SVKM's Narsee Monjee Institute of Management Studies

Mukesh Patel School of Technology Management & Engineering

Program: B. Tech. Integrated (Mechanical)				**Semester:** IV	
Course/Module: Manufacturing Processes - II				**Module Code:** BTIME04001	
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	0	3	Marks Scaled to 50	Marks Scaled to 50

Pre-requisite: Manufacturing Processes - I (BTIME03001)

Objectives:

- To provide basic understanding of different material removal processes.
- To explain the mechanics of cutting with single point, multi-point and multi edge cutting tools.
- To introduce the basics of different nonconventional machining processes.

Outcomes :

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

- Analyze the metal cutting processes with tool geometry and forces of cutting.
- Understand the operations and construction of different machine tools like milling, drilling, Shaping and Grinding Machines.
- Select the appropriate types of operation based on given component design.
- Compare the different nonconventional processes according to industrial applications.
- Differentiate the various plastics processing methods according to industrial applications.

Detailed Syllabus: (per session plan)

Unit	Description	Duration
1	**Metal cutting:** Tool Geometry, forces in single point cutting, tool wear and tool life, formation of chips and types of chips, Mechanics of orthogonal and oblique cutting, chip thickness ratio, velocity relationship in orthogonal cutting, Merchant's circle diagram, analysis of stresses and strains and work done during metal cutting, friction and thermal aspects of metal cutting, Cutting Fluids, Types of Cutting Fluids.	11
2	**Shaper and Planer:** Introduction, Construction, working and operations performed on Shapers, Planers & slotters. **Milling Machines**: Types of milling machines, tools and their geometry, various operations on milling machine, different attachments including dividing heads and work holding devices.	06
3	**Drilling Machines:** Types of machines, operations such as drilling, boring, reaming, spot facing, counter boring and sinking, tapping, drill speed and feeds. **Boring and Broaching Machine:** Classification-horizontal and vertical boring machine, types of broaching machines, advantages, limitations and applications of broaching.	08

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4	**Abrasive Machining Processes:** Mechanics of grinding, types and operations of grinding machines, Centreless grinding, Grinding wheel specifications and its selection, Truing and dressing of wheels, Super finishing processes such as lapping and honing. Abrasive jet machining (AJM) and Abrasive water jet machining (AWJM).	08
5	**Nonconventional Machining processes**: Mechanical, chemical and thermal energy based nonconventional machining processes, Electric discharge machining (EDM), Electro-chemical machining (ECM), Electro-chemical grinding (ECG), applications of different Nonconventional machining processes, Laser Beam machining and allied process.	06
6	**Processing of Plastics:** General aspects, methods of processing of plastics, compression moulding, transfer moulding, injection moulding, roto-moulding, blow moulding, thermoforming, Joining of thermoplastics, rules for design of plastic parts.	06
	Total	**45**

Text Books:

1. Rao P. N. (2008), "Manufacturing Technology- Vol II", *Tata McGraw Hill.*
2. Sharma P. C. (2008), "A Text Book of Production Engineering", *S Chand.*
3. Kalpakjian S. and Schmid S. R. (2002), "Manufacturing Engineering and Technology", 4th Edition, *Pearson.*

Reference Books:

1. Chapman W. A. J. (2005), "Workshop Technology-Vol I, II, and III", *ELBS Publishers.*
2. Chatopadhyaya A. B (2011), "Machining and Machine Tools", *Wiley India.*
3. Lal G. K. and Choudhury S.K. (2005), "Fundamentals of Manufacturing Processes", *Alpha Science International.*

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. Assignments based on the above syllabus (Min. 4).
2. Visit to tool room of manufacturing plant.
3. Viva Voce, Quizzes, Presentations based on syllabus.

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Program : B. Tech Integrated (Mechanical)				**Semester :** IV	
Course/Module: Machine Drawing and Computer Graphics				**Module Code:** BTIME04002	
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)**
2	4	0	4	Marks Scaled to 50	Marks Scaled to 50

Pre-requisite: Mathematics-I (BTIME01002), Mathematics-II (BTIME02001), Engineering Drawing-I (BTIME01006), Engineering Drawing-II (BTIME02006).

Objectives:

- To introduce the concepts of detail drawing of mechanical components and assemblies.
- To motivate the students to understand the importance of limit, fits and tolerances in Mechanical Systems.
- To impart the knowledge of jig and Fixtures.

Outcomes:

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

- Draw assembly and details of various mechanical components.
- Specify the tolerances, limits and fits and surface finish in assembly and details.
- Use drafting packages proficiently.

Detailed Syllabus: (per session plan)

Unit	Description	Duration
1	**Intersection of Solids and Development of Surfaces:** Curves of intersection of the surfaces of the solid in the following cases (a) Prism with Prism, Cylinder with Cylinder, Prism with Cylinder When (i) The axes are at 90^0 and intersecting (ii) The axes are at 90^0 and offset (b) Cylinder with cones When axis of cylinder is parallel to both reference planes and cone resting on base on HP and with axis intersecting and offset from axis of cylinder.	06
2	**Conventional Representation:** **(a)** Materials C.I., M.S., Brass, Bronze, Aluminum, Wood, Glass, Concrete and Rubber **(b)** Long and short break in pipe, rod and shaft **(c)** Ball and roller bearing, pipe joints, valves **(d)** Various sections- Half, Removed, Revolved, offset, Partial and Aligned sections. **(e)** Springs with square and flat ends, Gears, Sprocket wheels **(f)** Countersunk and Counter bore	06

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	(g) Tapers	
3	**Presentation of Limits, Fits and Tolerances:** (a) Characteristics of surface roughness- Indication of machining symbols showing direction of lay, roughness grades, machining allowances, manufacturing methods. (b) Introduction of ISO system of tolerances, dimensional tolerances, elements of interchangeable system, hole and shaft based system, limits, fits & allowances. Selection of fits. (c) Geometrical tolerances, tolerances of form and position and its geometrical representation. (d) General welding symbols, sectional representation and symbols used in engineering practices.	06
4	**Details to Assembly and Assembly to Details of the following** (a) Introduction (b) Couplings- Universal coupling & Oldham's coupling (c) Bearing- Foot Step Bearing & Plummer Block (d) Lathe tool Post, Lathe tail stock (e) Machine vice & Pipe Vice (f) Screw Jack (g) Valves: V Gate valve, globe valve, non-return valve. (h) Drill Jig and fixture (i) Piston and connecting rod (j) Joints: Knuckle Joints, Cotter Joints	12
	Total	**30**

Text Books:

1. N. D. Bhatt and V. M. Panchal (2010), "Machine Drawing", 45th Edition, *Charotar Publishing House.*
2. P. S. Gill (2010), "Machine Drawing", *S. K. Kataria and Sons.*

Reference Books:

1. Sideshvar and Shashtri (2001), "Machine Drawing", 1st Edition, *Tata McGraw Hill.*
2. Narayana and V. Reddy (2010), "Production Drawing", *New Age International.*
3. General principles of presentation of technical drawing IS 10714-2006.
4. Guide for selection of fits IS: 2709-1982

Any other information:

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

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Details of Term work:

1. Total five A2 size drawing sheets.(one on Intersection of Solids. Conventional Representation and three sheets on Assembly to details and Details to assembly showing Limits, Fits and tolerances on it.)
2. Computer drafted A3 size drawing sheets consisting problems on Details to Assembly and Assembly to Details.

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Program: B. Tech. Integrated (Mechanical)				**Semester:** IV	
Course/Module: Strength of Materials				**Module Code:** BTIME04003	
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: Engineering Mechanics (BTIME03007)

Objectives:

- To impart knowledge of the deformable bodies subjected to different types of loads
- To determine the failure criteria of a body subjected to various stresses
- To understand the concepts of deformations.
- To identify the different tests to be performed on materials

Outcomes:

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

- Calculate the resultant stresses induced in the components.
- Analyse the failures based on the stresses generated in the components.
- Evaluate the deformations of various determinate beams.
- Relate various failures based on the testing of materials.

Detailed Syllabus: (per session plan)

Unit	Description	Duration
1	**Stress and Strain:** Strain, modulus of elasticity, modulus of rigidity, bulk modulus, yield stress, ultimate stress, factor of safety, shear stress, Poisson's ratio, analysis of members made of composite materials.	06
2	**Shear Force and Bending Moment:** Axial force, shear force and bending moment diagrams for statically determinate beams for different types of loading.	07
3	**Simple Theory of Bending**: Flexure formula for straight beams, simple problems involving application of flexure formula, section modulus, moment of resistance of a section.	06
4	**Shear Stress in Beams:** Distribution of shear stress across plane sections used commonly for structural purposes.	04
5	**Simple Theory of Torsion:** Torsion of circular shafts – solid and hollow, stresses in power transmission shafts (including shafts in series and parallel).	03
6	**Bending Moment Combined with Axial Loads:** Application to members subjected to eccentric loads, core of a section, problems on chimneys involving lateral loads.	04
7	**Principal Stresses:** General equations for transformation of stress, stress on an oblique plane of a member subjected to General two directional stress systems. Principal planes and principal stresses, maximum shear stress Mohr's circle concept.	06

8	**Deflection of Beams:** Deflection of cantilevers, simply supported and overhanging beams using double integration and Macaulay's methods for different types of loading.	05
9	**Thin Shells:** Stresses in thin cylindrical and spherical shells subjected to internal pressure. Efficiency of Rivetted Joints.	04
	Total	**45**

Text Books:

1. James M. Gere, Barry J. Goodno (2012), "Mechanics of Materials - SI Edition", *Cengage Learning*.
2. Ferdinand P. Beer, .E Russell Johnson Jr. John T. DeWolf (2008), "Mechanics of Materials", 3rd Edition, *Tata McGraw Hill*.

Reference Books:

1. Andrew Pytel, Jaan Kiusalaas (2011), "Mechanics of Materials", 2nd Edition, *Cengage Learning*.

Any other information:

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

Details of Term work:

1. Minimum 8 assignments covering the prescribed syllabus

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Program: B. Tech. Integrated (Mechanical)				**Semester:** IV	
Course/Module: Machine Shop – II				**Module Code:** BTIME04004	
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)**
0	2	0	1	Marks Scaled to 50	---

Pre-requisite: Machine Shop - I (BTIME03003)

Objectives:

- To practices machining of flat surfaces on shaping and grinding machines.
- To practices milling, boring and screw cutting operations (both on internal and external surfaces).

Outcomes :

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

- Understand the making of composite job having more than two parts and different type of machining processes.
- Understand difference between metal machining and composite machining.
- Understand different operations like milling, shaping, grinding, boring etc.

Detailed Syllabus: (per session plan)

Unit	Description	Duration
1	One composite job consisting minimum four parts employing operations on lathe, precision turning, external and internal threading, boring.	15
2	Shaping, milling, grinding & Knurling operations on composite job.	12
3	Demo on machining of Glass Fiber Reinforcement Plastic (GFRP) composite material, Drilling and edge milling operation are to be study. (Any of the commercial available GFRP/Epoxy plates are to be used).	03
	Total	**30**

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Program: B. Tech. Integrated (Mechanical)				**Semester:** IV	
Course/Module: Engineering Mathematics-II				**Module Code:** BTIME04005	
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 provide an understanding of Matrices and differential equations in technical subjects.
- To impart knowledge of Beta & Gamma functions and double integrals, its applications to solve engineering problems.

Outcomes:

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

- Solve system of linear equations
- Evaluate problems using Beta and Gamma functions
- Analyse suitable method to solve differential equations
- Relate the concepts of double integral to solve engineering problems.

Detailed Syllabus: (per session plan)

Unit	Description	Duration
1.	**Matrices:** Rank of a matrix, Rank by Normal form and Echelon form, Reduction of a matrix A to normal form PAQ, Linear dependence and independence of rows and columns of a matrix over real field. **Applications:** Solving system of linear homogeneous and non-homogeneous equations using Cramer's rule, matrix inversion method, reduction to echelon form.	12
2.	**Beta and Gamma functions**: Definition of Beta and Gamma functions and their properties; Relation between Beta and Gamma functions; Duplication formula.	08
3.	**Ordinary Differential Equations**: Definition of differential equation, order and degree of differential equation, formulation of differential equation. **Solution of differential equation of first order and first degree:** Variable separable method, reducible to variable separable method, Homogeneous differential equation, reducible to homogeneous differential equation, exact differential equation and those which can be reduced to exact form using integrating factor (four rules), Linear differential equations, Bernoulli's differential equation. **Solution of Linear differential equations of higher order with constant coefficients:** Complementary functions, Particular integrals of the differential equations of the type $f(D)y = X$	15

	where $X = e^{ax}, \sin(ax+b), \cos(ax+b), x^m, e^{ax}V(x), xV(x)$. Applications of differential equations in modelling: First-order Equations, Free Mechanical Oscillations, Forced Mechanical Oscillations.	
4.	**Double Integration:** Double integration in cartesian and polar co-ordinates, evaluation of integrals over a given region, change of order of integration, change of co-ordinate system, application of double integration to compute area, mass of a lamina and volume.	10
	Total	**45**

Text Books:

1. Robert Wrede (2010), Murray Spiegel, *Schaum's Outline of Advanced Calculus, Third Edition.*
2. B. S. Grewal (2013), "Higher Engineering Mathematics", *Khanna Publishers.*

Reference Books:

1. Erwin Kreyszig (2010), "Advanced Engineering Mathematics", *Wiley Eastern Ltd, 10th edition.*
2. Howard Anton (2012), "Calculus", *Wiley, 10th edition.*
3. G. Birkhoff and G. C. Rota, Ordinary Differential Equations (2003), *4th Edition, Wiley Singapore Edition.*
4. Alan Jeffrey (2003), Handbook of Mathematical Formulas and Integrals, *Academic Press, 3rd edition.*

Any other information:

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:** IV	
Course/Module: Engineering Physics				**Module Code:** BTIME04006	
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)**
2	2	0	3	Marks Scaled to 50	Marks Scaled to 50

Objectives

- To enable the students understand the basic principles of physics, making them meet the needs of engineering and technology.

Outcomes

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

- Apply the concept of interference, diffraction in various engineering applications.
- Understand the quantization effect in reduced dimensional materials and their consequences.
- Implement the concepts of clean energy for power generation.
- Illustrate the usage of nanomaterial in various applications.

Detailed Syllabus: (per session plan)

Unit	Description	Duration
1.	**Optics:** Interference: Analytical treatment of interference. Interference in thin film in reflected system. Wedge shaped film. Newton's rings and applications. Diffraction: Fraunhoffer's diffraction at single slit, double slits, N Parallel slits (multiple slits). Diffraction grating, resolving power of grating, dispersive power of grating.	08
2.	**Quantum physics:** The origin of quantum theory, Blackbody radiation, Wein's law, Rayleigh- Jeans Law, Stefen's law, Plank's theory, dual nature of radiation. Wave nature of Matter: De Broglie's hypothesis, Davisson-Germer Experiment, the double slit experiment with particles, the need for a wave function, Born's interpretation of the wave function. Wave Packets and Uncertainty Principle: General statement of Heisenberg's Uncertainty Principle, Energy-Time and Position-momentum uncertainty relation and its applications	08
3.	**Energy technology :** Need for clean energy, different methods for obtaining clean energy viz. nuclear energy (including basics of nuclear physics like fission and fusion etc.) solar cells (including conventional and Nano material based solar cells), hydrogen fuels and wind mills. Advantages and limitations of each method.	06

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4.	**Introduction to Nanotechnology:** Definition of nanotechnology, quantum confinement effect [how the material properties differ as the size is reduced: Coloumb Blockade, Surface plasmon resonance, some basic Nano materials like carbon nanotubes, graphene, quantum dots, applications of nanotechnology (scratch resistance coatings, clothing, antimicrobial applications, drug delivery, IC technology), Nano- toxicity (basic idea). Scanning and Transmission electron microscopes, Scanning Tunneling Microscope, Atomic Force Microscope.	08
	Total	**30**

Text Books:

1. Jenkins and White (2013), Optics, *MC Graw Hill.*
2. Arther Beiser (2009), Concept of Modern Physics, *Tata McGraw Hill, 6th edition.*

Reference Books:

1. Halliday and Resnick (2014), Fundamentals of Physics, *Wiley India, 10th edition.*
2. L. I. Schiff (1968), Quantum Physics, *McGraw Hills.*
3. V. V. N. Kishore (2009), Renewable Energy Engineering and Technology – A Knowledge Compendium, *TERI Press.*
4. Sulabha K. Kulkarni (2011), Nanotechnology: Principles and Practices, *Springer.*
5. Richard P. Feynman (2011), Feynman lectures on physics, *The New Millennium Edition.*
6. Dattu R Joshi (2010), Engineering Physics, *Tata McGraw Hill, 1st Edition.*

Any other information:

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:** IV	
Course/Module: Numerical Techniques				**Module Code:** BTIME04007	
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 bring awareness of various numerical techniques to solve Engineering problems.

Outcomes:

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

- Analyse error in numerical data.
- Solve algebraic, transcendental and system of linear equations using different numerical techniques.
- Understand the concept of interpolation and regression.
- Apply the techniques learnt in numerical differentiation and integration to solve engineering problems.
- Evaluate ordinary differential equation numerically.

Detailed Syllabus: (per session plan)

Unit	Description	Duration
1.	**Introduction to Numerical Computing:** Introduction, Types of Errors: Absolute error, Relative error, Percentage error, Round-off error, Truncation error.	02
2.	**Roots of Equations:** Bisection Method, False Position Method, Newton-Raphson Method, Secant Method, Convergence of Numerical Methods.	10
3.	**Systems of Linear Algebraic Equations:** Gaussian Elimination Method, Gauss Jordan Method, Gauss Seidel Method, Jacobi Method.	06
4.	**Interpolation:** Finite Differences, Forward Differences, Backward Differences, Newton's Forward Interpolation, Newton's Backward Interpolation, Lagrange's Interpolation. Application of this technique to estimate data type such as income, distance, production etc.	07
5.	**Curve Fitting:** Method of Least Square to fit the straight line and the parabola.	03
6.	**Numerical differentiation & Integration:** Derivatives using Forward and Backward difference formula, Trapezoidal Rule for Numerical Integration, Simpson's 1/3 Rule, Simpson's 3/8 Rule. Application to estimate the distance covered in given time and volume of a solid.	09

7.	**Solution to Ordinary differential equations:** Picard's method, Taylor series method, Euler's method, Fourth-Order Runge-Kutta method.	08
	Total	**45**

Text Books:

1. E. Balagurusamy (2008), Numerical Methods, *Tata-Mc Graw Hill.*

Reference Books:

1. S. S. Sastry (2007), Introductory methods of Numerical Analysis, *PHI, 5th edition.*
2. B. S. Grewal (2010), Numerical Methods in Engineering & Science with Programs in C & C+ +, *Khanna Publishers.*
3. John Heinbockel (2004), Numerical Methods for Scientific Computing, *Trafford Publishing.*

Any other information:

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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