### STUDY & EVALUATION SCHEME

**B. TECH. (MECHANICAL ENGINEERING)**

*(w.e.f. session 2016-17)*

#### 2nd Year

### IV Semester

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Course Category</th>
<th>Subject Code</th>
<th>Name of the Subject</th>
<th>Periods</th>
<th>Evaluation Scheme</th>
<th>Subject Total</th>
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<td>Elective-1</td>
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<td>2.</td>
<td>DC</td>
<td>ME207</td>
<td>Kinematics of Machines</td>
<td>03</td>
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<td>3.</td>
<td>DC</td>
<td>ME208</td>
<td>Manufacturing Science – I</td>
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<td>DC</td>
<td>ME209</td>
<td>Measurements, Metrology and Control</td>
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<td>5.</td>
<td>ESA</td>
<td>EC217</td>
<td>System &amp; Automatic Control</td>
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<td>HM/ESA</td>
<td>ES202/CS203</td>
<td>Disaster Management/ Cyber Law And Information Security</td>
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<td>DC</td>
<td>ME210</td>
<td>Manufacturing Science - I Lab</td>
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<td>02</td>
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<td>8.</td>
<td>DC</td>
<td>ME211</td>
<td>Measurements, Metrology and Control Lab</td>
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<td>DC</td>
<td>ME212</td>
<td>Machine Drawing - II Lab</td>
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<td>10.</td>
<td>ESA</td>
<td>EC218</td>
<td>System &amp; Automatic Control Lab</td>
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<td>11.</td>
<td>HM</td>
<td>BM226</td>
<td>**Human values &amp; Professional Ethics</td>
<td>03</td>
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**Total**

17 06 08 27 270 210 480 520 1000

* Elective-1
  a. CS227  Introduction to Soft Computing
  b. ME213  Polymer Science & Technology
  c. EC219  Laser Systems and Applications
  d. EE223  Electric Machines

** Audit Course (BM226) : This is compulsory audit course in which a student must pass this paper with 50% passing marks up to the final year and marks will not be included in result.**

### Sessional Total (CA)

= Class Test + Teacher Assessment

### Subject Total

= Sessional Total (CA) + End Semester Examination (ESE)

- **BS** – Basic Sciences
- **HM** – Humanities
- **DE** – Departmental Elective
- **DC** – Departmental Core
- **OE** – Open Elective
- **ESA** – Engineering Sciences & Arts (Foundation Course & Engineering Courses)
UNIT –I
Links, Kinematics pairs, Linkage Mechanisms, Inversion of slider crank chain, Number of degrees of freedom for a plane mechanism, Kutzbach Criterion for Plane mechanism Gruber’s Criterion for Plane mechanism, Inversion of four bar chain, single slider crank chain, Double slider crank Chain.

UNIT-II
METHODS for determining the velocity of a point on a link, Instantaneous center, Number of Instantaneous centres in a mechanism, Types of instantaneous Centers, Kennedy’s theorem, velocity of a point on a link by instantaneous center method, velocity of a point on a link by relative velocity method.

Acceleration diagram for a link, Acceleration of a point on a link, Acceleration in slider crank Mechanism, Coriolis Component of acceleration.

UNIT-III
Pantograph, Straight line motion mechanisms, Peucellier’s mechanism, Hart’s straight line mechanism, Scott reusel mechanism Grasshopper mechanisms, Analysis of hook’s joint, Introduction to the analysis of Complex mechanism, Davis and Ackermann steering gear mechanism.

Introduction to kinematic synthesis of planer
Linkages, geometrical methods, 3position synthesis of coupling rod, analytical method, frendenstem equation for function generation (3 position).

UNIT-IV
Classification of Cams and followers, Displacement, Velocity and acceleration diagram for different motions of follower, construction of cam profile for different motions of follower, cams with specified contours like Tangent cam with reciprocating roller follower, Circular Arc cam with flat faced follower.

UNIT-V
Classification and terminology of gears, law of gearing, minimum number of teeth to avoid interference, Path of contact, Arc of Contact, Gear Trains (Simple, Compound and planetary). Introduction to kinematic synthesis of planar linkages.

Books:
2. Theory of Machines: Ghosh and Mallik, East West Press
MANUFACTURING SCIENCE-I
ME208
(w.e.f. session 2016-17)

UNIT –I
Introduction:

Metal Forming Processes:
Elastic and Plastic deformation, yield criteria. Hot working vs cold working. Load required to accomplish metal forming operation.
Analysis (equilibrium equation method) of forging process with sliding and sticking friction and mixed condition for slab and disc. Work required for forging. Hand power and drop forging.

UNIT-II
Drawing, Extrusion and Rolling:

UNIT-III
Sheet Metal Working:
Die and punch assembly and press working methods and processes. Cutting mechanisms, blanking Vs piercing, Compound vs progressive die. Flat face vs Inclined face punch. Analysis of forming process likes cup/deep drawing and bending.

UNIT-IV
Unconventional Metal Forming Processes:
Unconventional metal forming processes such as explosive forming, electro-magnetic and electro-hydraulic forming.
Powder Metallurgy:
Introduction, process, advantages and applications.
Manufacturing of Plastic Components:
Plastics, its past, present and future. Injection molding, Extrusion of plastic Section, Welding of plastics, Applications of plastics, Resins and adhesives.

UNIT-V
Casting (Foundry):
Jigs and Fixtures:
Locating and clamping devices, Principles of Jigs and fixtures and their applications.

Books:
1. Manufacturing Science: Ghosh and Mallik, East West Press.
3. Materials and Processes in Manufacturing: Degarmo, PHI.
6. Manufacturing Technology: P.N. Rao, TMH.
UNIT –I
Mechanical Measurements:
Introduction:
Introduction to measurement and measuring instruments, Generalised measuring system and functional elements, units of measurement, static and dynamic performance characteristics of measurement devices, calibration, concept of error, sources of error, statistical analysis of errors
Sensors and Transducers:
Types of sensors, types of transducers and their characteristics.
Signal Transmission and Processing:
Devices and Systems.
Signal Display and Recording Devices

UNIT-II
Time Related Measurements :
Counters, stroboscope, frequency measurement by direct comparison
Measurement of displacement
Measurement of Pressure :
Gravitational, directing acting, elastic and indirect type pressure transducers. Measurement of very low pressures.
Strain Measurement:
Types of strain gauges and their working, strain gauge circuits, temperature compensation. Strain rosettes, calibration.

Measurements of Force and Torque:
Different types of load cells, elastic transducers, pneumalic and hydraulic systems.
Temperature Measurement:
By thermometers, bimetallic, thermocouples, thermistors and pyrometers.
Vibration:
Seismic instruments, vibration pick ups and decibel meters, vibrometers accelerometers.

UNIT-III
Metrology and Inspection :
Standards of linear measurement, line and end standards. Limit fits and tolerances. Interchangeability and standardisation.
Linear and angular measurements devices and systems Comparators: Sigma, Johansson’s Microkrator
Limit gauges classification, Taylor’s Principle of Gauge Design.

UNIT-IV
Measurement of geometric forms like straightness, flatness, roundness.
Tool markers microscope, profile projector, autocollimator.
Interferometry: Principle and use of interferometry, optical flat.
Measurement of screw threads and gears.
Surface texture: Quantitative evaluation of surface roughness and its measurement.
UNIT-V

Controls:

Introduction:

Representation of Control Components and Systems:
Translation and rotational mechanical components, series and parallel combinations, cascade system, analogous system.

Controllers:
Brief introduction to Pneumatic, hydraulic and electric controllers.

Books:

3. Mechanical Measurements and Control: Kumar D.S., Metropolitan, New Delhi.
UNIT 1:
INTRODUCTION

UNIT 2:
CONTROLACTIONAND CONTROLLERS
Basic control actions – characteristics of on-off, proportional, single-speed floating, integral and derivative control modes- P+I, P+D and P+I+D control modes- Pneumatic and electronic controllers to realize various control actions. Tuning of PID controller- Ziegler Nichols method and damped oscillation method.

UNIT 3:
TIME RESPONSE PATTERNS

UNIT 4:
FREQUENCY RESPONSE OF LINEAR SYSTEMS

UNIT 5:
ROOT LOCUS ANALYSIS
Sketching a root locus, Selection of gain from the root locus, Controller design using the root locus: Lead compensation, Lag compensation.

Text Books:

Reference Books:
2. B.C. Kuo, “Automatic Control systems”, Wiley India Ltd.
Unit 1


Intellectual property issues and cyber space, Indian perspective, Overview of Intellectual property related legislation in India, Patent, Copy Right, Trademark law, Law related to semiconductor layout & design.

Unit 2


Unit 3

Investigation and Ethics: Cyber Crime, Cyber jurisdiction, Cyber crime and evidence act, Treatment of different countries of cyber crime, Ethical issues in data and software privacy, Plagiarism, Pornography, Tampering computer documents, Data privacy and protection, Domain Name System, Software piracy, Issues in ethical hacking.


Cyber crime forensic: CASE STUDY in Cyber Crime.

Unit 4


References:
3. “Cyber Law in India” - Farooq Ahmad-Pioneer books.
UNIT - I

Values and Self Development - Social values and individual attitudes, Work ethics, Indian vision of humanism, Moral and non moral valuation, Standards and principles, Value judgments. Importance of cultivation of values, Sense of duty, Devotion, Self reliance, Confidence, Concentration, Truthfulness, Cleanliness, Honesty, Humanity, Power of faith, National unity, Patriotism, Love for nature, Discipline.

UNIT - II

Personality and Behavior Development - Soul and scientific attitude, God and scientific attitude, Positive thinking, Integrity and discipline, Punctuality, Love and kindness, Avoiding fault finding, Free from anger, Dignity of labor, Universal brotherhood and religious tolerance, True friendship, Happiness vs. suffering love for truth, Aware of self destructive habits, Association and cooperation, Doing best, Saving nature.

UNIT - III

Character and Competence - Science vs. God, Holy books vs. blind faith, Self management and good health, Science of reincarnation, Equality, Nonviolence, Humility, Role of women, All religions and same message, Mind your mind, Self control, Honesty, Studying effectively.

UNIT - IV


UNIT - V

Legislative Procedures - Indian constitution, Philosophy, fundamental rights and duties, Legislature, Executive and Judiciary, Constitution and function of parliament, Composition of council of states and house of people, Speaker, Passing of bills, Vigilance, Lokpal and functionaries.

Text Books:

Reference Books:
1. Design of pattern for a desired casting.
2. Pattern making using a given design of pattern.
3. Making a mould for a desired casting.
4. Study of oil fired tilting furnace and using it to make a casting.
5. Mould sand testing (at least one of the following)
   a) Determination of grain fineness number.
   b) Permeability test
   c) Moisture content test
6. Study of power hammer and forging operation.
7. Tube bending on tube bending machine.
8. Wire drawing/Extrusion of soft material.
9. Rolling experiment.
10. Study of jigs and fixtures and drilling of holes with the help of jigs.
11. Blanking / Piercing operation on power press.
12. Injection moulding with plastic.
1. Study and working of simple measuring instruments. Like vernier calipers, micrometer, tachometer etc.
4. Study of limit gauges.
5. Study and angular measurements using bevel protractor.
6. Adjustments of spark plug gap using feeler gauges.
7. Study of dial indicator to check a shape run use.
8. Study and understanding of limits, fits and tolerances.
10. Temperature measurement experiment.
11. Strain measurement by using strain gauge.
12. Speed measurement using stroboscope.
13. Flow measurement experiment.
15. Experiment on Controls.
MACHINE DRAWING –II LAB
ME212
(w.e.f. session 2016-17)

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Review : ( 1 Class)
Orthographic projections, missing lines, interpretation of views and sectioning.

Part and Assembly Drawing: (2 Classes)
Introduction, assembly drawing of stuffing box, steam engine, cross head, air valve, lathe tailstock, gate valve, screw jack, connecting rods, spark plug, tool post, safety valves etc.
Drawing exercise.

Specification of Materials: ( 1 Class)
Engineering materials, code designation of steels, copper and aluminium and its alloys.

Limits, Tolerances and Fits: ( 1 Class)
Introduction, limit systems, tolerances and fits, drawing and exercises.

Surface Roughness : ( 1 Class)
Introduction, surface roughness, machining symbols, indication of surface roughness, drawing exercises.

Production Drawing: ( 2 Classes)
Introduction to developing and reading of production drawing of simple machine elements like helical gear, bevel gear, flange, pinion shaft, connecting rod, crankshaft, belt pulley, piston details etc. Idea about tool drawing.

Computer Aided Drafting : ( 3 Classes)
Introduction, input, output devices, introduction to drafting software like Auto CAD, basic commands and development of simple 2D and 3D drawing.

Books:
3. AutoCAD 14 for Engineering Drawing: P.Nageswara Rao, TMH.
1. To obtain speed-torque characteristics and efficiency of a dc shunt motor by direct loading.

2. To study open loop and closed loop control of a dc separately excited motor.

3. To study AC/DC servo motor and note its speed-torque characteristics.

4. To determine transient response of a second order system for step input for various values of constant ‘K’ using linear simulator unit and compare theoretical and practical results.

5. To study P, PI and PID temperature controller for an oven and compare their performance.

6. To study dc servo position control system within P and PI configurations.

7. To obtain efficiency and voltage regulation by performing O.C. and S.C. tests on a single phase transformer at full load and 0.8 p.f. loading.

8. To simulate a DC motor (Armature control) system and draw the characteristics of the angular velocity using MATLAB.

9. Plot the impulse, step and ramp response of a given transfer function using MATLAB and determine peak overshoot and peak time.

10. To analyze the stability of given transfer function using Bode/Root-locus/Nyquist plot and find the gain margin and phase margin using MATLAB.

11. Draw a ladder logic for packaging of goods by conveyer system with given condition

   (i) Conveyer stays for ½ seconds for each box

   (ii) After packaging of 10 boxes conveyer belt stay till reset for next cycle of 10 boxes.

12. Draw a ladder logic container for a pump which start by a push button to fill the tank with fluid. when tank 1(T1) is full, the PLC should automatically start filling the tank 2 (T2) by closing valve V1 and opening free valve V2 and when tank 2 (T2) is full then pump will be disconnected automatically and sign lamp L is turned on to show both tank are full.
INTRODUCTION TO SOFT COMPUTING
CS227
(w.e.f. session 2016-17)

UNIT-I

Neural Networks-I (Introduction & Architecture)

UNIT-II

Neural Networks-II (Back propagation networks)
Architecture: perceptron model, solution, single layer artificial neural network, multilayer perception model; back propagation learning methods, effect of learning rule co-efficient; back propagation algorithm, factors affecting backpropagation training, applications.

UNIT-III

Fuzzy Logic-I (Introduction)
Basic concepts of fuzzy logic, Fuzzy sets and Crisp sets, Fuzzy set theory and operations, Properties of fuzzy sets, Fuzzy and Crisp relations, Fuzzy to Crisp conversion.

UNIT-IV

Fuzzy Logic –II (Fuzzy Membership, Rules)
Membership functions, interference in fuzzy logic, fuzzy if-then rules, Fuzzy implications and Fuzzy algorithms, Fuzzyfications & Defuzzificatations, Fuzzy Controller, Industrial applications.

UNIT-V

Genetic Algorithm (GA)
Basic concepts, working principle, procedures of GA, flow chart of GA, Genetic representations, (encoding) Initialization and selection, Genetic operators, Mutation, Generational Cycle, applications.

Text Books:

Reference Books:
1. Siman Haykin, ”Neural Networks” Prentice Hall of India
2. Timothy J. Ross, “Fuzzy Logic with Engineering Applications” Wiley India.
UNIT –I & II

POLYMERS:
Introduction, chemistry of polymer synthesis, polymer reaction kinetics, physical properties and characterization of polymers, effect of structure on properties of polymers, organic polymers. Introduction to high performance polymers and composites and their processing.

UNIT –III & IV

POLYMERIZATION:
Introduction, step-growth polymerization, free radical chain growth polymerization, emulsion polymerization, ionic and cationic polymerization, chain statistics and rubber elasticity.

UNIT –V

PREPARATION AND APPLICATIONS:
Preparation, properties and technical applications of thermo-plastics (PVC, PVA), thermostats (PF, UF) and elastomers (SBR, GR-N), silicones. Application of polymers in space, ocean, electronics, medical, agriculture, automobile, sports and building construction.

Text Books/Reference Books:

1. Polymer Science And Technology: Premamoy Ghogh
2. Polymer Science And Technology: Joel R. Fried
3. Polymer Science And Technology: Robert O Ebewele
UNIT-I : Introduction to Laser System
Review of elementary quantum physics, Schrodinger wave equation, Heisenberg uncertainty principle, concept of coherence & it's type, absorption, spontaneous emission & stimulated emission processes, principle operation of laser action.

UNIT-II : Laser Operation

UNIT-III : Laser Systems
Introduction to general lasers and their types. Three & four level lasers, laser rate equation, CW & Pulsed Lasers, atomic, ionic, molecular, excimer, liquid and solid state Lasers and systems, short pulse generation and Measurement.

UNIT-IV : Applications of Laser-I
Laser application in material processing (drilling, cutting, welding, marking, cladding), medicine (ophthalmology, glaucoma), communication(optical fiber communication), Bar code readers.

UNIT-V : Applications of Laser-II
Applications:

Text Books:

Reference Books :