**B. Tech. Mechatronics Engineering(3rdSemester) only for Batch: 2017-2021**

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| **Sr. No.** | **Course No.** | **Course Title** | **Teaching Schedule** | | | | **Allotment Marks** | | | | **Exam Duration**  **(Hours)** |
| **L** | **T** | **P** | **Total** | **Sessional** | **Theory** | **Practical** | **Total** |  |
| 1 | MT-201N | Digital Electronics | 3 | 1 | - | 4 | 25 | 75 | - | 100 | 3 |
| 2 | MT-203N | Essential Mechanics & Fluids | 3 | 1 | - | 4 | 25 | 75 | - | 100 | 3 |
| 3 | MT-205N | Thermal Engineering | 3 | 1 | - | 4 | 25 | 75 | - | 100 | 3 |
| 4 | MT-207N | Mathematical Foundation for Engineers | 3 | 1 | - | 4 | 25 | 75 | - | 100 | 3 |
| 5 | AS-201N/ HS-201N | [Mathematics–III](#MATHEMATICSIII) /  [Fundamentals of Management](#FOMGMT) | 3 | 1 | - | 4 | 25 | 75 | - | 100 | 3 |
| 6 | MT-209N | Theory ofMachines-I | 3 | 1 | - | 4 | 25 | 75 | - | 100 | 3 |
| 7 | MT-211N | Digital Electronics Lab | - | - | 2 | 2 | 40 | - | 60 | 100 | 3 |
| 8 | MT-213N | Essential Mechanics & Fluids Lab | - | - | 2 | 2 | 40 | - | 60 | 100 | 3 |
| 9 | MT-215N | Theory of Machines-I Lab | - | - | 3 | 3 | 40 | - | 60 | 100 | 3 |
|  |  | **Total** | **18** | **6** | **7** | **31** | **270** | **450** | **180** | **900** |  |
| 10 | MPC-201N | [Environmental Studies](#environmentalstudies) | 3 | 0 | 0 | 3 | - | 100 | 0 | 100 | 3 |

***Note:***

1. *MPC-201N is a mandatory course and student has to get passing marks in order to qualify for the award of degree but its marks will not be added in the grand total.*
2. *Students are allowed to use programmable scientific calculator during examination.*

**B. Tech. Mechatronics Engineering (4thSemester) only for Batch: 2017-2021**

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| **Sr. No.** | **Course No.** | **Course Title** | **Teaching Schedule** | | | | **Allotment Marks** | | | | **ExamDuration**  **(Hours)** |
| **L** | **T** | **P** | **Total** | **Sessional** | **Theory** | **Practical** | **Total** |  |
| 1 | MT-202N | Computer Aided Design and Manufacturing | 3 | 1 | - | 4 | 25 | 75 | - | 100 | 3 |
| 2 | MT-204N | Analog Circuits | 3 | 1 | - | 4 | 25 | 75 | - | 100 | 3 |
| 3 | MT-206N | Design Basics | 3 | 1 | - | 4 | 25 | 75 | - | 100 | 3 |
| 4 | MT-208N | Energy Management | 3 | 1 | - | 4 | 25 | 75 | - | 100 | 3 |
| 5 | AS-201N/  HS-201N | [Mathematics–III](#MATHEMATICSIII)/  [Fundamentals of Management](#FOMGMT) | 3 | 1 | - | 4 | 25 | 75 | - | 100 | 3 |
| 6 | MT-210N | Theory of Machines-II | 3 | 1 | - | 4 | 25 | 75 | - | 100 | 3 |
| 7 | MT-212N | Analog Circuits Lab | - | - | 2 | 2 | 40 | - | 60 | 100 | 3 |
| 8 | MT-214N | Computer Aided Design and Manufacturing Lab | - | - | 2 | 2 | 40 | - | 60 | 100 | 3 |
| 9 | MT-216N | Theory of Machines-II Lab | - | - | 3 | 3 | 40 | - | 60 | 100 | 3 |
|  |  | **Total** | **18** | **6** | **7** | **31** | **270** | **450** | **180** | **900** |  |
| 10 | MPC-202N | [Energy Studies](#ENERGYSTUDIES) | 3 | 0 | 0 | 3 | - | 100 | 0 | 100 | 3 |

***Note:***

1. *All the students have to undergo 5 to 6 week industrial training after 4th semester and it will be evaluated in 5th semester.*
2. *Students are allowed to use programmable scientific calculator during examination.*
3. *MPC-202N is a mandatory course and student has to get passing marks in order to qualify for the award of degree but its marks will not be added in the grand total.*

**B. Tech. Mechatronics Engineering (5thSemester) only for Batch: 2017-2021**

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| **Sr. No.** | **Course No.** | **Course Title** | **Teaching Schedule** | | | | **Allotment Marks** | | | | **Exam Duration**  **(Hours)** |
| **L** | **T** | **P** | **Total** | **Sessional** | **Theory** | **Practical** | **Total** |  |
| 1 | MT-301N | Signal Conditioning | 3 | 1 | - | 4 | 25 | 75 | - | 100 | 3 |
| 2 | MT-303N | Pneumatic and Hydraulic Instrumentation | 3 | 1 | - | 4 | 25 | 75 | - | 100 | 3 |
| 3 | MT-305N | Embedded Systems-I | 3 | 1 | - | 4 | 25 | 75 | - | 100 | 3 |
| 4 | MT-307N | Heat Transfer | 3 | 1 | - | 4 | 25 | 75 | - | 100 | 3 |
| 5 | MT-309N | Production Technology-I | 3 | 1 | - | 4 | 25 | 75 | - | 100 | 3 |
| 6 | MT-311N | Measurements and Control | 3 | 1 | - | 4 | 25 | 75 | - | 100 | 3 |
| 7 | MT-313N | Signal Conditioning Lab | - | - | 2 | 2 | 40 | - | 60 | 100 | 3 |
| 8 | MT-315N | [Pneumatic](#QUALITYASSURANCERELIABILITY) and Hydraulic Instrumentation Lab | - | - | 3 | 3 | 40 | - | 60 | 100 | 3 |
| 9 | MT-317N | Embedded Systems-I Lab | - | - | 2 | 2 | 40 | - | 60 | 100 | 3 |
| 10 | MT-319N | Industrial Training | 2 | - | - | 2 | 100 | - | - | 100 |  |
|  |  | **Total** | **20** | **6** | **7** | **33** | **370** | **450** | **180** | **1000** |  |

***Note:***

1. *Students are allowed to use programmable scientific calculator during examination.*
2. *The industrial training undertaken after 4th semester will be evaluated on the basis of student presentation and training reportsubmitted by the student related to industrial training.*

**B. Tech. Mechatronics Engineering (6thSemester) only for Batch: 2017-2021**

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| **Sr. No.** | **Course No.** | **Course Title** | **Teaching Schedule** | | | | **Allotment Marks** | | | | **Exam Duration**  **(Hours)** |
| **L** | **T** | **P** | **Total** | **Sessional** | **Theory** | **Practical** | **Total** |  |
| 1 | MT-302N | Automatic Control Systems | 3 | 1 | - | 4 | 25 | 75 | - | 100 | 3 |
| 2 | MT-304N | Embedded Systems-II | 3 | 1 | - | 4 | 25 | 75 | - | 100 | 3 |
| 3 | MT-306N | [Refrigeration and Air Conditioning](#rac) | 3 | 1 | - | 4 | 25 | 75 | - | 100 | 3 |
| 4 | MT-308N | Internal Combustion Engines | 3 | 1 | - | 4 | 25 | 75 | - | 100 | 3 |
| 5 | MT-310N | Production Technology-II | 3 | 1 | - | 4 | 25 | 75 | - | 100 | 3 |
| 6 | MT-312N | Automatic Control SystemsLab | - | - | 2 | 2 | 40 | - | 60 | 100 | 3 |
| 7 | MT-314N | Embedded Systems-IILab | - | - | 2 | 2 | 40 | - | 60 | 100 | 3 |
| 8 | MT-316N | Production Technology-II Lab | - | - | 4 | 4 | 40 | - | 60 | 100 | 3 |
|  |  | **Total** | **15** | **5** | **8** | **28** | **245** | **375** | **180** | **800** |  |

***Note:***

1. *Students are allowed to use programmable scientific calculator during examination.*
2. *All the students have to undergo 5 to 6 week industrial training after 6th semester and it will be evaluated in 7th semester.*

**B. Tech. Mechatronics Engineering (7thSemester) only for Batch: 2017-2021**

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| **Sr. No.** | **Course No** | **Course Title** | **Teaching Schedule** | | | | **Allotment Marks** | | | | **Exam Duration**  **(Hours)** |
| **L** | **T** | **P** | **Total** | **Sessional** | **Theory** | **Practical** | **Total** |  |
| 1 | MT-401N | Automobile Engineering | 3 | 1 | - | 4 | 25 | 75 | - | 100 | 3 |
| 2 | MT-403N | Operations Research | 3 | 1 | - | 4 | 25 | 75 | - | 100 | 3 |
| 3 |  | Elective-I | 3 | 1 | - | 4 | 25 | 75 | - | 100 | 3 |
| 4 |  | Elective-II | 3 | 1 | - | 4 | 25 | 75 | - | 100 | 3 |
| 5 | MT-405N | Smart Materials | 3 | 1 | - | 4 | 25 | 75 | - | 100 | 3 |
| 6 | MT-407N | The Professional Engineer (Project-I) | 2 | - | 3 | 5 | 100 | - | 100 | 200 | 3 |
| 7 | MT-409N | Seminar | 2 | - | - | 2 | 100 | - | - | 100 |  |
| 8 | MT-411N | Industrial Training | 2 | - | - | 2 | 100 | - | - | 100 |  |
|  |  | **Total** | **21** | **5** | **3** | **29** | **425** | **375** | **100** | **900** |  |

***Note:***

1. *Students are allowed to use programmable scientific calculator during examination.*
2. *The industrial training undertaken after 6th semester will be evaluated on the basis of student presentation and training reportsubmitted by the student related to Industrial training.*

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| **ELECTIVE – I**   * 1. MT-413N Advanced ManufacturingTechnology   2. MT-415N Finite ElementMethods   3. MT-417N Applied Numerical Techniques and ComputerProgramming   4. MT-419N Communication Systems | **ELECTIVE – II**   1. MT-421N Renewable Energy Resources 2. MT-423N Computational Fluid Dynamics 3. MT-425N Mechatronics Engineering 4. MT-427N Antenna & Wave Propagation |

**B. Tech. Mechatronics Engineering (8thSemester) only for Batch: 2017-2021**

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| **Sr. No.** | **Course No.** | **Course Title** | **Teaching Schedule** | | | | **Allotment Marks** | | | | **Exam Duration**  **(Hours)** |
| **L** | **T** | **P** | **Total** | **Sessional** | **Theory** | **Practical** | **Total** |  |
| 1 | MT-402N | Data Communication Systems | 3 | 1 | - | 4 | 75 | 25 | 0 | 100 | 3 |
| 2 | MT-404N | Non-ConventionalMachining | 3 | 1 | - | 4 | 75 | 25 | 0 | 100 | 3 |
| 3 | MT-406N | Sound and Noise Control | 3 | 1 | - | 4 | 75 | 25 | 0 | 100 | 3 |
| 4 |  | Elective-III | 3 | 1 | - | 4 | 75 | 25 | 0 | 100 | 3 |
| 5 |  | Elective-IV | 3 | 1 | - | 4 | 75 | 25 | 0 | 100 | 3 |
| 6 | MT-408N | Data Communication Systems Lab | - | - | 2 | 2 | 40 | - | 60 | 100 | 3 |
| 7 | MT-410N | The Professional Engineer (Project-II) | - | - | 9 | 9 | 100 | - | 100 | 200 | 3 |
| 8 | MT-412N | Comprehensive Viva | - | - | - | - | 100 | - | - | 100 | 3 |
| 9 | MT-414N | General Fitness and Professional Aptitude (Viva-Voce) | - | - | - | - | - | - | 100 | 100 | 3 |
|  |  | **Total** | **15** | **5** | **11** | **31** | **615** | **125** | **260** | **1000** |  |

***Note:***

1. *Students are allowed to use programmable scientific calculator during examination.*

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| **ELECTIVE – III**   1. MT-416N [Autotronics](#Automobile) 2. MT-418N IndustrialRobotics 3. MT-420N ManufacturingManagement 4. MT-422N Fuzzy Logic and NeuralNetworks | ELECTIVE- IV  1. MT-424N Quality Assurance and Reliability 2. MT-426N Work Design and Ergonomics 3. MT-428N Digital Image Processing 4. MT-430N Non Destructive Testing |

# Semester 3

**Digital Electronics**

##### MT-201N

**L T P Sessional: 25Marks**

**3 1 - Theory: 75Marks**

**Total: 100 Marks Exam Duration: 3 Hours**

**UNIT I**

**Fundamentals of digital techniques:** Digital signal, logic gates: AND. OR, NOT, NAND, NOR- EX-OR, EX-NOR, Boolean algebra, Review of Number systems. Binary codes: BCD, Excess-3. Gray codes

**Combinational design using gates:** Design using gates. Karnaugh map and QuineMcluskey methods of simplification

**UNIT II**

**Combinational design using mst devices:**  Multiplexers and Demultiplexers and their use as logic elements. Decoders, Adders / Subtracters, BCD arithmetic Circuits, Encoders, Decoders / Drivers for display devices

**Sequential circuits:** Flip Flops: S-R- J-K. T. D, master-slave, Conversion of one flip-flop to another flip flop, excitation table, edge triggered- shift registers, its types: SISO, PISO,PIPO,SIPO, Counters, Asynchronous and Synchronous Ring counters and Johnson Counter, Design of Synchronous and Asynchronous sequential circuits.

**UNIT III**

**Digital logic families:** Switching mode operation of p-n junction, bipolar and MOS-devices. Bipolar logic families: RTL, DTL, DCTL, HTL, TTL, ECL, MOS, and CMOS logic families, Tristate logic, Interfacing of CMOS and TTL families

**UNIT IV**

**A/d and d/a converters:** Sample and hold circuit, weighted resistor and R -2 R ladder D/A Converters, specifications for D/A converters. A/D converters: Quantization, parallel -comparator, successive approximation, counting type, Dual-slope ADC, specifications of ADCs

**Programmable logic devices:** ROM, PLA, PAL, Introduction to FPGA and CPLDs

**TEXT BOOK:**

1. Modem Digital Electronics (Edition III): R. P. Jain; TMH

**REFERENCE BOOKS:**

1. Digital Integrated Electronics: Taub& Schilling: MGH

2. Digital Principles and Applications: Malvino& Leach: McGraw Hill.

3. Digital Design: Morris Mano: PHI

**Note:** *Examiner will set eight questions by selecting two from each unit. Students will be required to attempt five questions selecting at least one question from each unit.*

**Essential Mechanics & Fluids**

**MT-203N**

**L T P Sessional: 25Marks**

**3 1 - Theory: 75Marks**

**Total: 100 Marks Exam Duration: 3 Hours**

**Unit 1**

**Simple stresses & strains:** Concept & types of Stresses and strains, Polson’s ratio, stresses and strain in simple and compound bars under axial loading, stress strain diagrams, Hooks law, elastic constants & their relationships, temperature stress & strain in simple & compound barsunder axial loading, Numerical.

**Compound stresses & strains:** Concept of surface and volumetric strains, two dimensional stress system, conjugate shear stress at a point on a plane, principle stresses & strains and principal planes, Mohr’s circle of stresses, Numerical.

**Unit II**

**Shear Force & Bending Moments:** Definitions, SF & BM diagrams for cantilevers, simplysupported beams with or without over-hang and calculation of maximum BM & SF and the point

of contra flexture under (i) concentrated loads, (ii) uniformly distributed loads over whole span or a part of it, (iii)combination of concentrated loads and uniformly distributed loads, (iv) uniformly varying loads and (v) application of moments, relation between the rate of loading, the shear force and the bending moments, Problems.

**Torsion of circular Members:** Torsion of thin circular tube, Solid and hollow circular shafts,tapered shaft, stepped shaft & composite circular shafts, combined bending and torsion,equivalent torque, effect of end thrust. Numerical.

**Unit III**

**Fluid Properties and Fluid Statics:** Concept of fluid and flow, ideal and real fluids, continuumconcept, properties of fluids, Newtonian and non-Newtonian fluids. Pascal’s law, hydrostaticequation, hydrostatic forces on plane and curved surfaces, stability of floating and submergedbodies, relative equilibrium. Problems.

**Fluid Kinematics:**Eulerian and Lagrangian description offluid flow; stream, streak and path lines; types of flows, flow rate and continuity equation,differential equation of continuity in cylindrical and polar coordinates, rotation, vorticity andcirculation, stream and potential functions, flow net. Problems.

**Unit IV**

**Fluid Dynamics:** Concept of system and control volume, Euler’s equation, Bernoulli’s equation,venturimeter, orifices, orificemeter, mouthpieces, kinetic and momentum correction factors,Impulse momentum relationship and its applications. Problems.Potential Flow: Uniform andvortex flow, flow past a Rankin half body, source, sink, source-sink pair and doublet, flow past acylinder with and without circulation. Problems.

**TEXT BOOKS**

1. Ramamurtham.S and Narayanan.R, “*Strength of material”*, DhanpatRai Pvt. Ltd., New Delhi, 2001.

2. Bansal.R.K, “*Strength of Material”*, Lakshmi publications Pvt. Ltd., New Delhi, 1996.

3. Kumar.K.L, “*Engineering Fluid Mechanics”*, Eurasla publishers Home Ltd., New Delhi, 1995.

4. Bansal.R.K, “*Fluid Mechanics and Hydraulic Machines”* ,Laxmi publications (P) Ltd., New Delhi,

1995.

5. Popov.E.P, “*Mechanics of Materials”*, Prentice Hall, 1982.

6. Timoshenko.S.P and Gere .M.J, “*Mechanics of Materials”*, C.B.S. publishers, 1986.

**REFERENCES**

1. Ferdinand P. Beer and Russell Johnston.E, “*Mechanics of Materials”*, SI metric Edition McGraw Hill,

1992

2. Srinath.L.N, “*Advanced Mechanics of Solids”,*Tata McGraw Hill Ltd., New Delhi.

3. Ramamurthan.S, “*Fluid Mechanics and Hydraulics”*, DhanpatRai and Sons, Delhi, 1988.

4. Fox R.W and Mc. Donald .A.T, “*Introduction to fluid Mechanics”*, 5th Ed. John Wiley and Sons, 1999.

**Note:** *Examiner will set eight questions by selecting two from each unit. Students will be required to attempt five questions selecting at least one question from each unit.*

**Thermal Engineering**

**MT-205N**

**L T P Sessional: 25Marks**

**3 1 - Theory: 75Marks**

**Total: 100 Marks Exam Duration: 3 Hours**

**UNITI**

**Basic Concepts: Thermodynamics:** Macroscopic and Microscopic Approach, Thermodynamic Systems, Surrounding and Boundary, Thermodynamic Property – Intensive and Extensive, Thermodynamic Equilibrium, State, Path, Process and Cycle, Quasi-static, Reversible and Irreversible Processes, Working Substance. Concept of Thermodynamic Work and Heat, Equality of Temperature, Zeroth Law of Thermodynamic and its utility.

**UNIT II**

**Ideal and Real Gases:** Concept of an Ideal Gas, Basic Gas Laws, Characteristic Gas Equation, Avagadro’s law and Universal Gas Constant, P-V-T surface of an Ideal Gas. Vander Waal’s Equation of state, Mixture of Gases, Mass, Mole and Volume Fraction, Gibson Dalton’s law, Gas Constant and specific Heats, Entropy for a mixture of Gases.

**UNIT III**

**First Law of Thermodynamics:** Energy and its Forms, Energy and 1st law of Thermodynamics, Internal Energy and Enthalpy, 1st Law Applied to Non-Flow Process, Steady Flow Process and Transient Flow Process, Throttling Process and Free Expansion Process. Numerical

Second Law of Thermodynamics: Limitations of First Law, Thermal Reservoir Heat Source and Heat Sink, Heat Engine, Refrigerator and Heat Pump, Kelvin- Planck and Clausius Statements and Their Equivalence, Perpetual Motion Machine of Second Kind. Carnot Cycle, Carnot Heat Engine and Carnot Heat PumpNumericals

**UNIT IV**

**Entropy:** Clausius Inequality and Entropy, Principle of Entropy Increase, TemperatureEntropy Plot, Entropy Change in Different Processes, Introduction to Third Law of thermodynamics. Availability, Irreversibility and Equilibrium: High and Low Grade Energy, Availability and Unavailable Energy, Loss of Available Energy Due to Heat Transfer Through a Finite Temperature Difference, Effectiveness and Irreversibility. Numericals.

**TEXT BOOKS:**

1. Engineering Thermodynamics – C P Arora, Tata McGraw Hill
2. Engineering Thermodynamics – P K Nag, Tata McGraw Hill

**REFERENCE BOOKS:**

1. Thermal Science and Engineering – D S Kumar, S K Kataria and Sons
2. Engineering Thermodynamics -Work and Heat transfer – G F C Rogers and Maghew Y. R. Longman

**Note:** *Examiner will set eight questions by selecting two from each unit. Students will be required to attempt five questions selecting at least one question from each unit.*

**Mathematical Foundation for Engineers**

**MT-207N**

**L T P Sessional: 25Marks**

**3 1 - Theory: 75Marks**

**Total: 100 Marks Exam Duration: 3 Hours**

##### UNIT I

**Principle of Mathematical Induction:**Process of the proof by induction, motivating the application of the method by looking at natural numbers as the least inductive subset of real numbers. The principle of mathematical induction and simple applications.

**Sets:**Sets and their representations. Empty set.Finite and Infinite sets.Equal sets.Subsets.Subsets of a set of real numbers especially intervals (with notations). Power set. Universal set. Venn diagrams. Union and Intersection of sets.Difference of sets. Complement of a set. Properties of ComplementSets.

##### UNITII

**Binomial Theorem:** Statement and proof of the binomial theorem for positive integral indices. General and middle term in binomial expansion, simple applications.

**Sequence and Series:** Sequence and Series. Arithmetic Progression (A. P.). Arithmetic Mean (A.M.) Geometric Progression (G.P.), general term of a G.P., sum of first n terms of a G.P., infinite G.P. and its sum, geometric mean (G.M.), relation between A.M. and G.M.

##### UNIT III

**Mathematical Reasoning:** Mathematically acceptable statements. Connecting words/phrases-consolidating the understanding of "if and only if (necessary and sufficient) condition", "implies", "and/or", "implied by", "and", "or", "there exists" and their use through variety of examples related to real life and Mathematics.

Validating the statements involving the connecting words, Difference between contradiction, converse and contrapositive.

##### UNIT IV

**Statistics:** Measures of position - mean, median, mode,Measure of dispersion - range, inter-quartile range, variance, standard deviation, Measure of skewness

##### TEXT BOOK:

1. Foundation Mathematics, A. Croft and R. Davidson, Addison-Wesley 1997, ISBN: 0201178044
2. Discrete Mathematics for Computer Scientists, J. Truss, Addison-Wesley 1999, ISBN: 0201360616

##### REFERENCE BOOK:

1. Advanced Engg. Mathematics : E. Kreyzig
2. Higher Engg. Mathematics : B.S. Grewal

**Note:** *Examiner will set eight questions by selecting two from each unit. Students will be required to attempt five questions selecting at least one question from each unit.*

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| **Mathematics- III** |
| **AS-201N** |

**L T P Sessional: 25Marks**

**3 1 - Theory: 75Marks**

**Total: 100 Marks Exam Duration: 3 Hours**

**UNIT-I**

**Fourier series:** Euler’s formulae, Orthogonality conditions for the Sine and Cosine function, Dirichlet’s conditions, Fourier expansion of functions having points of discontinuity, Change of interval, Odd and even functions, Half-range series.

**Fourier Transforms:** Fourier integrals, Fourier transforms, Fourier Cosine and Sine transforms, Properties of Fourier transforms, Convolution theorem, Parseval’s identity, Fourier transforms of the derivative of a function, Application of transforms to boundary value problems (Heat conduction and vibrating string).

**UNIT-II**

**Partial Differential Equations and LPP**: Formation and Solutions of PDE, Lagrange’s Linear PDE, First order non-linear PDE, Charpit’s method, Homogeneous linear equations with constant coefficients, Method of separation of variables.

**Solution of linear programming problems:** using Graphical and Simplex methods.

**UNIT-III**

**Theory of Complex Variables:** A review of concept of functions of a complex variable, Limit, continuity, differentiability and analyticity of a function. Basic elementary complex functions (exponential functions, trigonometric & Hyperbolic functions, logarithmic functions) Cauchy-Riemann Equations.

**Line integral in complex plane:** definition of the complex line integral, basic properties,

Cauchy’s integral theorem, and Cauchy’s integral formula, brief of Taylor’s, Laurent’s and Residue theorems (without proofs).

**UNIT-IV**

**Probability theory:** A review of concepts of probability and random variables, definitions of probability, addition rule, conditional probability, multiplication rule, Conditional Probability, Mean, median, mode and standard deviation, Bayes’ Theorem, Discrete and continuous random variables, probability mass, probability density and cumulative distribution functions, mathematical expectation, moments, moment generating function.

**Standard Distributions:** Binomial, Poisson and Normal distribution.

**TEXT BOOKS:**

1. Advanced Engg. Mathematics : E. Kreyzig
2. Higher Engg. Mathematics : B.S. Grewal

**REFERENCES BOOKS:**

1. E. Kreyszig : Advanced Engineering Mathematics, Wiley India.
2. B. V. Ramana: Engineering Mathematics, Tata McGraw Hill.
3. R.K. Jain, S.R.K. Iyengar: Advanced Engineering Mathematics, Taylor & Francis.
4. Murray R. Spiegel[:](http://www.amazon.in/s/ref=dp_byline_sr_book_1?ie=UTF8&field-author=Murray+R+Spiegel&search-alias=stripbooks)Schaum's Outline of Complex Variables, McGraw Hill

Professional.

1. Michael D. Greenberg: Advanced Engineering Mathematics, Pearson Education,

Prentice Hall.

**Note:** *Examiner will set eight questions by selecting two from each unit. Students will be required to attempt five questions selecting at least one question from each unit.*

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| **Fundamentals of Management** |
| **HS-201N** |

**L T P Sessional: 25Marks**

**3 1 - Theory: 75Marks**

**Total: 100 Marks Exam Duration: 3 Hours**

**UNIT-1**

**Introduction to Management:** Meaning, Definition, nature, importance & Functions, Management as Art, Science & Profession- Management as social System, Concepts of management-Administration

**Evolution of Management Thought**: Development of Management Thought- Scientific management, Administrative Theory of Management, Bureaucratic Organization, Behavioral approach (Neo Classical Theory): Human Relations Movement; Behavioral Science approach; Modern approach to management – Systems approach and contingency approach.

**UNIT-II**

**Planning**: nature, purpose and functions, types of plans, planning process, Strategies and Policies: Concept of Corporate Strategy, formulation of strategy, Types of strategies, Management by objectives (MBO), SWOT analysis, Types of policies, principles of formulation of policies

**Organizing**: nature, importance, process, organization structure: Line and Staff organization, Delegation of Authority and responsibility, Centralization and Decentralization, Decision Making Process , Decision Making Models, Departmentalization: Concept and Types (Project and Matrix), formal & informal organizations

**UNIT-III**

**Staffing**: concept, process, features; manpower planning; Job Analysis: concept and process; Recruitment and selection: concept, process, sources of recruitment; performance appraisal, training and development

**Directing**: Communication- nature, process, formal and informal, barriers to Effective Communication, Theories of motivation-Maslow, Herzberg, McGregor ; Leadership – concept and theories, Managerial Grid, Situational Leadership. Transactional and Transformational Leadership.

**UNIT-IV**

**Controlling**: concept, process, types, barriers to controlling, controlling Techniques: budgetary control, Return on investment, Management information system-MIS , TQM-Total Quality Management, Network Analysis- PERT and CPM.

**Recent Trends in Management**: Management of Crisis, Total Quality Management, Stress Management, Concept of Corporate Social Responsibility (CSR) and business ethics.

Functional aspects of business: Conceptual framework of functional areas of management- Finance; Marketing and Human Resources

**TEXT BOOKS:**

* 1. Management Concepts - Robbins, S.P; Pearson Education India
  2. Principles of Management - Koontz &O’Donnel; (McGraw Hill)

**RECOMMENDED BOOKS:**

* 1. *Business Organization and Management* – Basu; Tata McGraw Hill
  2. Management and OB-- Mullins; Pearson Education
  3. Essentials of Management – Koontz, Tata McGraw-Hill
  4. Management Theory and Practice – Gupta, C.B; Sultan Chand and Sons, new Delhi
  5. Prasad, Lallan and S.S. Gulshan. *Management Principles and Practices.* S. Chand& Co. Ltd., New Delhi.
  6. Chhabra, T.N. *Principles and Practice of Management*. DhanpatRai& Co., Delhi.
  7. Organizational behaviour – Robins Stephen P; PHI.

**Note:** *Examiner will set eight questions by selecting two from each unit. Students will be required to attempt five questions selecting at least one question from each unit.*

|  |  |
| --- | --- |
|  | **Theory of Machines-I** |
|  | **MT-209N** |

**L T P Sessional: 25Marks**

**3 1 - Theory: 75Marks**

**Total: 100 Marks Exam Duration: 3 Hours**

##### UNIT I

**Kinematics:**Introduction to analysis, Kinematics’ pairs, Degree of freedom, Dynamitic chain mechanism, Machine, Four-bar chain, inversions, Single and double slider crank chain, Quick return mechanisms, Introduction to function generation, Path generation and rigid bodied guidance.

**Velocity determination:** Relative velocity methods, Instantaneous center method Acceleration determination, Kennedy’s Space cent rode and body cent rode

##### UNIT II

**Centripetal and tangential acceleration:** Acceleration determination by graphical method using velocity polygons, Cariole’s component of acceleration, Klein’s and other constructions.

**SHM:** Introduction, Velocity and Acceleration of a Particle Moving with Simple Harmonic Motion, Differential Equation of Simple Harmonic Motion, Terms Used in Simple Harmonic Motion, Simple Pendulum, Laws of Simple Pendulum, Closely-coiled Helical Spring. Compound Pendulum, Centre of Percussion, Bifilar Suspension, Trifilar Suspension (Torsional Pendulum).

##### UNIT III

**Straight line motion:** Pantograph, straight-line motion mechanisms (Peculiar, Hart, Scott Russell, Grasshopper, Watt, Kemp’s Tchybishev, Parallel linkages) Indicator mechanisms (Simplex Crosby, Thomson, etc) Automobile steering gears (Davis and Ackerman), Hooks joint (universal coupling), Double hooks joints.

**Friction:** Types of friction, Laws of dry friction, Motion along inclined plane Screw threads, Wedge, Pivots and collars, Plate and cone clutches, Antifriction bearings, friction circle and friction axis, bearings and lubrication. Motion along inclined plane and screws, Pivots and Collars Thrust Bearings lubrication

##### UNIT IV

**Cams:**Types of cams and followers, various motions of the follower, Construction of cam profiles, Analysis for velocities and accelerations of tangent and circular arc cams with roller and flat–faced followers.

**Power transmission:** Open and crossed belt drives, velocity ratio, slip , material for belts, crowning of pulleys, law of belting, types of pulleys, length of belts ratio of tensions, centrifugal tension, power transmitted by belts and ropes, initial tension, creep, chain drive, chain length, classification of chains

##### TEXT BOOKS:

* 1. Theory of machines: S. S. Rattan, Tata McGraw HillPublications
  2. Theory of machines : R S Khurmi, S Chand Publications

**REFERENCE BOOKS:**

1. Theory of Mechanism and Machines: JagdishLal, Metropolitan BookCo.
2. Mechanism synthesis and analysis: A.H. Soni, McGraw HillPublications.
3. Mechanism: J.S.Beggs.
4. Mechanics of Machines: P.Black, PergamonPress.
5. Theory of Machines: P.L.Ballaney, KhannaPublisher.

**Note:** *Examiner will set eight questions by selecting two from each unit. Students will be required to attempt five questions selecting at least one question from each unit.*

**Digital Electronics Lab**

**MT-211N**

##### L T P Sessional: 40Marks

* **- 2 Practical: 60Marks**

**Total: 100 Marks**

**Exam Duration:3 Hours**

**Note:**Student will be required to perform total of 10experiments. 7 experiments will be from the below given list and rest experiments will be designed based upon the curriculum.

**LIST OF EXPERIMENT**

1. Familiarization with Digital Trainer Kit and associatedequipment.
2. Verify Truth Table of TTL gates AND, OR, NOT, NAND, NOR, EX-OR,EX-NOR.
3. Design and realize a given function using K-Maps and verify itsperformance.
4. To verify the operation of Multiplexer andDemultiplexer.
5. To verify the operation ofComparator.
6. To verify the truth table of S-R, J-K, T, DFlip-flops.
7. To verify the operation of Bi-directional shiftregister.
8. To design and verify the operation of 3-bit asynchronouscounter.
9. To design and verify the operation of synchronous Up/down counter using J-K flipflops& drive a seven-segment display using thesame
10. To design and verify the operation of asynchronous Decadecounter.
11. Study of TTL logic familycharacteristics.
12. Study of Encoder andDecoder.
13. Study of BCD to 7 segmentDecoder.

**Essential Mechanics &Fluids Lab**

##### MT-213N

##### L T P Sessional: 40Marks

* **- 2 Practical: 60Marks**

**Total: 100 Marks**

**Exam Duration:3Hours**

**NOTE:**Student will be required to perform total of 10 experiments. 7 experiments will be from the below given list and rest experiments will be designed based upon the curriculum.

**LIST OF EXPERIMENTS**

* 1. To perform Torsion test on mild steelspecimen
  2. To perform tensile test in ductile and brittle materials and to draw stress-strain curve and to determine various mechanicalproperties.
  3. To perform any one hardness test (Rockwell, Brinell&Vicker’s test) and determine hardness ofmaterials.
  4. To perform compression test on C.I. and to determine ultimate compressivestrength.
  5. A simply supported beam is carrying point loads, Uniformly distributed load and uniformly varying loads. Draw the SFD and BMD for thebeam.
  6. To find the moment of inertia of flywheel.
  7. To compare the actual value of pressure with calculated value with centre of pressure apparatus.
  8. To determine the hydrostatic force on a curved surface under partial submerge and full submergecondition.
  9. To perform Charpy and Izod impact test on steelspecimen
  10. To perform Double shear test on steelspecimen
  11. To perform Compression test onbrick
  12. Determination of coefficient of discharge of orificemeter
  13. Determination of coefficient of discharge of venturimeter
  14. Major losses in pipeflow
  15. Verification of Bernoulli'stheorem
  16. Minor losses - expansion and contraction losses inpipes

##### Theory of Machines-I Lab

**MT-215N**

##### L T P Sessional: 40Marks

* **- 3 Practical: 60Marks**

**Total: 100 Marks**

**Exam Duration:3 Hours**

**NOTE:** Student will be required to perform total of 10 experiments. 7 experiments will be from the below given list and rest experiments will be designed based upon the curriculum.

**LIST OF EXPERIMENTS**

* 1. To determine the modulus of rigidity of the material of a closed coil helical springand the stiffness of aspring
  2. To determine the value of coefficient of friction for a given pair of surfaces using frictionapparatus
  3. To determine the modulus of rigidity of horizontalshaft
  4. To determine experimentally the ratio of the cutting time to idle time (cutting stroke to idle stroke) of the crank and slotted lever (QRM)/ Whitworth and compare the result to theoretical values plot thefollowing
     + - θ v/s X (displacement ofslider).
       - θ v/svelocity.
       - θ v/s Acceleration and to compare the values of velocities (Take angles θ =45˚, 90˚, 135˚, 225˚, 270˚ &335˚, ω = 1rad/s)
  5. To determine the value of coefficient of friction between the screw and nut of the jack,while:
     + - Raising theload
       - Lowering theload
  6. To draw experimentally a curve of the follower-displacement v/s cam-angle. Differentiate the above curve to get velocity and acceleration plot and compare the values with those obtainedanalytically.
  7. Todeterminethecoefficientoffrictionbetweenbeltandpulleyandplotagraphbetween log10 T1/T2 v/s, θ.
  8. To determine the displacement, velocities, & accelerations of the driven shaft of a Hooke’s joint for a constant speed of the drivershaft.
  9. Study of bifilar and trifilar suspensionsystem
  10. Study of the inversions of the single slider crankmechanism.
  11. To verify the law of moment using Bell- cranklever.

**Environmental Studies**

**MPC-201N**

**L T P Sessional: -----**

**3 0 - Theory: 100 Marks**

**Total: 100 Marks Exam Duration: 3 Hours**

**UNIT 1**

**The multidisciplinary nature of environmental studies:** Definition, Scope and Importance. Need for public awareness. Natural Resources: Renewable and Non-Renewable Resources: Natural resources and associated problems.

1. Forest Resources: Use and over-exploitation, deforestation, case studies. Timber eztraction, mining, dams and their effects on forests and tribal people.
2. Water Resources- Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
3. Mineral Resources- Use and exploitation, environmental effects of extracting and using mineral resources, case studies.
4. Food Resources- World Food Problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.
5. Energy Resources- Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. Case studies.
6. Land Resources- Land as a resource, land, degradation, man induced landslides, soil erosion and desertification.

Role of an individual in conservation of natural resources.Equitable use of resources for sustainable lifestyle.

**UNIT II**

**Ecosystem:** Concept of an ecosystem.Structure and function of an ecosystem.Producers, consumers and decomposers.Energy flow in the ecosystem.EcologicalSuccession.Food Chains, food webs and ecological pyramids. Introduction, types, characteristic features, structure and function of the following ecosystem-

1. Forest Ecosystem
2. Grassland Ecosystem
3. Desert Ecosystem
4. Aquatic Ecosystems(ponds, streams, lakes, rivers, oceans, estuaries

**Field Work:**Visit to a local area to document Environments etsriver/forest/grassland/hill/mountain.Visit to a local polluted site- Urban/Rural Industrial / Agricultural. Study of common plants, insects and birds. Study of simple ecosystems-pond, river, hill, slopes etc. (Field work equal to 5 lecture hours).

**UNIT III**

**Biodiversity and its conservation:** Introduction, Definition: genetic, species and ecosystem diversity. Biogeographical classification of India. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. Biodiversity of global, National and local levels. India as a mega-diversity nation Hot spots of Biodiversity. Threats to biodiversity: Habitat loss, poaching of wild life, man-wildlife conflicts. Endangered and endemic species of India.Conservation of Biodiversity- In situ and Ex-Situ conservation of biodiversity.

**Environmental Pollution**: Definition. Cause, effects and control measures of- (a) Air Pollution (b) Water Pollution (c) Soil Pollution (d) Marine Pollution (e) Noise Pollution (f) Thermal Pollution (g) Nuclear Hazards

**Solid waste management:** Cause, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution.Pollution case studies. Disaster management:floods, earthquake, cyclone and landslides

**UNIT IV**

**Social Issues and the Environment**: .From unsustainable to sustainable development. Urban problems related to energy. Water conservation, rain water harvesting, watershed management. Resettlement and rehabilitation of people: Its problems and concerns. Case Studies.Environmental ethics-issues and possible solutions. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies.WastelandReclamationConsumerism and waste products.Environment Protection Act.Air (Prevention and Control of Pollution) Act.Water (Prevention and Control of Pollution) Act.Wildlife Protection Act.Forest Conservation Act. Issues involved in enforcement of environmental legislation. Public Awareness.Human population and the Environment.Populationgrowth, variation among nations. Population explosion-Family Welfare Programme. Environment and human health.Humanrights.ValueEducation.HIV/AIDS, Women and Child Welfare.Role of Information Technology in Environment and Human Health.Case Studies.

**TEXT BOOKS:**

1. Environmental Studies- Deswal and Deswal. DhanpatRai& Co.
2. Environmental Science & Engineering Anandan, P. and Kumaravelan, R. 2009. Scitech Publications (India) Pvt. Ltd., India

**REFERENCE BOOKS:**

1. Environmental Studies. Daniels Ranjit R. J. and Krishnaswamy. 2013. Wiley India.
2. Environmental Science-Botkin and Keller. 2012. Wiley, India

**Note:** *Examiner will set eight questions by selecting two from each unit. Students will be required to attempt five questions selecting at least one question from each unit.*

# Semester 4

**Computer Aided Design and Manufacturing**

##### MT-202N

**L T P Sessional: 25Marks**

**3 1 - Theory: 75Marks**

**Total: 100 Marks Exam Duration: 3 Hours**

**UNIT-I**

**Introduction to CAD/CAM:** Historical Development, Industrial look at CAD/CAM Application of CA/CAM, Display devices, Input/ Output Devices, CPU.

Introduction to CIM, Definition, Nature of Elements of CIM, CIM Wheel, Introduction to computer aided quality control, Contact and Non Conduct Inspection Method.

**UNIT-II**

**Modeling:** Wireframe modeling, Representation of curves, Parametric and non-parametric curves, straight lines, Hermite cubic splines, B splines curves.

Plane surface, ruled surface, surface of revolution, bi-cubic surface, Bezier surface, B spline surface, Solid modeling, boundary representation, sweeping, parametric solid modeling.

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**UNIT-III**

**Basic commands:**Introduction, Transformation of points & line, 2-D translation, rotation, Reflection, Scaling, shearing and combined transformation, Homogeneous coordinates, Orthographic and perspective Projections.

**Group technology:** Part families, Part classification and coding, Optiz method, product flow analysis, Machine cell Design, Advantages of GT

**UNIT-IV**

**Numerical control:** Types of NC systems, MCU & other components, Co-ordinate system, NC manual part programming, G & M codes, part program for simple parts, Computer assisted part programming.**FMS:**Introduction, FMS component, Types of FMS, FMS layout, planning for FMS, advantage and applications.Introduction, conventional process planning, Steps in variant process planning, types ofCAPP, planning for CAPP

**TEXT BOOKS:**

1. Chris McMahon and Jimmie Browne, CAD/CAM – Principle Practice and Manufacturing Management, Addison Wesley England, Second Edition, 2000.
2. Rogers, D.F. and Adams, A., Mathematical Elements for Computer Graphics, McGraw Hill Inc, NY, 1989
3. Ibrahim Zeid, CAD/CAM theory and Practice, Tata McGraw Hill Publishing Co. Ltd., New Delhi, 1992.
4. M.P. Groover, Automation, Productions systems and Computer-Integrated Manufacturing by Prentice – Hall

**REFERENCE BOOKS:**

1. Ibrahim Zeid, Mastering CAD/CAM, Tata McGraw Hill Publishing Co. Ltd., New Delhi.
2. P. Radhakrishnan, S. Subramanayan and V.Raju, CAD/CAM/CIM, New Age International (P) Ltd., New Delhi.
3. Groover M.P. and Zimmers E. W., CAD/CAM: Computer Aided Design and Manufacturing, Prentice Hall International, New Delhi, 1992.
4. Dr. Sadhu Singh, Computer Aided Design and Manufacturing, Khanna Publishers, New Delhi, Second Edition, 2000.
5. Chang, Wang &Wysk Computer Aided Manufacturing. Prentice Hall
6. Kundra&Rao, Numerical Control and Computer Aided Manufacturing by, Rao and Tiwari, Tata Mc-Graw Hill.
7. Mattson, CNC programming Principles and applications, Cengage Learning India Pvt.

Ltd. Delhi

**Note:** *Examiner will set eight questions by selecting two from each unit. Students will be required to attempt five questions selecting at least one question from each unit.*

**Analog Circuits**

**MT-204N**

**L T P Sessional: 25Marks**

**3 1 - Theory: 75Marks**

**Total: 100 Marks Exam Duration: 3 Hours**

##### UNIT-I

**P-N junction diode:** P-N junction and its characteristics, the load line concept, Applications: half-wave and full-wave rectifiers, capacitor-filter circuit, clipping and clamping circuits. Special Diodes: Zener diode, Schottky barrier diode, Varactor diode, Photodiode, Light emitting diode.

**Regulated power supplies:** Concept of DC Power supply, line and load regulations, three terminal IC regulators, SMPS.

##### UNIT-II

**Transistors:**Review of BJT and its characteristics, variation of operating point and stability. Transistor as amplifier, small signal equivalent circuit and Hybrid pi model, Emitter follower, Miller’s theorem, R-C coupled amplifier, Multistage amplifier. Transistor Biasing: fixed bias, emitter bias with and without emitter resistance, limitations on BJT’S (at high frequency), Large signal model: Ebers-Moll Model. Large Signal Amplifier: Class A and ClassB.

##### UNIT-III

**Feedback oscillators and power amplifiers:**basic principles and types of feedback in amplifiers. Effect of feedback, Sinusoidal Oscillators: Use of positive feedback, Barkhausen’s criterion, Different oscillator circuits-tuned collector, Hartley Colpitts, phase shift,Wien’s bridge, and crystal oscillator.

**Multivibrators:**Concept of multi-vibrator: astable, monostable, and bistable and their applications, IC555.

##### UNIT-IV

**Field effect transistors:** JFET, pinch-off voltage, Volt-ampere characteristics, small signal model, MOSFET-Enhancement & Depletion mode, V-MOSFET, MOSFET amplifiers: C-S Amplifiers, C-D Amplifiers, C-D Amplifier. Biasing of JFETS and MOSFETS.

##### TEXT BOOKS:

1.Integrated Electronics: Millman&Halkias; McGraw Hill. 2. Electronic circuit analysis and design (Second Edition): D.A. Neamen; TMH

##### REFERENCE BOOKS:

1. Electronics Principles: Malvino; McGraw Hill. 2. Electronics circuits: Donald L. Schilling & Charles Belove: McGraw Hill. 3. Electronics Devices & Circuits: Boylestad&Nashelsky; Pearson.

**Note:** *Examiner will set eight questions by selecting two from each unit. Students will be required to attempt five questions selecting at least one question from each unit.*

**Design Basics**

**MT-206N**

**L T P Sessional: 25Marks**

**3 1 - Theory: 75Marks**

**Total: 100 Marks Exam Duration: 3 Hours**

##### UNIT I

**Kinematics of simple vibrating motion:** Simple harmonic motions, Vectorial representation of harmonic motion. Degree of freedom, Equations of motions, general solution of free vibration, Phase planemethod

**Vibrations:** Damped free vibration, undamped and damped forced vibrations, Vibrating isolation, Vibrating instruments.

##### UNIT II

**Undamped free vibration:** Principle modes , Influence coefficients, Coordinate coupling, Orthogonality, Vibration absorbers.Geometric method, Stability of equilibrium points, Method of harmonic balance.Influence coefficients, Dunkerleys equation, Matrix iteration, Holzer method, Rayleigh method, and Rayleigh-Ritz method.

##### Unit III

**Bending & shear Stresses in Beams:** Bending stresses in beams with derivation & application to beams of circular, rectangular, I,T and channel sections, composite beams, shear stresses in beams with derivation combined bending torsion & axial loading of beams. Numericals.

**Columns & Struts:** Column under axial load, concept of instability and buckling, slenderness ratio, derivation of Eulers formulae for the elastic buckling load, Eulers, Rankine, Gordom’s formulae Johnson’s empirical formula for axial loading columns and their applications, eccentric compression of a short strut of rectangular & circular sections, Numerical.

##### Unit IV

**Slope & Deflection:** Relationship between bending moment, slope & deflection, Mohr’s theorem, moment area method, method of integration, Macaulay’s method, calculations for slope and deflection of (i) cantilevers and (ii) simply supported beams with or without overhang under concentrated load, Uniformly distributed loads or combination of concentrated and uniformly distributed loads, Numerical.

**Fixed Beams:** Deflections, reactions and fixing moments with SF & BM calculations & diagrams for fixed beams under (i) concentrated loads, (ii) uniformly distributed load and (iii) a combination of concentrated loads & uniformly distributedload.

##### TEXT BOOKS:

1. Mechanical vibration - By G.K. Grover; Nemchand Chand andSons
2. Mechanical Vibration – By Thomson; PrenticeHall
3. Strength of Materials – G.H.Ryder, Third Edition in SI Units 1969 Macmillan, India.
4. Mechanics of Materials – (Metric Edition) : Ferdinand P. Beer and E. Russel Johnston, Jr. Second Edition, McGraw Hill.

##### REFERENCE BOOKS:

* 1. Mechanical Vibration - By Den Hartog; McGrawHill
  2. Introductory course to mechanical vibrations – By Rao and Gupta; WileyEastern
  3. Book of Solid Mechanics – Kazmi, Tata McGrawHill
  4. Strength of Materials – D.S. Bedi - S. Chand & Co.Ltd.
  5. Advanced Mechanics of Solids and Structures – N. KrishanRaju and D.R.Gururaje-Narosa PublishingHouse.
  6. Strength of Materials – Andrew Pytel and FredinandL. Singer Fourth Edition, Int. Student Ed. Addison – WesleyLongman.

**Note:** *Examiner will set eight questions by selecting two from each unit. Students will be required to attempt five questions selecting at least one question from each unit.*

## Energy Management

## MT-208N

**L T P Sessional: 25Marks**

**3 1 - Theory: 75Marks**

**Total: 100 Marks Exam Duration: 3 Hours**

##### UNIT I

**Global scenario:**Introduction to global energy scenario, global energy requirements, depletion of conventional energy resources, availability of non conventional energy resources, fallouts of energy resources, application of carbon credit

**Technology and consideration for electrical and fuel energy:** Electrical energy, the evolution of electric power, power plant location, electric power network, designed capacities, electric power storage, fuel energy, fossil fuels, coal, coal analysis, properties of coal, heating value of coal, fuel oil, natural and petroleum gas, combustion reactions

##### UNIT II

**Principles of energy management:**Introduction, energy planning, energy staffing, energy organization, energy requirement, energy costing, energy budgeting, energy monitoring, energy consciousness, energy conversions, energy efficient equipments, energy management professions, environment pollution due to energy use, evaluation of alternative energy resources.

**Design of energy management programme:** Saving energy and implementation of energy conservation, principles of energy management, need for energy management programe, agenda for organization structure, role of energy manager, implement energy conservation actions, continuing energy conservation efforts

##### UNIT III

**Energy analysis and thermodynamics:** fundamentals of thermodynamics, the first law, the second law, Carnot cycle, Rankine cycle, energy balance, heat balance for steam process, energy balance of steam generator. Energy nalaysis of real insdustrial systems-transportation systems, energy conservation in transportation, pattern of energy consumption, emission targets for transportation, new technologies, progress in clean diesel technology, areas of improvement, fuel, engine, exhaust systems, cleaning of tailpipe

##### UNIT IV

**Energy analysis of real industrial systems-buildings:** energy consumption in buildings, construction cost vs life cycle cost, building design-walls and roof, heating and ventilation (HVAC) systems, water supply systems, lighting systems, building data logger and advanced controls, the energy conservation act, natural building code of India. Procedures for Energy analysis and audit, categories of energy audit, types of energy audit, ventilation audit, measuring and detection instruments for energy survey, scope of energy audit

**TEXT BOOKS:**

1. Energy Management Principles by Criag B. Smith, Published by Pergamon Press.

2. Energy systems and developments – Jyoti Parikh, Oxford University Press.

3. Energy Engineering and Management by AmlanChakrabarti PHI learning pvt Ltd.

**REFERENCE BOOKS :**

1. Energy – resources, demand and conservation with reference to India – ChamanKashkari,

Tata McGraw Hill Co. Ltd.

2. Integrated renewable energy for rural development – Proceedings of Natural solar energy

convention, Calcutta.

**Note:** *Examiner will set eight questions by selecting two from each unit. Students will be required to attempt five questions selecting at least one question from each unit.*

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| **Fundamentals of Management** |
| **HS-201N** |

**L T P Sessional: 25Marks**

**3 1 - Theory: 75Marks**

**Total: 100 Marks Exam Duration: 3 Hours**

**UNIT-1**

**Introduction to Management:** Meaning, Definition, nature, importance & Functions, Management as Art, Science & Profession- Management as social System, Concepts of management-Administration

**Evolution of Management Thought**: Development of Management Thought- Scientific management, Administrative Theory of Management, Bureaucratic Organization, Behavioral approach (Neo Classical Theory): Human Relations Movement; Behavioral Science approach; Modern approach to management – Systems approach and contingency approach.

**UNIT-II**

**Planning**: nature, purpose and functions, types of plans, planning process, Strategies and Policies: Concept of Corporate Strategy, formulation of strategy, Types of strategies, Management by objectives (MBO), SWOT analysis, Types of policies, principles of formulation of policies

**Organizing**: nature, importance, process, organization structure: Line and Staff organization, Delegation of Authority and responsibility, Centralization and Decentralization, Decision Making Process , Decision Making Models, Departmentalization: Concept and Types (Project and Matrix), formal & informal organizations

**UNIT-III**

**Staffing**: concept, process, features; manpower planning; Job Analysis: concept and process; Recruitment and selection: concept, process, sources of recruitment; performance appraisal, training and development

**Directing**: Communication- nature, process, formal and informal, barriers to Effective Communication, Theories of motivation-Maslow, Herzberg, McGregor ; Leadership – concept and theories, Managerial Grid, Situational Leadership. Transactional and Transformational Leadership.

**UNIT-IV**

**Controlling**: concept, process, types, barriers to controlling, controlling Techniques: budgetary control, Return on investment, Management information system-MIS , TQM-Total Quality Management, Network Analysis- PERT and CPM.

**Recent Trends in Management**: Management of Crisis, Total Quality Management, Stress Management, Concept of Corporate Social Responsibility (CSR) and business ethics.

Functional aspects of business: Conceptual framework of functional areas of management- Finance; Marketing and Human Resources

**TEXT BOOKS:**

* 1. Management Concepts - Robbins, S.P; Pearson Education India
  2. Principles of Management - Koontz &O’Donnel; (McGraw Hill)

**RECOMMENDED BOOKS:**

* 1. *Business Organization and Management* – Basu; Tata McGraw Hill
  2. Management and OB-- Mullins; Pearson Education
  3. Essentials of Management – Koontz, Tata McGraw-Hill
  4. Management Theory and Practice – Gupta, C.B; Sultan Chand and Sons, new Delhi
  5. Prasad, Lallan and S.S. Gulshan. *Management Principles and Practices.* S. Chand& Co. Ltd., New Delhi.
  6. Chhabra, T.N. *Principles and Practice of Management*. DhanpatRai& Co., Delhi.
  7. Organizational behaviour – Robins Stephen P; PHI.

**Note:** *Examiner will set eight questions by selecting two from each unit. Students will be required to attempt five questions selecting at least one question from each unit.*

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| **Mathematics- III** |
| **AS-201N** |

**L T P Sessional: 25Marks**

**3 1 - Theory: 75Marks**

**Total: 100 Marks Exam Duration: 3 Hours**

**UNIT-I**

**Fourier series:** Euler’s formulae, Orthogonality conditions for the Sine and Cosine function, Dirichlet’s conditions, Fourier expansion of functions having points of discontinuity, Change of interval, Odd and even functions, Half-range series.

**Fourier Transforms:** Fourier integrals, Fourier transforms, Fourier Cosine and Sine transforms, Properties of Fourier transforms, Convolution theorem, Parseval’s identity, Fourier transforms of the derivative of a function, Application of transforms to boundary value problems (Heat conduction and vibrating string).

**UNIT-II**

**Partial Differential Equations and LPP**: Formation and Solutions of PDE, Lagrange’s Linear PDE, First order non-linear PDE, Charpit’s method, Homogeneous linear equations with constant coefficients, Method of separation of variables.

**Solution of linear programming problems:** using Graphical and Simplex methods.

**UNIT-III**

**Theory of Complex Variables:** A review of concept of functions of a complex variable, Limit, continuity, differentiability and analyticity of a function. Basic elementary complex functions (exponential functions, trigonometric & Hyperbolic functions, logarithmic functions) Cauchy-Riemann Equations.

**Line integral in complex plane:** definition of the complex line integral, basic properties,

Cauchy’s integral theorem, and Cauchy’s integral formula, brief of Taylor’s, Laurent’s and Residue theorems (without proofs).

**UNIT-IV**

**Probability theory:** A review of concepts of probability and random variables, definitions of probability, addition rule, conditional probability, multiplication rule, Conditional Probability, Mean, median, mode and standard deviation, Bayes’ Theorem, Discrete and continuous random variables, probability mass, probability density and cumulative distribution functions, mathematical expectation, moments, moment generating function.

**Standard Distributions:** Binomial, Poisson and Normal distribution.

**TEXT BOOKS:**

1. Advanced Engg. Mathematics : E. Kreyzig
2. Higher Engg. Mathematics : B.S. Grewal

**REFERENCES BOOKS:**

1. E. Kreyszig : Advanced Engineering Mathematics, Wiley India.
2. B. V. Ramana: Engineering Mathematics, Tata McGraw Hill.
3. R.K. Jain, S.R.K. Iyengar: Advanced Engineering Mathematics, Taylor & Francis.
4. Murray R. Spiegel[:](http://www.amazon.in/s/ref=dp_byline_sr_book_1?ie=UTF8&field-author=Murray+R+Spiegel&search-alias=stripbooks)Schaum's Outline of Complex Variables, McGraw Hill

Professional.

1. Michael D. Greenberg: Advanced Engineering Mathematics, Pearson Education,

Prentice Hall.

**Note:** *Examiner will set eight questions by selecting two from each unit. Students will be required to attempt five questions selecting at least one question from each unit.*

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| **Theory of Machines-II** |
| **MT-210N** |

**L T P Sessional: 25Marks**

**3 1 - Theory: 75Marks**

**Total: 100 Marks**

**Exam Duration: 3 Hours**

**UNIT I**

**Gears:**Types of gears, terminology, condition for correct gearing, cyclical and involutes profiles of gear teeth, pressure angle, path of contact, arc of contact, Interference, undercutting, minimum number of teeth, number of pairs of teeth in contact, helical, spiral, worm and worm gear, bevel gear. Gear trains; simple, compound, reverted, and epicyclical, Solution of gear trains, sun and planet gear, bevel epicyclical gear, compound epicyclical gear, pre- selective gear box, differential of automobile, torque in geartaints.

**UNIT II**

**Brakes:** Types of brakes, friction brakes, external shoe brakes, band brakes, band and block brakes, internal expanding shoe brake, dynamometers; absorption, and tensional. Static and dynamic balancing of rotating parts, balancing of I. C. Engines, balancing of multi-cylinder engine; V-engines and radial engines, balancing of machines.

**UNIT III**

**Gyroscope:** Gyroscopic couple and its effect on craft, naval ships during steering, pinching and rolling, Stability of an automobile (2-wheeers), Introduction, open and closed lop control, terms related to automatic control, error detector, actuator, amplification, transducers, lag in responses, damping, block diagrams, system with viscous damped output, transfer functions, relationship between open –loop and closed loop transferfunction.

**UNIT IV**

**Vibrations:**Introduction, Terms Used in Vibratory Motion, Types of Vibratory Motion, Types of free Vibrations, Natural frequency of free Longitudinal Vibrations, Natural frequency of free Transverse Vibrations, Effect of Inertia of the Constraint in Longitudinal and Transverse Vibrations, Natural frequency of free Transverse Vibrations Due to a Point Load Acting Over a Simply Supported Shaft, Natural frequency of free Transverse Vibrations Due to Uniformly Distributed Load Over a Simply Supported Shaft, Natural frequency of free Transverse Vibrations of a Shaft fixed at Both Ends and Carrying a Uniformly Distributed Load, Natural frequency of free Transverse Vibrations for a Shaft Subjected to a Number of Point Loads.

##### TEXT BOOKS:

1. Theory of machines: S. S. Rattan, Tata McGraw HillPublications
2. Theory of machines : R S Khurmi, S Chand Publications

**REFERENCE BOOKS:**

1. Theory of Mechanism and Machines: JagdishLal, Metropolitan BookCo.
2. Mechanism synthesis and analysis: A.H. Soni, McGraw HillPublications.
3. Mechanism: J.S.Beggs.
4. Mechanics of Machines: P.Black, PergamonPress.
5. Theory of Machines: P.L.Ballaney, KhannaPublisher.

**Note:** *Examiner will set eight questions by selecting two from each unit. Students will be required to attempt five questions selecting at least one question from each unit.*

**Analog Circuits Lab**

**MT-212N**

##### L T P Sessional: 40Marks

* **- 2 Practical: 60Marks**

**Total: 100 Marks**

**Exam Duration:3 Hours**

**NOTE:** Student will be required to perform total of 10 experiments. 7 experiments will be from the below given list and rest experiments will be designed based upon the curriculum.

**LIST OF EXPERIMENTS**

1. Measurement & study of P-N junction diode-I-V and C-V characteristics.

2. Study of Half-wave and Full-wave rectifier.

3. Study of Active filters.

4. Study of diode as Clipper and Clamper.

5. Study of Zener diode as Voltage Regulator.

6. Measurement and study of Input and Output characteristics of a BJT.

7. Study of CE amplifier-Current & Power gains and Input, Output Impedances.

8. To study the frequency response of RC coupled amplifier.

9. Measurement and study of Output characteristics of JFET.

10. Measurement and study of Output characteristics of MOSFET.

11. Study of SCR/Thyristor characteristics.

12. Study of UJT characteristics.

13. Study of Push-Pull amplifier.

14. Simulation of few analog electronics circuits using PSPICE tools.

**Computer Aided Design and Manufacturing Lab**

##### MT-214N

##### L T P Sessional: 40Marks

* **- 2 Practical: 60Marks**

**Total: 100 Marks**

**Exam Duration:3 Hours**

**NOTE:** Student will be required to perform total of 10 experiments. 7 experiments will be from the below given list and rest experiments will be designed based upon the curriculum.

**LIST OF EXPERIMENTS**

1 To study the 2 dimensional drawing, orthographic views, front view, top view and side view.

2 To study the wireframe, surface and solid modelling.

3 Draw the part drawing of product 1 using any 3D software.

4 Draw the part drawing of product 2 using any 3D software.

5 Make assembly by using any 3D software.

6 To study the G codes and M codes.

7 Write a NC program for milling operation.

8 Write a NC program for drilling operation.

9 Write a NC program for turning operation.

10 To study the optiz method.

**Theory of Machines-II Lab**

**MT-216N**

##### L T P Sessional: 40Marks

* **- 3 Practical: 60Marks**

**Total: 100 Marks**

**Exam Duration:3 Hours**

**NOTE:** Student will be required to perform total of 10 experiments. 7 experiments will be from the below given list and rest experiments will be designed based upon the curriculum.

##### LIST OF EXPERIMENTS

1. To determine experimentally, the moment of inertia of a flywheel and axle compare with theoreticalvalues.
2. To find out critical speed experimentally and to compare the whirling speed of a shaft with theoreticalvalues.
3. To find experimentally the Gyroscopic couple on motorized gyroscope and compare with appliedcouple.
4. To calculate the torque on a planet carrier and torque on internal gear using epicyclic gear train and holding torqueapparatus.
5. To study the different types of centrifugal and inertia governors and demonstrate anyone.
6. To study the automatic transmissionunit.
7. To study the differential types ofbrakes.
8. To find experimentally frequency of simple pendulum.

**Energy Studies**

## MPC-202N

**L T P Sessional: ----**

**3 0 - Theory: 100 Marks**

**Total: 100 Marks Exam Duration: 3 Hours**

**UNIT-I**

**Introduction**: Types of energy, Conversion of various forms of energy, Conventional and Non-conventional sources, Need for Non-Conventional Energy based power generation.

**Energy Management:** General Principles of Energy Management, Energy Management Strategy.

**Energy Audit:** Need, Types, Methodology and Approach.

**UNIT-II**

**Conventional Energy sources:** Selection of site**,** working of Thermal, Hydro, Nuclear and Diesel power plants and their schematic diagrams & their comparative advantages- disadvantages.

**UNIT-III**

**Non-Conventional Energy sources:** Basicprinciple, site selection of Solar energy power plant, photovoltaic technologies, PV Systems and their components, Wind energy power plant, Bio energy plants,Geothermal energy plantsand tidal energy plants.MHD

**UNIT-IV**

**Energy Scenario**: Lay out of power system, Role of Energy in Economic development, energy demand, availability and consumption, Commercial and Non-commercial energy, Indian energyscenario, long term energy scenario, energy pricing, energy sector reforms in India, energy strategy for the future.

**TEXT BOOKS:**

1. Energy Studies-Wiley Dream tech India.
2. Non-conventional energy resources- Shobhnath Singh, Pearson.
3. Soni, Gupta, Bhatnagar: Electrical Power Systems – DhanpatRai& Sons

**REFERENCE BOOKS:**

1. NEDCAP: Non Conventional Energy Guide Lines
2. G.D. Roy :Non conventional energy sources
3. B H Khan :Non Conventional energy resources - McGraw Hill
4. Meinel A B and Meinal M P,Addison: Applied Solar Energy- Wesley Publications.
5. George Sutton: Direct Energy Conversion –McGraw

**Note:** *Examiner will set eight questions by selecting two from each unit. Students will be required to attempt five questions selecting at least one question from each unit.*

# Semester 5

**Signal Conditioning**

**MT-301N**

**L T P Sessional: 25Marks**

**3 1 - Theory: 75Marks**

**Total: 100 Marks**

**Exam Duration: 3 Hours**

**UNIT-I**

**Introduction to signal and its types**: Introduction to Signals Processing, Classification of signals & their representation, continuous-discrete, Periodic –Non Periodic, even-odd, random-deterministic, energy-power signals & their problems. Commonly used signals (unit step, unit ramp, unit impulse, signum, gated factions etc.) in continuous & discrete form. Operations on signals (time shifting, time scaling, amplitude sacling etc.) properties of impulse.

**UNIT – II**

**Fourier series & Transformation:**Definition, conditions of existence of FS, properties, magnitude and phase spectra, some important FS theorems. Definition of FT, conditions of existence of FT, properties, magnitude and phase spectra, Some important FT theorems, Parseval’s theorem, Inverse FT, relation between LT and FT(ii) Discrete time Fourier transform (DTFT), inverse DTFT, convergence, properties and theorems, Comparison between continuous time FT and DTFT

**UNIT – III**

**Laplace-Transform (LT) and Z-transform (ZT):** One-sided LT of some common signals, important theorems and properties of LT, inverse LT, solutions of differential equations using LT, Bilateral LT, Regions of convergence (ROC), Convolution Theorem One sided and Bilateral Z-transforms, ZT of some common signals, ROC, Properties and theorems, solution of difference equations using one-sided ZT, s- to z-plane mapping, convolution theorem.

**UNIT – IV**

**Sampling Theorem:** Representation of continuous time signals by its sample –Types of sampling, sampling theorem. Reconstruction of a Signal from its samples, aliasing –sampling of band passsignals.Sample and Hold, Quantization and Coding, Analysis of quantization error

**TEXT BOOKS:**

1. Oppenheim and Nawab, Signals and Systems
2. John G. Proakis, Digital Signal Processing, PHI
3. S. K. Mitra, Digital Signal Processing , TMH

**REFERENCES BOOKS:**

1. Rabiner and Gold, Digital Signal Processing, PHI
2. Salivahan, Digital Signal Processing , TMH 5. Digital Signal Processing: Alon V. Oppenhelm;PHI

**Note:** *Examiner will set eight questions by selecting two from each unit. Students will be required to attempt five questions selecting at least one question from each unit.*

**Pneumatic and Hydraulic Instrumentation**

**MT-303N**

**L T P Sessional: 25Marks**

**3 1 - Theory: 75Marks**

**Total: 100 Marks**

**Exam Duration: 3 Hours**

##### UNIT – I

**Fundamental principles:** Industrial Prime movers, a brief system comparison, an electrical system, hydraulic system, pneumatic system, definitions of terms: mass and force, pressure, work, energy and power, torque, Pascal’s law, pressure measurement, fluid flow, temperature scales and temperature measurement, gas laws.

**Basic components of a pneumatic system:** receiver tank, compressors, piston compressors, single acting and double acting compressors, multistage compressors, combined two stage compressors, diaphragm compressors, screw compressors, rotary compressors, dynamic compressors, air treatment: stages of air treatment, filters, air dryers, lubricators, pressure regulation: relief valves, non-relieving pressure regulators, relieving pressure regulators, service units.

##### UNIT – II

**Actuators:** Linear actuators, construction, mounting arrangements, cylinder dynamics, seals, rotary actuators, constructional details, application notes, speed control, actuator synchronization, regeneration, counterbalance and dynamic braking, pilot operated check valves, pre-fill and compression relief.

##### UNIT – III

**Hydraulic pumps and pressure regulation:** pressure regulation, pump types, gear pumps, vane pumps, piston pumps, combination valves, loading valves, filters, Control valves: Graphic symbols, types of control valve, poppet valves, spool valves, rotary valves, pilot operated valves, check valves, pilot operated check valves, restriction check valves, shuttle and fast exhaust valves, sequence valves, time delay valves, servo valves and modular cartridge valves.

##### UNIT – IV

**Hydraulic and pneumatic accessories:** hydraulic reservoirs, hydraulic accumulators, hydraulic coolers, hydraulic fluids, pneumatic piping, hoses and connections, hydraulic piping, hoses and connections, Process Control Pneumatics, signals and standards, the flapper nozzle, volume boosters, the air relay and force balance principle, pneumatic controllers, process control valves and actuators, flow control valves, actuators, valve positioners, converters: I-P converters and P-I converters, sequencing applications

##### TEXT BOOKS:

1. Pneumatic & Hydraulic, Andrew Parr PHI,1999
2. Pneumatic & Hydraulic, R Srinivasan, vijaynicole
3. Process Control Instrumentation Technology, C. D. Johnson ,PHI,2002
4. Computer based Industrial Control, KrishankantPHI,2004

##### REFERENCE BOOKS:

1. Process Industrial Instruments & Control Handbook D.Considine , McGraw Hill,1993.
2. Instrument Engineers Handbook ,B.Gliptak ,BH Publication,1999.

**Note:** *Examiner will set eight questions by selecting two from each unit. Students will be required to attempt five questions selecting at least one question from each unit.*

**Embedded Systems-I**

**MT-305N**

**L T P Sessional: 25Marks**

**3 1 - Theory: 75Marks**

**Total: 100 Marks**

**Exam Duration: 3 Hours**

**UNIT-I**

Introduction to Microcontroller: -Evaluation of Microcontrollers. Classification of Microcontroller – On the basis of architecture andinstruction set.Embedded processor.Comparison between Microprocessor and Microcontrollers.A brief history of 8051.Overview of 8051 microcontroller family.Block Diagram and Architecture of 8051. Pin Description of 8051 microcontroller.

#### UNIT-II

Assembly and C programming of Microcontroller :- 8051 Instruction Format,Addressing modes, Data transfer instructions. Logical operations, Arithmetic operations, looping, jumpand call instructions, Time Delay programming. SFR (Special Function Registers).Development of different programs.Data types and Time Delays in 8051 C. Logic and Arithmetic operation in C.

#### UNIT-III

8051 Internal Architecture: - I/O port programming. Serial communication using 8051.Counter andTimers programming.Different modes of timer.Serial data input / output,Setting Baud Rate.Interrupt Programming –timer interrupts, external hardware interrupts, serial communication interrupt, priority interrupt. External memory interfacing.

#### UNIT-IV

Interfacing of microcontroller: Microcontroller based seven segment numeric displays.Microcontroller interfacing with keypad, Microcontroller based D/A& A/D converters andMicrocontroller based LCD display.Motor interfacing with microcontroller 8051.

##### TEXT BOOKS

1. The 8051 Microcontroller And Embedded Systems Using Assembly And C: Muhammad AliMazidi.
2. The 8051 Microcontroller: Kenneth J.Ayala

##### REFERENCE BOOKS

1. The 8051 Microcontroller:Mackenzie
2. 8051 Microcontroller: Internals, Instructions, Programming&Interfacing:GhoshalSubrata

**Note:** *Examiner will set eight questions by selecting two from each unit. Students will be required to attempt five questions selecting at least one question from each unit.*

**Heat Transfer**

**MT-307N**

**L T P Sessional: 25Marks**

**3 1 - Theory: 75Marks**

**Total: 100 Marks**

**Exam Duration: 3 Hours**

**UNIT I**

**Introduction:** definition of heat, modes of heat transfer; basic laws of heat transfer, application of heat transfer, simple problems.

**Conduction:** Fourier equation, electrical analogy of heat conduction; thermal conductivity, steady one dimensional heat conduction without internal heat generation: conduction through plane and composite wall, the cylindrical shell; the spherical shell; critical thickness of insulation; variable thermal conductivity, steady one dimensional heat conduction with uniform internal heat generation: the plane slab.

**UNIT II**

**Convection: Introduction**: Newton’s law of cooling, convective heat transfer coefficient, Nusselt number, convection boundary layers: Introduction of velocity and thermal boundary layers and its significance with respect to convection (without derivations of boundary layer equations), local and average convection coefficient, functional form of the solution of boundary layer equations, Physical significance of the dimensionless parameters, Reynolds analogy, ***External Forced Convection:*** Introduction to empirical method of solution, flow over a flat plate with both conditions of constant heat flux and constant temperature, cylinder in cross flow, flow over a sphere, ***Internal Forced Convection:*** Introduction to velocity profile, pressure gradient and friction factor in fully developed flow, mean temperature, energy balance considering constant surface heat flux and for constant surface temperature, convection correlations for laminar flow in circular tubes both in entry region and in the fully developed region, ***Natural convection:*** Physical considerations, governing equations (without derivations), functional form of the solution of governing equations, empirical correlations for external free convection flow over the vertical plate, horizontal and inclined plates, horizontal cylinder and sphere.

**UNIT III**

**Extended Surfaces:** governing equation for fins of uniform cross section, temperature distribution and heat dissipation rate in infinitely long fin, fin insulated at tip, fin losing heat at tip; efficiency and effectiveness of fins.

**Heat Exchangers:** classification of heat exchangers; overall heat transfer coefficient, logarithmic mean temperature difference, effectiveness of heat exchangers, NTU method of heat exchanger design, applications of heat exchangers.

**UNIT IV**

**Radiation:** fundamental concepts, absorption, reflection and transmission, black body concept, monochromatic and total emissive power, Planck’s distribution law, Stefan Boltzman law, Wien’s displacement law, Kirchoff’s law, intensity of radiation,Lambert’s cosine law, heat transfer between black surfaces, radiation shape factor.

**TEXT BOOKS:**

1. Fundamentals of Heat and Mass transfer – Frank P. Incropera, David P. Dewitt, T.L. Bergman and A.S. Lavine, Wiley Publications.
2. Heat Transfer: A Practical Approach - Yunus A Cengel, Tata McGraw Hill.
3. Heat Transfer – J.P. Holman, Tata McGraw Hill.

**REFERENCE BOOKS:**

1. A Text book of Heat Transfer - S.P Sukhatme, University press
2. Heat and Mass Transfer - D.S Kumar, S.K. Kataria& Sons
3. Heat and Mass Transfer – P.K. Nag, Tata McGraw Hill.
4. Heat Transfer – Y.V.C. Rao, University Press.
5. Heat Transfer – P.S.Ghoshdastidar, Oxford Press.

**Note:** *Examiner will set eight questions by selecting two from each unit. Students will be required to attempt five questions selecting at least one question from each unit.*

**Production Technology-I**

**MT-309N**

**L T P Sessional: 25Marks**

**3 1 - Theory: 75Marks**

**Total: 100 Marks**

**Exam Duration: 3 Hours**

##### UNIT I

##### Theory of Metal Cutting and Machinability:Introduction, classification of cutting tools, single point cutting tool nomenclature, positive and negative rake tools, elements of machining, classical metal machining processes, chip formation and types of chips, basic mechanism of chip formation, forces on the chip, velocity relationships, theories on mechanics of metal cutting, power and energy relations, thermal aspects of machining. Evaluation of machinability, tool life, tool life plots, types of tool failure, flank wear, variables influencing the tool failure.

##### UNIT II

##### Economics of metal machining &Mechanics of Multi-Point Cutting Tools: Economics of machining: Element of machining cost, analysis for optimum cutting speed, problems on economics of machining, tooling economics, machines economics and optimization. Milling cutters: conventional milling and climb milling, chip cross section in milling, power required in milling, forces and torque in drilling, power requirement in broaching.

##### UNIT III

##### Jigs and Fixtures & Turrets: Tool engineering, tool design, types of tools, usefulness of jigs and fixtures, principles of jigs and fixture design, locating and clamping, locating devices, types of clamping devices, elements of jig, milling fixtures, turning fixtures, boring and broaching fixtures, materials for Jigs and fixtures, economics of jigs and fixtures.Introduction, characteristics of turret lathes, difference between turret and capstan, main parts of turrets, universal chucking equipment, universal bar equipment.

##### UNIT IV

##### Metrology: Direct reading instruments, micrometers, differential micrometers, bench micrometers, vernier calipers, vernier height guage, slip gauges, measurement of angles, sprit level, auto- collimator, measurement of tapers, external taper, dovetail angle, comparator-mechanical comparator, dial guage, principle of mechanical comparator, electrical comparator, optical comparator, working principle of an optical comparator, optical flat as comparator, checking height of a component, Surface finish and its measurement, micro and macro deviation, factors affecting surface finish and evaluation of surface finish, peak to valley method, centre line average method and root mean square method.

**TEXT BOOKS:**

1. Production Engineering and Science: Dr. PC Pandey and Dr. CK Sharma, Standard publishers Distributors
2. Manufacturing science: Ghosh and Malik, E.W.Press

**REFERENCE BOOKS:**

1. Principles of metal cutting: Sen and Bhattacharya, New CentralBook.
2. Metal cutting principles: Shaw, MIT PressCambridge
3. Manufacturing analysis: Cook,Adisson-Wesley
4. Modern machining processes: Pandey and Shan, Tata McGraw HillPublications

**Note:** *Examiner will set eight questions by selecting two from each unit. Students will be required to attempt five questions selecting at least one question from each unit.*

**Measurements and Control**

**MT-311N**

**L T P Sessional: 25Marks**

**3 1 - Theory: 75Marks**

**Total: 100 Marks**

**Exam Duration: 3 Hours**

**UNIT-I**

**Introduction:** Definition, application of measurement instrumentation, functional elements of a generalized measuring system, measuring standards, types of measurement, types of input to measuring instruments and instrument system, classification of measuring instruments, merits and demerits of mechanical measuring systems, comparison of mechanical measuring system with electrical measuring systems, calibration. Errors: Introduction to error, types of error, types of uncertainties, propagation of uncertainties in compound quantity, Static performance parameters: accuracy, precision, resolution, static sensitivity, linearity, hysteresis, dead band, backlash, and drift, Sources of error, Selection of measuring instruments, Mechanical and Electrical loading

**UNIT-II**

**Fundamentals of dynamic characteristics:** Generalized mathematical model of measuring systems, types of input, dynamic performance parameters: dynamic error, speed of response, etc, dynamic response of a first order mechanical systems with different inputs e.g. step, ramp, sinusoidal and impulse input. Introduction to measuring data: types of measuring data, statistical attributes, various methods of presentation, estimation of presentation and uncertainties, confidence level, precision and statistical treatments of single and multi-sample type experimental data, Chauvent's criteria of rejecting a dubious data, curve fitting, best linear calibration and its precision, significant figures and rounding off. Overall uncertainty in estimation of measuring systems, common-sense approach and engineering applications.

**UNIT-III**

**Transducers:** Introduction, primary function, classification, electrostatic transducers: principle theory, types, advantages and limitations, Fixed contact mechano-resistive transducers: classification, and uses, Metallic resistance strain gauge: types, construction theory of operation, Adhesive: property, selection criteria, mounting of strain gauges, Mathematical analysis of ballast and DC-Wheatstone bridge circuits, Characteristic and comparison of ballast and DC-Wheatstone bridge circuits, temperature effects and their compensation.

Measurement of load, force, and thrust using resistant strain gauges, Elastic load cells, proving rings, fluid pressure measurement in pipe and containers, using strain gauges, measuring of torque in transmission shaft under axial and bending loads in varying ambient conditions.

**UNIT-IV**

**Control Systems:** Introduction, classification of control systems: control system terminology, servo mechanism, process control and regulators, Manual and automatic control systems, physical systems and mathematical models, linear control systems, Laplace transform, transfer function, block diagram, signal flow graphs, system stability, Time and frequency domain.

**TEXT BOOKS:**

1. Mechanical Measurements & Control: D.S. Kumar, Metropolitan book

**REFERENCE BOOKS:**

1. Instrumentation & Mechanical Measurements: A.K. Tayal, Galgotia Publ.
2. Measurements Systems Application & Design: Ernest Doebelin, McGraw-Hill

**Note:** *Examiner will set eight questions by selecting two from each unit. Students will be required to attempt five questions selecting at least one question from each unit.*

**Signal Conditioning Lab**

**MT-313N**

##### L T P Sessional: 40Marks

* **- 2 Practical : 60Marks**

**Total: 100 Marks Exam Duration: 3 Hours**

**NOTE:** Student will be required to perform total of 10 experiments. 7 experiments will be from the below given list and rest experiments will be designed based upon the curriculum.

**LIST OF EXPERIMENTS:**

1. Introduction to MATLAB and to generate different type of signals.
2. Write a MATLAB script to find average value, root mean square value, mean square value of a given signal.
3. Write a MATLAB script to find average power of a given signal.
4. Write a MATLAB script to find energy of a given signal.
5. Write a MATLAB script to find commutation of even and odd symmetries in a signal with algebraic operations.
6. Write a MATLAB script to find signal parameters (amplitude-scaling, time-scaling and timeshifting).
7. Write a MATLAB script to find different operations on a given sequence.
8. Write a MATLAB script to obtain sampling and find out sample rate.
9. Write a MATLAB script to find out quantization of a given signal.
10. Write a MATLAB script to obtain linear convolution of two signals.
11. Write a MATLAB script to obtain circular convolution of two signals.
12. Write a MATLAB script to obtain correlation of two signals.
13. Write a MATLAB script to find Z-transform of a given sequence.

**Pneumatic and Hydraulic Instrumentation Lab**

**MT-315N**

**L T P Sessional: 40Marks**

**- - 3 Practical: 60Marks**

**Total: 100 Marks**

**Exam Duration: 3 Hours**

**NOTE:** Student will be required to perform total of 10 experiments. 7 experiments will be from the below given list and rest experiments will be designed based upon the curriculum.

**LIST OF EXPERIMENTS:**

**Study and experiment the following circuits.**

1. Basic Hydraulic circuit

2. Meter in & Meter out hydraulic circuit

3. Basic pneumatic circuit

4. Meter in & Meter out pneumatic circuit

5. Regenerative circuit.

6. Electro pneumatic circuit

7. Synchronizing circuit

8. Automatic Reciprocation circuit

9. Sequential circuit

10. Automatic Reciprocation of Double acting cylinder using PLC

11. Fluid power circuits using Automation studio software.

**Embedded Systems-ILab**

**MT-317N**

##### L T P Sessional: 40Marks

* **- 2 Practical : 60Marks**

**Total: 100 Marks Exam Duration: 3 Hours**

**NOTE:** Student will be required to perform total of 10 experiments. 7 experiments will be from the below given list and rest experiments will be designed based upon the curriculum.

**LIST OF EXPERIMENTS:**

1. Introduction to microcontroller and interfacingmodules.
2. To interface the seven segment display with microcontroller8051.
3. To create a series of moving lights using 8051 onLEDs.
4. To interface the stepper motor withmicrocontroller.
5. To display the digital output of ADC on 16\*2 LCDModule.
6. To display character ‘A’ on 8\*8 LEDMatrix.
7. To display the data and time on LCDModule.
8. To switch on and off relay by usingkeys.
9. To interface the DC motor usingH-Bridge.
10. To interface a keypad withmicrocontroller.

##### Industrial Training

##### MT-319N

|  |  |  |
| --- | --- | --- |
| **L**  **2** | **T P**  **- -** | **Sessional : 100 Marks**  **Practical : 0 Marks**  **Total : 100 Marks** |
|  |  | **Exam Duration: 03 hours** |

Student will submit summer training report of 5 to 6 week industrial trainingfor his/her assessment. The evaluation will be made based upon the report submitted by student and presentation of work done in industry during the specified period.

**Semester 6**

**Automatic Control Systems**

### MT-302N

**L T P Sessional: 25Marks**

**3 1 - Theory: 75Marks**

**Total: 100 Marks**

**Exam Duration: 3 Hours**

**UNIT 1**

**Introduction of control system:** Concept of control, Classification of control systems, Transfer Functions ,system representation-Analogies, Mathematical modeling of physical system (Mechanical,thermal and electrical system), Block diagram reduction technique, Signal Flow Graph , Control System components ( Servomotors, Techogenerators, Stepper motor).

**UNIT-II**

**Time domain analysis:** Typical test signals, Time response of first order systems to various standard inputs (unit step input ,unit ramp input, unit impulse input) time response of 2nd order system (to step input and unit ramp input) , Time domain specifications for under-damped 2nd order system, Steady state error and error constants, Effect of adding poles and zero to a system. Feedback characteristics of control system (Effect of feedback on sensitivity, overall gain and stability).Basic Control actions (P/I,D/PI/PD and PID control)

**UNIT-III**

**Stability anaysis:** Concept of stability, pole zero configuration and stability, necessary and sufficient conditions for stability Routh-Hurwitz stability criterion and relative stability analysis. Root locus concept,Nyquist stability Criterion, frequency response analysis -Bode plot –gain margin and phase margin.

**UNIT-IV**

**Compensation techniques**: Classifications-Lag, Lead and Lag lead compensator, Necessity of compensation,compensation networks, application of lag and lead compensation, basic modes of feedback control, proportional, integral and derivative controllers. Concepts of state, state variables and state model, derivation of state models from block diagrams- State space representations– Solutions of state equations. Concepts of Controllability and Observability

**TEXT BOOKS**:

1. Linear Control System by R.S. Chauhan, (Umesh Publications)

2. Automatic Control System by S.HasanSaeed (SK Kataria and Sons publications)

3.Linear Control system by B.S.Manke ( khanna Publishers)

**REFERENCE BOOKS:**

1. Control system Engg. By Nagrath and Gopal

2. Control system Engg. By Ogata

3. Automatic Control Systems :B.C.Kuo, PHI

**Note:** *Examiner will set eight questions by selecting two from each unit. Students will be required to attempt five questions selecting at least one question from each unit.*

**Embedded Systems-II**

**MT-304N**

**L T P Sessional: 25Marks**

**3 1 - Theory: 75Marks**

**Total: 100 Marks**

**Exam Duration: 3 Hours**

**UNIT-I**

**Introduction to microcontrollers:** Evaluation of Microcontrollers- Microcontrollers and Embedded system, Criteria for choosing a microcontroller, Overview of AVR Family, Block diagram of AVR microcontroller, AVR microcontroller I/O pins, AVR microcontroller peripherals, Special purpose AVRs.

**UNIT-II**

**Internal architecture of avr microcontroller:**General purpose registers in AVR, AVR data memory, using instructions with the data memory, IN and OUT instructions, AVR Status Register, AVR data format and directives Introduction to AVR assembly programming, Program counter and program ROM space in AVR, Harvard architecture in AVR, instruction size of the AVR, RISC architecture of AVR.

**UNIT-III**

**Assembly and c programming of microcontroller:**AVR instruction format, addressing modes of AVR microcontroller, Branch Instruction and looping, Call instructions and stack, I/O port programming, I/O bit manipulation in AVR, time delay and instruction pipeline, Arithmetic Instructions, Logical and compare instructions, Rotate and shift instructions, data serialization.AVR timer programming,AVR Interrupt programming and AVR serial port programming in assembly and C.

**UNIT-IV**

**AVR microcontroller interfacing:**LCD interfacing ,Keyboard interfacing, ADC characteristics, ADC programming in AVR, Sensor interfacing and Signal Conditioning DAC Interfacing, Relays and opto isolators, Stepper motor interfacing,DC motor control using PWM.

**TEXT BOOKS:**

1. The AVR Microcontroller and Embedded system using Assembly and C by Muhammad Ali Mazidi-Prentice Hall of India.

**REFERENCE BOOKS:**

1. The Atmel AVR Microcontroller Mega and XMega in Assembly and C by Han-Way Huang- Cengage Learning, 2014.

**Note:** *Examiner will set eight questions by selecting two from each unit. Students will be required to attempt five questions selecting at least one question from each unit.*

**Refrigeration and Air Condition**

**MT-306N**

**L T P Sessional: 25Marks**

**3 1 - Theory: 75Marks**

**Total: 100 Marks**

**Exam Duration: 3 Hours**

**UNIT I**

**Basics of heat pump & refrigerator:** Carnot’s refrigeration and heat pump; Units of refrigeration; COP of refrigerator and heat pump; Carnot’s COP; ICE refrigeration; evaporative refrigeration; refrigeration by expansion of air; refrigeration by throttling of gas; Vapour refrigeration system; steam jet refrigeration; thermoelectric cooling; adiabatic demagnetization.

**Basic principles of operation of air refrigeration system:** Bell-Coleman air refrigerator; advantages of using air-refrigeration in aircrafts; disadvantages of air refrigeration in comparison to other cold producing methods; simple air refrigeration in air craft; simple evaporative type air refrigeration in aircraft; necessity of cooling the aircraft.

**UNIT II**

**Simple Vapour Compression Refrigeration System:** different compression processes(wet compression, dry or dry and saturated compression, superheated compression); Limitations of vapour compression refrigeration system if used on reverse Carnot cycle; representation of theoretical and actual cycle on T-S and P-H charts; effects of operating conditions on the performance of the system; advantages of vapour compression system over air refrigeration system.

**Methods of improving COP:** flash chamber; flash inter cooler; optimum interstate pressure for two stage refrigeration system; single expansion and multi expansion processes; basic introduction of single load and multi load systems; Cascade systems.

**Basic absorption system:** COP and Maximum COP of the absorption system; actual NH3 absorption system; functions of various components; Li-Br absorption system; selection of refrigerant and absorbent pair in vapour absorption system; Electro refrigerator; Comparison of Compression and Absorption refrigeration systems; nomenclature of refrigerants; desirable properties of refrigerants.

**UNIT III**

**Psychometery:**Difference in refrigeration and air conditioning; Psychometric properties of moist air (wet bulb, dry bulb, dew point temperature, relative and specific humidity of moist air, temperature of adiabatic saturation); empirical relation to calculate Pv in moist air.

**UNIT IV**

**Air Conditioning:** Classification; factors affecting air conditioning systems; comfort air-conditioning system; winter air conditioning system; summer air- conditioning system; year round air conditioning. unitary air-conditioning system; central air conditioning system; room sensible heat factor; Grand sensible heat factor; effective room sensible heat factor.

**TEXT BOOKS:**

* 1. Basic Refrigeration and air-conditioning by Annanthana and Rayanan, TMG
  2. Refrigeration and air-conditioning by R.C.Arora, PHI

**REFERENCES BOOKS:**

1. Refrigeration and air-conditioning by C.P arora
2. Refrigeration and air-conditioning by Arora and Domkundwar, Dhanpatrai

**Note:** *Examiner will set eight questions by selecting two from each unit. Students will be required to attempt five questions selecting at least one question from each unit.*

**Internal Combustion Engines**

**MT-308N**

**L T P Sessional: 25Marks**

**3 1 - Theory: 75Marks**

**Total: 100 Marks**

**Exam Duration: 3 Hours**

**UNIT 1**

Heat engines; Internal and external combustion engines; Classification of I.C. Engines; Cycle of operations in four strokes and two-stroke IC engines; Wankle Engine.

Air standard cycles: Assumptions made in air standard cycles; Otto cycle; Diesel cycle; Dual combustion cycle; Comparison of Otto, diesel and dual combustion cycles; Sterling and Ericsson cycles; Air standard efficiency, Specific work output. Specific weight; Work ratio; Mean effective pressure; Deviation of actual engine cycle from ideal cycle.

**UNIT II**

Mixture requirements for various operating conditions in S.I. Engines; Elementary carburetor, Calculation of fuel air ratio; The complete carburetor; Requirements of a diesel injection system; Type of injection system; Petrol injection; Requirements of ignition system; Types of ignition systems, ignition timing; Spark plugs.

S.I. engines; Ignition limits; Stages of combustion in S. I. Engines; Ignition lag; Velocity of flame propagation; Detonation; Effects of engine variables on detonation; Theories of detonation; Octane rating of fuels; Pre-ignition; S.I. engine combustion chambers. Stages of combustion in C.I. Engines; Delay period; Variables affecting delay period; Knock in C.I. Engines; Cetane rating; C.I. Engine combustion chambers.

**UNIT III**

Functions of a lubricating system, Types of lubrication system; Mist, Wet sump and dry sump systems; Properties of lubricating oil; SAE rating of lubricants; Engine performance and lubrication; Necessity of engine cooling; Disadvantages of overcooling; Cooling systems; Air-cooling, Water-cooling; Radiators.

Performance parameters; BHP, IHP, Mechanical efficiency; Brake mean effective pressure and indicative mean effective pressure, Torque, Volumetric efficiency; Specific fuel consumption (BSFG, ISFC); Thermal efficiency; Heat balance; Basic engine measurements; Fuel and air consumption, Brake power, Indicated power and friction power, Heat lost to coolant and exhaust gases; Performance curves

**UNIT IV**

Working of a single stage reciprocating air compressor; Calculation of work input; Volumetric efficiency; Isothermal efficiency; Advantages of multi stage compression; Two stage compressor with inter-cooling; Perfect inter cooling; Optimum intercooler pressure.

##### TEXT BOOKS:

1. Internal combustion engine by Ramalingamsci-tech publication
2. Internal combustion engine by Ganeshan TMG

**REFERENCE BOOKS:**

1. Internal combustion engine by Mathur& Sharma
2. Heat power engineering by Dr. V.P. Vasandhani& Dr. D.S. Kumar

**Note:** *Examiner will set eight questions by selecting two from each unit. Students will be required to attempt five questions selecting at least one question from each unit.*

**Production Technology-II**

**MT-310N**

**L T P Sessional: 25Marks**

**3 1 - Theory: 75Marks**

**Total: 100 Marks**

**Exam Duration: 3 Hours**

##### UNIT I

**Kinematics of Machine Tools:** Introduction, drives in machine tools, mechanical drive: conversion of rotary motion into rotary motion, conversion of rotary motion into rectilinear reciprocating motion, selecting maximum and minimum cutting speeds and feeds, upper and lower speed limits of a lathe, stepped and step less drives, characteristics of mechanical stepped drive, series in spindle speed A.P., G.P. and Logarithmic progressions, stand value of ratio, designing layout for mechanical stepped drives, Kinematics calculation of speed gear boxes, stepless mechanical drives.

##### UNIT II

**Gear manufacturing and layout for Automatics:** Methods of gear manufacturing, classification of methods, milling, broaching, the process of gear generating, hobbing, hobbing machine relationship, estimating hob time, gear shaping hobbing v/s milling, hobbing v/s shaping, bevel gear cutting, worm gears, gear finishing methods, gear burnishing, gear grinding, gear lapping, gear honning.

**Automatic lathes**: classification of automatic machines, setting up of automatics, tooling layout and operation sheet, cam design, tool layout of automatic screw machine, programmed automatic lathes, bar stock feeding.

**UNIT III**

**Unconventional Machining Processes & Press Tool Design:** Need for unconventional processes, classification, Ultrasonic machining, principle of USM, elements of process, process parameters, electrochemical machining,ecm plant, theory of ECM, electrolyte, application of ECM, electrochemical grinding, Laser beam machining.

##### UNIT-IV

**Press:** Introduction, classifications of presses, methods of transmitting power, major components of mechanical press, selecting the proper press, components of die assembly, classification of dies, cutting action in die, punch and die clearance, control of hole and die clearance, cutting forces, shear on punch and dies, punch press energy, centre of pressure, method of calculating centre of pressure.

**Fits:** Concept of interchangeability, basic terminology, types of fits, clearance fits, transition fits, interference fits, selective assembly, system of fits

##### TEXT BOOKS:

1. Manufacturing science: Ghosh and Malik, E.W. Press
2. Modern machining processes: Pandey and Shan, Tata McGraw HillPublications

**REFERENCE BOOKS:**

1. Principles of metal cutting: Sen and Bhattacharya, New CentralBook.

2.Metal cutting principles: Shaw, MIT PressCambridge

1. Manufacturing analysis: Cook,Adisson-Wesley

**Note:** *Examiner will set eight questions by selecting two from each unit. Students will be required to attempt five questions selecting at least one question from each unit.*

**Automatic Control Systems Lab**

### MT-312N

|  |  |  |  |
| --- | --- | --- | --- |
| **L** | **T** | **P** | **Sessional: 40 Marks** |
| **-** | **-** | **2** | **Practical: 60 Marks** |

**Total: 100 Marks**

**Exam Duration: 3 Hours**

**NOTE:** Student will be required to perform total of 10 experiments. 7 experiments will be from the below given list and rest experiments will be designed based upon the curriculum.

**LIST OF EXPERIMENTS:**

1. To study D.C. Position control system.

2. To study linear system simulator.

3. To study light intensity control using P & PI controller with provision for disturbance and transient speed control.

4. To study D.C motor speed control.

5. To study the stepper motor characteristics and its control through microprocessor kit.

6. To study Temperature control system.

7. To study Compensation design

8. To study Digital control system.

### Embedded Systems-IILab MT-314N

**L T P Sessional: 40 Marks**

**-- 2 Practical: 60Marks**

**Total: 100 Marks**

**Exam Duration: 3 Hours**

**NOTE:** Student will be required to perform total of 10 experiments. 7 experiments will be from the below given list and rest experiments will be designed based upon the curriculum.

**LIST OF EXPERIMENTS:**

1. Study of architecture of Atmega 2560
2. Study of Pin diagram of Atmega 2560

**Study and Demonstrate of the following on atmega 2560**

1. Beep and Buzzer
2. I-O interfacing
3. Motion control
4. Motion control with PWM
5. LCD interfacing
6. Sensor Switching
7. Servo Motor Control using PWM
8. Timer overflow interrupt
9. ADC sensor display on LCD

##### Production Technology-II Lab

**MT-316N**

**L T P Sessional: 40Marks**

**-- 4 Practical: 60Marks**

**Total: 100 Marks**

**Exam Duration: 3 Hours**

**NOTE:** Student will be required to perform total of 10 experiments. 7 experiments will be from the below given list and rest experiments will be designed based upon the curriculum.

**LIST OF EXPERIMENTS:**

1. Introduction to milling machines its types functions applications etc.
2. Practice of slab milling on milling machine.
3. Practice of slotting on milling machine.
4. To cut gear teeth on milling machine using dividing head.
5. Introduction to gear hobber, demonstration of gear hobbing and practice.
6. Introduction to various grinding wheels and demonstration on the surface grinder.
7. Introduction to tool and cutter grinder and dynamometer.
8. Study the constructional detail and working of CNC lathes Trainer.
9. To carry out welding using TIG/MIG welding set.
10. Introduction, demonstration & practice on profile projector & gauges.
11. To make a component on lathe machine using copy turning attachment.
12. To cut external threads on a lathe.
13. To cut multi slots on a shaper machine.
14. To perform drilling and Boring operation on a Component.

# Semester 7

**Automobile Engineering**

## MT-401N

**L T P Sessional: 25Marks**

**3 1 - Theory: 75Marks**

**Total: 100 Marks**

**Exam Duration: 3 Hours**

**UNIT I**

INTRODUCTION: Brief history of automobiles, Main components of an automobile, Brief description of each component. Brief description of constructional details and working of a four stroke I.C. Engine (S.I. Engines and C.I. Engines) including lately developed overhead cam shaft, Multi-cylinder engines, Introduction to recent developments in I.C. Engines- Direct injection systems, Multi-point fuel injection systems, Introduction, Brief description of different components of Transmission System. CLUTCH: Clutch Introduction to Clutch and its different types, Principle of Friction Clutch, Clutch Lining and friction materials used in Friction Clutches, Torque transmitted, Brief description of Cone Clutch, Single Plate and Multiplate Clutches, Dry and wet clutches, Automatic clutch action, Centrifugal clutches, Electromagnetic clutches, Fluid Flywheel.

**UNIT II**

GEAR BOX: Gear Box Air resistance, gradient resistance and rolling resistance coming across a moving automobile, Tractive effort, Variation of tractive effort with speed, Performance curves (object and need of a gear box), Sliding mesh gear box, Control mechanism, Sliding type selector mechanism, Ball type selector mechanism, Steering column gear shift control, Constant mesh gear box, Synchromesh device, Automatic transmission in general, AP automatic gear box, Torque converter, Torque converter with direct drive, Lubrication of Gear Box. PROPELLER SHAFT: Functions and requirements of a propeller shaft, Universal joints, Constructional forms of universal joints, Flexible-ring joints, Rubber-bushed flexible joints. Constant-velocity joints.Differential : Principle of operation, Constructional details of a typical Differential unit, Traction control differentials, Multi-plate clutch type traction control device.

**UNIT III**

BRAKES: Functions and methods of operation, Brake efficiency. Elementary theory of shoe brake, brake shoe adjustments, A modern rear-wheel brake, Disc brakes, Brake linkages, Leverage and adjustment of the brake linkage, Servo- and power operated brakes, Vacuum brake operation,' Hydraulic Brakes-constructional details and working, Direct action vacuum servos, Power-operated brakes, A dual power air brake system, Suspension system Suspension principles, Road irregularities and human susceptibility, Suspension system, Damping, Double tube damper, Single tube damper, Lever arm type damper, Springs-Leaf springs, Coil and torsion springs, variable rate springs, Composite leaf springs, Rubber springs, Air springs, Adjustable and self-adjusting suspensions, Interconnected suspension system, Interconnected air and liquid suspensions, Independent suspension system, Different independent suspension layouts, McPherson strut type, Rear suspension-live axle, McPherson strut rear suspension.

**UNIT IV**

Steering Geometry: Castor, Camber, Kingpin inclination, Combined angle, Toe-in, Steering system-basic aims, Ackerman linkage, Steering linkages for independent suspension, Center point steering, Costarring or trailing action, Cornering power, Self-righting torque, Steering characteristics-over steer and under steer, Axle beam, Stub-axle construction, Steering column, Reversible and irreversible steering, Rack-and-pinion steering mechanism, Effect of toe-in on steering, Power steering, Vickers System.

**TEXT BOOKS:**

1. The Motor Vehicle - By Newton, Steeds and Garretle Basic

2. Automobile Engineering - By Kirpal Singh

**REFERENCE BOOKS:**

1. Automobile Engineering \*' -By K.M. Gupta, Umesh Publications

**Note:** *Examiner will set eight questions by selecting two from each unit. Students will be required to attempt five questions selecting at least one question from each unit.*

**Operations Research**

**MT-403N**

**L T P Sessional: 25Marks**

**3 1 - Theory: 75Marks**

**Total: 100 Marks**

**Exam Duration: 3 Hours**

**UNIT I**

**Introduction:** Definition and Development of Operations Research, Necessity and scope of OR in Industry, Operations Research in Decision making, Models in OR, Fields of application, Difficulties and Limitation of OR.

**General Linear Programming Problems**: Introduction, Maximization and minimization of function with or without Constraints, Formulation of a linear programming problem, Graphical method and Simplex method, Big M method, Degeneracy, Application of linear Programming (LPP) in Mechanical Engineering.

**UNIT II**

**The Transportation Problems:** Mathematical formulation, Stepping stone method, Modified Distribution Method, Vogels Approximation Method, Solution of balanced and unbalanced transportation problems and case of degeneracy, Assignment problems, Least time transportation problem

**Network Analysis:** CPM/PERT, Network Representation, Techniques for drawing network, Numbering of events (Fulkersen Rule), PERT calculations - Forward path, back-ward path, Slack, probability, comparison with PERT, Critical path, Float, Project cost, Crashing the net work, updating (PERT and CPM).

**UNIT III**

**Decision Theory:** Steps in decision theory approach, Decision Machinery environment, Decision machining under certainty and uncertainty, Decision machining under condition of risk, Decision trees, Minimum enchained criteria, Advantages and limitations of decision tree solutions, Post Optimality.

**UNIT IV**

**Queuing Theory**: Introduction, Applications of queuing Theory, Waiting time and idle time costs, Single channel queuing theory and multi-channel queuing theory with Poisson arrivals and exponential services, Numerical on single channel and multi channel queuing theory.

**TEXT BOOKS:**

1. Operations Research by Prem Kumar Gupta and D. S. Heera, S. Chand Publications
2. Introduction to Operations Research, by F.S. Hillier and G.J. Lieberman, seventh edition, McGraw Hill publications

**REFERENCE BOOKS:**

1. Introduction to Mathematical Programming by Winston, W.L. (4th ed.), Duxbury Press.
2. Operations Research by P SankaraIyer, McGraw Hill publications.

**Note:** *Examiner will set eight questions by selecting two from each unit. Students will be required to attempt five questions selecting at least one question from each unit.*

**Smart Materials**

**MT-405N**

**L T P Sessional: 25Marks**

1. **1 - Theory: 75 Marks**

**Total: 100 Marks Exam Duration: 3 Hours**

##### UNIT I

**Smart materials:**

Introduction, Historical Perspective, Overview of Microsystems and Smart Systems, Need for

Miniaturization, Role of Microfabrication, Typical applications of Microsystems and Smart Systems.

**Intelligent materials:**

Structural Materials, Functional Materials, Primitive functions of Intelligent Materials, Intelligence inherent in Materials, Materials Intelligently Harmonizing with Humanity, Intelligent Biological Materials.

**UNIT II**

**Smart Materials and Structural Systems:**

The principal ingredients of a premier class of smart materials, Actuator Materials, Sensing Technologies, Micro-sensors, Intelligent Systems, Hybrid Smart Materials, Passive Sensory Smart Structures, Reactive actuator based Smart Structures, Active Sensing and Reactive Smart

Structures.Smart Skins, Synthesis of Future smart systems.

UNIT III

**Electrorheological Fluids:**

Suspension and Electro-rheological fluids, The Electro-Rheological Phenomenon, Charge Migration mechanism for the dispersed phase, Electrorheological Fluid Actuators, Experimental investigations.

##### UNIT IV

**Piezoelectric Materials:**

Introduction, Basic Principle, History, Classification of Dielectric materials, Important Dielectric Parameters, Electrostrictive effect, Piezoelectric Effect, Pyroelectric Effect, Ferroelectric Materials, Poling. Examples of Piezoelectric Materials: Quartz, Lead ZirconateTitanate(PZT), Fabrication of PZT, Polymer Piezoelectric Materials, Barium Titanate, Zinc Oxide Thin Films, Polymer Composites.

**Engineering Applications of Piezoelectric Materials:**

Gas Lighter, Pressure Sensor, Accelerometer, Piezoelectric Gyroscope, Piezoelectric Microphone, Piezoelectric Actuators, Piezoelectric Motor, Piezoelectric Transformer

##### TEXT BOOKS:

1. Smart Materials and Structures by B.V. Gandhi and B.S. Thompson, Chapman and Hall

Pub.

2. Smart Materials Edited by Mel Schwartz , CRC Press.

3. Smart Structures Analysis and Design by A.V. Srinivasan and D. Michael McFarlaid,

Cambridge University Press.

4. Piezoelectric Materials and Devices: Applications in Engineering and Medical Sciences

by M.S. Vijaya, CRC Press.

**REFERENCE BOOKS:**

1. Smart Structures and Materials by Brian Culshaw, Artech House.

2. Smart Structures by Gauenzi, P., Wiley Publication.

3. Piezoelectricity by Cady, W. G., Dover Publication.

**Note:** *Examiner will set eight questions by selecting two from each unit. Students will be required to attempt five questions selecting at least one question from each unit.*

**The Professional Engineer (Project-I)**

##### MT-407N

|  |  |  |  |
| --- | --- | --- | --- |
| **L** | **T** | **P** | **Sessional: 100 Marks** |
| **2** | **-** | **3** | **Practical: 100 Marks** |
|  |  |  | **Total :- 200 Marks** |

**Exam Duration: 03 Hours**

##### UNIT-I

**Ethics-scope and issues in the engineering sector:** What are research ethics, Importance of research ethics, Plagiarism Avoidance, Referencing and citation

##### UNIT-II

**Project management and scheduling techniques:** Planning Activities, Estimating the time requirements of a project, Project Milestones, Project Quality, Project Management, Gantt Chart, Pert Chart, COCOMO model, Function Point Analysis,

##### UNIT-III

**Research methodologies:** Designing a Research Programme, Research Approaches, Quantitative Methods, Qualitative Methods.

**Data gathering methods:** Questionnaire, Interview, Focus Groups, Observation, Studying Documentation

##### UNIT-IV

**Abstract and literature review:** Writing an abstract, Structure of a Literature Review, Guidelines for writing a literature review, Identifying a good literature review and a bad literature review, Literature searching techniques and sources.

##### TEXT BOOKS:

1. Research Methodology: Methods and Techniques- C RKothari
2. Project Management: Planning and Control Techniques- RoryBurke

##### REFERENCE BOOKS:

1. Research Methodology- R. Panneerselvam

***Note:*** *Students will have to submit an* ***individual*** *preparatory report for a proposed project, including literature survey, data gathering methods, ethical assessment, project plan and resources and a logbook detailing background work, sources and reflective comment on the work undertaken. Student will have to complete design of project which may include mechanical designs along with electronic circuitry design. Student will have to include simulation results along with circuitry testing. Report must also include project cost, project management and identification of critical activities involved in the project. Block diagram of the project must be discussed in detail. In next semester, student will convert the idea into the form of final hardware.*

##### SeminarMT-409N

**L T P Practical: 0 Marks**

**2 - - Sessional:100 Marks**

**Total: 100 Marks**

Student will give talk on some technical topics. Evaluation will be done based upon the technical content and presentation skills.

**Industrial Training**

**MT-411N**

**L T P Practical: 0 Marks**

2 - - **Sessional: 100 Marks**

**Total : 100 Marks**

Student will submit summer training report of 5 to 6 week industrial training for his/her assessment. The evaluation will be made based upon the report submitted by student and presentation of work done in industry during the specified period.

**Advanced Manufacturing Technology**

##### MT-413N

|  |  |  |  |
| --- | --- | --- | --- |
| **L** | **T** | **P** | **Sessional: 25 Marks** |
| **3** | **1** | **-** | **Theory: 75 Marks** |
|  |  |  | **Total: 100 Marks** |

**Exam Duration: 3 Hours**

##### UNIT I

**Machining:**Hot machining, Machining of Plastics, Unit heads, Plastics cooling, electro forming, Surface Cleaning and Surface Treatments, Surface Coatings, Paint Coating and Slushing, Adhesive Bonds, Adhesive Bond Joints, Adhesives, Surface Coating for Tooling, Graphite Mould Coating, VacuumMould Process.

##### UNIT II

**Polymers and plastics:** Introduction, Polymers, Polymerization, Addition of Polymers, Plastics, Types of plastics, Properties of Plastics, Processing of Thermoplastic Plastics, Injection Moulding, Extrusion Process, Sheet forming processes, Processing of Thermosetting Plastics, Compression Moulding, Transfer Moulding, Casting of Plastics, Machining of plastics, other processing methods of plastics

**Thread Manufacturing:** Introduction, casting, thread chasing, Thread Rolling, Die Threading and Tapping, Thread Milling, Thread Measurement and Inspection

##### UNIT III

**Metalformimg:** Theoretical basis of metal forming, classification of metal forming processes, cold forming, hot working, Warm working, Effect of variables on metal forming processes, Methods of analysis of manufacturing processes, Open Die forging, Rolling Power Rolling, Drawing, Extrusion.

##### UNIT IV

**Composites and laminates:** Introduction, Types of Composites materials, Agglomerated Materials, Reinforced materials, Laminates, Surface Coated Materials, Production of Composite Structures, Fabrication of particulate composite Structures, Fabrication of reinforced Composite, Fabrication of Laminates, Machining, Cutting and Joining of Composites.

##### TEXT BOOKS:

1. Principles ofManufacturingBy J.S.Campbell, TataMcGraw-Hill
2. Production EngineeringSciencesByPandey and Sinh StandardPub.
3. A text book of ProductionTechnologyBy P.C. Sharma S.Chand&Company.

##### REFERENCE BOOKS:

1. Manufacturing Materials andProcessesBy Lindberg PrenticeHall
2. A text book of ProductionEngineeringBy P.C. Sharma S.Chand&Company.
3. ManufacturingTechnologyManufacturingScience by A.Ghosh, East-WestPublications.

By Radhakrishnan,Scitech

**Note:** *Examiner will set eight questions by selecting two from each unit. Students will be required to attempt five questions selecting at least one question from each unit.*

### Finite Element Methods

### MT-415N

**L T P Sessional: 25Marks**

**3 1 - Theory: 75 Marks**

**Total: 100 Marks Exam Duration: 3 Hours**

##### UNIT I

**Basic Concept:**Historical background, Engineering applications, general description, Comparison with other methods.

**Need for weighted-integral forms:** Relevant mathematical concepts and formulae, weak formulation of boundary value problems, variational methods, Rayleigh-Ritz method, and weighted residual approach.

##### UNIT II

**Model boundary value problem:** Finite element discretization, element shapes, sizes and node locations, interpolation functions, derivation of element equations, connectivity, boundary conditions, FEM solution, post-processing, compatibility and completeness requirements, convergence criteria, higher order and isoparametric elements, natural coordinates, Langrange and Hermitepolynomials.

##### UNIT III

**External and internal equilibrium equations**: one-dimensional stress-strain relations, plane stress and strain problems, axis-symmetric and three dimensional stress-strain problems, strain displacement relations, boundary conditions, compatibility equations, computer programs.

##### UNIT IV

**Weighted residual methods:**Galerkin FE formulation – axially loaded bar – heat flow in a bar. Isoparametric formulation: Natural coordinates – linear and quadratic bar element – linear triangle and plane bilinear elements for scalar fields – jacobian matrix – element matrices - Gauss quadrature – requirements for isoparametric elements – accuracy and mesh distortion. Advanced topics: Introduction to non-linear and dynamic finite element procedures, error estimation, coupled problems (only brief details areneeded).

##### TEXT BOOKS:

1. The Finite ElementMethodBy Zienkiewicz, Tata McGraw

**REFERENCE BOOKS:**

1. The Finite Element Method forEngineersBy Huebner, John Wiley
2. An Introduction to the Finite ElementMethodBy J.N.Reddy, McGraw Hill

**Note:** *Examiner will set eight questions by selecting two from each unit. Students will be required to attempt five questions selecting at least one question from each unit.*

### Applied Numerical Techniques and Computer Programming

##### MT-417N

|  |  |  |  |
| --- | --- | --- | --- |
| **L** | **T** | **P** | **Sessional: 25 Marks** |
| **3** | **1** | **-** | **Theory: 75 Marks** |
|  |  |  | **Total: 100 Marks** |

**Exam Duration: 3 Hours**

##### Unit I

**Interpolation and Curve Fitting:**Lagrangian Polynomials, Divided differences, Interpolating with a cubic spline, Bezier Curves and B-Spline Curves, Polynomial approximation of surfaces, Least Square approximations, Flow Chart for Computer Programmes.

##### Unit II

**Solving Non-Linear Equations:** Bisection Method, Linear Interpolation Methods, Newton’s Methods, Muller’s Methods, Fixed-point Iteration Method, Flow Chart for Computer Programmes.

Solving Sets of Equations: The Elimination Method, Gauss and Gauss Jordan Methods, Other Direct Methods, Iterative Methods, The Relaxation Methods, Flow Chart for Computer Programmes.

##### Unit III

**Numerical Differentiation and Integration:** Derivatives from difference tables. High Order Derivative, Extra-polation Techniques. The Trapezoidal Rule, Simpson’s Rules.Flow Chart for Computer Programmes.

**Numerical Solution of Ordinary Differential Equations:**The Taylor-Series Method, Euler and modified Euler methods,Range-Kuttamethods,Miline’sMethod.Theadams-Moulton method, Convergence Criteria, Errors and error Propagation. Flow Chart for Computer Programmes.

##### Unit IV

**Numerical Solution of Ordinary and Partial Differential Equations**: Taylor series method, Euler and modified Euler method, RungeKutta methods, Milne’s method, Finite differences approximations of partial derivatives,Solution of Laplace equation(Elliptic)by standard5– point formula, solution of one dimensional heat equation(Parabolic)by Bender-Schmidt method, crank–Nicolson method, Solution of one dimensional wave equation(Hyperbolic) by iterative method.

##### TEXT BOOKS:

1. Applied Numerical Analysis by Curtis f. Gerald and Patrick O. Wheatley – Published by AddisonWesley.
2. Introductory Methods of Numerical Methods – S.S. Sastry, PHI, NewDelhi.
3. Numerical Method: E. Balagurusamy,Tata McGraw HillPublication.

##### REFERENCE BOOKS:

* 1. MATHEMATICA – A system for doing mathematics by Computer by Wolfram, Stephen – Published by Addition –Wesley.
  2. Applied Numerical Methods by Camahan, Brice,Et.al, Published by Wiley, York.
  3. Numerical Solution of partial differential equations by Smith, G.D. Published by Oxford University PressLondon.
  4. Iterative Methods for the solution of Equations by J.F. Traub – Published by Prentice Hall.
  5. Numerical Methods in Engineering and Science by B.S. Grewal- Published by KhannaPublishers.
  6. Numerical Methods in Engineering by M.G. Salvadori and M.L. Baron- Published by Prentice HallIndia.

**Note:** *Examiner will set eight questions by selecting two from each unit. Students will be required to attempt five questions selecting at least one question from each unit.*

**Communication Systems**

##### MT-419N

**L T P Sessional: 25Marks**

**3 1 - Theory: 75Marks**

**Total: 100 Marks**

**Exam Duration: 3 Hours**

**UNIT I**

**Noise:**ClassificationofNoise,Varioussourcesof Noise,Methodsof Noise Calculationin networksandinter connected networks. Additionof noisedue toseveralsources;noisein amplifiers in cascade,noise in reactive circuits, Noise figure, its calculation and measurement.Noise temperature,Mathematical representationof randomnoise, narrow band noiseanditsrepresentation.Transmissionofnoisethroughlinearsystems,signaltonoise ratio, noisebandwidth.

**UNIT II**

**Analog Modulationtechniques:**Informationsource,encoder,transmitter,channel/medium, receiver, decoder andinformation sink. Need for modulation, Baseband and Pass band signals,AmplitudeDoublesidebandwithCarrier (DSB-C),Doublesidebandwithout Carrier,Single SideBandModulation,DSB-SC, DSB-C,SSB ModulatorsandDemodulators, VestigialSideBand(VSB),QuadratureAmplitudeModulator,Frequency Modulation.Radio Transmitter and Receiver.

**UNIT III**

**DigitalDatatransmission:**Linecoding review,Pulseshaping,Scrambling, PCM.Methodof generationanddetectionofcoherent&non-coherentbinary ASK,FSK&PSKPulse Modulation**Digital TransmissionofAnalog Signals:**Sampling Theoremanditsapplications, PulseAmplitude Modulation(PAM), Pulse WidthModulation, Pulse PositionModulation. Theirgenerationand Demodulation.PulseCodeModulation(PCM), Frequency Division Multiplexing,TimeDivisionMultiplexing, LineCoding andtheir PowerSpectraldensityand CodeDivision Multiplexing.

**UNIT IV:**

**OpticalFibrecommunications andNoisesinCommunicationsystems:**Basic BlockDiagram, Advantages&DisadvantagesofOpticalFiberCommunication,Ray Theory,Electromagnetic Mode Theory,StepIndexFiber, GradedIndexFiber,Attenuation-Bending Loses, Scattering, Absorption,Dispersion.Applicationof opticalfibers, Noise incommunications,performance comparisonsinthepresenceofnoise,NoiseinAmplitudeModulation: Analysis,Signalto NoiseRatio,FigureofMerit,NoiseinFrequencyModulation:Preemphasis, DeEmphasis and SNRImprovement,PhaseLockedLoops .

**TEXTBOOKS:**

1. HaykinS.,MohrM.,2006,AnIntroductiontoAnalogandDigitalCommunications,

2nd Ed, Wiley,ISBN: 978-0-471-43222-7

2. HaykinS.,2009,CommunicationSystems,InternationalStudentVersion,5thEd, Wiley,ISBN: 978-0-470-16996-4

**REFERENCE BOOKS:**

1. OtungI.,2001,CommunicationEngineeringPrinciples,PalgraveMacmillan,ISBN:

9780333775226

2. ProakisJ.G.,SalehiM.,BauchG.,2004,ContemporaryCommunicationSystems

UsingMATLAB, 2nd Edition, Thomson Boos/Cole,ISBN: 97805344061

**Note:** *Examiner will set eight questions by selecting two from each unit. Students will be required to attempt five questions selecting at least one question from each unit.*

### Renewable Energy Resources

##### MT-421N

**L T P Sessional: 25Marks**

**3 1 - Theory: 75Marks**

**Total: 100 Marks**

**Exam Duration: 3 Hours**

##### UNIT-I

**Direct energy conversion:**Description, working principle, magneto hydrodynamic systems (MHD), thermoelectric generators, thermionic generator, fuel cells, solar cells, EMF generated, power output, losses and efficiency, applications, hydrogen conversion and storage systems.

##### UNIT-II

**Extraterrestrial solar radiation: C**omponents of radiation, geometry of earth and sun, geometry of collector arid the solar beam, effects of earth's atmosphere, measurements of solar radiation, calculation of heat balance for a solar collector, type of water heaters, selective surfaces, crop heaters, space heating, space cooling, water desalination, solar ponds, solar concentrators, electric power system, problems.

##### UNIT III

**Photo electric energy:** Introduction, the silicon p-n junction, photon absorption solar radiation input, photovoltaic circuit properties and loads, limits to cell efficiency, solar cell construction type and adaptations of photovoltaic, other types of photoelectric and thermo electric generation, problems.

##### UNIT IV

**Hydro power:**Principles of hydro power, assessing the resource for small installations, an impulse turbine, reaction turbines, hydro electric systems, the hydraulic rain pump, wind turbine types and terms, linear momentum and basic theory, dynamic matching, steam tube theory, characteristics of the wind, power extraction by a turbine, electricity generation, mechanical power, problems.

##### TEXT BOOKS:

1. Non-Conventional energy sources by Rai G D, Khanna Publishers, NewDelhi

**REFERENCE BOOKS:**

1. Renewable Energy Rsources by John W. Twidell and Anthony D. Weir, published by E.& F. N. Spon Ltd.London.

**Note:** *Examiner will set eight questions by selecting two from each unit. Students will be required to attempt five questions selecting at least one question from each unit.*

### Computational Fluid Dynamics

##### MT-423N

**L T P Sessional: 25Marks**

**3 1 - Theory: 75Marks**

**Total: 100 Marks**

**Exam Duration: 3 Hours**

##### UNIT I

**Methods of prediction:** Comparison of experimental investigation Vs theoretical calculation; Mathematical description of physical phenomena; significance of governing differential equations; the general form of governing differential equation.

**Classification of problems:** Physical classification: Equilibrium problems and Marching problems; Mathematical classification: Elliptic, parabolic and hyperbolic partial differential equations; Nature of co-ordinates; one way and two-way co-ordinates; Proper choice of co- ordinates.

##### UNIT II

**The concept of discretisation:**Finite differences; Taylor series formulation; Finite difference discretisation of ordinary and partial derivatives; Truncation error, round-off error, discretisation error; Consistency and stability of numerical schemes; Variation formulation; Method of weighted Residuals, control volume formulation.

##### UNIT III

**Steady one- dimensional Conduction:** The inter-face conductivity, Non linearity, Source- Term Linearization, Types of Boundary Conditions. Unsteady one-dimensional Conduction: Explicit, Crank-Nicolson and Fully Implicit scheme's Discretisation of two and three- dimensional problems, Stability analysis.

##### UNIT IV

**Introduction to finite volume method**: Regular finite volume – approximations in the discretization technique – discretization procedure – semi-explicit method – implementation of boundary conditions (only elementary theory and no direct problems).

##### TEXT BOOKS:

1. Computational FluidDynamicsBy Anderson, McGraw-Hill

**REFERENCE BOOKS:**

1. Numerical Heat Transfer and fluidflowBy Patankar, McGraw-Hill

**Note:** *Examiner will set eight questions by selecting two from each unit. Students will be required to attempt five questions selecting at least one question from each unit.*

### Mechatronics Engineering

##### MT-425N

**L T P Sessional: 25Marks**

**3 1 - Theory: 75Marks**

**Total: 100 Marks**

**Exam Duration: 3 Hours**

##### UNIT I

**Mechatronics:** A measurement system with its constituent elements, open and closed loop systems, sequential controllers, micro processor based controllers, the Mechatronics approach.A review of displacement, position velocity, motion, force fluid pressure, liquid flow, liquid level, temperature, light sensors/along with performance terminology, selection of sensors, input data by switches, Signal Conditioning Processes, Inverting Amplifiers, Non Inverting Amplifiers, Summing, Integrating, Differential, Logarithmic Amplifiers, Comparators, Amplifiers Error, Filtering, Wheatstone Bridge, Temperature Compensation, Thermocouple Compensation, Modeling of Mechanical systems and Simulations

##### UNIT II

**Pneumatic and hydraulic systems:** directional control valves, valve symbols, pressure control valves, cylinder sequencing, process control valves, rotary actuators, mechanical systems - types of motion, kinematic chains, cams, gear trains, Ratchet & Pawl, belt and chain drives, bearings, mechanical aspects of motor selection, electrical systems, mechanical and solid state switches, solenoids, D.C. & A.C moto4rs, stepper motors,problems.

##### UNITIII

**Electrical Actuation Systems:** Switching Devices, Mechanical Switches – SPST, SPDT, DPDT, Debouncing keypads; Relays, Solid State Switches, Diodes, Thyristors, Transistors, Solenoid Type Devices: Solenoid Operated Hydraulic and Pneumatic Valves, Control of DC Motors, Permanent Magnet DC Motors, Bush less Permanent Magnet DC Motors, AC Motors and speed controls, Stepper Motors and Controls, ServoMotors.

##### UNIT IV

**Logic gates:**A review of number systems and logic gates, Boolean algebra, Karnaugh maps, sequential logic basic structure of programmable logic controllers, input/output processing, programming mnemonics; timest, internal relays and counters, master and jump controls, data handling, analog input/output, selection of a PLC,PROBLEMS.Control, microcomputer structure, micro-controllers, applications, programming languages,instruction sets, assembly language programs, subroutines, Why C Language?A review of program structure, branches, loops, arrays, pointers, examples of programs, interfacing, input/output, interface requirements. Peripheral interface adapters, serial communication interface, examples of interfacing, problems.

##### TEXT BOOKS:

1. Mechatronics by W. Bolton, published by AdditionWesley.
2. Nitaigour Premchand Mahalik, Mechatronics principles, concepts and applications, Tata McGrawHill.

**REFERENCE BOOKS:**

1. Joji P, Pneumatic Controls,Wiley.
2. Dan Necsulescu, Mechatronics,Pearson
3. David g Alciatore, Michael B Histand, “IntroductiontoMechatronicsand measurement systems”, McGraw HillEducation.
4. A Smaili, F Mrad, “Mechatronics – IntegratedTechnologiesfor Intelligent Machines, Oxford HigherEducation.
5. NitaigourPremchandMahalik,“Mechatronics Principles,Concepts& Application”, Tata McGraw Hill Publishing Co.Ltd.,2003.

**Note:** *Examiner will set eight questions by selecting two from each unit. Students will be required to attempt five questions selecting at least one question from each unit.*

##### Antenna & Wave Propagation

**MT-427N**

**L T P Sessional: 25Marks**

**3 1 - Theory: 75 Marks**

**Total: 100 Marks Exam Duration: 3 Hours**

##### UNIT I

**Basic Principle**: Scalar & vector potential for electric & magnetic components, Retardation, retarded vector potential relation between scalar & vector potential current element.

**Basic Antennas**: Half wave dipole, quarter wave mono pole, short dipole, calculation of radiation resistance, effective length & pointing vector. Current distribution: Linear current & sinusoidal distribution.

##### UNITII

**Antenna Parameter:** Solid angle, radiation intensity, directive gain directivity, power gain, beam width: HPBW, FNBW, band width, Q factor resonance in antenna, antenna as a transmission line, antenna as active component, antenna temp. Radiation pattern, Eplane H plane, efficiency.Effective aperture, scattering aperture, loss aperture, directivity, polarization. Transmission between two Antenna, Reciprocity theorem application of Reciprocity theorem.

**Low Freq Antennas:** Monopole, folded, loop antenna, biconical antenna, yagiuda antenna: different antenna used for A.M & FM transmission. VHF & LHF antennas, Resonant Antennas & non-resonant antenna, design parameter of different Antenna.

##### UNIT III

**Microwave Antenna**: Parabolic Antenna, Lens Antenna, horn Antenna, Antenna used for tracking & antenna used for satellite communication.E-plane horn, H-Plane horn circulars Horn, pyramidal Horn.

**Radio Wave Propagation:** Different technique for radio wave propagation: Ground wave propagation, space wave, sky wave, duct propagation, troposcatter.

##### UNIT IV

**Ionosphere propagation**: Skip distance, LUF, MUF, Critical freq, Variation of refractive index with height, effect of earth magnetize field on ionospheres propagation, calculation of refractive index dielectric constant & Conductivity for ionospheres. Ionospheres abnormalities.

**Antenna Array:** Multiplication of Pattern, Significance of Antenna Array, Broadside, End fired, Uniform, Parasitic feed in Antenna Array, Calculation of Directivity & B.W for Antenna array. Increased directed directive end fired array. Tapering of Array: Binomial Array, Techepbyshe.

##### TEXT BOOKS:

1. Jordan Balmian:- Electromagnetic Field Theory(PHI)
2. Kraus Antenna & Wave propagation (McGrawHill)

##### REFERENCE BOOKS:

1. Antenna & Wave propagation by K.D.Prasad (SatyaPrakashan)
2. Collin R.E :- Antenna & Wave Propagation(TMH)

**Note:** *Examiner will set eight questions by selecting two from each unit. Students will be required to attempt five questions selecting at least one question from each unit.*

# Semester 8

**Data Communication Systems**

##### MT-402N

|  |  |  |  |
| --- | --- | --- | --- |
| **L** | **T** | **P** | **Sessional: 25 Marks** |
| **3** | **1** | **-** | **Theory: 75Marks** |
|  |  |  | **Total: 100 Marks** |

**Exam Duration: 3 Hours**

**UNIT I**

**InformationTheoryConcepts:**Informationsource,encoder, transmitter, channel/medium, receiver,decoderandinformationsink.Informationsources,DMS, Entropy,Types of channels,Channelcapacity.

**Source EncodingTechniques-**Conditional and JointEntropy,Sourcecodingtechniques- Shannon-Fanocoding, Huffman minimum redundancycoding.

**UNIT II**

**Flow& Error ControlTechniques:**Generationanddetectionofcodedsignals,Typesof Errorcontrolstrategies-Forwarderrorcorrection &ARQ, Transmission errors-randomand bursterror;Errordetectionmethods-Parity checking,Checksumerrordetection&Cyclic redundancycheck. Classification of error control codes-Block code, Convolution code.

**UNIT III**

**DigitalModulationTechniques:** ASK,BPSKBFSK,QPSK,MSK,Errorprobabilityin BPSKandBFSK,MSK,ErrorprobabilityinMSK,PCM,ProbabilityoferrorinPCM system, calculation of signal-to-noise ratio. Classification of noise, calculation of Noise temperature, signal to noise ratio&Noise figure

**UNIT IV**

**Cellular systems:**mobile radio.mobilecommunications,CellularConcept,Frequency Reuse,MultipleaccesstechnologiesTDM, FDMCDMAandOFDM.TrunkingandGradeofService, Multipath Fading.

**TEXT BOOKS:**

1. F. M. Reza, InformationTheory, McGraw Hill.
2. D.C.Aggarwal, Satellite Communications,KhannaPublishers.

**REFERENCE BOOKS:**

1. Theodore S.Rappaport, Wireless Communications Principles and Practice, IEEE Press, Prentice Hall.
2. Simon Haykin, Communication systems,John Wiley&Sons.
3. SanjaySharma, Communication Systems, Kataria Sons.

**Note:** *Examiner will set eight questions by selecting two from each unit. Students will be required to attempt five questions selecting at least one question from each unit.*

**Non-Conventional Machining**

**MT-404N**

**L T P Sessional: 25Marks**

**3 1 - Theory: 75 Marks**

**Total: 100 Marks**

**Exam Duration: 3 Hours**

##### UNIT I

**Unconventional machining processes**: Classification, considerations in process selection.

##### Ultrasonic machining: Elements of process, design of cutting tool, metal removal mechanism, effect of parameters, economic considerations, limitations and applications, surface finish.

##### UNIT II

**Electrochemical machining:** Elements of process, process chemistry, metal removal mechanism, tool design, accuracy, surface finish and work material characteristics, economics advantages, limitations and applications

##### Electric discharge machining: Principle and mechanism of metal removal, generators, electrode feed control, electrode material, tool electrode design, EDM wire cutting, surface finish, accuracy and applications.

##### UNIT III

**Electron beam machining:** Electron beam machining, laser beam machining, their principles and metal removal mechanism, process parameters, advantages and limitations, applications.

##### UNIT IV

**Laser beam machining:** Laser Beam Machining Process, principles, pumping processes, emission types-beam control. Applications Ultrasonic Machining Process-working principles-types of transducersconcentrators- nodal point clamping-feed mechanism-metal removal rate- Process Parameters, Applications

**TEXT BOOKS:**

1. Modern machining processes By P.C. Pandey and M.S. Shan.

2. Machining Science ByGhosh and Mallik, Affiliated East West

3. Nontraditional Manufacturing processes By G.F. Benedict, Maicel Dekker.

**REFERENCE BOOKS:**

1. Advanced Methods of Machining -By J.A. McGeongh, Chapman and Hall.

2. Electrochemical Machining of Metals -By Rurnyantsev&Davydov, Mir Pub.

3. Rapid prototyping: Principles and applications in Manufacturing

4. A Text Book: of Production Engineering, P.C.Sharma,

**Note:** *Examiner will set eight questions by selecting two from each unit. Students will be required to attempt five questions selecting at least one question from each unit.*

**Sound and Noise Control**

**MT- 406N**

**L T P Sessional: 25Marks**

**3 1 - Theory: 75 Marks**

**Total: 100Marks**

**Exam Duration: 3 Hours**

**UNIT I**

**Basic concepts of Sound and Noise:** Introduction, sound, loudness and loudness level, noise sources and levels, effect of noise on hearing, noise from equipment, noise control measures. Noise and its effects, audiometry, dangerous properties of noise, effect of noise on worker’s mind and output, effects of noise on human body

**UNIT II**

**Planning to noise control:** Introduction, commercial buildings, hospitals, flats and apartments, Noise reduction: Introduction, noise reduction at source, selection of machinery, noise from radiating surfaces, reducing transmission of mechanical vibrations, noise control by absorption of reflected sound, barriers and enclosures.

**UNIT III**

**Technology of reducing motor vehicle noise:** Introduction, foreseeable trends, sources of noise in motor vehicles, engine speed effects, vehicle speed effects, noise reduction without radical changes in design, control of engine noise-The case of the diesel engine, radical changes in design, noise, safety and air pollution, Traffic noise reduction: Introduction, urban planning and road design, soundproofing and arrangement of living space.

**UNIT IV**

**Personal safety devices:** Introduction, acoustic problems, ear protector requirements. Instrumentation for noise analysis: Introduction, microphones, sound level meters, acoustical measurement, dosimeters, frequency anlysers, amplitude distribution analysers. Audiometric testing and dosimeters: audiometeric testing outside the plant, audiometric test booths and dosimeters.

**TEXT BOOKS:**

1. S C Bhatia, Textbook of Noise Pollution and its control, ATLANTIC PUBLISHERS AND DISTRIBUTORS (P) LTD
2. L Bernak and I Ver (1992) Noise and Vibration Control Engine e ring: Principle s and
3. Applications,John Wily, ISBN 0-471-61751-2

**REFERENCE BOOKS:**

1. D A Bies (2002), Engine e ring Noise Control, Spoon press, ISBN 0-419-20430-X
2. B S Smith, R J Peters and S Owe n (1996), Acoustics and Noise Control, Addision-Wesley,
3. ISBN058088646

**Note:** *Examiner will set eight questions by selecting two from each unit. Students will be required to attempt five questions selecting at least one question from each unit.*

**Data Communication SystemsLab**

**MT-408N**

|  |  |  |  |
| --- | --- | --- | --- |
| **L** | **T** | **P** | **Sessional : 40 Marks** |
| **-** | **-** | **2** | **Practical: 60 Marks** |
|  |  |  | **Total: 100 Marks** |
|  |  |  | **Exam Duration: 3 Hours** |

**NOTE:** Student will be required to perform total of 10 experiments. 7 experiments will be from the below given list and rest experiments will be designed based upon the curriculum.

**LIST OF EXPERIMENTS:**

1. Simple Mathematical operations usingMATLAB.
2. WriteaprogramusingMATLABtoimplementSamplingtheoremforallNyquistconditions.
3. WriteaprogramusingMATLABtocomputeselfinformationcontentofmessage with given probabilityofoccurrence&also compute entropyof thegiven source.
4. WriteaprogramusingMATLABtocomputejoint,marginal&conditionalentropies from given joint probabilitymatrix&verifytherelation between them.
5. WriteaprogramusingMATLABtoplotBERcurvesforBPSK,QPSK&QAM
6. digitalmodulation techniques.
7. WriteaprogramusingMATLABtoplotTimedivisionmultiplexed&demultiplexed signal.
8. Write a program using MATLAB to implement BPSK modulation technique in communication systems.
9. To detect&correct singlebiterrorin linear blockcodes usinginbuiltfunctions
10. Totransmitamultiplexedoutputofdifferentfrequencymessagesignalsthrougha
11. Single channel usingTDM system and recover back the original messagesignals on kit.
12. ToconvertananalogsignalintoapulsedigitalsignalusingPCMsystemandto convert thedigital signal into analogsignal using PCM demodulation system on kit.
13. To modulate &demodulate signal using BPSK technique on kit.

##### The Professional Engineer (Project-II)

##### MT-410N

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **L** | **T** | **P** |  | **Practical** | **: 100 Marks** |
| **-** | **-** | **9** |  | **Sessional** | **: 100 Marks** |
|  |  |  |  | **Total** | **:100 Marks** |
|  |  |  |  | **Exam Duration: 3 Hours** | |

The student is expected to finish the remaining portion of the project.

The project will be **individual** practical and investigative, requiring the student to investigate the existing background, theories and knowledge as applied to a problem in the design and/or operation of an existing or new process or product. By practical measurement, design, implementation and above all, creativity, the student will arrive at a solution based on sound engineering principles worked in previous semester. The project will be integrative, deploying and extending the range of skills and knowledge previously and concurrently developed.

##### Comprehensive Viva

##### MT-412N

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **L** | **T** | **P** | **Total** | **Practical** | **: 0 Marks** |
| **-** | **-** | **-** | **-** | **Sessional** | **: 100 Marks** |
|  |  |  |  | **Total** | **: 100 Marks** |
|  |  |  |  | **Exam Duration: 3 Hours** | |

The comprehensive viva voce is scheduled at the end of 8th semesters in order to judge the understanding as well as application of the knowledge gained by the students. This is also to see the articulation of what is being learnt by them. The viva-voce will be conducted by Principal/ Director of the institution.

##### General Fitness and Professional Aptitude (Viva-Voce)

##### MT-414N

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **L** | **T** | **P** | **Total** | **Practical** | **: 100Marks** |
| **-** | **-** | **-** | **-** | **Sessional** | **: 0 Marks** |
|  |  |  |  | **Total** | **: 100 Marks** |
|  |  |  |  | **Exam Duration: 3 Hours** | |

The general fitness and professional aptitude viva voce is scheduled at the end of 8th semesters in order to judge the general fitness of students as well as to check their professional aptitude. The viva-voce will be conducted by Principal/ Director appointed by university.

##### Autotronics

**MT-416N**

**L T P Sessional: 25Marks**

**3 1 - Theory: 75 Marks**

**Total: 100 Marks**

**Exam Duration: 3 Hours**

##### UNIT I

##### Fundamentals of Automotive Electronics: Microprocessor and micro Computer applications in automobiles; components for engine management System; electronic management of chassis system; vehicle motion control; electronic panel meters.

##### Sensors & Actuators: Introduction; Basic sensor arrangement; Types of Sensors such as oxygen sensors, Crank angle position sensors, fuel metering/vehicle speed sensors and detonation sensors, altitude sensors, flow Sensors, throttle position sensors, solenoids, stepper motors,relays.

##### UNIT II

##### Electronic Fuel Injection & Ignition System: Introduction; feed back carburetor system; throttle body injection and multi point fuel injection System; injection system controls; advantage of electronic ignition systems; types of solid state system and their principle of operation; electronic spark timing.

##### UNIT III

##### Digital Engine Control System: Open loop and closed loop control system; engine cooling and warm-up control; acceleration, deceleration and idle speed control; integrated engine control system; exhaust emission control engineering; on-board diagnostics; future automotive electronic systems.

##### UNIT IV

##### Automotive Electrical: Batteries; starter motor & drive mechanism; D.C. generator and alternator; regulation for charging; lighting design; dashboard instruments; horn, warning system and safety devices.

##### Electromagnetic Interference Suppression: Electromagnetic compatibility Electronic dash board instruments - Onboard diagnosis system. Security and warning system

**TEXT BOOKS:**

1. Automotive Electronics Handbook, Ronald K. Jurgen, McGraw Hill Publishing Co., ISBN 0- 07-034453-1.

2. Automotive Electricity and Electronics, Al Santini, Delmar Publishers, NY, ISBN 0-8273- 6743-0.

**REFERENCE BOOKS:**

1. Automobile Electrical & Electronic Equipments, Young, Griffitns, Butterworth Publication, London. 2. Understanding Automotive Electronics, Bechfold, SAE 1998

**Note:** *Examiner will set eight questions by selecting two from each unit. Students will be required to attempt five questions selecting at least one question from each unit.*

##### Industrial Robotics

**MT-418N**

**L T P Sessional: 25Marks**

**3 1 - Theory: 75 Marks**

**Total: 100 Marks**

**Exam Duration: 3 Hours**

##### UNIT I

**Automation and robots:**Robot classification, Applications, Robot specifications.

Dot and Cross products, Coordinate frames, Homogeneous coordinates, Link Coordinates, The arm equation, Five-axis articulated robot (Rhino XR-3), Four-axis SCARA robot (Adept One), Six-axis articulated robot (Intelledex 660).

##### UNIT II

**The inverse kinematics problem:** General properties of solutions, Tool Configuration, Inverse kinematics of Five-axis articulated robot (Rhino XR- 3), Inverse Kinematics of Four- axis SCARA robot (Adept One), inverse kinematics of Six- axis articulated robot (Intelledex 660), and Inverse kinematics of a three-axis planar articulated robot, a robotic workcell.

##### UNIT III

**Workspace analysis:** Work envelope of a five-axis articulated robot (Rhino XR-3), Work envelope of a four-axis SCARA robot (Adept One), Workspace fixtures, The pick and place operations, Continuous path motion, Interpolated motion, Straight line motion.The tool configuration and Jacobean matrix, Joint space singularities, Generalized inverses, Resolved motion rate controls, rate control of redundant robots, rate control using (1) inverses, The manipulator Jacobean, Induced joint torque and forces.

##### UNIT IV

**Lagrange's equation:**  Kinetic and potential energy, Generalized force, Lagrange-Euler dynamic model, Dynamic model of a two-axis planner articulated robot, Dynamic model of a three-axis SCARA robot, Direct and inverse dynamics, Recursive Newton-Euler formulation, Dynamic model of a one-axis robot (invertedpendulum).

**TEXT BOOKS:**

1. Industrial Robotics By M.P. Groover, McGraw Hill

**REFERENCE BOOKS:**

1. Industrial Robotics and Automation - By S.R.Deb Tata McGraw Hill

**Note:** *Examiner will set eight questions by selecting two from each unit. Students will be required to attempt five questions selecting at least one question from each unit.*

##### Manufacturing Management

**MT-420N**

**L T P Sessional: 25Marks**

**3 1 - Theory: 75 Marks**

**Total: 100 Marks**

**Exam Duration: 3 Hours**

##### Unit I

**Manufacturing systems designs:** Definition, Systems, Subsystems, Systems Approach Fundamentals, Systems Approach for designing, Manufacturing Systems, Systematic Layout Planning (SLP), Computerized Plant Layout-CRAFT, ALDEP, CORELAP, Assembly Line balancing, Problems and solutions of assembly lines, Group Technology & Cellular Systems, Classification & Grouping, overview of FMS. Strategic consideration for comparison of various systems.

##### Unit II

**New product development (npd):**Product Development, Customer Need, Strategies for New Product Development, Product life cycle, Product status. Corporate Design Strategies, Japanese Approach to NPD. PUGH total Design approach, PAHL & BEITZ Approach, Project Approach.

##### Unit III

**Forecasting methods:** Forecasting Framework, Forecasting cost and accuracy, Forecasting Uses and Methods – Delphi, Exponential Smoothing, Forecasting Errors – MAD, Regression Methods-Linear Model for single & multiple variables, Brief idea of computerized forecasting systems.

##### Unit IV

**Value engineering:** Origin of Value Engineering, Meaning of value, value analysis and value engineering, uses of value engineering, when to apply value analysis, reason of unnecessary cost, difference between value analysis and other cost reduction techniques, steps in value analysis. Phases and constituents elements of each phase. FAST technique, Ten commandments(principles of value analysis) of value engineering

##### TEXT BOOKS:

1. Operations management – Schoroeder, McGraw HillInternational
2. Industrial Engineering and production management – MartandTelsang, S. Chand & Company, NewDelhi.
3. Production operations management – chary, TMH, NewDelhi.

##### REFERENCE BOOKS:

1. Production Operations Management – Adam & Ebert, PHI, NewDelhi
2. Operational Management –Monks, Mcgraw Hill,Int.
3. Production & Operations Management – I. Hill, Prentice HallInt.
4. Production Planning & Inventory Control – Narasimhametal, PHI, NewDelhi
5. Production & Operation Management- Panneerselvam, PHI, NewDelhi
6. Managing for Total Quality-Logothetis, PHI, NewDelhi
7. Concept of Reliability Engineering –L.S. Srinath, Affiliated EastWest.
8. Revolutionizing Product Development – Wheelwright & Clark, Freepress.
9. Management In Engineering – Freeman-Ball &Balkwill, PHI, NewDelhi.
10. Production & operations management – Martinich, John Wiely , NewDelhi.
11. The goal by Eliyahu M. Goldratt& Jeff Cox, Productivity Press India Ltd,,Bangalore
12. Toyota Production System by TaichiOhno, Productivity Press India Ltd,Bangalore

**Note:** *Examiner will set eight questions by selecting two from each unit. Students will be required to attempt five questions selecting at least one question from each unit.*

##### Fuzzy Logic and Neural Networks

##### MT-422N

**L T P Sessional: 25Marks**

**3 1 - Theory: 75 Marks**

**Total: 100 Marks**

**Exam Duration: 3 Hours**

##### UNIT I

**Neural Networks**: Fundamental of neural network, overview of biological Neuro-system, Mathematical Models of Neurons, ANN architecture, Learning Methods, Learning Paradigms-Supervised, Unsupervised and reinforcement Learning, ANN training Algorithms- perceptions, Training rules, Delta, Back Propagation Algorithm, Multilayer Perceptron Model, Radial Basis functions, Hopfield Networks, Associative Memories, Applications of Artificial NeuralNetworks.

##### UNIT-II

**Fuzzy sets:** Introduction to Fuzzy Logic, Classical and Fuzzy Sets: Overview of Classical Sets, Operations on Fuzzy Sets: Compliment, Intersections, Unions, Combinations of Operations, Extension principle and fuzzy relations Fuzzy Logic: Fuzzification and defuzzification, Membership Function, Linguistic Variables, Linguistic hedges, Fuzzy rules and reasoning, lamda cut-sets. Arithmetic operations on Fuzzy numbers.

##### UNIT-III

**Fuzzy Inference System:** Fuzzy Modeling, Mamdani Fuzzy model, TSK Fuzzy model, Fuzzy Controller, Industrial Applications.Introduction of Neuro-Fuzzy Systems, Architecture of Neuro Fuzzy Networks, Hybrid learning algorithms, Neuro-fuzzy Control.

##### UNIT-IV

**Introduction to Evolutionary Techniques:** Genetic Algorithm, Basic Concepts, Flow Chart of GA, Genetic representations (Encoding), Initialization and Selection, Genetic Operators, Mutation, Generational Cycle, Convergence of GA and Applications.

##### TEXT BOOKS

1. James A. Anderson “ Introduction to Neural Networks”, Prentice HallIndia.
2. H.J. Zimmermann “ Fuzzy set theory & its Applications “, Allied PublishersLtd.

##### Reference BOOKS:

1. Nil Junbong“ Fuzzy Neural Control Principles & Algorithm”,PHI.

2. N.K. Bose “ Neural Network Fundamental with Graphics “, TATA McGrawHill.

3. Klir George J. “ Fuzzy sets and Fuzzy Logic Theory and Applications”,PHI.

4. J.M Zurada , “ Introduction to Artificial Neural Network” , JaicoPublishers

5. S. Rajasekaran, “Neural Network, Fuzzy Logic and Genetic Algorithms”, PHI Learning India2011

6. S. N. Sivanandam, S.N. Deepa, “Principles of Soft Computing”, WileyIndia.

**Note:** *Examiner will set eight questions by selecting two from each unit. Students will be required to attempt five questions selecting at least one question from each unit.*

##### Quality Assurance and Reliability

##### MT-424N

**L T P Sessional: 25Marks**

**3 1 - Theory: 75 Marks**

**Total: 100 Marks Exam Duration: 3 Hours**

**UNIT I**

**Introduction**- Definition of Quality, Quality function, Dimensions of Quality, Brief history ofquality methodology, Statistical methods for quality improvement, Quality costs, Introduction to Quality function deployment.

**Quality Assurance (QA)** - Introduction, Definition, Management principles in QA, Forms ofQA, QA in different stages. Quality planning, QA program, QA aspect, Quality in materialmanagement, Vendor selection & development.

**UNIT II**

**Statistical Process Control** - Introduction to statistical process control, Concept of variation,Assignable & Chance causes, Attributes & variables, Frequency distribution curve & its types.Normal Distribution curve, Problems on FD curve & ND curve, Application of SPC.

**Control Charts for Variables**- Definition, Formulae & its problems. Control chart patterns,Process capability. Problems on x & R chart and Process capability.

**UNIT III**

**Control Charts for Attributes**- Definition, Formulae & its problems. Problems on p, c charts.Choice between variables and attributes control charts. Guidelines for implementing controlcharts.

**Sampling Inspection** - Sampling: Definition, types of sampling, importance, benefits andlimitations of sampling, Operating Characteristic Curve, Average Outgoing Quality Curve,Errors in Making Inferences from Control Charts (Type I and II errors).

**UNIT IV**

**Reliability Concepts -** Introduction of Reliability concepts, Failure data analysis and examples,Failure rate, Failure density, Probability of failure, Mortality rate, Mean time to failure,Reliability in terms of Hazard rate and Failure Density, examples, Useful life and wear out phaseof a system,

**System Reliability and Improvement**: Reliability of series and parallel connected systems andexamples, Logic diagrams, Improvement of system reliability, Element Redundancy, Unit redundancy, Standby redundancy.

##### TEXT BOOKS:

1.Mahajan, “Quality Control and Reliability”, DhanpatRai& Sons

2. Srinath L S, “Reliability Engineering”, East west press.

3. Sharma S C, Inspection Quality Control and Reliability, Khanna Publishers

**REFERENCE BOOKS:**

1. Grant E L, Statistical Quality Control“, McGraw-Hill.

**Note:** *Examiner will set eight questions by selecting two from each unit. Students will be required to attempt five questions selecting at least one question from each unit.*

##### Work Design and Ergonomics

##### MT-426N

**L T P Sessional: 25Marks**

**3 1 - Theory: 75 Marks**

**Total: 100 Marks Exam Duration: 3 Hours**

**Unit I**

**Introduction to Work Study:** Productivity, Scope of methods, motion and time study.

**Work Methods Design:** Operation Process Chart, Flow Process Chart, Flow Diagram, String Diagram, Man and machine chart, Two handed process chart, Travel Chart, Micro motion and memo motion study.

**Unit II**

**Work Measurement:** Tools and Techniques

**Work Sampling:** Determining time standards from standard data and formulas, Pre-determined

motion time standards, Work factor system, Methods time measurement, Analytical Estimation,

Measuring work by physiological methods – heart rate measurement – measuring oxygen consumption– establishing time standards by physiology methods.

**Unit III**

**Human Factors Engineering:** Introduction to ergonomics, Man/machine/environment systems concept, Human Anthropometry and its use in work place layout.

**Human Performance:** Information input and processing, factors affecting human performance, physical work load and energy expenditure, heat stress, manual lifting, Static and dynamic muscular load, human motor activity, metabolism, physical work load, repetitive and inspection work, measurement of physical work load, mental work load and its measurement, musculoskeleton disorder, work duration and work pauses, principles of motion economy.

**Unit IV**

**Design of Work Space & Equipment:** Work-space design for standing and seated workers, arrangement of components with in a physical space, Interpersonal aspect of work place design, Ergonomic Factors to be considered, design of displays and controls, design for maintainability

**Design of Environment:** Illumination and its effect, Climate - Heat Humidity – Body heat

balance, effective temperature scales, zones of discomfort, effect of heat on body and work performance, Vibrations - Response of body to low frequency vibrations, vibrations and discomfort, effect on health of worker, high frequency vibrations, effect of high frequency vibrations, methods of reducing vibrations

##### TEXT BOOKS:

1. Introduction to Work Study, I.L.O., 3rd Revised Edn.

2. Motion and Time Study – Design and Measurement of Work, Barnes, Raeph.m., JohnWiley & sons, New York.

3. Human Factors in Engineering and Design, Macormick, E.J., Tata McGraw-Hill

4. A Guide to Ergonomics of Manufacturing, Martin Helander, TMH.

5. Human Factor Engineering, Sanders & McCormick, McGrawhill Publications.

##### 6. Sound, Noise and Vibration Control, Lyle, F. Yerges, Van Nostrand.

##### REFERENCE BOOKS:

1. Improving Productivity and Effectiveness, Mundel, Marvin, E., Prentice Hall.

2. Human Factors Engineering & Design, Sounders, M.S. and McCornic, E.J., McGrawHill.

3. Motion and time study, Benjamin .W. Neibel,, Richard .D .Irwin Inc., Seventh Edition.

4. Work design Stephen Konz., Publishing Horizon Inc., Second Edition.

5. Introduction to Ergonomics, Bridger R.S.,McGraw Hill.

6. Applied Ergonomics, Hand Book: Brien Shakel (Edited) Butterworth Scientific, London.

7. Work Study and Ergonomics, Shan, H.S, DhanpatRai& Sons.

**Note:** *Examiner will set eight questions by selecting two from each unit. Students will be required to attempt five questions selecting at least one question from each unit.*

##### Digital Image Processing MT-428N

**L T P Sessional: 25Marks**

**3 1 - Theory: 75 Marks**

**Total: 100 Marks Exam Duration: 3 Hours**

**UNIT I**

**Digital image fundamentals:** Introduction, image model, sampling and Quantization, relationship between pixels, imaging geometry, discrete, Fourier transform, properties of two dimensional Fourier transform, fast Fourier transform.

**UNIT II**

**Image enhancement and compression:** Enhancement by point processing, spatial filtering and enhancement in the frequency domain, pseudo color image processing, image compression models, error free compression, image compression standards.

**UNIT III**

**Image restorations:** Degradation, models, diagonalizations of matrices, inverse filtering, interactive estorations, geometric transformations.

**Image segmentation**: Detection of discontinuities, edge linking and boundary detection, thresholding, region orienting segmentation.

**UNIT IV**

**Representations and recognition:** Boundary representation, Chain Code, Polygonal approximation, signature, boundary segments, Boundary description,Shape number, Fourier Descriptor, moments- Regional Descriptors –Topological feature, Texture – Patterns and Pattern classes

**TEXT BOOKS:**

1. Rafael c. Gonzalez and Richard E. Woods, digital image processing, Addison

Wesley publishing company, 1987

**REFERECE BOOKS:**

1. William K. Pratt, digital image processing, John Wiley and sons, 1978

2. Jain, Fundamentals of digital image processing, PHI, 1996

3. Barrie W. Jervis , “digital signal processing (Pearson education India)

4. Prokis, “ digital signal processing” (PHI)

**Note:** *Examiner will set eight questions by selecting two from each unit. Students will be required to attempt five questions selecting at least one question from each unit.*

##### Non Destructive Testing MT-430N

**L T P Sessional: 25Marks**

**3 1 - Theory: 75 Marks**

**Total: 100 Marks Exam Duration: 3 Hours**

**UNIT I**

**Introduction to NDET and surface NDT techniques**: Introduction to non-destructive testing and evaluation, visual examination, liquid penetrant testing and magnetic particle testing. Advantages and limitations of each of these techniques.

**UNIT II**

**Radiographic testing:**  Radiography principle, electromagnetic radiation sources, X-ray films, exposure, penetrometer, radiographic imaging, inspection standards and techniques, neutron radiography. Radiography applications, limitations and safety.

**UNIT III**

**Eddy current testing and ultrasonic testing:** Eddy current principle, depth of penetration, eddy current response, eddy current instrumentation, probe configuration, applications and limitations. Properties of sound beam, ultrasonic transducers, inspection methods, flaw characterization technique, immersion testing. Special/Emerging Techniques Leak testing, Acoustic Emission testing, Holography, Thermography, Magnetic Resonance Imaging, Magnetic Barkhausen Effect. In-situ metallography

**UNIT IV**

Defects in materials / products and Selection of NDET Methods Study of defects in castings, weldments, forgings, rolled products etc. and defects arising during service. Selection of NDET

methods to evaluate them. Standards and codes.

**TEXT BOOKS:**

1. Baldevraj, Jayakumar T., Thavasimuthu M., (2008) “Practical Non-Destructive Testing”, 3rd

edition, Narosa Publishers.

Reference Books

2. American Society for Metals, “Non-Destructive Evaluation and Quality Control”: Metals

Hand Book: 1992, Vol. 17, 9th Ed, Metals Park, OH.

3. Paul E Mix, “Introduction to nondestructive testing: a training guide”, Wiley, 2nd edition

New Jersey, 2005.

**REFERENCES BOOKS:**

1. Ravi Prakash, “Nondestructive Testing Techniques”, New Age International Publishers, 1st

rev. edition, 2010.

**Note:** *Examiner will set eight questions by selecting two from each unit. Students will be required to attempt five questions selecting at least one question from each unit.*