Course Outline and Detailed Syllabus for B. Tech. Mechanical Engineering (6th Semester)

Semester-VI

S. No	Course Code	Course Title	Hours Per Week			Total Contact Hours	Credits
			L	T	P		
1.	MEC350C	Advanced Manufacturing Processes	**4**	**0**	**0**	**4**	**4**
2.	MEC351C	Machine Design	**3**	**0**	**0**	**3**	**3**
3.	MEC352C	Mechanical Vibrations	**4**	**0**	**0**	**4**	**4**
4.	MECXXXE	Elective-I (Discipline Centric)	**3**	**0**	**0**	**3**	**3**
5.	XXXXXXG	Elective-II (Generic)	**-**	**-**	**-**	**-**	**X**
6.	MEC360C	Mechanisms & Vibrations Lab	**0**	**0**	**2**	**2**	**1**
7.	MEC361C	CAD/CAM Lab	**0**	**0**	**2**	**2**	**1**
8.	MEC362C	Project-II	**0**	**0**	**6**	**90 (Total)**	**3**
9.	-	Open Elective	**-**	**-**	**-**	-	**-**
Total Credits							**19+X**

Electives (Discipline Centric)

S. No.	Course Code	Course Title	Hours Per Week			Total Contact Hours	Credits
			L	T	P		
1.	MEC350E	Introduction to Tribology	**3**	**0**	**0**	**3**	**3**
2.	MEC351E	Computer Aided Manufacturing	**3**	**0**	**0**	**3**	**3**
3.	MEC352E	Mechatronics	**3**	**0**	**0**	**3**	**3**
4.	MEC353E	Composite Materials	**3**	**0**	**0**	**3**	**3**
5.	MEC354E	Refrigeration and Air Conditioning	**3**	**0**	**0**	**3**	**3**

Note:

1. *Discipline Centric Electives are offered to the students of the Department of Mechanical Engineering only.*
2. *The students of the Department of Mechanical Engineering have to choose Discipline Centric Electives from the above list.*

Electives (Generic)

S. No.	Course Code	Course Title	Hours Per Week			Total Contact Hours	Credits
			L	T	P		
1.	MEC350G	Computer Aided Design	**3**	**0**	**0**	**3**	**3**
2.	MEC351G	Introduction to programming in MATLAB®	**1**	**0**	**2**	**3**	**2**
3.	MEC352G	Power Plant Engineering	**3**	**0**	**0**	**3**	**3**

Note:

1. *Generic electives are offered to the students of the School of Engineering and Technology including the students of the Department of Mechanical Engineering.*
2. *The students of the Department of Mechanical Engineering have to choose Generic Electives from the list of courses offered by all the Departments of School of Engineering and Technology.*

Open Electives

S. No.	Course Code	Course Title	Hours Per Week			Total Contact Hours	Credits
			L	T	P		
1.	MEC001	Optimization Techniques	**3**	**0**	**0**	**3**	**3**
2.	MEC002	Quality Management	**3**	**0**	**0**	**3**	**3**
3.	MEC003	Concurrent Engineering	**3**	**0**	**0**	**3**	**3**
4.	MEC004	Maintenance Engineering	**3**	**0**	**0**	**3**	**3**
5.	MEC005	Fundamentals of Manufacturing Processes	**3**	**0**	**0**	**3**	**3**
6.	MEC006	Solar Energy	**3**	**0**	**0**	**3**	**3**
7.	MEC007	Basic Automobile Engineering	**3**	**0**	**0**	**3**	**3**
9.	MEC008	Basic Mechanical Engineering	**3**	**0**	**0**	**3**	**3**

Note:

1. *Open electives are offered to the students of all Departments of the university other than the Department of Mechanical Engineering.*
2. *The students of the Department of Mechanical Engineering have to choose Open Electives offered by the departments other than the Department of Mechanical Engineering.*

MEC350C Advanced Manufacturing Processes 4-0-0

Advanced Machining Processes/ Non- Conventional Machining Processes: EDM, ECM, ECG, CM, AJM, Wire cut EDM, USM, LBM process principle, process parameters and their applications. Process capabilities and their applications.

Advanced Casting Processes: Metal mould casting, continuous casting, squeeze casting, vaccum mould casting, evaporative pattern casting and ceramic shell casting.

Advanced Welding Processes: Atomic hydrogen, ultrasonic welding (USW), Plasma arc welding (PAW), laser beam welding (LBW), and Electron beam welding (EBW).

Advanced Metal Forming Processes: Details of high energy rate forming (HERF) process, Electro-magnetic forming, explosive forming, Electro-hydraulic forming, Stretch forming and Contour roll forming.

Rapid Prototyping and Rapid Manufacturing: Introduction to Prototyping, Traditional Prototyping and Rapid Prototyping, Rapid Manufacturing Processes: Additive, Subtractive, Formative, Generic RP process.

Text Books/Reference Books:

1. Kalpakjian S., Schmid S. R., Manufacturing Engineering and Technology, *Pearson publication*.
2. Gibson D. W. Rosen, Brent Stucker, Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing, *Springer Publications*.

MEC351C Machine Design 3-0-0

Design of clutches and brakes: Types of clutches and brakes, analysis and design of different types of clutches and brakes.

Design of belt drives: Types of belt drives, velocity ratio of a belt drive, slip and creep in belts, design of flat belt drives, V-belt drives and rope drives, wire ropes, designation of wire ropes, stresses induces in wire ropes, design of chain drives.

Design of gear drives: Forms of gear teeth, Interference in gears, types of gears, Tooth systems, force analysis of different gears, design of spur and helical gears, Lewis bending equation, surface durability of gears, AGMA stress and strength equations, design of bevel gears and worm gears.

Design of bearings: Classification of bearings, journal bearings, types of lubrication, Petroff's equation, design considerations in journal bearings, thrust bearings, collar bearings, boundary lubricated bearings, rolling contact bearings and their types, designation of rolling contact bearings, bearing life and reliability, combined radial and thrust loading, variable loading, selection of ball, cylindrical and tapered roller bearings, lubrication in roller bearings.

Design of IC engine parts: Principal parts of an IC engine, design of engine cylinder, piston, piston rings, piston head, connecting rod, crankshaft, valves.

Text Books:

1. Budynas R. G., Nisbett J. K., Shigley's Mechanical Engineering Design, *McGraw Hill Education (India).*
2. Mott R. L., Machine Elements in Mechanical design, *Prentice-Hall Inc, New Jersey*.

Reference Books:

1. Spotts M. F., Design of Machine Elements, *Prentice-Hall Inc, New Jersey*.
2. Bhandari V. B., Design of Machine Elements, *McGraw Hill Education (India).*
3. Sharma P. C., Aggarwal D. K., A Textbook of Machine Design, *S. K. Kataria and Sons New Delhi India.*

MEC352C Mechanical Vibrations 4-0-0

Introduction: Fundamentals of vibration, classification of vibrations, discrete and continuous systems, elements of vibrating systems, harmonic motion, vibration analysis tools.

Single degree of freedom systems: Free vibration of undamped systems, first and second order systems, equations of motion, equilibrium and energy methods, Rayleigh's method, equivalent system method, undamped torsional systems, free vibrations of damped systems, different types of damping, viscous, coulomb and structural damping, logarithmic decrement, forced vibration of undamped and damped systems, harmonic excitations, resonance, harmonic motion of support, rotating unbalanced masses, self-excitation and stability analysis.

Two degree of freedom systems: Equations of motion, free vibrations of undamped systems, coordinate coupling, principal coordinates, Eigen value problems, natural modes of vibration, orthogonality of natural modes, undamped vibration absorbers.

Multi degree of freedom systems: Equations of motion, influence coefficients, stiffness, flexibility and inertia coefficients, undamped free vibrations, Eigen value problems, modal vectors, modal analysis, determination of natural frequencies and mode shapes, matrix methods, Rayleigh's method, Holzer Method, Jacobi's method, Dunkerley's Method.

Introduction to continuous systems: Vibration of strings, bars, shafts and beams, Rayleigh's method, orthogonality of modes, Rayleigh's quotient, wave equation, exact and approximate methods.

Introduction of Noise: Industrial Noise and Vibration Control: Basic sources of industrial noise and vibration, basic industrial noise and vibration control methods; The economic factor; Sound transmission from one room to another acoustic enclosures, acoustic barriers, sound absorbing materials; Vibration control procedures; Fault detection from noise and vibration signals.

Text Books:

1. Rao S. S., Mechanical Vibrations, *Prentice Hall India (Pearson), New Delhi.*
2. Meirovitch L., Fundamentals of Vibrations, *McGraw-Hill International Edition.*

Reference Books:

1. Kelly S. G., Mechanical Vibrations: Theory and practice, *Cengage Learning, USA.*
2. Dukkipati R. V., Srinivas J., Advanced Mechanical Vibrations, *Narosa Publishing India.*
3. Den Hartog J. P., Mechanical Vibrations, *Dover Publications.*
4. Thomson W. T., Theory of Vibrations with Applications, *CBS Publishers.*
5. Groover G. K., Mechanical Vibrations, *Nem Chand and Bros, New Delhi.*

MEC350E Introduction to Tribology 3-0-0

Introduction: Definition and History of Tribology, Industrial significance of Tribology, Origins and significance of Micro/ Nanotribology.

Solid Surface Characterization: The nature of surfaces, Physico-Chemical Characteristics of Surface Layers: deformed layer, chemically reacted layer, physisorbed layer, chemisorbed layer, Methods of characterization of surface layer. Analysis of surface roughness: Average roughness parameter, statistical analysis, fractal characterization and practical consideration in measurement of surface roughness. Measurement of surface roughness: mechanical stylus method, optical methods, scanning probe microscopy methods, fluid methods, electrical methods, electron microscopy method. Analysis of measured height distribution. Comparison of measurement methods.

Contact between Solid Surfaces: Introduction, Analysis of the contacts: single asperity contact of homogeneous and frictionless solids, single asperity contact of layered solids in frictional contacts, multiple asperity dry contacts. Measurement of the real area of contact: Measurement techniques, typical measurements.

Friction: Introduction, Solid-Solid contact: rules of sliding friction, basic mechanism of sliding friction, other mechanisms of sliding friction, friction transition during sliding, static friction, stick-slip, rolling friction. Liquid- Mediated contact. Friction of materials: metals and alloys, ceramics, polymers, solid lubricants.

Wear: Introduction, Types of wear mechanism: adhesive wear, abrasive wear, fatigue wear, impact wear, chemical wear, electrical arc induced wear, fretting and fretting corrosion. Types of particles present in wear debris: plate shaped particles, ribbon shaped particles, spherical particles, irregularly shaped particles. Wear of materials: Wear of metals and alloys, wear of ceramics, wear of polymers.

Text Books/Reference Books:

1. Bharat Bhushan, Introduction to Tribology, *John Wiley & Sons.*
2. Kalpajian S., Schmid S. R., Manufacturing Engineering and Technology, *Pearson Publications.*
3. Dwivedi D. K., Surface Engineering: Enhancing Life of Tribological Components, *Springer Publications.*

MEC351E Computer Aided Manufacturing 3-0-0

Introduction: Production system facilities, Support functions, automation principles and strategies, manufacturing operations, production concepts and mathematical models, Levels of automation, Numerical control technology, Computer numerical control, Direct and distributed numerical control.

Material Handling and Storage: Material handling system design, Principles of material handling, Industrial trucks, automated guided vehicle systems, rail guided vehicles, conveyor systems, cranes and hoists, analysis of material transport systems, Storage location strategies, performance of storage systems, conventional storage methods, automated storage systems, analysis of storage systems.

Group Technology and Cellular Manufacturing: Part families, part classification and coding, production flow analysis, cellular manufacturing, group technology, analysis of cellular manufacturing.

Flexible Manufacturing Systems: FMS components, applications and benefits, planning and implementation issues, analysis of flexible manufacturing systems.

Automatic Assembly Systems: Fundamental of assembly lines, assembly systems, line balancing algorithms, single and mixed model assembly lines, automated production lines, transfer lines without and with storage buffers, design of automated assembly systems, analysis of assembly systems.

Text Books:

1. Groover M. P., Automation Production Systems and Computer Integrated Manufacturing, *Prentice Hall India (Pearson), New Delhi.*

Reference Books:

1. Ranky P. G., Computer Integrated Manufacture, *Prentice Hall India (Pearson), New Delhi.*
2. Tien-Chien Chang, Richard A. Wysk, Hsu-Pin Wang, Computer-Aided Manufacturing, *Prentice Hall India (Pearson), New Delhi.*
3. Sawhney G. S., Fundamentals of Computer Aided Manufacturing, *I. K. International Publishing.*

MEC352E Mechatronics 3-0-0

Introduction: Definition of Mechanical Systems, Philosophy and approach; Systems and Design: Mechatronic approach, Integrated Product Design, Modelling, Analysis and Simulation, Man-Machine Interface.

Sensors and transducers: Classification, Development in transducer technology, Optoelectronics-Shaft encoders, CD Sensors, Vision System, etc.

Drives and Actuators: Hydraulic and Pneumatic drives, Electrical Actuators such as Servo-motor/Stepper motor/Brushed and Brush-less DC motors, AC drives, Drive circuits, open and closed loop control;

Embedded Systems: Hardware Structure, Software Design and Communication, Programmable Logic Devices, Automatic Control and Real Time Control Systems;

Smart materials: Shape Memory Alloys, Piezoelectric and Magnetostrictive Actuators: Materials, Static and dynamic characteristics, illustrative examples for positioning, vibration isolation, etc.

Micro-mechatronic systems: Micro-sensors, Micro-actuators; Micro-fabrication techniques. LIGA Process: Lithography, etching, Micro-joining etc. Application examples; Case studies. Examples of Mechatronic Systems from Robotics Manufacturing, Machine Diagnostics, Road vehicles and Medical Technology.

Text Books:

1. Devdas Shetty, Richard A. Kolk, Mechatronics System Design, *PWS Publishing Company*.
2. Bolton W., Mechatronics: A Multidisciplinary Approach, *Pearson Education India.*

Reference Books:

1. Rajput R. K., A Textbook of Mechatronics, *S. Chand & Company.*
2. Bolton W., Mechatronics: Electronic Control Systems in Mechanical and Electrical Engineering, *Prentice Hall India, New Delhi.*

MEC353E Composite Materials 3-0-0

Introduction to Composites: Fundamentals of Composites, Need For Composites, Classification Of Composites, Polymer Matrix Composites, Metal Matrix Composites, Ceramic Matrix Composites, Particle Reinforced Composites, Fibre Reinforced Composites.

Polymer Matrix Composites: Polymer Resins, Thermosetting Resins, Thermoplastic Resins, Reinforcement Fibres, Various Types Of Fibres, PMC Processes, Hand Lay Up Processes, Spray Up Processes, Compression Moulding, Reinforced Reaction Injection Moulding, Resin Transfer Moulding, Filament Winding, Injection Moulding, Fibre Reinforced Plastics, Glass Fibre Reinforced Plastics, Laminates.

Metal Matrix Composites: Characteristics Of metal matrix composites, Types Of Metal Matrix Composites, Reinforcements, Rule Of Mixtures, Processing Of metal matrix composites, Powder Metallurgy Process, Diffusion Bonding, Stir Casting, Squeeze Casting, Interface Properties.

Ceramic Matrix Composites: Ceramic Materials, Types Of Ceramic Matrix Composites, Oxide Ceramics, Non Oxide Ceramics, Reinforcements, Sintering, Hot Pressing, Cold and hot Isostatic Pressing, Processing Of Ceramic Matrix Composites.

Mechanics Of Composites: Lamina Constitutive Equations, Lamina Assumptions, Homogeneous Orthotropic Lamina, Isotropic Limit Case, Orthotropic Stiffness Matrix, Stress and Strain Displacement Relations, Basic Assumptions Of Laminated Anisotropic Plates, Laminate Constitutive Equations.

Text Books

1. Mathews F. L., Rawlings R. D., Composite Materials: Engineering and Science, *Chapman & Hall Publications*.

Reference Books:

1. Chawla K. K., Composite Materials, *Springer Publications*.
2. Clyne T. W., Withers P. J., Introduction to Metal Matrix Composites, *Cambridge University Press*.
3. Sharma S.C., Composite Materials, *Narosa Publications*.
4. Broutman L.J., Krock R.M., Modern Composite Materials, *Addison-Wesley Publications*.

MEC354E Refrigeration and Air Conditioning 3-0-0

Vapour Compression & Air Refrigeration Systems: Analysis of V.C. System, Multipressure System, Cascading V.C. Systems, Steam Jet Refrigeration, Cold preservation of food, cold storage.

Vapour Absorption Refrigeration System: Properties of binary mixture, processes executed by binary mixture, processes executed by binary mixtures, Acqua-Ammonia and LiBr Absorption systems; rectification. Non-conventional refrigeration systems: vortex tube, thermo electric, pulse-tube, thermo-acoustic refrigeration

Refrigerants: Primary& secondary refrigeration, properties and selection of refrigerants. Impact of CFC's on Ozone layer and global warming, Alternatives of CFS's. Components of conventional refrigeration systems: Evaporators, Condensers, Compressors, Expansion devices, Generator and Absorber, their types and selection.

Air-conditioning: Psychrometry of A.C. processes, Thermal comfort and Comfort chart, A.C. Systems, Cooling and heating loads. A.C. duct sizing, air distribution, fans, air cleaning, pipe sizing and layout. A.C. controls: elements of basic control systems, thermostats, humidistats dampers, sequencing of control operations.

Text Books:

1. Arora C. P., Refrigeration and Air Conditioning, *McGraw Hill Education (India).*

Reference Books:

1. Dossat R. J., Principles of Refrigeration, *John Wiley & Sons.*
2. Stoecker W. F., Jones J. F., Refrigeration and Air Conditioning, *McGraw Hill Education (India).*
3. Prasad M., Refrigeration and Air Conditioning, *New Age Publishers.*

MEC350G Computer Aided Design 3-0-0

Introduction: The design process, elements of CAD, 3D Modelling and Viewing, types of geometric models, coordinate systems, sketch planes, features, modelling aids and tools, geometric modifiers, layers, grids, clipping, arrays, offsetting, editing, principles of Software Design, characteristics of good software, algorithm Design, flow chart, coding, top-down programming, modular programming.

Curve Modelling: Curve entities, curve representation, analytical and synthetic curves, lines, circles, ellipses, parabolas, conics, cubic splines, Bezier curves, B-splines, NURBS, Knot vector, non-parametric and parametric equations, curve manipulations, blending, segmentation, trimming.

Surface Modelling: Surface entities, surface representation, surface analysis, tangent, normal and twist vectors, analytic surfaces and synthetic surfaces, plane surfaces, bilinear surface, ruled surfaces, tabulated cylinder, Bi-cubic surface, Bezier surface, B-spline surface, Coons surface, offset surface, Blending surface, surface manipulation techniques, displaying, segmentation, trimming.

Solid Modelling: Geometry and topology, Solid entities, Solid representation, set theory, set operations, half spaces, basic elements, and building operations, wireframe modeling, Boundary representation, Constructive Solid Geometry, CSG trees, sweeps, solid manipulations, segmentation, trimming, intersection, displaying.

Computer Graphics: Graphics display, transformations, translation, rotation, scaling, reflection and shearing, homogeneous coordinate systems, concatenated transformations, inverse transformations, mapping of geometric models, projections, orthographic projections, isometric projections, perspective projections, visualization, model cleanup, hidden line removal, hidden surface removal, shading, colours, computer animation, animation types, animation techniques.

Text Books:

1. Zeid I., Mastering CAD/CAM, *McGraw Hill Education (India).*
2. Rao P. N., CAD/CAM; Theory and Practice, *McGraw Hill Education (India).*

Reference Books:

1. Zeid I., CAD/CAM; Theory and Practice, *McGraw Hill Education (India).*
2. Onwubiko C., Foundation of Computer Aided Design, *West Publishing Company.*
3. Sinha Hsu, Computer Aided Design: An Integrated Approach, *West Publishing Company.*
4. Rogers D. F., and Adams J. A., "Mathematical Elements for Computer Graphics", *McGraw Hill Education (India).*

MEC351G Introduction to Programming in MATLAB® 1-0-3

MATLAB Basics: Introduction to MATLAB as a tool, Display Formats, Command window, Arithmetic Operations, Elementary Math Built-in Functions, Variables, Commands for Managing Variables, General Commands, Arrays, Matrices, Operations with Arrays and Matrices, Element-by-Element Operations.

Programming in MATLAB: Script files, Mat-files, Saving & Loading Data, Input and Output Commands, Global variables, Relational & Logical Operations, Branches & Control flow (if, switch), Loops (while, for).

Handling Graphics: Basic 2D plots, Specialized 2D Plots, 3D plots, style options, titles, and axes control, zoom, Saving and Printing Graphs.

User Defined Functions: Introduction, Function files, Variables Passing, Sharing Data using Global Memory, Nested Functions.

Engineering Applications: MATLAB exercises on Electrical Circuits, Control Systems and Engineering Mechanics.

Text Books:

1. Getting Started With MATLAB: A Quick Introduction, Rudra Pratap, *Oxford University Press, 2010*.
2. MATLAB programming for Engineers, Fifth Edition, Stephen J Chapman, *Cengage Learning.*

Reference Books:

1. MATLAB: An introduction with applications, Rao V Dukkipatti, *New Age International, 2008*.

MEC352G Power Plant Engineering 3-0-0

Fuels and Combustion: Thermodynamic cycle of steam flow: Rankine cycle, Actual Rankine cycle, Reheat cycle, Carnot cycle, heat rate, Classification of fuels, calorific value and its determination. Combustion equation, stoichiometric air fuel ratio, excess air requirement, actual air fuel ratio, flue gas analysis, pulverized coal firing system, fluidized bed combustion.

Thermal Power Plants: Types of boilers, Feed water and its treatment, Steam turbine and alternators, Site selection, Main parts and its working, Fuel handling, delivery of load, unloading, preparation, transfer, storage.

Hydroelectric Power Plants: General layout and arrangement of Hydroelectric power plants, Types of turbines, description and principles of impulse and reaction turbines, turbine characteristics, selection of turbines, governing of turbines.

Diesel Power Plants: Main components and its working, Diesel plant efficiency and heat balance, characteristics and selection of diesel power plant.

Nuclear Power Plants: Introduction, atomic physics and nuclear reactions, materials and site selection, nuclear reactors and working of each part. Layout and classification of nuclear power plants, nuclear waste disposal.

Text Books:

1. Nag P. K., Power Plant Engineering, *McGraw Hill Education (India)*.
2. Hedge R. K., Power Plant Engineering, *Pearson Education India*.

Reference Books:

1. M.M. El-Wakil, Power Plant Technology, *McGraw Hill, 2002*.
2. J.H. Rust, Nuclear Power Plant Engineering, *Haralson Pub Co., 1999*.
3. P.J. Potter, Power Plant Theory and Design, *Kreiger Pub. Co., 1988*.
4. E.B. Norris, and E. Therkelsen, Heat Power, *McGraw Hill, 1999*.

MEC360C **Mechanisms and Vibrations Lab** **0-0-2**

List of Experiments:

Theory of Machines:

1. To study various types of links and mechanisms and draw the inversions and velocity diagrams of different mechanisms by Graphical Method.
2. To study the operation of various types of brakes and clutches.
3. To study and conduct experiments on different types of governors: Watt Governor, Proell Governor, Porter Governor, Hartnell Governor.
4. To study the basic fundamentals and operation of different types of gears and gear trains.
5. To study the operation of various types of drives, couplings and bearings.
6. To study the operation of different types of cams and follower.
7. To study and perform experiments on the operation of a gyroscope.
8. To conduct experiments on the balancing of rotating and reciprocating masses.

Mechanical Vibrations:

1. To study undamped free oscillations of a simple pendulum and determine the natural frequency of oscillations.
2. To study undamped free vibrations of a spring mass system and to determine the natural frequency of vibrations.
3. To study the free vibration of a damped second order system and determine the frequency of damped vibrations. Also draw decay curve and determine the logarithmic decrement.
4. To study the vibrations of a compound pendulum and determine its radius of gyration.
5. To find the center of percussion of a compound pendulum.
6. To study the torsional vibration of a single rotor shaft system and to determine the natural frequency.
7. To study the forced vibration of damped second order systems and draw load magnification factor v/s frequency and phase angle v/s frequency curves.
8. To determine the radius of gyration of given bar using bifilar suspension.
9. To determine the radius of gyration of disc using trifilar suspension.
10. To study the vibrations of different types of beams.

MEC361C **CAD/CAM Lab** **0-0-2**

List of Experiments:

1. Study and Understand different types of commands used in Modelling and Simulation Packages like SOLID WORKS and ANSYS.
2. Creation of holes, cuts, shafts, chamfers, slots, revolved features, patterns, sweeps, blends etc.
3. Creation of assembly of different machine parts and other assembly operations.
4. Modelling of different types of mechanical components and assemblies using SOLID WORKS. At least 20 components and 15 assemblies should be modelled by the students during the semester.
5. Analysis and Simulation of simple structural problems using ANSYS. At least 10 problems should be analysed by the students during the semester.
6. Study of the structure of a CNC turning centre and CNC machining centre.
7. Part-Programming on CNC machines using G and M codes for Machining given profiles.
8. Computer Assisted Part Programming using APT language.