiting conditions (choking), governing equation for the isentropic flow of a perfect gas, isentropic flow tables for a perfect gas, effect of area change on the flow properties, the converging nozzle. Effect of varying the back pressure and inlet pressure. Converging diverging or De Laval nozzle

Module 111

Module 1IV
Steady one dimensional adiabatic flow with friction in a constant area duct – governing equations, Fanno line, Fanno line equation for perfect gas, friction parameter, relationship between duct length and Mach number, entropy change caused by friction, effect of friction on flow properties, Fanno line tables.
Steady one dimensional flow with heat transfer in a constant area duct – governing equations, Rayleigh line, intersection of Fanno line and Rayleigh line, Rayleigh line equations for a perfect gas, relationship between heat transfer, stagnation temperature and Mach number, effect of heat transfer on flow properties, Rayleigh line tables.
**Text books**

**Sessional work assessment**
- Two Tests = 30
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- Total marks = 50

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- Q V - 2 questions A and B of 15 marks each from module IV with choice to answer any one
MODULE I (12 hours)
Introduction to refrigeration-unit of refrigeration-refrigerator and heat pump-coefficient of performance-reversed Carnot cycle-pressure enthalpy diagram-vapour compression refrigeration cycle-analysis of practical vapour compression cycle-non conventional refrigeration systems-thermo electric refrigeration-vortex tube-pulse tube refrigeration-refrigerant mixtures-cooling by adiabatic demagnetization

MODULE II (12 hours)
Steam jet refrigeration-analysis of steam jet refrigeration system-components-advantages and limitations-air refrigeration systems-thermodynamic analysis of bell coleman cycle-application to air craft refrigeration-absorption refrigeration systems-principle and operation of aqua ammonia and lithium-bromide water systems-electrolux system-comparison between vapour compression and absorption systems-introduction to adsorption refrigeration system-MEMS cooling systems

MODULE III (14 hours)

MODULE IV (14 hours)
Psychrometry-psychrometric properties and relations-psychrometric chart-psychrometric processes-summer air conditioning system-winter air conditioning system-year round air conditioning system-central air conditioning system-unitary air conditioning system-direct
expansion system-all water system-all air system-air water system-design procedure for air conditioning systems-estimation of air conditioning load-noise and noise control-refrigeration and air conditioning controls-high pressure and low pressure cutout-high side and low side float valve-flow regulating devices-thermostats-humidstats

**Text Book:**

**Reference Books:**
1. Roy J Doosat, “Principles of Refrigeration.”, Pearson Education
2. C.P Arora, “Refrigeration and Air Conditioning.” TMH

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Module I (13 Hours)

**Design of clutches & brakes** – friction clutches and brakes – uniform pressure and uniform wear assumptions – design of disc and cone types of clutches and brakes – design of external contracting and internal expanding elements – band type clutches and brakes – centrifugal clutches

**Design of belts and chain drives** – belt and chain drives of common types – design of flat and V belt drives Selection of roller chains

Module II (13 Hours)


Module III (13 Hours)


Module IV (13 Hours)

details like tolerance – surface finish etc. – computer applications in the preparation for working drawings.

**Text book**


**Reference books**


**Data hand books** (allowed for reference during examinations)


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Q V - 2 questions A and B of 15 marks each from module IV with choice to answer any one
Module I (12 hours)
Supply chain management (SCM) - concept of logistics and SCM - decision phases - design, planning and operation - decision areas - type of supply chain views - flows in supply chain - supply chain and competitive performance - performance measures for SCM - strategic fit - drivers of supply chain

Module II (12 hours)
Sourcing and procurement - sourcing - factors in source selection - vendor rating - qualitative and quantitative methods - purchasing - objectives and procedure - purchasing systems - tender method - computer based systems/EDI - inventory concept - functions of inventory - selective inventory control techniques - structure of inventory problem - costs associated with materials management - relevant costs

Module III (14 hours)
Independent demand items - probabilistic - single order quantities - payoff matrix - incremental analysis - mathematical formulation of discrete and continuous cases - independent demand items - deterministic and dynamic - deterministic inventory models without and with backordering - sensitivity analysis - quantity discount - all units and incremental discounts

Module IV (14 hours)
Independent demand items - probabilistic and dynamic inventory models - Q and P system models - dependent demand items - deterministic models - lot sizing models - lot by lot - EOQ - part period balancing - wagner-whitin method - concept of just-in-time - kanban - introduction to distribution requirement planning
Text books
2. Tersine R.J., Principles of Inventory and Materials Management, Prentice-Hall Inc

Reference books
1. Christopher M., Logistics and Supply Chain Management, Pitman Publishing Company
2. John Mortimer (Editor), Logistics in Manufacturing: An IFS Executive Briefing, IFS Publications, U.K. & Springer-Verlag
3. Narasimhan S.L., Mcleavy D.W. & Billington P.J., Production Planning and Inventory Control, Prentice Hall of India
4. Raghuram G. & Rangaraj N., Logistics and Supply Chain Management: Cases and Concepts, Macmillan India Limited

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Q IV - 2 questions A and B of 15 marks each from module III with choice to answer any one
Q V - 2 questions A and B of 15 marks each from module IV with choice to answer any one
Module I (13 hours)

Module II (11 hours)
Finite element analysis of one dimensional problems - procedure - one dimensional elements and interpolation functions - analysis of one dimensional second and fourth order equations - approximation errors in the finite element method - computer implementation

Module III (15 hours)
Finite element analysis of two dimensional problems - two dimensional elements and interpolation functions - second order equations involving a scalar valued function - comments on mesh generation and composition of boundary conditions - analysis of plane elasticity and incompressible fluid flow problems - time dependent problems (transient heat transfer) - isoparametric elements and numerical integration

Module IV (13 hours)
Alternative formulations - least square formulation - mixed formulation - Eigenvalue problems - nonlinear problems - three dimensional elements and interpolation functions - formulation of three dimensional problems (two and three dimensional Navier-Stokes equations - three dimensional heat transfer equations)

Text books
Reference books

Sessional work assessment
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Q V - 2 questions A and B of 15 marks each from module IV with choice to answer any one
Module I (13 hours)

**Introduction to artificial neural networks** - biological neurons - Mc Culloch and Pitts
modals of neuron - types of activation function - network architectures - knowledge
representation - learning process - error-correction learning - supervised learning -
unsupervised learning - single unit mappings and the perceptron - perceptron convergence
theorem (with out proof) - method of steepest descent - least mean square algorithms -
adaline/medaline units - multilayer perceptrons - derivation of the back-propagation
algorithm

Module II (13 hours)

**Radial basis and recurrent neural networks** - RBF network structure - covers theorem and
the separability of patterns - RBF learning strategies - K-means and LMS algorithms -
comparison of RBF and MLP networks - recurrent networks - Hopfield networks - energy
function - spurious states - error performance - simulated annealing - the Boltzman machine -
Boltzman learning rule - the mean field theory machine - MFT learning algorithm -
applications of neural network - the XOR problem - traveling salesman problem - image
compression using MLPs - character retrieval using Hopfield networks

Module III (13 hours)

**Fuzzy logic** - fuzzy sets - properties - operations on fuzzy sets - fuzzy relations - operations
on fuzzy relations - the extension principle - fuzzy measures - membership functions -
fuzzification and defuzzification methods - fuzzy controllers - Mamdani and Sugeno types -
design parameters - choice of membership functions - fuzzification and defuzzification
methods - applications

Module IV (13 hours)

**Introduction to genetic algorithm and hybrid systems** - genetic algorithms - natural
evolution - properties - classification - GA features - coding - selection - reproduction - cross
over and mutation operators basic GA and structure

**Introduction to Hybrid systems** - concept of neuro-fuzzy and neuro-genetic system
Reference books

7. Suran Goonatilake & Sukhdev Khebbal (Eds.), “Intelligent Hybrid Systems”, John Wiley

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Q V - 2 questions of 15 marks each from module IV with choice to answer any one
Module I (12 hours)
Classification of partial differential equations - system of first and second-order partial differential equations - initial and boundary conditions - finite difference formulations - finite difference equations - finite difference approximation of mixed partial derivatives

Module II (12 hours)
Parabolic partial differential equations - explicit methods - implicit methods - parabolic equations in two-space dimensions - consistency, stability, and error analysis of finite difference equations - artificial viscosity

Module III (12 hours)
Elliptic equations - finite difference formulations - solution algorithms - hyperbolic equations - finite difference formulations - splitting methods - multiple-step method

Module IV (16 hours)
Scalar representation of the navier-stokes equations - model equations - numerical algorithms - incompressible navier-stokes equations - primitive variable and vorticity - stream function formulations - poisson equation for pressure - numerical algorithms - boundary conditions - staggered grid

Text book
Hoffmann Klaus A., "Computational Fluid Dynamics for Engineers - Volume I", Engineering Education System, Wichita

Reference books
2 Fletcher C.A.J., “Computational Techniques for Fluid Dynamics I, Springer Verlag
**Sessional work assessment**

Computer run assignments = 20  
Two tests = 30  
Total = 50  

**University examination pattern**

Q I - 8 short type questions of 5 marks each, 2 from each module  
Q II - 2 questions A and B of 15 marks each from module I with choice to answer any one  
Q III - 2 questions A and B of 15 marks each from module II with choice to answer any one  
Q IV - 2 questions A and B of 15 marks each from module III with choice to answer any one  
Q V - 2 questions A and B of 15 marks each from module IV with choice to answer any one
MODULE I (14 hours)
System concepts-systems and system environment-component of a system-discrete and continuous systems-types of system study-system analysis-system design and system postulation-system models-types of models-system simulation-steps in a simulation study-comparison of simulation and analytical models-Monte Carlo simulation—examples of simulation of single server queuing system and simple inventory systems-concepts in discrete event system simulation-event scheduling/time advance algorithms-modeling world views.

MODULE II (12 hours)

MODULE III (13 hours)

MODULE IV (13 hours)
Simulation modelling and analysis of manufacturing systems-objectives-performance measures-issues in simulation of manufacturing systems-simulation of simple job shop manufacturing systems-introduction to simulation software for manufacturing applications-salient features of simulation languages such as general purpose simulation systems(GPSS),
and simulation language for alternative modelling (SLAM)-salient features of simulators such as WITNESS and Arena.

Text book

Reference books

Sessional work assessment
Two tests = 30
Two assignments = 20
Total marks = 50

University examination pattern
Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions A and B of 15 marks each from module I with choice to answer any one
Q III - 2 questions A and B of 15 marks each from module II with choice to answer any one
Q IV - 2 questions A and B of 15 marks each from module III with choice to answer any one
Q V - 2 questions A and B of 15 marks each from module IV with choice to answer any one
Module I (10 hours)
Introduction to the concept of quality - quality control - quality assurance - quality management - quality and total quality - small q and big Q - concept of total quality management - TQM axioms - major contributions of deming, juran and crossby to quality management - enablers for total quality - strategic quality management

Module II (10 hours)

Module III (10 hours)
Customer needs and product quality - market research - product design - quality function deployment - reliability - reliability goals - failure mode, effect, and criticality analysis - design for safety - error proofing design for manufacturability - manufacturing planning for quality - quality responsibilities on the factory floor - total employee involvement and empowerment - benchmarking - continuos improvement strategies - kaizen approach

Module IV (11 hours)
Statistical tools in quality - making predictions using the normal, poisson and binomial probability distributions - statistical process control - control charts for variables - $\bar{X}$, R and $\sigma$ charts - process capability indices - control charts for attributes - P, np, c and u charts

Module V (11 hours)
Acceptance sampling - lot by lot acceptance using single sampling by attributes - OC curve - average outgoing quality and the AOQL - double sampling - multiple and sequential sampling - dodge - romig sampling tables - ATI and AFI - introduction to life testing and reliability
Text books

Sessional work assessment
Two tests = 30
Two assignments = 20
Total marks = 50

University examination pattern
Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions A and B of 15 marks each from module I with choice to answer any one
Q III - 2 questions A and B of 15 marks each from module II with choice to answer any one
Q IV - 2 questions A and B of 15 marks each from module III with choice to answer any one
Q V - 2 questions A and B of 15 marks each from module IV with choice to answer any one
Individual students should be asked to choose a topic in any field of mechanical engineering, preferably from outside the B.Tech syllabus and give a seminar on that topic for about thirty minutes - a committee consisting of at least three faculty members (preferably specialised in different fields of mechanical engineering) will assess the presentation of the seminars and award the marks to the students - each student should be asked to submit two copies of a write up of his seminar talk - one copy should be returned to the student after duly certifying it by the H O D and the other kept in the departmental library

**Sessional work assessment**

<table>
<thead>
<tr>
<th>Component</th>
<th>Marks</th>
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<tbody>
<tr>
<td>Presentation</td>
<td>30</td>
</tr>
<tr>
<td>Report</td>
<td>20</td>
</tr>
<tr>
<td>Total marks</td>
<td>50</td>
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</tbody>
</table>
The project work can be a Modeling and Simulation, Case study, Design or Experiments in the field of Mechanical Engineering. It can be allotted as a group project with groups consisting of 3 to 4 students. The project work started in the seventh semester (mini project) may be continued in this semester - the students should complete the project work in this semester and present it before the assessment committee.

The assessment committee will assess the various projects, fix the relative grading and group average marks - the guides will award the marks for the individual students in a project maintaining the group average - each group should submit the copies of the completed project report signed by the guide (in the format prescribed by the department) to the department - the Head Of the Department will certify the copies and return them to the students - one copy will be kept in the departmental library.

All students should undergo Industrial Training Programme either by attending a training programme for a minimum of 5 days in a Registered Industry / Research Institute or by visiting at least 5 reputed Industries / Engg Establishments. They have to submit a report of the Industrial Training Programme.

A maximum of 25 marks will be awarded for the Industrial Training.

**Sessional work assessment**

<table>
<thead>
<tr>
<th>Component</th>
<th>Marks</th>
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<tbody>
<tr>
<td>Project Work</td>
<td>75</td>
</tr>
<tr>
<td>Industrial Training</td>
<td>25</td>
</tr>
<tr>
<td>Total marks</td>
<td>100</td>
</tr>
</tbody>
</table>
There is only university examination for VIVA VOCE - the university will appoint examiners for conducting the viva voce examination - the examiners will ask questions from subjects studied for the B.Tech. Course, Mini Project, Project and Industrial Training and Seminar etc. The relative weightage will be as follows:

<table>
<thead>
<tr>
<th>Subjects</th>
<th>= 30</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mini Project</td>
<td>= 20</td>
</tr>
<tr>
<td>Project and Industrial Training</td>
<td>= 30</td>
</tr>
<tr>
<td>Seminar</td>
<td>= 20</td>
</tr>
<tr>
<td>Total marks</td>
<td>= 100</td>
</tr>
</tbody>
</table>
First Semester Development 1A On completion of this subject students will be able to apply basic programming and problem solving skills in a 3rd generation object-oriented programming language (such as... More information. Clarke College. Teaching and for Second Year B.Tech Program in Information Technology I Semester With Effective from 201213 Theory Practical Scheme Marks Marks L T P Credits Max. Min. Max. The curriculum which has been prepared by Jamshoro College of Nursing, Sindh and approved by the Pakistan Nursing Council is hereby adopted by the Postgraduate College of Nursing, Khyber Medical University, Peshawar with some minor amendments. Khyber Medical University highly appreciates the hard work and dedication shown by the following faculty of Postgraduate College of Nursing, Peshawar. This article presents the MSIS 2006 Model Curriculum and Guidelines for Graduate Degree Programs in Information Systems. As with MSIS 2000 and its predecessors, the objective is to create a model for schools designing or revising an MS curriculum in Information Systems. First, the number of required courses in the core increases by two, one in technology and one in management. Second, the curriculum recognizes that while moving from MSIS 2000 to MSIS 2006 in one step is possible for some institutions, however, a phased, two-stage implementation is suggested. In brief, the changes in moving to MSIS 2006 from MSIS 2000 involve: Adding one IS Management course and one IS Technology course. €