



राष्ट्रीय प्रौद्योगिकी संस्थान, मिजोरम  
**NATIONAL INSTITUTE OF TECHNOLOGY, MIZORAM**  
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**DEPARTMENT OF MECHANICAL ENGINEERING**

**8<sup>th</sup> Semester:**

SL.No	Course code	Course Title	L-T-P	Credits
1.	MEL1843	Numerical control of Machine Tools	3-0-0	6
2.	MEL1844	Advance Manufacturing Process	3-0-0	6
3.	MEL18XX	Elective -II	3-0-0	6
4.	MEP1845	Project -II	0-0-8	8
5.	MEP1846	Numerical control and CAM Laboratory	0-0-3	3
6.	MEP 1847	Advance Manufacturing Process Laboratory	0-0-3	3

Elective-II

SL.No	Course code	Course Title	L-T-P	Credits
1.	MEL1850	Combustion Engineering	3-0-0	6
2.	MEL1851	Experimental Stress Analysis	3-0-0	6

Course code	Course Title	Semester	L-T-P	Credits
MEL1843	Numerical control of Machine Tools	8 <sup>th</sup>	3-0-0	6

**Introduction:** Fundamentals of Numerical Control (NC), Computer Numerical control (CNC), Direct Numerical control (DNC), comparison between conventional and CNC systems, Classification of CNC system, Design consideration in CNC machine tools, Industrial applications of CNC, Economic benefit of CNC.

**System Devices:** Drives, Feedback devices, Counting devices, Data Input Devices, Lead screws.

**Control Systems:** Fundamental problems of control, Position or point to point, straight line and contouring control, Machine tool control, Open and closed loop control, Adaptive Control system.

**Interpolation:** Digital Differential Analyzers (DDA) integrator, DDA hardware interpolator, CNC software interpolators, Software DDA interpolator, Linear and Circular interpolation.

**NC Part Programming Concepts:** NC coordinate system, Part programming terminology, preparatory and miscellaneous Codes, Part programming formats, procedures and methods, Manual programming, Computer aided programming, APT programming and practice.

**Associated Systems of CNC:** Introduction to Flexible manufacturing systems (FMS), CAD/CAM, Industrial robots and CIM systems.

**Books:-**

SL.No	Name of the book	Author	Publication
1	Computer control of manufacturing system	Y. Koren	McGraw hill international.
2	Automation, Production systems and computer integrated manufacturing	M.P. Groover	Prentice Hall Publishers.
3	Computer Aided Manufacturing	Rao, Tiwari and Kunda	Tata McGraw Hill

Course code	Course Title	Semester	L-T-P	Credits
MEL1844	Advanced Manufacturing Process	8 <sup>th</sup>	3-0-0	6

**Introduction:** Introduction to Advanced Manufacturing Processes and their importance.

**Advanced Machining Processes:** Introduction of advanced machining processes, process principle, applications, advantages and limitations of processes such as Abrasive Jet Machining (AJM), Water Jet Machining (WJM), Abrasive Water Jet Machining (AWJM), Ultrasonic Machining (USM), Electrochemical Machining (ECM), Electro Discharge Machining (EDM), Electron Beam Machining (EBM), Laser Beam Machining (LBM) processes.

**Advanced Casting Processes:** Metal mould casting, Continuous casting, Squeeze casting, Vacuum mould casting, Evaporative pattern casting, Ceramic shell casting their process principles and applications.

**Advanced Welding Processes:** Electron Beam Welding (EBW), Laser Beam Welding (LBW), Ultrasonic Welding (USW), their process principles and applications.

**Advanced Metal Forming Processes:** High energy rate forming (HERF) process, Electromagnetic forming, explosive forming, Electro hydraulic forming, Stretch forming, Contour roll forming, their process principles and applications.

**Rapid Prototyping (RP):** Importance of RP, Introduction of solid-based, liquid-based, powder-based RP processes.

**Introduction to Emerging Trends in Manufacturing:** Micro-manufacturing, Micro-Electro-Mechanical-Systems (MEMS), Basic concepts of Nanotechnology.

**Books:-**

SL.No	Name of the book	Author	Publication
1	Introduction to Manufacturing Processes	Schey	Mc Graw hill international.
2	Micromanufacturing and Nanotechnology	N. P. Mahalik	Springer

Elective-II

Course code	Course Title	Semester	L-T-P	Credits
MEL1852	Combustion Engineering	8 <sup>th</sup>	3-0-0	6
<p><b>Introduction:</b> Introduction to combustion, Applications of combustion, Types of Fuels and various modes of combustion, Scope of combustion.</p> <p><b>Review of basic thermodynamics:</b> Thermodynamics properties, Laws of thermodynamics, Stoichiometry, Thermo-chemistry, adiabatic temperature, chemical equilibrium.</p> <p><b>Chemistry of Combustion:</b> Basic Reaction Kinetics, Elementary reactions, Chain reactions, Multistep reactions, simplification of reaction mechanism, Global kinetics.</p> <p><b>Physics of Combustion:</b> Fundamental laws of transport phenomena, Conservations Equations, Transport in Turbulent Flow.</p> <p><b>Premixed Flame:</b> One dimensional combustion wave, Laminar premixed flame, Burning velocity measurement methods, Effects of chemical and physical variables on Burning velocity, Flame extinction, Ignition, Flame stabilizations, Turbulent Premixed flame.</p> <p><b>Diffusion Flame:</b> Gaseous Jet diffusion flame, Liquid fuel combustion, Atomization, Spray Combustion, Solid fuel combustion.</p> <p><b>Combustion and Emission:</b> Atmosphere, Chemical Emission from combustion, Quantification of emission, Emission control methods.</p> <p><b>Books:-</b></p>				
<b>SL.No</b>	<b>Name of the book</b>	<b>Author</b>	<b>Publication</b>	
1	Principle of Combustion	Kuo K.K	John Wiley and Sons.	
2	Combustion	Irvin Glassman	Academic Press.	
3	Fundamentals of Combustion	D. P. Mishra	Prentice Hall Publishers.	

Course code	Course Title	Semester	L-T-P	Credits
MEL1853	Experimental Stress Analysis	8 <sup>th</sup>	3-0-0	6

**Strain Analysis Methods:** Three element rectangular strain rosette, correction, stress gauges, over-deterministic methods for strain analysis, residual stress determination Applications: Application of strain gauges for measurement of load, temperature, pressure, vibration, stress and strain etc.

**Optical Methods of Stress Analysis:** Basic of Optics, Optical Instrumentation Moiré Fringe technique-theory and experimental procedures, Fractional fringe measurement- Tardy's Method, Babinet Soleil Method.

**Theory of Photoelasticity:** Polariscope- Plane polariscope, Circular polariscope, Different Arrangements photo elastic photography, Photo elastic materials-properties, selection, casting methods, calibration. Analysis Techniques-Determination of direction of Principal stresses at given point, Determination of exact fringe order N and the principal stress Separation methods, Method based on Hooke's Law, Electrical analogy method, Oblique incidence method, Shear difference method, Scaling model results to prototype Application of photo elasticity to 2-D and 3-D Stress analysis.

**Optical methods for Determining Fracture Parameters:** Irwin's methods, application. of moiré and isopachic fringe pattern to determine stress intensity factor, mixed mode intensity factors.

**Coating Techniques:** Bifringent coating- stress-optic and strain-optic relation, sensitivity and coating materials, fringe order determination. Brittle coating technique. Strategy.

**Holography:** Plane and spherical waves - coherence - holographic setup – Interferometry - Displacement measurement - obtaining Isopachics.

**Books:-**

SL.No	Name of the book	Author	Publication
1	Experimental Stress Analysis	J.W. Dalley and W.F. Riley	Mc Graw hill international.
2	Experimental Stress Analysis	L.S. Srinath et al	Tata McGraw Hill.
3	Experimental Stress Analysis	Sadhu Singh	Khanna Publishers.