आईएफटीएम विश्वविद्यालय, मुरादाबाद, उत्तर प्रदेश

IFTM University, Moradabad, Uttar Pradesh

NAAC ACCREDITED

SCHOOL OF ENGINEERING & TECHNOLOGY
DEPARTMENT OF MECHANICAL ENGINEERING
IFTM UNIVERSITY, MORADABAD.
www.iftmuniversity.ac.in

Study & Evaluation Scheme of
Master of Technology (M.Tech) Mechanical Engineering

Programme:	***Master of Technology in Mechanical Engineering***
Course Level:	***PG Degree***
Duration:	***02 Years (Four semesters) Full Time***
Medium of instruction:	***English***
Minimum Required Attendance:	***75%***
Maximum credits:	***58***

Programme Outcomes (POs):

Students completing this programme will be able to:

- Understanding of tools and techniques, and their usage in analysis and design.
- To conduct literature surveys and contribute in emerging areas through collaborative and multidisciplinary research.
- To understand and integrate existing and new acquired knowledge in the discipline for future enrichment.
- Ability of creative thinking, critical analysis and decision making for productive research and development.
- Devise feasible and optimal solutions to the problems in the area of expertise, amenable to society and environment.
- Ability of independent and reflective learning.
- Understanding of the professional and ethical responsibilities
- To improve capability for solving engineering problems
- Ability to write reports and communicate through effective presentations.
- To impart research skills amongst the graduates with professional and ethical attitude.

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STUDY AND EVALUATION SCHEME (Effective from 2018-19)
YEAR I, SEMESTER- I

S.N.	Course Code	Course Name	Periods			EVALUATION SCHEME				Course Total	Credits
						Mid Term Exam			External Exam		
			L	T	P	CT	AS +AT	Total			
THEORY											
1.	MME-101	Advanced Operations Research	3	1	0	20	10	30	70	100	4
2.	MME-102	Advanced Thermal Engineering	3	1	0	20	10	30	70	100	4
3.	MME-103	Modeling and Simulation	3	1	0	20	10	30	70	100	4
4.	MME-1	Elective – I	3	1	0	20	10	30	70	100	4
		TOTAL	**12**	**04**	**00**	**-**	**-**	**-**	**-**	**400**	**16**

Elective – I (MME-1)

Group A		Group B	
MME -111	Machining Science	MME- 121	Advanced Materials Technology
MME -112	Advanced Welding Technology	MME -122	Advanced Computer Aided Design
MME- 113	CNC, FMS & CIM	MME -123	Advanced Machine Design
MME- 114	Unconventional Machining	MME- 124	Fracture Mechanics
MME- 115	**Metal Casting**	MME- 125	Theory of Elasticity

Note: The student has to select Elective from same group in each semester.

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M.Tech – I Year (I Semester)

MME–101: ADVANCED OPERATIONS RESEARCH **L T P 3 1 0**

Objective: - The main aims of this course are to provide suitable and effective knowledge in concepts and tools of Operations Research. To understand mathematical models used in Operations Research. To apply these techniques constructively to make effective decisions in the field of engineering. Learn and understand different methods and applications to optimize the results and solutions.

UNIT – 1 **(08 Sessions)**
Introduction: Definition and scope of OR, Techniques and tools, model formulation, general methods for solution, Classification of Optimization problems, Optimization techniques.
Linear Optimization Models: Complex and revised Simplex algorithms, Degeneracy and duality, Post optimum and Sensitivity analysis, Assignment, transportation and transshipment models, Traveling salesman problem, Integer and parametric programming.

UNIT – 2 **(08 Sessions)**
Game Problems: Minimax criterion and optimal strategy, two persons zero sum game, Games by Simplex dominance rules.
Waiting Line Problems: Classification of queuing problems, M/M/1 & M/M/1/N queuing systems, Steady state analysis of M/M/m queues, Discrete and continuous time Markov models, Chapman-Kolmogorov equation, Birth & death processes in manufacturing, Open and Closed queuing networks.

UNIT – 3 **(08 Sessions)**
Inventory Management: ABC analysis, deterministic and Probabilistic models.

UNIT – 4 **(08 Sessions)**
Dynamic Programming: Characteristics of dynamic programming problems, Bellman's principle of optimality, Problems with finite number of stages.

UNIT – 5 **(08 Sessions)**
Stochastic Programming: Basic concepts of Probability theory, Stochastic linear programming.

Course Outcome: The student is able to:
- Demonstrate the operation research theory, application, and algorithms relevant to solving linear programming problems.
- Understand the various data structures available in game theory and apply them in solving computational problems.
- Identify the goals and objectives of inventory management and describe the importance of stocks in an organization and the reasons for holding stock.
- To develop dynamic programming associated with network flows and related real life applications.
- Know various discrete and continuous probability distributions along with their characteristics and identify the situations where they provide realistic models.

Suggested Readings:
- Elements of Queuing Theory SaatyPitam: Tata Mc Graw-Hills Company (Pvt.) Ltd.
- Nonlinear and Dynamic Programming Hadley Addison Wesley
- Fundamentals of Operations Research Ackoff & Sasieni Wiley eastern
- Principles of OR with Applications to Managerial Decisions Wagner Prentice Hall
- Operations Research: Taha, McMillan
- Operations Research R Panneerselvam Prentice Hall of India
- Operations Research A P Verma S.K. Kataria & Sons
- Introduction to Operations Research Hillier and Lieberman Prentice Hall

Website Sources:
- www.pdfdrive.com
- www.dmi.gov.in
- www.yourarticlelibrary.com
- onlinecourses.nptel.ac.in
- en.wikipedia.org

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M.Tech – I Year (I Semester)

MME – 102: Advanced Thermal Engineering **L T P 3 1 0**

Objective: To impart knowledge on the principles of energy quality and the significance of the same for industrial and domestic applications of thermal systems. To impart knowledge on the real gas behaviour and the application of statistical thermodynamic towards understanding the same. To impart knowledge on different thermodynamic property relations and their applications.

UNIT -1 **(06 Sessions)**
Basic Definitions & Concepts, Equation of state, Calculation of thermodynamic properties, generalized compressibility charts.

UNIT -2 **(06 Sessions)**
Second law analysis, Availability, irreversibility, Maxwell equations, Joule-Thomson coefficient, Thermodynamics of reactive mixtures, Stoichiometry.

UNIT -3 **(10 Sessions)**
Generalized conduction equation, steady and unsteady heat conduction in a slab of finite thickness; Effect of heat generation; Non-zero initial condition.

UNIT -4 **(08 Sessions)**
Constant flux and convective boundary conditions, Heat conduction in an inhomogeneous medium; Examples of composite media.
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UNIT -5 **(10 Sessions)**
Radiation heat transfer, Surface properties, Configuration factor, Radiative heat exchange between gray surfaces. Navier-Stokes equation, Stream function, Velocity potential, Vorticity and circulation potential flow theory, Boundary layer theory. .

Course Outcome: The students will be able to:

- Understand theoretical principles of exergy analysis, behavior of real and ideal gases from using statistical thermodynamics point of view, thermodynamic property relations and reactive systems.
- Analyse thermodynamic processes in various industries/case studies (performed individually and in groups and presented in the form of report) and suggest improvements.

Suggested Readings:

- Engineering thermodynamics -Jones & Dugan -
- Engineering thermodynamics -Achuthan -
- Thermal Engineering -Sarkar –
- Thermal Spraying for Power Generation Components -Klaus Erich Schneider

Website Sources:

- https://nptel.ac.in
- https://www.wikipedia.org
- https://www.youtube.com
- http://www.thapar.edu/

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M.Tech – I Year (I Semester)

MME-103: MODELING AND SIMULATION **L T P 3 1 0**

Objective: The objective of this course is to familiarize the students to collect the knowledge about the system and its behavior and to solve a real world system by using different simulation software.

UNIT-1 **(09 Sessions)**
Introduction: A review of basic probability and statistics, random variables and their properties, Estimation of means variances and correlation.
Physical Modeling: Concept of System and environment, Continuous and discrete systems, Linear and non-linear systems, Stochastic activities, Static and Dynamic models, Principles of modeling, Basic Simulation modeling, Role of simulation in model evaluation and studies, advantages of simulation.

UNIT-2 **(09 Sessions)**
System Simulation: Techniques of simulation, Monte Carlo method, Experimental nature of simulation, Numerical computation techniques, Continuous system models, Analog and Hybrid simulation, Feedback systems, Computers in simulation studies, Simulation software packages. System Dynamics: Growth and Decay models, Logistic curves, System dynamics diagrams.

UNIT-3 **(08 Sessions)**
Probability Concepts in Simulation: Stochastic variables, discrete and continuous probability functions, Random numbers, Generation of Random numbers, Variance reduction techniques, Determination of length of simulation runs.

UNIT-4 **(07 Sessions)**
Simulation of Mechanical Systems: Building of Simulation models, Simulation of translational and rotational mechanical systems, Simulation of hydraulic systems.

UNIT-5 **(07 Sessions)**
Simulation of Manufacturing Systems: Simulation of waiting line systems, Job shop with material handling and Flexible manufacturing systems, Simulation software for manufacturing, Case studies.

Course Outcome: Students completing this course will be able:
- To study internal (perhaps unobservable) behavior of the system e.g. biological system.
- Examine effect of environmental changes e.g. weather forecasting.
- To apply Simulation in various fields e.g. Manufacturing, Computer Systems, E-business, Finance, Telecommunications, Transportation, Military etc.
- To apply the knowledge in industries and organizations.

Suggested Readings:

- *System Simulation,* Geoffrey Gordon, Prentice Hall
- *System Simulation: The Art and Science,* Robert E. Shannon, Prentice Hall
- *System Modeling and Control,* J. Schwarzenbach and K.F. Gill, Edward Arnold
- *Modeling and Analysis of Dynamic Systems,* Charles M Close and Dean K. Frederick Houghton Mifflin
- *Simulation of manufacturing,* Allan Carrie John, Wiley & Sons

Website Sources:
- www.wikipedia.org
- http://acqnotes.com
- www.youtube.com
- www.researchgate.netwww.slideshare.net
- https://onlinecourses.nptel.ac.in

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M.Tech – I Year (I Semester)

Elective - I

MME -115: Metal Casting **L T P 3 1 0**

Objective: To impart fundamental knowledge of foundry industry, molding with designing aspects like gating and risering systems and solidification of metals. To let them understand for casting the products free from any kind of defects.

Unit-1 **(08 Sessions)**
Introduction: Features of Casting problems, Survey and Scope of Foundry Industry, Solidification of pure metals, Nucleation and growth in alloys, Solidification of actual casting, Progressive and directional solidification, Centre line feeding resistance, Rate of solidification, Chvorinov's rule, Electrical analog of solidification problems.

Unit-2 **(08 Sessions)**
Gating and Risering Systems: Gating systems and their characteristics, Effects of gates on aspiration, Turbulence and dross trap, recent trends, Riser design, Risering curves, NRL method of riser design, Feeding distance, Risering of complex casting, Risering of alloys other than steel, Riser design by geometrical programming.

Unit-3 **(08 Sessions)**
Moulding and Core Making: Review and critical comparison of various established processes, recent developments e.g. low pressure and ferrous die casting, High pressure moulding, Full mould process, Flaskless moulding, Hot and cold box moulding, Ceramic shell moulding, V-process, Continuous casting, Squeeze and pressed casting, Nishiyama process, Shaw process, Anitoch process, etc.

Unit-4 **(08 Sessions)**
Melting and Fluidity: Selection and control of melting furnaces; molting, refining and pouring; Coupla design, Measurement of fluidity, Effect of various parameters on fluidity, Methods of elimination and control of gases in casting.

Unit-5 **(08 Sessions)**
Internal Stress, Defects and Surface Finish: Residual stresses, Hot tears and cracks in casting; Stress relief, defects and their causes and remedies; Parameters affecting surface finish and related defects e.g., Rough casting, bum-on sand bum-in metal penetration, Facing and washes; Mold wall movement; transport zones, Expansion scabbing etc.
Casting of Sand Design Considerations: Recent developments, e.g., Mulling index; Mouldability index, Compactability; deformability etc.

Course Outcome: After completion of this course the students will be able:
- To learn that how the casting methods may be utilize for casting the product.
- To design pattern and mould as per the requirement of any company
- To work in the industry related to designing of mold, pattern and casting.

Suggested Readings:
- Bronze Sculpture Casting And Patination: Mud Fire Metal Steve Hurst Schiffer Publishing
- Fine Art Metal Casting Richard Rome -
- Casting Technology and Cast Alloys Chakraborty Prentice Hall of India
- Meta Casting: Principles and Practice TV Rammana Rao New Age International
- Fundamentals of Metal Casting H. Loper and Rosenthal Tata McGraw Hill

Website Sources:
- nptel.ac.in
- http://www.springer.com
- www.indianfoundry.org
- www.sciencedirect.com

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DEPARTMENT OF MECHANICAL ENGINEERING
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Master of Technology (M.Tech) Mechanical Engineering

STUDY AND EVALUATION SCHEME (Effective from 2018-19)
YEAR I, SEMESTER- II

S.N.	Course Code	Course Name	Periods			EVALUATION SCHEME				Course Total	Credits
						Mid Term Exam			External Exam		
			L	T	P	CT	AS +AT	Total			
THEORY											
1.	MME-201	Numerical Methods & Analysis	3	1	0	20	10	30	70	100	4
2.	MME-202	Advanced Mechanics of Solids	3	1	0	20	10	30	70	100	4
3.	MME-203	Combustion Engineering	3	1	0	20	10	30	70	100	4
4.	MME- 2	Elective –II	3	1	0	20	10	30	70	100	4
		TOTAL	**12**	**04**	**00**	**-**	**-**	**-**	**-**	**400**	**16**

Elective – II (MME-2)

Group A		Group B	
MME-211	Machine Tool Design	MME -221	Finite Element Method
MME-212	Product Design and Development	MME -222	Engineering Design Optimization
MME-213	Industrial Design and Ergonomics	MME- 223	Reliability, Maintenance, Management, and Safety
MME-214	**Heat Treatment Processes**	MME- 224	Theory of Plasticity

Note: The student has to select Elective from same group in each semester.

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M.Tech – I Year (II Semester)

MME–201: NUMERICAL METHODS AND ANALYSIS **L T P 3 1 0**

Objective: - The main aims of this course are to study numerical analysis to make the students familiarize with the ways of solving complicated mathematical problems with the help of numerical methods and analyze the results. To improve and analyze the results and students skills in numerical methods by using the numerical analysis software such as MATLAB and computer facilities in engineering.

UNIT – 1 **(08 Sessions)**
Solution of Algebraic and Transcendental Equation: Bisection Method, Method of False position,Newton-Raphson method including method of complex roots, Graeffe's root square method (Computer based algorithm and programme for these methods)

UNIT – 2 **(08 Sessions)**
Interpolation and Approximation: Newton interpolation formula for finite differences, Gauss's forward and backward interpolation formulae, Stirling's Formula , Bessel's and Laplace-Everett's formulae, Lagrange's and Newton-divided difference formula, Cubic spline, Least squares approximation using Chebyshev polynomial.

UNIT – 3 **(08 Sessions)**
Solution of Linear Simultaneous Equations: Cholesky's (Crout's) method, Gauss-Seidel iteration and relaxation methods, Solution of Eigen value problems; Smallest, Largest and intermediate Eigen values (Computer based algorithm and programme for these methods)

UNIT – 4 **(08 Sessions)**
Numerical Differentiation and Integration: Numerical differentiation using difference operators, Trapezoidal Rule, Simpson's 1/3 and 3/8 rules, Boole's rule, Weddle's rule.

UNIT – 5 **(08 Sessions)**
Solution of Differential Equations: Modified Euler's method, Runge-Kutta method of 2nd, 3rd and 4th orders, Predictor- Corrector method, Stability of ordinary differential equation, Solution of Laplace's and Poisson's equations by Liebmann's method, Relaxation method.

Course Outcome: The student is able to:

- Apply Numerical analysis which has enormous application in the field of Science and different fields of Engineering.
- Familiar with numerical solutions of nonlinear equations in a single variable.
- Familiar with numerical integration and differentiation, numerical solution of ordinary differential equations.
- Familiar with calculation and interpretation of errors in numerical method.
- Familiar with programming with numerical packages like MATLAB.

Suggested Readings:

- Numerical Method for Scientific and Engineering Computation M.K. Jain, S.R.K. Iyenger and R.K. Jain Wiley Eastern Ltd.
- Numerical Methods for Engineers S.K. Gupta Wiley Eastern Ltd.
- Numerical Methods B.S. Grewal Khanna Publications
- Numerical Methods A.D. Booth Academic Press, NY
- An Introduction to Numerical Analysis K.E. Atkinson John Wiley & Sons, NY.

Website Sources:

- www.pdfdrive.com
- www.dmi.gov.in
- www.yourarticlelibrary.com
- onlinecourses.nptel.ac.in
- en.wikipedia.org

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Master of Technology (M.Tech) Mechanical Engineering
M.Tech – I Year (II Semester)

MME 202: Advanced Mechanics of Solids **L T P 3 1 0**

Objective: The objective of this course is to present the mathematical and physical principles in understanding the linear continuum behavior of solids under different loading conditions.

Unit-1 **(08 Sessions)**
Analysis of stress and strain. Constitutive relationships and failure theories. Plane stress and plane strain problems.

Unit-2 **(08 Sessions)**
Torsion, Torsion of non-circular sections, review of fatigue analysis.

Unit-3 **(08 Sessions)**
Introduction to fracture mechanics.

Unit-4 **(08 Sessions)**
Inelastic behavior, Viscoelasticity, Structure and behavior of polymers.

Unit-5 **(08 Sessions)**
Behavior of unidirectional composites and orthotropic lamina, Failure theories for fiber composites, development of various structures in composites. Computer based analysis and solutions to problems in mechanics of solids.

Course Outcome: Students completing this course will be able to:

- Understand the concepts of stress at a point, strain at a point, and the stress-strain relationships for linear, elastic, homogeneous, isotropic materials.
- Determine principal stresses and angles, maximum shearing stresses and angles, and the stresses acting on any arbitrary plane within a structural element.
- Utilize basic properties of materials such as elastic moduli and Poisson's ratio to appropriately solve problems related to isotropic elasticity.

Suggested Readings:

- L. S. Sreenath, Advanced Mechanics of Solids, McGraw Hill, 2008.
- S. M. A. Kazimi, Solid Mechanics, McGraw Hill, 2008.
- S. Jose, Advanced Mechanics of Materials, Pentagon Educational Services, 2013.
- S. P. Timoshenko and J. N. Goodier, Theory of elasticity, McGraw Hill, 1970.
- R. J. Atkin and N. Fox, An introduction: The theory of elasticity, Longman, 1980.
- J. P. D. Hartog, Advanced Strength of Materials, McGraw Hill, 1987.
- C. K. Wang, Applied Elasticity, McGraw Hill, 1983.

Website Sources:

- nptel.ac.in/course.html
- www.nsf.gov
- en.wikipedia.org
- www.sciencedirect.com
- www.slideshare.net
- www.researchgate.net

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Master of Technology (M.Tech) Mechanical Engineering
M.Tech – I Year (II Semester)

MME -203: Combustion Engineering **L T P 3 1 0**

Objective: To build up knowledge of the concepts and theories of a of classical fuel combustion and develop the understanding of the basic principles and concepts of advanced fuel combustion and control process. Also To provide students with the required skills, for analyzing thermal cycles, and make them familiar with the fundamental physical and chemical principles regarding formation and control of air pollutants in industrial and technological processes.

UNIT -1 **(08 Sessions)**
Introduction: Importance of combustion; Combustion equipment's, Hostile fire problems, pollution problems arising from combustion.
Thermodynamics of Combustion: Enthalpy of formation; Enthalpy of reaction; Heating values; First & second laws; Analysis of reaction system, Chemical equilibrium, Equilibrium composition; Adiabatic & equilibrium, Flame temperature.

UNIT -2 **(08 Sessions)**
Kinetics of Combustion: Law of mass action; Reacting rate; Simple and complex reaction; Reaction order & molecularity, Arhenius laws; Activation Energy; Chain reaction; Steady rate & Partial equilibrium approximation; chain explosion; Explosion limit and oxidation characteristics of hydrogen, Carbon monoxide, Hydrocarbons.

UNIT -3 **(08 Sessions)**
Flames: Remixed flame structure & propagation of flames in homogeneous mixtures; Simplified Rankine Hugoniot relation, Properties of Hugoniot curve, analysis of Deflagration & detonation branches, Properties of Chapmen Jouguet wave, Laminar flame structure; Theories of flame propagation & calculation of flame speed measurements. Stability limits of laminar flames; Flammability limits & quenching distant, Burner design, Mechanism of flame stabilization in laminar & turbulent flows, Flame quenching, Diffusion flames; Comparison of diffusion with premixed flame, combustion of gaseous fuel, jets burke & Schumann development.

UNIT -4 **(08 Sessions)**
Burning of Condensed Phase: General mass burning considerations, Combustion of fuels droplet in a quiescent and convective environment, Introduction to combustion of fuel sprays.
Ignition: Concept of ignition, Chain ignition, Thermal spontaneous ignition, Forced ignition.

UNIT -5 **(08 Sessions)**
Combustion Generated Pollution & its Control: Introduction, Nitrogen oxide, Thermal fixation of atmospheric nitrogen prompts, NO, Thermal NOx & control in combustors. Fuel NOx & control, post combustion destruction of NOx, Nitrogen dioxide, carbon monoxide Oxidation-Quenching, Hydrocarbons, Sulphur oxide.

Course Outcome: Students completing this course will be able to:
- Recognize and understand reasons for differences among operating characteristics of different engine types and designs
- Differentiate among different internal combustion engine designs
- Develop an understanding of real world engine design issues
- Develop an ability to optimize future engine designs for specific sets of constraints (fuel economy, performance, emissions)

Suggested Readings:
- Internal Combustion Engines: Applied Thermo sciences Ferguson Colin R John Wiley
- Engineering Fundamentals of the Internal Combustion Engine Pulkrabek Pearson Education India
- Instrumentation for Combustion and Flow in Engines Durao D F G Kluwer Aca
- Energy From Biomass: A Review of Combustion and Gasification Technologies Quaak Peter

Website Sources:
- https://ocw.mit.edu/courses/mechanical-engineering/2-61-internal-combustion-engines-spring-2017/readings/
- https://www.cambridgescholars.com/download/sample/64815
- https://www.accessengineeringlibrary.com/content/book/9780071614719/back-matter/appendix1
- https://www.aiche.org/resources/publications/cep/2020/february/troubleshoot-combustion-and-air-pollution-control-equipment

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Master of Technology (M.Tech) Mechanical Engineering
M.Tech – I Year (II Semester)

Elective - II

MME -214: Heat Treatment Processes **L T P 3 1 0**

Objective: To provide through knowledge of heat treatment processes for metals. To understand the requirement of heat treatment process at various stage of material from raw material to finished product. To understand how the properties of the metals change after teat treatment process.

UNIT -1 **(06 Sessions)**
Introduction: Nature and alloys; Heat treatment process, Requirements, Theory, Advantages, Process variables.

UNIT -2 **(10 Sessions)**
Heat Treatment of Ferrous Metals: Iron Carbon phase diagram; TTT diagram; different microstructures; transformations; Annealing, Stress relieving; Spherodizing; Normalizing; Hardening; Tempering; Austemepring; Martempering; Quenching; Quenchants; Quenching media;

UNIT -3 **(10 Sessions)**
Surface hardening; Hardenability; Sub-zero treatment; Thermo-mechanical treatment; Chemical Treatment; Tool steel and their heat treatment; cast Iron and their heat treatment.

UNIT -4 **(08 Sessions)**
Heat Treatment of Non-Ferrous Metals: Aluminium and its alloys; Heat treatable and non-heat-treatable aluminum alloys; Classification of heat treatment of aluminum alloys; Heat treatment of Aluminum and its alloys; Heat treatment of Magnesium and its alloys;

UNIT -5 **(06 Sessions)**
Heat treatment of Titanium and its alloys; Heat treatment of Copper and its alloys; Heat treatment of Nickel and its alloys, Energy Economy in heat treatment.

Course Outcome: There are following outcomes after completing this course by students:

- They will better understand the role of heat treatment process for enhancement of properties of metals.
- They will be able to select the appropriate process to modify a particular property of the material.
- They will be able to work in an industry related to manufacturing metal products.
- Will better utilize the energy used in heat treatment of the metals or products can be done after completing this course.

Suggested Readings:

- Principles of Heat Treatment of Steels R.C. Sharma New Age International (P)
- Heat Treatment: Principle and Techniques T.V. Rajan, C.P. Sharma and Ashok Sharma Prentice Hall India.

Website Sources:

- nptel.ac.in
- http://www.springer.com
- https://www.slideshare.net/fellowbuddy/heat-treatment-61493702
- https://www.vssut.ac.in/lecture_notes/lecture1428553162.pdf
- www.utube.com

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Master of Technology (M.Tech) Mechanical Engineering

STUDY AND EVALUATION SCHEME (Effective from 2018-19)
YEAR II, SEMESTER-III

S.N.	Course Code	Course Name	Periods			EVALUATION SCHEME				Course Total	Credits
						Mid Term Exam			External Exam		
			L	T	P	CT	AS +AT	Total			
THEORY											
1.	MME-301	Production Technology	3	1	0	20	10	30	70	100	4
2.	MME-302	Non Destructive Testing	3	1	0	20	10	30	70	100	4
3.	MME-3	Common Elective-III	3	1	0	20	10	30	70	100	4
PRACTICALS / PROJECT											
4.	MME-351	Seminar	0	0	4	-	100	100	-	100	2
5.	MME-352	Pre-Dissertation	0	0	4	-	50	50	50	100	2
		TOTAL	**09**	**03**	**08**	**-**	**-**	**-**	**-**	**500**	**16**

Common Elective – III (MME-3)

MME-311 Neural Network and Fuzzy Systems
MME-312 Micro-Electro-Mechanical Systems
MME-313 Advance Instrumentation
MME-314 Industrial Tribology.
MME-315 Advance Fluid Mechanics
MME-316 Total Quality Management
MME-317 Industrial Automation and Robotics

Note: Dissertation to be started in III Semester and continued in IV Semester.

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M.Tech – II Year (III Semester)

MME – 301: Production Technology **L T P 3 1 0**

Objective: To impart knowledge to students in the latest technological topics on Production and Industrial Engineering and to provide them with opportunities in taking up advanced topics of the field of study.

UNIT – I **(08 Sessions)**
Welding Technology: Welding comparison with other fabrication processes, Classification, Fusion and pressure welding, Weldability of metals, Metallurgy of welding, Weld design, Stress distribution and temperature fields in the welds, Recent developments in welding viz. Diffusion, Friction, Electron beam and Induction welding,

UNIT-II **(08 Sessions)**
Cladding, Metalizing, Surfacing and Fabrication, Welding defects and inspection of welds, Thermal cutting of metals and its use in fabrication of process machines, cutting of cast iron, stainless steel and non-ferrous metals.

UNIT – III **(12 Sessions)**
Metal Forming: Classification of forming process, Stress, strain and strain rules, laws, Yield criterion and flow rules, Friction and lubrication in metal forming processes, Indirect compression processes e.g., Drawing and Extrusion processes, Direct compression processes e.g., forming and rolling, Theory of deep drawing, Load bounding techniques and upper bound estimates of field theory, Bending and forming, High-energy rate forming techniques and their applications, Recent advances in metal forming.

UNIT – IV **(04 Sessions)**
Metal Cutting: Tool geometry and signature, Theory of orthogonal and oblique metal cutting, Tool wear and lubrication,

UNIT-V **(08 Sessions)**
Theoretical evaluation of temperature fields at shear zone and tool-chip interface, Dynamics of metal cutting and machine tool stability, A critical review of theories of dynamic cutting machining at super high speeds, recent advances in cutting tool and science of metal cutting.

Course Outcome: Students completing this course will be able to:
- Acquire fundamental knowledge and understanding of Production and Industrial Engineering.
- Acquire abilities and capabilities in the areas of advanced manufacturing methods, quality assurance and shop floor management.
- To provide guidance to students for their choices in research and professional career outlook and to encourage students to take up research

Suggested Readings:
- Fundamentals of Metal Machining G. Boothroyd
- Metal Forming Analysis Avitzur
- Metal Cutting Principle M.C. Shaw
- Theory of Plastic Deformation and Metal Working V. Masterov & V. Berkovsky
- Metal Cutting E.M. Trent

Website Sources:
- https://www.plattecountyschooldistrict.com/domain/1481
- https://courses.lumenlearning.com/atd-baycollege-introbusiness/chapter/reading-the-technology-of-goods-production/
- https://www.springer.com/gp/book/9783319485775

SCHOOL OF ENGINEERING & TECHNOLOGY
DEPARTMENT OF MECHANICAL ENGINEERING
IFTM UNIVERSITY, MORADABAD.

Master of Technology (M.Tech) Mechanical Engineering
M.Tech – II Year (III Semester)

MME 302: Non Destructive Testing **L T P 3 1 0**

Objective: The main objectives of this course is to introduce the concept of non-destructive testing among the students and make them understand various types of non-traditional practices available for manufacturing industry.

Unit-1: Introduction **(08 Sessions)**
Scope and advantages of NDT. Comparison of NDT with DT. Some common NDT methods used since ages. Terminology. Flaws and defects, visual inspection, equipments used for visual inspection. Ringing test, chalk test (oil whitening test). Attractive uses of above tests in detecting surface cracks, bond strength & surface defects.

Unit-2: Common NDT methods **(08 Sessions)**
Die penetrate test (liquid penetrate inspection), principle, scope. Equipment and techniques, tests stations, advantages, types of penetrant and developers. Illustrative examples – heavy castings of large size, frame of jet engine, porosity testing of nickel alloys, leak testing. Zyglo test.
Magnetic particle Inspection – Scope, principle, ferro magnetic and non-ferromagnetic materials, equipment and testing. Advantages, limitations, interpretation of results. DC and AC magnetization, skin effect, use of dye & wet powders for magna glow testing, different methods to generate magnetic fields, applications.

Unit-3: Radiographic methods **(08 Sessions)**
X-ray radiography principle, equipment & methodology. Applicability, types of radiations, limitations. Interpretation of radiographs, limitations of γ-ray radiography – working principle and equipments. Attenuation of electromagnetic radiations, source of radioactive materials and technique. Photo electric effect, Rayleigh's scattering (coherent scattering), Compton's scattering (Incoherent scattering). Pair production, beam geometry, scattering factor. Advantages of γ-ray radiography over X-ray radiography. Precautions against radiation hazards. Case Study ─ X-ray of human body.

Unit-4: Ultrasonic testing methods **(08 Sessions)**
Introduction, principle of operation, piezoelectricity. Ultrasonic probes, CRO techniques, advantages, limitation & typical applications. Applications in inspection of castings, forgings, extruded steel parts, bars, pipes, rails and dimensions measurements. Case study – Ultrasonography of human body.

Unit-5: Eddy Current Inspection **(08 Sessions)**
Principle, methods, advantages, scope and limitations. Types of Probes. Case Studies.

Course Outcome: Students completing this course will be able to:
- Select an appropriate NDT technique as per requirement.
- Set various process parameters and control the NDT process for the desired output parameters.
- To find the internal flaws in the material by NDT and take measures to eliminate them.
- To solve various problems encountered like leakage, cracks, blowholes etc with the manufacturing process by analyzing the data.
- To make use of modern tools and software for analyzing and solving real life problems.
- To introduce environmental friendly solutions to achieve organizational sustainability.

Suggested Readings:

- Malhotra, "Handbook on Non-destructive Testing of Concrete", Publisher: CRC Press, 2002.
- Mix, Paul E, "Introduction to Nondestructive Testing: A Training Guide", John Wiley and Sons Ltd, 1999.
- Blitz and Jack, "Electrical and Magnetic Methods of Nondestructive Testing", Institute of Physics Publishing, 2001.
- Achenbach, J D, "Evaluation of Materials and Structures by Quantitative Ultrasonics", Springer-Verlag Vienna, 2001.
- Henrique L M, "Non Destructive Testing and Evaluation for Manufacturing and Construction", Hemisphere Publishers, New York, 2001.

Website Sources:
- nptel.ac.in/course.html
- www.nsf.gov
- en.wikipedia.org
- www.sciencedirect.com
- www.slideshare.net
- www.researchgate.net

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Master of Technology (M.Tech) Mechanical Engineering
M.Tech – II Year (III Semester)

Common Elective – III

MME – 316: Total Quality Management **L T P 3 1 0**

Objective: The objective of this course is to learn how to plan and execute quality management strategies to gain and maintain a competitive advantage in today's global business era for any organization.

UNIT – I **(10 Sessions)**
Introduction and Components of TQM: Concept and Philosophy of TQM, Value and Quality assurance, Total Quality Control, Quality policy, Team-work and participation, Quality cost measurement, Quality Circle, Customer/Supplier integration, Education and training.

UNIT – II **(08 Sessions)**
Tools and Techniques of TQM: Statistical method in quality control, Process control chart, Acceptance sampling plan, Statistical Productivity control (SPC).

UNIT – III **(06 Sessions)**
Reliability: Failure analysis, System reliability and redundomy.

UNIT – IV **(08 Sessions)**
TQM implementation: Steps in promoting and implementing TQM in manufacturing industries, Industrial Case studies.

UNIT – V **(08 Sessions)**
ISO 9000 Quality Systems: Concepts, designation Standards, Quality system documentation, Quality manual, Quality procedures and work inspection.

Course Outcome: Students completing this course will be able to:

- To understand detailed philosophy and core values of Total Quality Management.
- Diagnose problems in the quality improvement process and learn how to improve the efficiency and productivity of an organization by continuous quality improvement.
- To learn how to use control charts techniques as a means to diagnose, reduce and eliminate causes of variation in production system.
- This course provides students the knowledge and techniques required to improve product quality, wastage, non-standardization and other reliability and productivity problems.

Suggested Readings:

- Total Quality Control F. Ammandev Tata McGraw Hill
- Total Quality Management Besterfield, et. al. Prentice Hall of India
- Total Quality Management: Text and Cases B. Janakiraman & RK Gopal Prentice Hall of India
- What is Total Quality Control? K. Ishikawa Prentice hall
- Total Quality Management: The Route to Improving Performance J.S. Oakland Butterworth Heineman Oxford
- Out of Crisis W.E Dming Centre of Advance Engineering Study, Cambridge

Website Sources:

- www.questia.com/library/economics-and-business/business/management/total-quality-management
- www.tandfonline.com/toc/ctqm20/current
- www.investopedia.com/terms/t/total-quality-management-tqm.asp
- onlinecourses.nptel.ac.in
- www.cgma.org/resources/tools/essential-tools/quality-management-tools.html
- http://www.netugc.com/total-quality-management-tqm

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STUDY AND EVALUATION SCHEME (Effective from 2018-19)
YEAR II, SEMESTER-IV

S.N.	Course Code	Course Name	Periods			EVALUATION SCHEME				Course Total	Credits
						Mid Term Exam			External Exam		
			L	T	P	CT	AS +AT	Total			
PRACTICALS / PROJECT											
1.	MME-451	Dissertation Work	0	0	20	-	250	250	250	500	10
		TOTAL	**-**	**-**	**20**	**-**	**-**	**-**	**-**	**500**	**10**

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M.Tech – II Year (IV Semester)

MME-451: Dissertation Work **L T P 0 0 20**

Objective: The objective of this course is to:

- Understand the tools and techniques, and their usage in analysis and design.
- To conduct literature surveys and contribute in emerging areas through collaborative and multidisciplinary research.

Topics covered in Dissertation:

- Introduction on the dissertation topic selected and approved in Pre- Dissertation.
- Literature Review.
- Problem formulation.
- Materials and Methods.
- Calculations.
- Results and Discussion.
- Conclusion and Future Scope.
- References.
- Publication on the dissertation work in an international journal.

Course Outcome: Students completing this course will be able to:

- Gain knowledge of the concepts of Mechanical engineering.
- Ability to analyse the problem correctly.
- Apply the knowledge to design and development of possible solutions.
- Ability for a systematic investigation of complex problems in engineering.
- Should be able to handle and use modern tools in Mechanical engineering
- Appreciate the implications of environment for sustainable solutions.
- Understand and practice the profession in ethical manner.
- Ability to work as an individual and in team.
- Ability to communicate effectively in oral as well as written manner.
- Develop an approach for lifelong learning in profession.
- Ability to manage and finance the engineering projects.

Website Sources:

- nptel.ac.in
- http://www.springer.com
- www.sciencedirect.com
- www.slideshare.net
- www.researchgate.net