Shri Rawatpura Sarkar University, Raipur

Examination Scheme & Syllabus

for

M.Tech.(Machine Design)

Semester-III

(Effective from the session: 2022-23)

SHRI RAWATPURA SARKAR UNIVERSITY, RAIPUR, CHHATTISGARH
FACULTY OF ENGINEERING

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

S. N	Course Code	Th/ Pr	Subject	Type of Course	Teaching hours per week			TC	Examination Scheme				Total Marks
					L	T	P		Theory		Practical		
									EX	IN	EX	IN	
1	MENDE301T	Th	Robotics	Core	3	1	-	4	70	30	-	-	100
2	MENDE302T	Th	Elective-III	Core	3	1	-	4	70	30	-	-	100
3	MENDE303P	Pr	Preliminary work on dissertation	-	-	-	28	14	-	-	140	60	200
4	MENDE304P	Pr	Seminar based on Dissertatio	-	-	-	4	2	-	-	-	100	100
	Total Contact hr per week: 32			**Total Credit:24**					**Grand Total Marks:**				**500**

L: LECTURE T: TUTORIAL P: PRACTICAL TC: TOTAL CREDIT

Elective-III

S.NO.	Subject Name	Subject Code
1	Fatigue & Creep	MENDE302A
2	Measurement System Analysis	MENDE302B
3	Computer Graphics & Visualization	MENDE302C

M.Tech. (Machine Design)
Semester-I
2022-23

<table>
<tr><td>Course Title</td><td colspan="5">ROBOTICS</td></tr>
<tr><td>Course Code</td><td colspan="5">MENDE301</td></tr>
<tr><td rowspan="2">Course Credits</td><td>L</td><td>T</td><td>P</td><td>TC</td><td></td></tr>
<tr><td>3</td><td>1</td><td>-</td><td>4</td><td></td></tr>
<tr><td>Prerequisites</td><td colspan="5">Understanding of basic concept of Manufacturing Processes: UG level manufacturing technique course.</td></tr>
<tr><td>Course Objectives</td><td colspan="5">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.</td></tr>
<tr><td>Course Contents</td><td colspan="5">UNIT – I
Competitive Aspects of Manufacturing Processes
UNIT-1
Robotics
Basic concepts in Robotics: Advances and application and application of robotics in Robots, Resolution, Accuracy and Repeatability, Point Continues part system control loops, types of manipulators, wrist & Grippers.
UNIT-2
Kinematic Analysis of Robotics
Geometry based direct kinematics, Co-ordinate and vector transformation using matrix, Denant-Hartenberg Conversion, application of DH notation, Inverse Kinematics.

UNIT-3
Robot – A Dynamics: Elementary treatment of Lagrange –Euler, Newton – Euler formulations, Generalized D’Alembert equation of motion.
UNIT-4
Drives, Control of Trajectory: Hydraulic system stepper motor, Direct current servomotors, A-C servomotors, adaptive control, interpolars, trajectory planning, resolved motion rate control methods.</td></tr>
</table>

	UNIT-5 Robotic Sensors: Vision system, Range proximity, touch, force and torque Sensors, Assembly-Aid devices, Robot Programming, Artificial Intelligence. Applications of Robot: Handling, loading unloading, welding, painting, assembly, Machining, Manufacturing, Work – cell, Installation of Robots.
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. **M.**P.Groover, M.Weiss, P.N.Nagal and N.G.Odrey, Industrial Robotics, Mcgraw Hill International Deduction, 1986 2. K.S.Fu, R.C, Gonzaler C.S.G.Lee, Robothes (Control, Sensing vision & intelligence)
Reference Books	1. Shimon Y.Nof (Editor) handbook of industrial robotics, John wiley and sons, 1985 2. Fu K.S. , Gonzalez R.C and Lee C.S.G., Robotics : Control sensing vision and intelligence ,Mcgraw Hill ,1987 3. D.T.Pham, Expert –System in Engineering, Springer Verlog, 1988 Anthony C.McDonald, Robot Technology, theory, design and applications Prentice Hall, New Jersey 1986 4. Yoren Koren, Robotes for Engineers.

M.Tech. (Machine Design)
Semester-I
2022-23
Elective –III

Course Title	**FATIGUE & CREEP**				
Course Code	**MENDE302A**				
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** Design Against Fatigue: Factors affecting fatigue behaviour, Environmental effects, Influence of superimposed static stress, Gerber parabola, Modified Good man diagram, Sadenburg line, Stress Concentration, Notch sensitivity, Cumulative fatigue damage, Linear damage rule, Miners Equation, Practical measure to combat fatigue. Loading in finite /life range **UNIT-2** Design Against Fracture: Stress intensity, factor of a crack in finite bodies, fracture criteria, Fracture toughness, Fatigue crack propagation, Plastic deformation, Plastic deformation around crack tip, Crack opening displacement, Design of steam, turbine rotors, Rotor discs, Design of thin walled pressure vessels and pressure piping, **UNIT-3** Design Against Creep: Creep of solids, Creep phenomenon, Parameter methods, Larson Miller Parameter, herby Dorn parameter, Manson Hafford parameter, Creep under biaxial stress, Materials for application at elevated temperature **UNIT-4** Surface Failure: Surface geometry, Mating surfaces, Different types of wears - Adhesive, Abresive, Corosion, Pitting, spalling: Contact pressure in spherical contact, Stress distribution in spherical contact, Stresses in ball and thrust bearing Cylinder contact stresses, Stresses in cam and follower, Surface				

	fatigue strength. **UNIT-5** Design for reliability: Introduction Probabilistic approach to design, Design for reliability, Failure mode and effects analysis, Design for safety
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. P Mechanical Engineering Design – Joseph E Shigley & Charles R Mischke 2. Engineering Design – George E Dieter (McGraw Hill)
Reference Books	1. Advanced Machine Design – A Mubeen (Khanna Publisher) 2. Machine Design – Robert L Norton (Pearson Education)

M.Tech. (Machine Design)
Semester-I
2022-23
Elective-III

<table>
<tr><td>Course Title</td><td colspan="5">MEASUREMENT SYSTEM ANALYSIS</td></tr>
<tr><td>Course Code</td><td colspan="5">MENDE302B</td></tr>
<tr><td rowspan="2">Course Credits</td><td>L</td><td>T</td><td>P</td><td>TC</td><td></td></tr>
<tr><td>3</td><td>1</td><td>-</td><td>4</td><td></td></tr>
<tr><td>Prerequisites</td><td colspan="5">Material science and engineering, manufacturing science physical chemistry etc.</td></tr>
<tr><td>Course Objectives</td><td colspan="5">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.</td></tr>
<tr><td>Course Contents</td><td colspan="5">UNIT I

Analysis of Measurement: Classification of Measurement, Analysis of Experimental data, Types of measurement errors, Uncertainity analysis, Propagation of uncertainty and Curve fitting

UNIT-II
Static & Dynamic Characteristics: Measurement system variations, static performance, characteristics, linearity, Static sensitivity, Repeatebility, Hysteris threshold resolution, Redability and span, Dynamic Characteristic

UNIT-III
Direct, Indirect & Combined Measurement: Direct Measurements, Relationship between single and multiple measurement, Estimation of elementary errors, Calculation of uncertainty in multiple measurements, Indirect Measurements, Correlation coefficient and combined measurement, Measurement with linear equality and inequality

UNIT-IV
Data analysis: Data acquisition and processing: Types and configuration of DAS, Signal conditioning, A/D, D/A conversions, Electro-optical devices, piezoelectric transducer, photo elastic, brittle coating and Moire Fringe stress – analysis techniques.</td></tr>
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	UNIT-V Theory of Calibration Types of Calibration, Estimation of Measement Instruments in Verification, Rejects of verification and ways to reduce their number, calculation of a necessary number of standards.
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. FMechanical Measurement – Buck & Beckwith - Narosa Publishing House
Reference Books	1. Modern Measurement system – Ernest O Doeblin – Tata Mc Graw Hill 1994 2. Experimental Methods for engineers, Hallisman, Tata McGraw Hill 3. Engineering Experimentation –Doeblin, Tata Mcgraw Hill 4. Measurement Errors and Uncertanities-Semyon G. Rabinvich-AIP Press Pub. 5. Measurement & Metrology – A.K.Shawney & M.Mahajan of solidification – W. Kurz and D.J. Fisher – Tans Tech. Publication

Elective-III

Course Title	**Computer Graphics & Visualization**
Course Code	**MENDE104C**

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** Raster graphics and volume graphics. Video basics. Display devices and interactive devices; 2-D and 3-D graphics primitives. Clipping in 2-D and 3-D; Generation and projection of 3-D wire frame solid models, polygonal models. Space curves and surface models. **UNIT-II** Intersection of surfaces and blending; hidden line and hidden surface elimination algorithms; Ray-surface intersection and inverse mapping algorithms. Ray tracing for photo realistic rendering. Illumination models. Shading, Transparency, Shadowing and Texture mapping; Representation of colours. **UNIT-III** Visualization of experimental and simulated data. Surface construction from scattered data, 3-D data arrays and 2-D cross sections. Elevation maps, topological maps, contour maps and intensity maps; fractals for visualization of complex and large data sets. **UNIT-IV** Algebraic stochastic and Geometric fractals. Modeling of natural forms and textures using fractals; Visualization of multi variate relations. Flow visualization and hyper streamlines; Visualization of Meteorological, cosmological, seismic, biological data for scientific decision making. **UNIT-V** Animation. Modeling issues in dynamic visualization. Behavioral animation; walk through – coordinate transformation and view transformation; virtual reality interfaces. Interactive				

	and immerse systems for Prototyping and visualization; Visualization in concurrent engineering. Interactive multimedia technology and standards for Video-Graphics -Audio integration and tele-video conferencing.
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. Computer Graphics By Krishnamoorthy TMH
Reference Books	1. Computer Graphics a Program Approach By Harrington 2. Computer Graphics By Hearn & Baker