Shri Shankaracharya Technical Campus, Bhilai

(An Autonomous Institute affiliated to Chhattisgarh Swami Vivekanand Technical University Bhilai)

SCHEME OF EXAMINATION AND SYLLABUS

M. Tech. (MACHINE DESIGN)

SEMSETER – III

SL. NO.	BOARD OF STUDY	SUBJECT CODE	SUBJECT	PERIODS/WEEK			EXAMINATION SCHEME			TOTAL MARKS	CREDIT L+(T+P)/2
				L	T	P	ESE	CT	TA		
1	Mechanical Engineering	ME224301	Research Methodology & Report Writing	3	1	-	100	20	20	140	4
2	Mechanical Engineering		ELECTIVE - III	3	1	-	100	20	20	140	4
3	Mechanical Engineering	ME224391	Preliminary work on Dissertation	-	-	28	100	-	100	200	14
4	Mechanical Engineering	ME224300	Seminar on Industrial Training and Dissertation	-	-	4	-	-	20	20	2
TOTAL				6	2	32	300	40	160	500	24

L – Lecture, T –Tutorial, P – Practical, ESE – End Semester Exam, CT – Class Test, TA – Teacher's Assessment

ELECTIVE - III			
SL. No.	Board of Study	Subject Code	Subject
1.	Mechanical Engineering	ME224321	Rotor Dynamics
2.	Mechanical Engineering	ME224322	Fracture Mechanics
3.	Mechanical Engineering	ME224323	Acoustics and Noise control
4.	Mechanical Engineering	ME224324	Mechatronics
5.	Mechanical Engineering	ME224325	Modelling and Simulation of Mechanical Systems

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SEMESTER – IV

SL. NO.	BOARD OF STUDY	SUBJECT CODE	SUBJECT	PERIODS/WEEK			EXAMINATION SCHEME			TOTAL MARKS	CREDIT
				L	T	P	ESE	CT	TA		
1	Mechanical Engineering	ME224491	Dissertation + Seminar	-	-	32	300	-	200	500	16
TOTAL				0	0	32	300	0	200	500	16

L – Lecture, T –Tutorial, P – Practical, ESE − End Semester Exam, CT − Class Test, TA – Teacher's Assessment

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SCHEME OF EXAMINATION AND SYLLABUS

M. Tech. (MACHINE DESIGN)

Subject Code ME224301	Research Methodology & Report Writing	L = 3	T = 1	P = 0	Credits = 4
Evaluation Scheme	ESE	CT	TA	Total	ESE Duration
	100	20	20	140	3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
1. To provide an overview of the research methodology and explain the technique of defining a research problem. 2. To provide exposure to various research designs and their characteristics. 3. To impart the knowledge of techniques of data collection and data analysis. 4. To impart an understanding of the art of interpretation and the art of writing research reports.	**At the end of this course, the students are expected to be able to:** **CO1:** Understand the importance and concepts and key components of a research problem. **CO2:** Understand various methods of research process and carry out the literature survey. **CO3:** Understand and apply the techniques of data collection and data sampling. **CO4:** Understand and apply the statistical techniques of data analysis. **CO5:** Understand the procedure of research report writing.

Unit – 1 CO1

Introduction to Research: Objective and importance of research, Types of research, steps involved in research, defining research problem. **[8 Hrs]**

Unit – 2 CO2

Research Design: Methods of research design, research process and steps involved, Literature Survey. **[10 Hrs]**

Unit – 3 CO3

Data Collection: Classification of Data, Methods of Data Collection, Sampling, Sampling techniques procedure and methods, Ethical considerations in research. **[10 Hrs]**

Unit – 4 CO4

Data Analysis: Importance of Data analysis, Statistical techniques and choosing an appropriate statistical technique, Hypothesis, Hypothesis testing, Data processing software (e.g. SPSS etc.), statistical inference, Interpretation of results **[10 Hrs]**

Unit – 5 CO5

Technical Writing and reporting of research: Types of research report: Dissertation and Thesis, research paper, review article, short communication, conference presentation etc., Referencing and referencing styles, Research Journals, Indexing and citation of Journals, Intellectual property, P lagiarism. **[10 Hrs]**

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Chairman (AC)	Chairman (BoS)	Date of Release	Version	

Text Books:

1. Research Methodology: Methods and Techniques – C.R. Kothari and Gaurav Garg – New Age International.
2. Research Methodology - a step by step guide for beginners – Ranjit Kumar – SAGE Publications Ltd.

Reference Books:

1. An introduction to Research Methodology – Garg B.L. et al. – RBSA Publishers.
2. An Introduction to Multivariate Statistical Analysis – Anderson T.W. – Wiley.
3. Proposal Writing – Coley S.M. Scheinberg, C.A. – SAGE Publications Ltd.

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SCHEME OF EXAMINATION AND SYLLABUS

M. Tech. (MACHINE DESIGN)

Subject Code ME224321	Rotor Dynamics	L = 3	T = 1	P = 0	Credits = 4
Evaluation Scheme	ESE	CT	TA	Total	ESE Duration
	100	20	20	140	3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
The course aims to equip the students to the methods of modeling and analyzing rotating machines for their dynamic behavior.	**At the end of this course, the students are expected to be able to:** **CO1:** Understand the mechanics of rotating machines. **CO2:** Analyze the free lateral response of rigid and flexible rotors models. **CO3:** Analyze the forced lateral response of rotor models and calculate critical speeds of rotors. **CO4:** Understand and apply balancing techniques of rotating components. **CO5:** Understand the methods of condition monitoring of rotating machines and identify the faults in rotating components.

Unit – 1 CO1

Introduction: Rotating machine Components, Aspects of rotating machine behavior, examples of rotating machines: Electrical Machines, Turbo generators, Gas Turbines. **[8 Hours]**

Unit – 2 CO2

Free lateral response of simple rotor models: Gyroscopic couples, Rigid rotors on flexible supports, Isotropic flexible supports, Simple model for flexible rotors. **[10 Hrs]**

Unit – 3 CO3

Forced lateral response: Rotor models, Critical speeds, Mode shapes associated with critical speeds, Stresses in rotors, Asymmetric rotors and instability. **[10 Hrs]**

Unit – 4 CO4

Balancing: balancing rigid rotors at design stage, Field balancing of rigid rotors, Field balancing of flexible rotors. **[10 Hrs]**

Unit – 5 CO5

Condition Monitoring of rotating machines: Different faults in rotors and their signatures, Data acquisition, Basic signal processing. **[10 Hrs]**

Text Books:

1. Dynamics of Rotating Machines, 1st edition – M. I. Friswell, J. E. T. Penny, S. D. Garvey, A. W. Lee – Cambridge University Press.

Reference Books:

1. Rotor Systems: Analysis and Identification, 1st edition – Tiwari R. – CRC Press, Florida.
2. Rotor Dynamics, 3rd edition – Rao J.S. – New Age, New Delhi.

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SCHEME OF EXAMINATION AND SYLLABUS

M. Tech. (MACHINE DESIGN)

Subject Code ME224322	Fracture Mechanics	L = 3	T = 1	P = 0	Credits = 4
Evaluation Scheme	ESE	CT	TA	Total	ESE Duration
	100	20	20	140	3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
1. To impart an understanding on the fracture behaviour of materials. 2. To make the students conversant with the fundamentals of crack propagation in materials and structures.	**At the end of this course, the students are expected to be able to:** **CO1:** Understand about different types of fracture and their effect on the material behaviour. **CO2:** Analyze the effects of crack on behaviour of materials. **CO3:** Analyze the fracture criteria by energy approach. **CO4:** Understand fundamentals of crack propagation in materials and structures. **CO5:** Understand the experimental techniques of detection and testing of cracks in a material specimen.

Unit – 1 CO1

Introduction to Fracture Mechanics: Types of fracture, Microstructural description of fracture, Mechanisms of Fracture, Stress concentration factor. **[8 Hrs]**

Unit – 2 CO2

Linear Elastic Fracture Mechanics (LEFM): Different modes of crack opening, Stresses and displacement around the stationary crack under static load. Airy stress function, Stress intensity factors (SIF), Determination of SIF, Fracture toughness, Irwin's criterion, K-dominance, Small scale yielding, Fracture testing. **[10 Hrs]**

Unit – 3 CO3

Energy Approach: Energy release rate, Griffith criterion, Relationship between G and K, J-integral, Fracture criteria in mixed mode fracture and effect of mixed mode plasticity. **[10 Hrs]**

Unit – 4 CO4

Nonlinear Fracture Mechanics: HRR-singularity field, J-dominance, Small scale yielding, Large scale yielding, Initiation and propagation of crack and its stability, Propagation of crack under fatigue load and effect of residual stresses. **[10 Hrs]**

Unit – 5 CO5

Experimental methods: Different types of test specimens and testing procedures. Detection of cracks. Stress waves, dynamic nature of fracture, crack speed and crack arrest.

Brief introduction to analytical and numerical methods in fracture mechanics. **[10 Hrs]**

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Text Books:

1. Elementary Engineering Fracture Mechanics – D. Broek – Springer; 4th edition.
2. Fundamentals of Fracture Mechanics – F. Knott

Reference Books:

1. Fracture Mechanics: Fundamentals and Applications – T. L. Anderson – CRC Press.
2. Elements of Fracture Mechanics – Prashant Kumar – McGraw-Hill.
3. Deformation and Fracture Mechanics of Engineering Materials – Richard W. Hertzberg – Wiley.

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SCHEME OF EXAMINATION AND SYLLABUS

M. Tech. (MACHINE DESIGN)

Subject Code ME224323	Acoustics and Noise control	L = 3	T = 1	P = 0	Credits = 4
Evaluation Scheme	ESE	CT	TA	Total	ESE Duration
	100	20	20	140	3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
Noise and Harshness has become a major issue in today's society, which calls for a quitter technology. This course will be extremely useful for engineers and researchers to design quitter machines or machine components.	**At the end of this course, the students are expected to be able to:** **CO1:** Understand the concept of technical acoustics. **CO2:** Apply the concept in solving industrial problems. **CO3:** Develop software code for a proper mathematical modeling. **CO4:** Identify a suitable research topic to solve realistic industrial problem.

Unit – 1 CO1

Fundamentals of vibration, Sound and vibration, Acoustics and engineers, basics of acoustics, dB levels, Concept of acoustic impedance etc. **[10 Hrs]**

Unit – 2 CO2

Type of waves, Characteristic of waves, Mathematical models of sound waves, 3D Wave equation. **[8 Hrs]**

Unit – 3 CO3

Acoustics of cavity, Helmholtz resonator, noise control techniques, Noise Control Application, Acoustics of Mufflers etc. **[10 Hrs]**

Unit – 4 CO3

Experimental Techniques, Source Modeling, Acoustic Structure Interaction, Sound Radiation from Vibrating Infinite Plate. **[10 Hrs]**

Unit – 5 CO4

Wavenumber space, K-Space Diagram, Concept of Angular Spectrum, Green's function, Rayleigh Integral, Velocity and far field pressure calculations, Directivity and Sound power calculation. **[10 Hrs]**

Text Books:

1. Noise and Vibration Control – M. L. Munjal – World Scientific Press, Singapore
2. Fundamentals of Acoustics – Lawrence E. Kinsler, Austin R. Frey, Alan B. Coppens and James V. Sanders – Wiley, New York.

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Reference Books:

1. Notes on Acoustics – Uno Ingard – Firewal Media, Delhi.
2. Fourier Acoustics: Sound Radiation and Near Field Acoustic Holography – E. G. Williams – Academic Press: New York.
3. Acoustics of Ducts and Mufflers, 2nd Edition – M. L. Munjal – John Wiley and Sons.