

MAHARSHI DAYANAND UNIVERSITY, ROHTAK
SCHEME OF STUDIES & EXAMINATIONS
B.E 3rd YEAR (SEMESTER – VI) MECHANICAL ENGINEERING
Modified ‘E’ Scheme Effective from 2007-08

Course No.	Course Title	Teaching schedule				Marks for class work	Marks for Examination		Total Marks	Duration of Exam.
		L	T	P	Total		Theory	Practical		
ME-302 E	Dynamics of Machines	3	1	-	4	50	100	-	150	3
ME-304 E	Machine Design - II	3	2	-	5	50	100	-	150	4
ME-306 E	Heat Transfer (ME, AE)	3	1	-	4	50	100	-	150	3
ME-308 E	Automatic Controls	3	1	-	4	50	100	-	150	3
ME-310 E	Measurements & Instrumentation (ME, AE)	3	1	-	4	50	100	-	150	3
ME-312 E	Industrial Engineering (ME, AE)	3	1	-	4	50	100	-	150	3
ME-314 E	Dynamics of Machines lab	-	-	2	2	25	-	25	50	3
ME-316 E	Heat Transfer Lab	-	-	3	3	50	-	50	100	3
ME-318 E	Measurements & Instrumentation Lab. (ME, AE)	-	-	2	2	25	-	25	50	3
GPME-302 E	General Proficiency	-	-	-	-	50	-	-	50	3
	Total	18	7	7	32	450	600	100	1150	

Note:

1. Each student has to undergo Practical training of 6- weeks during summer vacation and its evaluation shall be carried out in the VIIth Semester.
2. Students will be allowed to use Non-Programmable Scientific Calculator. However, sharing of calculator will not be permitted in the examination.
3. The practical hours for the subject ME-316E (Heat Transfer Lab.) have been increased from 2 hours to 3 hours. The marks for the class work and practical examination in the subject have also been increased from 25 each to 50 each. Thus the total marks of the subject shall be 100 in place of 50 marks w.e.f the session 2007-08.
4. The grand total of the semester marks shall be 1150 in-place of 1100 marks from the session 2007-08.
5. *The subject GPME-320-E (General Proficiency) code has been changed to GPME-302-E and will be effective from 2007-08.

ME- 302 E DYNAMICS OF MACHINES

L T P
3 1 -

Sessional : 50 Marks
Theory : 100 Marks
Total : 150 Marks
Duration of Exam : 3 Hrs.

- Unit I** Static and Dynamic Force Analysis : Static force analysis of planer mechanisms, dynamic force analysis including inertia and frictional forces of planer mechanisms.
- Unit II** Dynamics of Reciprocating Engines : engine types, indicator diagrams, gas forces, equivalent masses, inertia forces, bearing loads in a single cylinder engine, crankshaft torque, engine shaking forces.
- Unit III** Balancing of Rotating Components : static balance, dynamic balance, balancing of rotating masses, two plane balancing, graphical and analytical methods, balancing of rotors, balancing machines, field balancing.
- Unit IV** Balancing of Reciprocating Parts : Balancing of single cylinder engine, balancing of multi cylinder; inline, radial and V type engines, firing order.
- Unit V** Governors : introduction, types of governors, characteristics of centrifugal governors, gravity controlled and spring controlled centrifugal governors, hunting of centrifugal governors, inertia governors.
- Unit VI** Dynamometers : types of dynamometers, Prony brake, rope brake and band brake dynamometers, belt transmission dynamometer, torsion dynamometer, hydraulic dynamometer.
- Unit VII** Gyroscope : gyroscopes, gyroscopic forces and couples, gyroscopic stabilization, ship stabilization, stability of four wheel and two wheel vehicles moving on curved paths.

Text Books:

1. Theory of Mechanisms and Machines : Amitabha Ghosh and Ashok kumar Mallik, Third Edition Affiliated East-West Press.
2. Theory of Machines and Mechanisms : Joseph Edward Shigley and John Joseph Uicker, Jr. Second Edition Mc Graw Hill, Inc

Reference Books:

1. Mechanism and Machine Theory : J.S. Rao and R.V. Dukkanpati, New age International.
2. Theory and Machine (S I units) S.S. Rattan, Tata McGrawHill.

Note : In the semester examination, the examiner will set eight questions in all, at least one question from each unit & students will be required to attempt only 5 questions.

ME- 304 E MACHINE DESIGN –II

L	T	P	Sessional	: 50 Marks
3	2	-	Theory	: 100 Marks
			Total	: 150 Marks
			Duration of Exam	: 4 hrs.

- Unit I** Design for Production ; Ergonomic and value engineering considerations in design, Role of processing in design, Design considerations for casting, forging and machining. Variable Loading : Different types of fluctuating/ variable stresses, Fatigue strength considering stress concentration factor, surface factor, size factor, reliability factor etc., Fatigue design for finite and infinite life against combined variable stresses using Goodman and Soderberg's Criterion, Fatigue design using Miner's equation, Problems.
- Unit II** Shafts : Detailed design of shafts for static and dynamic loading, Rigidity and deflection consideration.
- Unit III** Springs : Types of Springs, Design for helical springs against tension and their uses, compression and fluctuating loads, Design of leaf springs, Surging phenomenon in springs, Design Problem.
- Unit IV** Bearings : design of pivot and collar bearing , Selection of ball and roller bearing based on static and dynamic load carrying capacity using load-life relationship, Selection of Bearings from manufacturer's catalogue, types of lubrication – Boundary, mixed and hydrodynamic lubrication, Design of journal bearings using Raimondi and Boyd's Charts, Lubricants and their properties, Selection of suitable lubricants, Design Problems.
- Unit V** Gears : Classification, Selection of gears, Terminology of gears, Force analysis, Selection of material for gears, Beam & wear strength of gear tooth, Form or Lewis factor for gear tooth, Dynamic load on gear teeth -Barth equation and Buckingham equation and their comparison, Design of spur, helical, bevel & worm gear including the Consideration for maximum power transmitting capacity, Gear Lubrication, Design Problems.

Text Books:

1. Mechanical Engg. Design- Joseph Edward Shigley-Mc Graw Hill Book Co.
2. Design of Machine Elements – V.B. Bhandari – Tata McGraw Hill, New Delhi.

Reference Books :

1. Engineering design – George Dieter, McGraw Hill, New York.
2. Product Design and Manufacturing –: A.K.Chitale and R.C.Gupta, PHI, New Delhi.
3. Machine Design An Integrated Approach: Robert L.Norton,Second Edition –Addison Wisley Longman
4. Machine Design : S.G. Kulkarni , TMH , New Delhi.

Note : 1. In the semester examination, the examiner will set eight questions in all, at least one question from each unit & students will be required to attempt only 5 questions.

2. The paper setter will be required to mention in the note of the question paper that the use of only PSG Design Data book is permitted.

ME –306E HEAT TRANSFER

L T P
3 1 -

Sessional : 50 Marks
Theory : 100 Marks
Total : 150 Marks
Duration of Exam :3 Hrs.

- UNIT I** Basics and Laws : Definition of Heat Transfer, Reversible and irreversible processes, Modes of heat flow, Combined heat transfer system and law of energy conservation.
- UNIT II** Steady State Heat Conduction : Introduction, I-D heat conduction through a plane wall, long hollow cylinder, hollow sphere, Conduction equation in Cartesian, polar and spherical co-ordinate systems, Numericals.
- UNIT III** Steady State Conduction with Heat Generation : Introduction, 1 – D heat conduction with heat sources, Extended surfaces (fins), Fin effectiveness 2-D heat conduction , Numericals.
- UNIT IV** Transient Heat Conduction : Systems with negligible internal resistance, Transient heat conduction in plane walls, cylinders, spheres with convective boundary conditions, Chart solution, Relaxation Method, Numericals.
- UNIT V** Convection: Forced convection-Thermal and hydro-dynamic boundary layers, Equation of continuity, Momentum and energy equations, Some results for flow over a flat plate and flow through tube, Fluid friction and heat transfer (Colburn analogy), Free convection from a vertical flat plate, Empirical relations for free convection from vertical and horizontal planes & cylinders, Numericals.
- UNIT VI** Thermal Radiation: The Stephen-Boltzmann law, The black body radiation, Shape factors and their relationships, Heat exchange between non black bodies, Electrical network for radiative exchange in an enclosure of two or three gray bodies, Radiation shields, Numericals.
- UNIT VII** Heat Exchangers: Classification, Performance variables, Analysis of a parallel/counter flow heat exchanger, Heat exchanger effectiveness, Numericals.
- UNIT VIII** Heat Transfer with Change of Phase: Laminar film condensation on a vertical plate, Drop-wise condensation, Boiling regimes, Free convective, Nucleate and film boiling, Numericals.

Text Books :

1. Heat Transfer – J.P. Holman, John Wiley & Sons, New York.
2. Fundamentals of Heat & Mass Transfer–Incropera, F.P. & Dewill, D.P –John Willey New York.

Reference Books :

1. Conduction of Heat in Solids – Carslow, H.S. and J.C. Jaeger – Oxford Univ. Press.
2. Conduction Heat Transfer – Arpasi, V.S. – Addison – Wesley.
3. Compact Heat Exchangers – W.M. Keys & A.L. Landon, Mc. Graw Hill.
4. Thermal Radiation Heat Transfer – Siegel, R. and J.R. Howell, Mc. Graw Hill.
5. Heat Transmission – W.M., Mc.Adams , Mc Graw Hill.

NOTE : 1. In the semester examination, the examiner will set Eight questions, at least one question from each unit. The students will be required to attempt only 5 questions.

2.The paper setter will be required to mention in the note of question paper that the use of Steam tables, Charts, Graphical plots is permitted.

ME- 308 E AUTOMATIC CONTROLS

L T P
3 1 -

Sessional Marks : 50
Theory Marks : 100
Total Marks : 150
Duration of Exam : 3 hrs.

- Unit I** Introduction And Applications: Types of control systems ; Typical Block Diagram : Performance Analysis; Applications – Machine Tool Control, Boiler Control, Engine Governing, Aerospace Control, Active Vibration Control; Representation of Processes & Control Elements – Mathematical Modeling. Block Diagram Representation, Representation of Systems or Processes, Comparison Elements; Representation of Feedback Control systems – Block Diagram & Transfer Function Representation, Representation of a Temperature, Control System, Signal Flow Graphs, Problems.
- Unit II** Types of Controllers : Introduction : Types of Control Action; Hydraulic Controllers; Electronic Controllers; Pneumatic Controllers; Problems.
- Unit III** Transient And Steady State Response: Time Domain Representation; Laplace Transform Representation; System with Proportional Control; Proportional – cum – Derivative control; Proportional – cum – Integral Control; Error Constants; Problems.
- Unit IV** Frequency Response Analysis: Introduction; Closed and Open Loop Transfer Function; Polar Plots; Rectangular Plots; Nichols Plots: Equivalent Unity Feed Back Systems; Problems.
- Unit V** Stability Of Control Systems : Introduction; Characteristic Equation; Routh's Criterion; Nyquists Criterion, Gain & Phase Margins: Problems.
- Unit VI** Root Locus Method : Introduction; Root Loci of a Second Order System; General Case; Rules for Drawing Forms of Root Loci; Relation between Root Locus Locations and Transient Response; Parametric Variation; Problems.
- Unit VII** Digital Control System : Introduction; Representation of Sampled Signal; Hold Device; Pulse Transfer Function; Block Diagrams; Transient Response; Routh's Stability Criterion; Root Locus Method; Nyquists Criterion; Problems.
- Unit VIII** State Space Analysis Of Control Systems: Introduction; Generalized State Equation; Techniques for Deriving System State – Space Equations; Transfer Function from State Equations; Solution of State Vector Differential Equations; Discrete Systems; Problems.

Text Books :

1. Theory & Applications of Automatic Controls by B.C. Nakra, Published by New Age International Pvt. Ltd. Publishers, New Delhi.
2. Modern Control Engg. by Ugata, Prentice Hall of India, New Delhi.

Reference Books :

1. Automatic Control Systems by Kuo' Published by Prentice Hall of India, New Delhi.
2. Control System Engineering, I. J. Nagrath and M. Gopal, New Age , New Delhi.

Note : In the semester examination, the examiner will set eight questions in all, at least one question from each unit & students will be required to attempt only 5 questions.

ME – 310 E MEASUREMENTS AND INSTRUMENTATION

L T P
3 1 -

Sessional : 50 Marks
Theory : 100 Marks
Total marks : 150 Marks
Duration of Exam: 3 Hrs.

- Unit I** Instruments and Their Representation : Introduction, Typical Applications of Instrument Systems, Functional Elements of a Measurement System, Classification of Instruments, Standards and Calibration.
- Unit II** Static and Dynamic characteristics of Instruments : Introduction, Accuracy, Precision, Resolution, Threshold, Sensitivity, Linearity, Hysteresis, Dead Band, Backlash, Drift, Formulation of Differential Equations for Dynamic Performance- Zero Order, First Order and Second order systems, Response of First and Second Order Systems to Step, Ramp, Impulse and Harmonic Functions.
- Unit III** Transducer Elements : Introduction, Analog and Digital Transducers, Electromechanical; Potentiometric, Inductive Self Generating and Non-Self Generating Types, Electromagnetic, Electrodynamical, Eddy Current, Magnetostrictive, Variable Inductance, Linearly Variable Differential Transformer, Variable Capacitance, Piezo-Electric Transducer and Associated Circuits, Unbonded and Bonded Resistance Strain Gages. Strain Gage Bridge circuits, Single Double and Four Active Arm Bridge Arrangements, Temperature Compensation, Balancing and Calibration, Ionisation Transducers, Mechano Electronic Transducers, Opto-Electrical Transducers, Photo Conductive Transducers, Photo Volatic Transducers, Digital Transducers, Frequency Domain Transducer, Vibrating String Transducer, Binary codes, Digital Encoders.
- Unit IV** Intermediate, Indicating and Recording Elements : Introduction Amplifiers, Mechanical, Hydraulic, Pneumatic, Optical, Electrical Amplifying elements, Compensators, Differentiating and Integrating Elements, Filters, Classification of Filters, A-D and D-A Converters, Digital Voltmeters (DVMs), Cathode Ray Oscillo scopes (CROs), Galvanometric Recorders, Magnetic Tape recorders, Data Acquisition Systems, Data Display and Storage.
- Unit V** Motion, Force and Torque Measurement : Introduction, Relative motion Measuring Devices, Electromechanical, Optical, Photo Electric, Moire-Fringe, Pneumatic, Absolute Motion Devices, Seismic Devices, Spring Mass & Force Balance Type, Calibration, Hydraulic Load Cell, Pneumatic Load Cell, Elastic Force Devices, Separation of Force Components, Electro Mechanical Methods, Strain Gage, Torque Transducer, Toque Meter.
- Unit VI** Pressure and Flow Measurement : Pressure & Flow Measurement, Introduction : Moderate Pressure Measurement, Monometers, Elastic Transducer, Dynamic Effects of Connecting Tubing, High Pressure Transducer, Low Pressure Measurement, Calibration and Testing, Quantity Meters, Positive Displacement Meters, Flow Rate Meters, Variable Head Meters, Variable Area Meters, Rotameters, Pitot-Static Tube Meter, Drag Force Flow Meter, Turbine Flow Meter, Electronic Flow Meter, Electro Magnetic Flow meter. Hot-Wire Anemometer.
- Unit VII** Temperature Measurement : Introduction, Measurement of Temperature, Non Electrical Methods – Solid Rod Thermometer, Bimetallic Thermometer, Liquid-in-Glass thermometer, Pressure Thermometer, Electrical Methods – Electrical Resistance

Thermometers, Semiconductor Resistance Sensors (Thermistors), Thermo–Electric Sensors, Thermocouple Materials, Radiation Methods (Pyrometry), Total Radiation Pyrometer, Selective Radiation Pyrometer.

Unit VIII Basic Statistical Concepts : Types of Measured Quantities (Discrete and Continuous), Central Tendency of Data, Mode, Median, Arithmetic Mean, Best Estimate of true Value of Data, Measures of Dispersion, Range, Mean Deviation, Variance, Standard Deviation, Normal Distribution, Central Limit Theorem, Significance Test, Method of Least Squares, Graphical Representation and Curve Fitting of Data.

Text Books :

1. Measurement systems Application and Design. Ernest O. Doebelin, Tata McGraw Hill Edition (Fourth Edition) 2002.
2. Measurement and Instrumentation in Engineering, Francis S. Tse and Ivan E. Morse, Marcel Dekker.

Reference Books :

1. Principles of Measurement and Instrumentation – Alan S. Morris Prentice Hall of India.
2. Mechanical Measurements : T.G. Beckwith, W.L. Buck and R.D. Marangoni Addison Wesley.
3. Instrumentation, Measurement and Analysis – B.C. Nakra and K.K. Chaudhary, TMH.
4. Mechanical Measurements by D. S. Kumar, Kataria & Sons.

Note : In the semester examination, the examiner will set eight questions in all, at least one question from each unit & students will be required to attempt only 5 questions.

ME- 312 E INDUSTRIAL ENGINEERING

L T
3 1 -

Sessional : 50 Marks
Theory : 100 Marks
Total : 150 Marks
Duration of Examination: 3 Hrs

UNIT - I

Definition of Industrial Engineering: Objectives, Method study, Principle of motion economy, Techniques of method study - Various charts, THERBLIGS, Work measurement - various methods, time study PMTS, determining time, Work sampling, Numericals.

UNIT - II

Productivity & Workforce Management :Productivity - Definition, Various methods of measurement, Factors effecting productivity, Strategies for improving productivity, Various methods of Job evaluation & merit rating, Various incentive payment schemes, Behavioural aspects, Financial incentives.

UNIT - III

Manufacturing Cost Analysis: Fixed & variable costs, Direct, indirect & overhead costs, & Job costing, Recovery of overheads, Standard costing, Cost control, Cost variance Analysis - Labour, material, overhead in volume, rate & efficiency, Break even Analysis, Marginal costing & contribution, Numericals.

UNIT - IV

Materials Management : Strategic importance of materials in manufacturing industries, Relevant costs, Inventory control models - Economic order quantity (EOQ), Economic batch quantity (EBQ) with & without shortage, Purchase discounts, Sensitivity analysis, Inventory control systems - P,Q,Ss Systems, Service level, Stock out risk, determination of order point & safety stock, Selective inventory control - ABC, FSN, SDE, VED and three dimensional, Numericals.

UNIT - V

Quality Management: Definition of quality, Various approaches, Concept of quality assurance systems, Costs of quality, Statistical quality Control (SQC), Variables & Attributes, X, R, P & C - charts, Acceptance sampling, OC - curve, Concept of AOQL, Sampling plan - Single, Double & sequential, Introduction to TQM & ISO - 9000.

UNIT - VI

Production Planning & Control (PPC) : Introduction to Forecasting - Simple & Weighted moving average methods, Objectives & variables of PPC, Aggregate planning - Basic Concept, its relations with other decision areas, Decision options - Basic & mixed strategies, Master production schedule (MPS), Scheduling Operations Various methods for line & intermittent production systems, Gantt chart, Sequencing - Johnson algorithm for n-Jobs-2 machines, n- Jobs-3 machines, 2 Jobs n-machines, n-Jobs m-machines Various means of measuring effectiveness of PPC, Introduction to JIT, Numericals.

UNIT - VII

Management Information Systems (MIS) : What is MIS ? Importance of MIS, Organizational & information system structure, Role of MIS in decision making, Data flow diagram, Introduction to systems analysis & design, Organizing information systems.

UNIT - VIII

Product Design and Development: Various Approaches, Product life cycle, Role 3S's – Standardization, Simplification, Specialization, Introduction to value engineering and analysis, Role of Ergonomics in Product Design.

Text Books:

1. Production & Operations Management - Chary, TMH, New Delhi.
2. Management Information Systems - Sadagopan, PHI New Delhi.
3. Modern Production Management – S.S. Buffa, Pub.- John Wiley.

Ref.Books:

1. Operations Management - Schroeder, McGraw Hill ISE.
2. Operation Management - Monks, McGraw Hill ISE.
3. Production & Operations Management - Martinich, John Wiely SE.
4. Industrial & Systems Engineering - Turner, MIZE, CHASE, Prentice Hall Pub.

Note : In the semester examination, the examiner will set eight questions in all, at least one question from each unit & students will be required to attempt only 5 questions.

ME- 314 E DYNAMICS OF MACHINE LAB

L T P
- - 2

Sessional : 25 Marks
Practical : 25 Marks
Total : 50Marks
Duration of Exam : 3 hrs.

List of Experiments :

1. To perform experiment on Watt and Porter Governors to prepare performance characteristic Curves, and to find stability & sensitivity.
2. To perform experiment on Proell Governor to prepare performance characteristic curves, and to find stability & sensitivity.
3. To perform experiment on Hartnell Governor to prepare performance characteristic Curves, and to find stability & sensitivity.
4. To study gyroscopic effects through models.
5. To determine gyroscopic couple on Motorized Gyroscope.
6. To perform the experiment for static balancing on static balancing machine.
7. To perform the experiment for dynamic balancing on dynamic balancing machine.
8. Determine the moment of inertial of connecting rod by compound pendulum method and tri-flair suspension pendulum.

Note : **1. Ten experiments are to be performed in the Semester.**

2. At least seven experiments should be performed from the above list. Remaining three experiments should be performed as designed & set by the concerned Institution as per the scope of the syllabus.

ME- 316 E HEAT TRANSFER LAB.

L T P
- - 3

Sessional : 50 Marks
Practical : 50 Marks
Total : 100 Marks
Duration of Exam : 3Hrs.

List of Experiments :

1. To determine the thermal conductivity of a metallic rod.
2. To determine the thermal conductivity of an insulating power.
3. To determine the thermal conductivity of a solid by the guarded hot plate method.
4. To find the effectiveness of a pin fin in a rectangular duct natural convective condition and plot temperature distribution along its length.
5. To find the effectiveness of a pin fin in a rectangular duct under forced convective and plot temperature distribution along its length.
6. To determine the surface heat transfer coefficient for a heated vertical tube under natural convection and plot the variation of local heat transfer coefficient along the length of the tube. Also compare the results with those of the correlation.
7. To determine average heat transfer coefficient for a externally heated horizontal pipe under forced convection & plot Reynolds and Nusselt numbers along the length of pipe. Also compare the results with those of the correlations.
8. To measure the emmissivity of the gray body (plate) at different temperature and plot the variation of emmissivity with surface temperature.
9. To find overall heat transfer coefficient and effectiveness of a heat exchange under parallel and counter flow conditions. Also plot the temperature distribution in both the cases along the length of heat of heat exchanger.
10. To verify the Stefan-Boltzmann constant for thermal radiation.
11. To demonstrate the super thermal conducting heat pipe and compare its working with that of the best conductor i.e. copper pipe. Also plot temperature variation along the length with time or three pipes.
12. To study the two phases heat transfer unit.
13. To determine the water side overall heat transfer coefficient on a cross-flow heat exchanger.
14. Design of Heat exchanger using CAD and verification using thermal analysis package eg. I-Deas etc.

Note:

- 1. At least ten experiments are to be performed in the semester.**
- 2. At least seven experiments should be performed from the above list. Remaining three experiments may either be performed from the above list or designed & set by the concerned institute as per the scope of the syllabus.**

ME- 318 E MEASUREMENTS & INSTRUMENTATION LAB.

L T P
- - 2

Sessional : 25 Marks
Practical : 25 Marks
Total : 50 Marks
Duration of Exam : 3 Hrs.

List of Experiments :

1. To Study various Temperature Measuring Instruments and to Estimate their Response times.
 - (a) Mercury – in glass thermometer
 - (b) Thermocouple
 - (c) Electrical resistance thermometer
 - (d) Bio-metallic strip
2. To study the working of Bourdon Pressure Gauge and to check the calibration of the gauge in a dead-weight pressure gauge calibration set up.
3. To study a Linear Variable Differential Transformer (LVDT) and use it in a simple experimental set up to measure a small displacement.
4. To study the characteristics of a pneumatic displacement gauge.
5. To measure load (tensile/compressive) using load cell on a tutor.
6. To measure torque of a rotating shaft using torsion meter/strain gauge torque transducer.
7. To measure the speed of a motor shaft with the help of non-contact type pick-ups (magnetic or photoelectric).
8. To measure the stress & strain using strain gauges mounted on simply supported beam/cantilever beam.
9. To measure static/dynamic pressure of fluid in pipe/tube using pressure transducer/pressure cell.
10. To test experimental data for Normal Distribution using Chi Square test.
11. To learn the methodology of pictorial representation of experimental data and subsequent calculations for obtaining various measures of true value and the precision of measurement using Data acquisition system/ calculator.
12. Vibration measurement by Dual Trace Digital storage Oscilloscope.
13. To find out transmission losses by a given transmission line by applying capacitive /inductive load.
14. Process Simulator.

Note:

1. **At least ten experiments are to be performed in the Semester.**
2. **At least seven experiments should be performed from the above list. Remaining three experiments may either be performed from the above list or designed & set by the concerned institution as per the scope of the Syllabus.**