Shri Rawatpura Sarkar University, Raipur

Examination Scheme & Syllabus

for

M.Tech.(Thermal Engineering)

Semester-III

(Effective from the session: 2022-23)

Faculty of Engineering
Shri Rawatpura Sarkar University, Raipur
M.Tech. (Thermal Engineering)
Semester-III
Examination Scheme
(Effective from the session: 2022-23)

S.N	Course Code	Th /Pr	Subject	Type of Course	Teaching hours per week				Examination Scheme				Total Marks
					L	T	P	TC	Theory		Practical		
									EX	IN	EX	IN	
1	MENTH301	**Th**	Computational Fluid Dynamics & Heat Transfer	Core	3	1	-	4	70	30	-	-	100
2	MENTH302	**Th**	Electives - III	Core	3	1	-	4	70	30	-	-	100
3	MENTH303	**Th**	Preliminary work on Dissertation	Core	-	-	28	14	-	-	140	60	200
4	MENTH301P	**Pr**	Seminar on Industrial Training and Dissertation	Core	-	-	4	2	-	-	-	100	100
	Total Contact hr per week:			**Total Credit:**					**Grand Total Marks:**				

L – LECTURE, T- TUTORIAL, P- PRACTICAL, EX-EXAM, IN- INTERNAL, TC- TOTAL CREDIT, Th- THOERY, Pr- PRACTICAL

List of Electives-III

S.No.	Subject	Subject Code
I	Power Plant Engineering	
II	Cold Preservation of Food	
III	Bio-Fluid Mechanics	
IV	Micro & Nano Scale Thermal Engineering	

Course Title	**ADVANCED MANUFACTURING PROCESSES**				
Course Code	**MENPE301**				
Course Credits	**L**	**T**	**P**	**TC**	
	3	**1**	**-**	**4**	
Prerequisites	Understanding of basic concept of Manufacturing Processes: UG level manufacturing technique course.				
Course Objectives	**This course will enable students to:** • Topics include: technological and manufacturing paradigms and the process of innovation, supporting systems, methodologies and techniques comprising design for manufacture. • Study of Advanced machining processes - introduction of USM, AJM, ECM, EDM, LBM, and EBM; • Advanced forming processes - electro-magnetic forming, explosive forming, electro-hydraulic forming, stretch forming, contour roll forming • Advanced welding processes - EBW, LBW, USW • Advanced foundry processes - metal mould, continuous, squeeze, vacuum mould, evaporative pattern, and ceramic shell casting.				
Course Contents	**UNIT – I** **Competitive Aspects of Manufacturing Processes** Selection of Material, product, design and quality of material, substitution of material, selection of manufacturing process, process capabilities, manufacturing considerations. Heat treatment of steel, Designation of steel. **UNIT - II** **Advanced Casting Processes** Metal mould casting, expendable mould – permanent pattern, expendable mould – expendable pattern, Continuous casting, Squeeze casting, Vacuum mould casting, Evaporative pattern casting, Ceramic shell casting, foundry mechanization. **UNIT - III** **Advanced Welding Processes** Welding – Solid state bonding – cold, diffusion, forge friction, liquid state – Joint, weld ability , Adhesive bonding – Types of adhesive, adhesive systems, Details of				

	electron beam welding (EBW), laser beam welding (LBW) ultrasonic welding (USW), welding of plastics, thermal cutting. **UNIT - IV** **Advanced Metal Forming Processes** Details of high energy rate forming (HERF) process, Electro-magnetic forming, explosive forming, Electro-hydraulic forming, Contour roll forming, Stretch forming **UNIT - V** **Advanced Machining Processes** Introduction, Process principle, Material removal mechanism, Parametric analysis and applications of processes such as ultrasonic machining (USM). Abrasive jet machining (AJM), Water jet machining (WJM), Abrasive water jet machining (AWJM), Electrochemical machining (ECM), Electro discharge machining (EDM), Electron beam machining (EBM), Laser beam machining (LBM) processes.
Course outcomes	**After the completion of course:** 1. Discuss the theory, concepts and principles of manufacturing engineering and quality systems. 2. Develop range of issues and problems related to the subject. 3. Manufacturing engineering and quality engineering are core systems used by organizations in the process of developing new products and getting them into production.
Text Books	1. Manufacturing Engineering Technology – S. Kalpakjian & S.C. Schemid – Pearson Education – New Delhi 2. Introduction to Manufacturing Processes – J.A. Schey – McGraw Hill, New York
Reference Books	1. Manufacturing Science – A. Ghosh & A. Mallik – Affiliated East West Press, Delhi. 2. Mechanical Metallurgy – G.E. Dieter – McGraw Hill, New York 3. Principles of Manufacturing Material and Processes – J.S. Cambell – TMH, New Delhi 4. "Materials and Processes in Manufacturing" (8th Edition), E. P. DeGarmo, J. T Black, R. A. Kohser 5. "Manufacturing Science" A. Ghosh, and A. K. Mallik, Affiliated East-West Press Pvt. Ltd. New Delhi. 6. "Nontraditional Manufacturing Processes", G.F. Benedict, Marcel Dekker, Inc. New York

Elective –III

Course Title	**PRODUCTIVITY MANAGEMENT**				
Course Code	**MENPE302A**				
Course Credits	**L**	**T**	**P**	**TC**	
	3	**1**	**-**	**4**	
Prerequisites					
Course Objectives	**This course will enable students: -** • To understand the latest developments in material science and materials to cope up with requirements of industry. • To Understand the developments in non-conventional manufacturing processes • To provide a technical understanding of common processes to aid in appropriate process selection for the material and required tolerances • To provide a technical understanding of common processes to aid in appropriate material selection for a predetermined process.				
Course Contents	**UNIT- I** **Productivity** Output, different inputs and productivity measures, partial and indirect measures, multi-factor productivity, Efficiency and effectiveness, quantity orientation, productivity and quality, measures to increase productivity. **UNIT- II** **Modern Tools and Techniques for Productivity Improvement** Job Redesign, human resource, Development Business Process Engineering, Bench Marking, Just-in-Time Production, Single Unit Production and Conveyance, Yo-I-Don and standardization, Kanban Production Information System. **UNIT- III** **Operation Strategy** Operations Decision, priorities, components of production strategy, framework for manufacturing, types, developing and implementing, focused operations, strategic management process, interfaces between operations and marketing function, Porter's five forces Models, Meaningful differentiation, flexibility,				

	comparison, Traditional Vs New approach, cost leadership, operation strategies. **UNIT- IV** **Performance Measurement** Principles, Indicators, key success factors, performance measurement system issues, Design and Implementation of performance measurement system. **UNIT- V** **Technology Management** Technical issues and Implications, Technology Development and Acquisition, Technology Absorption and Diffusion, Technology Environment, Technology Support System.
Course outcomes	**The students should be able to:** • Discuss the relative advantages and disadvantages for the techniques covered in class. • Be able to identify and justify the selection of at least 3 techniques to evaluate a particular sample. • Be given an unknown sample (or have one from own research) and collect a targeted dataset on it using an instrument available on campus.
Text Books	1. Production & Operation Management – S.N. Chary – TMH, Delhi 2. Productivity Engineering & Management – Sumanth David J. – TMH, Delhi
Reference Books	1. Productivity Management- Concepts and Techniques – S.C. Sawhney – TMH, Delhi 2. Industrial Engineering & Production Management – Martand Telsang – S. Chand & Co., Delhi 3. Managing Productivity - Schaffen Robot – Jaico Publishing House, Bombay

Elective-III

Course Title	**ADVANCES IN MATERIAL PROCESSING**				
Course Code	**MENPE302B**				
Course Credits	**L**	**T**	**P**	**TC**	
	3	**1**	**-**	**4**	
Prerequisites	**Material science and engineering, manufacturing science physical chemistry etc.**				
• **Course Objectives**	**This course will enable students: -** • To review physics and chemistry in the context of materials science & engineering. • To describe the different types of bonding in solids, and the physical ramifications of these differences. • Give an introduction to metals, ceramics, polymers, and electronic materials in the context of a molecular level understanding of bonding. • Give an introduction to the relation between processing, structure, and physical properties. • Give the beginning student an appreciation of recent developments in materials science & engineering within the framework of this class. • Give the beginning student an opportunity for teamwork in research Give the beginning student practice in basic expository technical writing.				
Course Contents	**Unit I** **Introduction to Advance Material** Composites, Ceramic, Polymer, Super alloy, Refractory metal and alloy, Low melting alloy, precious metal, shape memory alloy, amorphous alloy. **Unit II** **Solidification Principle** Heat transfer in solidification, Nucleation and growth, Plane front solidification of alloy, Lateral segregation, cellular and dendritic growth, segregation, solidification process and cast structure, single crystal growth, grain refinement and eutectic modification. **Unit III**				

	New Solidification Process Rapid solidification process: conduction process and convection process, chill block melt spinning process, free flight melt spinning process, free jet melt spinning process, planer flow casting process, crucible melt extraction process, spray deposition process, plasm spray deposition process, ultrasonic gas atomization process. **Solidification of metal matrix Composite** Infiltration Casting process, dispersion process, spray casting process, reactive processing, Squeeze casting, semi mold metal forming process, Cosworth process, Improved low pressure casting process (LIP), Directional solidification processing. **Unit IV** **Powder Metallurgy** Recent Advances in Powder Metallurgy: Hot Isostatic pressing, spark discharge sintering, gravity sintering, Induction sintering, sinter HIP process, ceracon process, Ospney process, Metal Inspection molding, Designing the powder Metallurgy parts for production. **Unit V** **Special Processing Methods** Hot machining, Unit head, Plasting tooling, Electroforming, surface cleaning and surface treatment, surface coating, surface coating for tooling. Modern techniques for Material Studies Optical Microscope, Electron Microscope, Chemical Analysis using atomic absorption, spectroscope, photoelectron spectroscope, magnetic resonance.
Course outcomes	The student will be able to: • Analyze the type of failure and reasons thereof for an alloy system under different loading conditions. • Select a suitable heat treatment/ case hardening for a given alloy application. • Identify the key characteristics, processing and applications of composites and AHSS. • Select a suitable strengthening mechanism for a given alloy composition and application. • analyze the thermal, metallurgical aspects during solidification in casting and welding and their role on quality of cast or weld objects.
Text Books	1. Fundamentals of solidification – W. Kurz and D.J. Fisher – Tans Tech. Publication 2. Rapidly solidified metals – T. R. Anantbraman C. Suryaharyan – Trans Tech. Publication
Reference Books	1. Modern Ceramic Engineering – D. W. Richardson – Mareel Dekker Inc. 2. ASM Handbook Vol. 7 & 15 ASM Inst.

Elective-III

Course Title	**Ergonomics**				
Course Code	**MENAE104C**				
Course Credits	**L**	**T**	**P**	**TC**	
	3	**1**	**-**	**4**	
Prerequisites	**Management basic concepts etc**				
Course Objectives	This course aims to: • Provide a broad-based introduction to ergonomic principles and their application in the design of work, equipment and the workplace. Consideration is given to musculo-skeletal disorders, manual handling, ergonomic aspects of the environment as well as to the social and legal aspects.				
Course Contents	**UNIT-I** **Human factors in Production System** Characteristics, features of man-machine system, Human performance and performance reliability, the human sensory motor system, stimulus dimensions, human information processing, noise and theory of signal detection. **Displays** Quantitative and Qualitative visual displays, auditory displays, factual and factory displays. **UNIT-II** **Method Study** Objectives, steps, human factor considerations, recording techniques, critical evaluation of method, learning curves. **UNIT-III** **Control System** Special movements and conceptual relationship of stimuli and response, continuous control system, control functions, tools and related devices, design of work place and works components, applied anthropomely, activity analysis, motion economy, design of individual work place. **UNIT-IV** **Human Performance** Performance under heat, cold, illumination, vibration, noise, pollution, static				

	and dynamic condition, organizational factors, energy expenditure in physical work activity, shift, work, age, sex. **UNIT-V** **Biomechanics** Concepts and principles, Bio-Engineering aspects of human motor activity, performance analysis of body, members in making specific movements.
Course outcomes	**The students should be able to:** • apply ergonomic principles to the creation of safer, healthier and more efficient and effective activities in the workplace. • conduct ergonomic risk assessments. • develop appropriate control measures for ergonomic risk factors. • describe work-related causes of musculo-skeletal disorders. • design a workplace according to good ergonomic principles. • assess ergonomic aspects of the working environment and work organization.
Text Books	1. Ergonomics – Murrel 2. Human Factors Engineering – Mc Comick & Sanders
Reference Books	1. Work Study – ILO – Universal Publications, Bombay 2. Motion & Time Study – Barnes R.M. – John Wiley & Sons, New York