SVKM's Narsee Monjee Institute of Management Studies
Mukesh Patel School of Technology Management & Engineering

Program: B. Tech. Integrated (Mechanical)				**Semester:** III	
Course/Module: Manufacturing Processes - I				**Module Code:** BTIME03001	
Teaching Scheme				**Evaluation Scheme**	
Lecture (Hours per week)	**Practical (Hours per week)**	**Tutorial (Hours per week)**	**Credit**	**Internal Continuous Assessment (ICA) (Marks - 50)**	**Term End Examinations (TEE) (Marks- 100 in Question Paper)**
3	0	0	3	Marks Scaled to 50	Marks Scaled to 50

Pre-requisite: Workshop Practice – I & II (BTIME01007 & BTIME02004)

Objectives:

- To introduce different manufacturing processes like casting, welding, forging, rolling, extrusion, drawing, machining etc.
- To impart knowledge of industrial applications of various processes, equipment used in manufacturing.

Outcomes :

After completion of the course, students would be able to:

- Select appropriate process of casting based on design of component.
- Classify and explain the different metal forming processes.
- Recommend suitable types of joining processes with reference to product design.
- Understand the operations and construction of lathe.
- Identify and eliminate different defects in manufacturing processes.

Detailed Syllabus: (per session plan)

Unit	Description	Duration
1	**Metal Casting:** **Pattern Making**: Types of patterns, allowances, colour coding; Foundry practices **Moulding sands**: types, properties, preparation and testing of sand. Core boxes, core making, types of cores and their manufacturing; Gating system – runner and risers; **Moulding processes**: shell moulding, CO_2 moulding, investment casting, die casting, centrifugal casting and continuous casting; Study of various defects in castings.	10
2	**Forming processes:** Cold and hot working **Rolling:** Principle and mechanism, types of rolling and their applications, defects in rolling. **Forging:** Classification of forging processes, basic categories and methods of forging, heat treatment of forged parts. **Extrusion**: Hot And cold Extrusion, Equipment, Estimation of extrusion force, defects In extruded parts; wire and tube **Drawing**: Metal Stamping And Forming, blanking, piercing, bending, deep drawing, roll forming, shear forming and flow Forming.	14

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	Press tools: Different type of presses and their working, strip layout, Progressive die, Compound and combination dies	
3	**Joining processes:** Surface preparation for joining and various types of joints; classification of welding processes - arc Welding, submerged arc welding, gas and metal arc welding, tungsten arc welding – theory and their applications; electron beam welding, ultrasonic welding, laser beam welding, resistance welding, spot, seam and projection welding processes, welding of various metals, characteristics of good weld, weld defects and weldability of metals; soldering, brazing and their applications; adhesives for joining.	**12**
4	**Lathe:** Introduction, Construction, working and operations performed on lathe, attachments and accessories, types of cutting tools, cutting parameters such as spindle speed, feed and depth of cut, Capstan and Turret lathe, automatic lathes and their construction.	**09**
	Total	**45**

Text Books:

1. Rao P. N. (2008), "Manufacturing Technology-Vol I", *Tata McGraw Hill.*
2. Kalpakjian S. and Schmid S. R. (2002), "Manufacturing Engineering and Technology", 4th Edition, *Pearson.*

Reference Books:

1. Chapman W. A. J. (2011), "Work Shop Technology- Vol I, II, III", *ELBS Publishers.*
2. Lal G. K. (2010), "Fundamentals of Manufacturing Processes", *Alfa Science International.*
3. Kou Sindo (2003), "Welding Metallurgy", *Wiley Inter science.*

Any other information: NIL

Details of Internal Continuous Assessment (ICA):
Test Marks: 20
Term Work Marks: 30

Details of Term work:
Term work should consist of the following:

1. Assignments based on the above syllabus (Min. 4).
2. Visit to foundry/ fabrication unit.
3. Viva Voce, Quizzes, Presentations based on syllabus.

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Program: B. Tech. Integrated (Mechanical)				**Semester:** III	
Course/Module: Engineering Thermodynamics				**Module Code:** BTIME03002	
Teaching Scheme				**Evaluation Scheme**	
Lecture Hours per week	**Practical Hours per week**	**Tutorials Hours per week**	**Credit**	**Internal Continuous Assessment (ICA) (Marks - 50)**	**Term End Examinations (TEE) (Marks- 100 in Question Paper)**
3	0	2	4	Marks Scaled to 50	Marks Scaled to 50

Pre-requisite: Mathematics-I & II (BTIAB01002 and BTIME02001)

Objectives:

- Introduce basics of thermodynamics and concepts of work and heat transfer.
- Impart knowledge of laws of thermodynamics and their applications
- To provide understanding of properties and behavior of pure substances and gas mixtures.

Outcomes:

After completion of the course, students would be able to:

- Understand the fundamental concepts of engineering thermodynamics.
- Analyze closed systems, steady and unsteady flow systems and laws of thermodynamics and available energy.
- Determine the properties of gases and mixtures of gases and properties of pure substances.
- Use steam tables and charts for property evaluation.

Detailed Syllabus: (per session plan)

Unit	Description	Duration
1	**Introduction:** Definition, and basic concepts of engineering thermodynamics; description of matter – macroscopic description and microscopic description; thermodynamic system, surroundings and the system boundary; thermodynamic properties, processes and cycles; homogeneous and heterogeneous systems; thermodynamic equilibrium; quasi-static process; pure-substance; concepts of continuum. **Pressure, Volume and Temperature:** definition of pressure, volume and temperature and their measurements; Thermal equilibrium; Zeroth law of thermodynamics; – thermometric property, scale of temperature, reference points, comparison of different types of thermometers; ideal gas; gas thermometers; ideal gas temperature; Celsius temperature scale; illustrative examples. **Work and Heat Transfer:** Mechanics definition of work and its limitations; thermodynamics definition of work; classification of work; general expression for mechanical displacement work; expressions for various forms of work; net work transfer between a system and its surroundings; definition of heat transfer; characteristics of heat transfer.	08
2	**First Law of Thermodynamics:** Definition of the first law; Application of first law for a closed system undergoing a cyclic and	08

	non-cyclic process; different forms of stored energy; pure substance; specific heats, Application of first law for an isolated system; first law equation for steady and unsteady flow open systems.	
3	**Second Law of Thermodynamics:** Limitations of first law; Kelvin-Planck statement of second law; Clausius statement of second law; equivalence between the two statements; reversibility and irreversibility- definition of a reversible heat engine; corollaries of second law of thermodynamics; reversibility and irreversibility as applied to a non-cyclic process; Statement of Third Law of Thermodynamics and its importance	**08**
4	**Entropy:** Introduction; Clausius inequality (or Clausius theorem); Entropy as a property of a system; Temperature – entropy plot and its usefulness in analyzing thermodynamic processes; entropy change for an irreversible process; principle of increase of entropy ; Carnot cycle, entropy generation in closed and open systems; Tds relations and their significance(first and second law combined), Isentropic process.	**06**
5	**Available Energy, Availability and Irreversibility:** classification of energy- high grade energy and low grade energy; concepts of available energy, unavailable energy, availability and its application to closed and open systems; second law efficiency	**05**
6	**Properties of Gases and Gas Mixtures:** Avogadro's law; equation of state for a gas; ideal gas; equations of state; properties of mixtures of gases- Dalton's law and Gibb's law, internal energy, enthalpy , specific heats and entropy of a mixture of gases	**04**
7	**Properties of Pure Substances:** p-v and p-T diagrams for a pure substance; T-s and h-s diagrams for a pure substance; quality/dryness fraction; steam tables and Mollier chart, calculation of thermodynamic properties such as specific volume, internal energy, enthalpy, entropy and steam quality for various processes using steam tables and Mollier chart.	**06**
	Total	**45**

Text Books:

1. P. K. Nag (2008), "Engineering Thermodynamics", *Tata McGraw Hill.*
2. M. J. Moran, H. N. Shapiro, D. D. Boettner, M. B. Bailey (2011), "Fundamentals of Engineering Thermodynamics", 7th Edition, *John Wiley and Sons.*

Reference Books:

1. Y. Cengel and M. Boles (2008), "Thermodynamics -An Engineering Approach", *Tata McGraw Hill.*
2. R. E. Sonntag, C. Borgnakke and G. J. V. Wylen (2005), "Fundamentals of Thermodynamics", 6th Edition, *Wiley India.*

Any other information: NIL

Details of Internal Continuous Assessment (ICA):
Test Marks: 20
Term Work Marks: 30

Details of Term work:
Term work should consist of the following:

1. Assignments covering syllabus (Min. 3).
2. Viva examination on fundamental concepts in the syllabus.

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Program: B. Tech. Integrated (Mechanical)				**Semester:** III	
Course/Module: Machine Shop - I				**Module Code:** BTIME03003	
Teaching Scheme				**Evaluation Scheme**	
Lecture Hours Per Week	**Practical Hours Per Week**	**Tutorials Hours Per Week**	**Credit**	**Internal Continuous Assessment (ICA) (Marks-50)**	**Term End Examinations (TEE) Theory (-----)**
0	2	0	1	Marks Scaled to 50	-

Pre-requisite: Workshop Practice-I (BTIAB01007)

Objectives:

- To train the students on turning operation such as plain, taper turning, facing, thread cutting, grooving, knurling and wire drawing die on metals

Outcomes :

After completion of the course, students would be able to:

- Perform different operations on lathe like plain, taper turning, facing, grooving and knurling.
- Perform different operation on lathe like drilling, boring, counter boring, internal taper turning for making of wire drawing die.

Detailed Syllabus: (per session plan)

Unit	Description	Duration
1	Two jobs on lathe performing plain and taper turning.	08
2	Two jobs on precision turning, taper turning and screw cutting.	10
3	Assembly of Two pieces of Wire drawing die by using operations like drilling, boring, counter boring, internal taper turning.	12
	Total	**30**

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Program: B. Tech. Integrated (Mechanical)				**Semester:** III	
Course/Module: Engineering Mathematics-I				**Module Code:** BTIME03004	
Teaching Scheme				**Evaluation Scheme**	
Lecture Hours per week	**Practical Hours per week**	**Tutorial Hours per week**	**Credit**	**Internal Continuous Assessment (ICA) (Marks - 50)**	**Term End Examinations (TEE) (Marks- 100 in Question Paper)**
3	0	2	4	Marks Scaled to 50	Marks Scaled to 50

Objectives:

- To impart knowledge of complex numbers and its applications to solve Engineering problems.
- To provide an understanding of principles of vector algebra, single variable and multivariable calculus.

Outcomes:

After completion of the course, students would be able to :

- Understand the concepts of complex numbers, hyperbolic functions, Mean value theorems and vector products to solve Engineering problems.
- Express functions in series using Taylor's and Maclaurin's expansions, and evaluate limits of indeterminate forms using L' Höspital's Rule.
- Find partial derivatives of functions and carry out the knowledge to error and approximations, maxima and minima.
- Apply the concepts such as gradient, directional derivative, curl and divergence to solve real life problems.

Detailed Syllabus: (per session plan)

Unit	Description	Duration
1.	**Complex Numbers:** Introduction to complex numbers, modulus and amplitude of a complex number, Argand's diagram, cartesian, polar and exponential forms of a complex number. **Algebra of complex numbers:** equality, addition, subtraction, multiplication and division. De-Moivre's theorem, Roots of complex numbers, Euler's form of circular functions, Hyperbolic functions, relation between circular and hyperbolic functions.	12
2.	**Mean value theorems, Series expansion and Indeterminate forms:** Rolle's theorem, Lagrange's mean value theorem, Cauchy's mean value theorem. Taylor's formula, Maclaurin's series. **Indeterminate forms:** $\frac{0}{0}, \frac{\infty}{\infty}, 0\times\infty, \infty-\infty, 0^0, \infty^0, 1^\infty$ by L'Höspital's rule.	10
3.	**Partial Derivatives and its applications:** Partial Derivatives of two and three variable functions, Partial derivative of composite function, Homogeneous functions in two or	13

	three variables, Euler's theorem, error and approximations, Maxima and Minima in 2 variables by second derivative test.	
4.	**Vectors:** Scalar and vector triple products, Product of four vectors, curves in space, Differentiation of a vector function of a single scalar variable, Theorems on derivatives, concept of tangent vector, scalar and vector point functions, gradient, directional derivative, Curl and Divergence, Irrotational and Solenoidal Fields.	10
	Total	**45**

Text Book:

1. Erwin Kreyszig (2010), "Advanced Engineering Mathematics", *Wiley Eastern Ltd, 10th edition.*

Reference Books:

1. Andreescu Titu, Andrica Dorin (2014), Complex Numbers from A to ... Z, *Birkhäuser Basel Publishers, 2nd edition.*
2. Thomas, Calculus (2014), *Pearson Education, 7th edition.*
3. Howard Anton (2012), "Calculus", *Wiley, 10th edition.*
4. B. V. Ramana (2010), "Higher Engineering Mathematics", *Tata McGraw Hill, 1st edition.*
5. Alan Jeffrey (2003), Handbook of Mathematical Formulas and Integrals, *Academic Press, 3rd edition.*

Any other information: NIL

Details of Internal Continuous Assessment (ICA):
Test Marks: 20
Term Work Marks: 30

Details of Term work:
As per institute norms.

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Program: B. Tech. Integrated (Mechanical				**Semester:** III	
Course/Module: Engineering Chemistry				**Module Code:** BTIME03005	
Teaching Scheme				**Evaluation Scheme**	
Lecture (Hours per week)	**Practical (Hours per week)**	**Tutorial (Hours per week)**	**Credit**	**Internal Continuous Assessment (ICA) (Marks - 50)**	**Term End Examinations (TEE) (Marks - 100 in Question Paper)**
2	2	0	3	Marks Scaled to 50	Marks Scaled to 50

Objectives

1. To introduce basic principles of chemistry such as functional group identification, properties of solutions, and reaction stoichiometry.
2. To familiarize the concepts and applications of fuels, polymers, and e-waste management.

Course Outcomes:

After completion of the course, students would be able to:

1. Identify different functional groups of compounds and various organic reactions associated with it.
2. Identify the importance of various classes of polymers and applications in daily life.
3. Classify different types of fuels and lubricants based on their properties and applications;
4. Recognize the importance of e-waste management with respect to environment and health hazards and solve numerical problems based on atom economy and distinguish the various formula applied to different types of solutions; interpret reaction stoichiometry and solve numerical problems.

Detailed Syllabus: (per session plan)

Unit	Description	Duration
1.	**Organic Reactions:** Reactions of functional groups: those containing oxygen (-COOH, -OH, -CHO, -C=O); Nucleophilic substitution reaction, Elimination reaction Organic Name Reactions E.g. Aldol & related reactions.	06
2.	**Solutions and Stoichiometry:** Types of solutions and its characteristics, properties of aqueous solutions, different units for expressing concentration of solutions (ppm, ppb, normality, molarity, molality, mole fraction of solute, mass fraction of solute and solvent), empirical and molecular formula from elemental composition, numerical based on empirical formula, normality, molarity, molality molarity.	06
3.	**Fuels & Combustion:** Definition, Classification, characteristics. Calorific Value-Theoretical & Experimental (Bomb calorimeter). **Solid Fuels**: Coal, proximate and ultimate analysis, Numerical based on analysis of coal. (Dulong formula) and bomb calorimetry. **Liquid fuels**: Mining of Petroleum, Cracking, Reforming, Knocking in IC engines, anti-knocking agents (TEL and MTBE),	06

4.	**Lubricants:** Definition, Mechanism of lubrication, Properties- viscosity, viscosity index, flash & fire, cloud & pour points, oiliness, saponification & acid value (numericals based on saponification and acid value)	04
5.	**Polymers:** Introduction and definition of important terms - monomer, polymer, polymerization, degree of polymerization, tacticity, and melting-glass transition temperature. Some commercially important polymers (PP, PVC). **Plastics**: Thermosetting & Thermoplastics, Compounding of plastics, Preparation, properties and applications of commercial plastics (Rubber, Phenol formaldehyde resin).	05
6.	**Environmental Aspects of Chemistry:** **i) Green Chemistry:** Principles of Green Chemistry with examples (Numerical Problems on Atom economy) **ii) E-waste management:** Definition, classification and management of e-waste.	03
	Total	**30**

Text Books:

1. Abhijit Mallick; Chemistry for Engineers, Viva books, 2nd Edition 2017.
2. Palanna.O.G., Engineering Chemistry, Tata McGraw Hill Education. Pvt. Ltd, 2nd Edition 2017.
3. Samir Sarkar; Fuels & Combustion, Orient Longman Pvt. Ltd 3rd Edition 2009.

Reference Books:

1. R.T. Morrison & R. N. Boyd, Organic Chemistry, Prentice Hall, 8th Edition 2016.
2. Johrie. R.; E-waste, TERI Press, 2009.
3. Paul C. Hiemenz & Timothy P. Lodge; Polymer Chemistry, CRC Press, 2nd Edition 2007.

Any other information:

Details of Internal Continuous Assessment (ICA)
Test Marks: 20
Term Work Marks: 30

Details of Term work:
1. Minimum Eight Lab experiments to be taken.
2. Unit wise assignments to be taken.
3. Presentation/Viva-voce/Quiz to be conducted.

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Program: B. Tech. Integrated (Mechanical)				**Semester:** III	
Course/Module: Constitution of India				**Module Code:** BTIME03006	
Teaching Scheme				**Evaluation Scheme**	
Lecture Hours per week	**Practical Hours per week**	**Tutorial Hours per week**	**Credit**	**Internal Continuous Assessment (ICA) (Marks - 50)**	**Term End Examinations (TEE) (Marks - 100 in Question Paper)**
2	0	0	0	Marks Scaled to 50	---

Objective:

- To understand the basic aspects of the constitution of India, the evolution, the directive principle & important provisions.
- To understand the implications of important constitutional provision on Business and Professionals.

Outcomes:

After completion of the course, students would be able to:

- Learn basic aspects of constitution of India.
- Apply Constitutional provision on Business and their Professionals.

Detailed Syllabus: (per session plan)

Unit	Description	Duration
1.	The Constitution, its evolution and Preamble to the Constitution.	04
2.	Fundamental rights and duties, exceptions with examples, individual responsibilities and duties, application to business.	10
3.	Directive principles of State Policy, its emphasis and its impact as related to business.	04
4.	Indian Judiciary and LokAdalats.	06
5.	Emergency Provisions under Article 352 – 360.	04
6.	Voting behaviour in India and present political scene. Responsibility of Business in relation to the Constitution.	02
	Total	**30**

Text Books:

1. Durga Das Basu (2009), "Indian Constitution", *20th Edition.*

Reference Books:

1. N. A. Palkhiwala (2009), "We the People".
2. Justice Hidayatullah (2009), "Indian Constitution".

Any other information:

Details of Internal Continuous Assessment (ICA)

Test Marks: 20

Term Work Marks: 30

Details of Term work:

1. Assignments / Case studies
2. Two class tests.

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Program: B.Tech. Integrated (Mechanical)				**Semester :** III	
Course/Module : Engineering Mechanics				**Module Code** : BTIME03007	
Teaching Scheme				**Evaluation Scheme**	
Lecture Hours per week	**Practical Hours per week**	**Tutorial Hours per week**	**Credit**	**Internal Continuous Assessment (ICA) (Marks - 50)**	**Term End Examinations (TEE) (Marks - 100 in Question Paper)**
3	0	2	4	Marks Scaled to 50	Marks Scaled to 50

Objectives:

- To develop thorough understanding of moment of inertia
- To know the concept of pin jointed frames
- To get acquainted with the dynamic system in equilibrium and the motion characteristics of particles
- To study the forces developed on bodies in motion

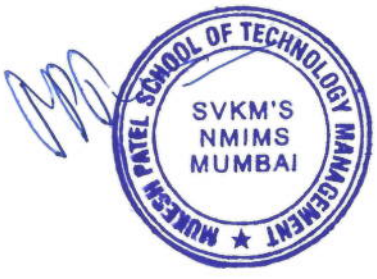
Outcomes:

After successful completion of this course, students should be able to

- Determine moment of inertia for plane areas
- Analyse pin jointed frames
- Evaluate the velocity, acceleration and displacement of a moving body
- Analyse the forces developed on the moving body

Detailed Syllabus:

Unit	Description	Duration
1.	**Moment of inertia of plane areas:** Moment of inertia of plane areas, parallel axis theorem. Introduction to polar moment of inertia, product of inertia and mass moment of inertia.	04
2.	**Analysis of pin jointed plane frames:** Perfect truss, method of joints, and method of section.	06
3.	**Forces in space:** Rectangular components of forces in space, resultant of concurrent forces, moment of a forces about a point and a given axis, resultant of general force system, Equilibrium of a particle in space.	07
4.	**Principle of virtual work:** Application to determine the reactions of determinate beams with/ without internal hinges	04
5.	**Kinematics of particle:** Motion along plane curved path, tangential and normal component of acceleration, simple harmonic motion. **Kinematics of rigid bodies:** Translation, pure rotation and plane motion of rigid bodies, instantaneous centre of rotation for the velocity for bodies in plane motion, link mechanisms (upto two links).	10
6.	**Kinetics of particles:** Newton's laws of motion, D'Alembert's principle, equation of dynamic equilibrium, linear motion, curvilinear motion.	08



	Kinetics of rigid bodies: D'Alembert's principle for bodies under translational motion, rotational motion about a fixed axis and plane motion Application to motion of bars, cylinders, spheres.	
7.	**Energy and momentum principles:** Work done by a force, potential and kinetic energy, power, work energy equation, principle of conservation of energy, momentum, principle of conservation of momentum, impact of solid bodies, elastic impact, semi-elastic impact and plastic impact.	06
	Total	**45**

Text Book:

1. N. H. Dubey (2014), "Engineering Mechanics", *Tata McGraw Hill*
2. R. C. Hibbler (2004), "Engineering Mechanics", *McMillan Publishers*

Reference Books:

1. F. L. Singer (1954), "Engineering Mechanics", *Harper & Raw Publication* (Classic book)
2. Beer & Johnson (2011), "Engineering Mechanics", *Tata McGraw Hill*
3. D. S. Kumar (2009), "Engineering Mechanics", *Tata McGraw Hill*
4. Macklin & Nelson (2012), "Engineering Mechanics", *Tata McGraw Hill*
5. A. K. Tayal (2008), "Engineering Mechanics", *Umesh Publication*
6. E. W. Nelson, Charles L. Best, W.G. Mclean, Merle Potter (2010), "Schaum's outlines on Engineering Mechanics -Statics", *Tata McGraw Hill*

Any other information:

Details of Internal Continuous Assessment (ICA)
Test Marks: 20
Term Work Marks: 30

Details of Term work:
Term work should consists of the following

1. Minimum eight assignments covering the prescribed syllabus.

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