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Objectives :

1. To acquaint with working principles and applications of Governors /Gyroscope
2. To study static and dynamic force analysis in the mechanisms
3. To familiarise with basics of mechanical vibrations
4. To study the balancing of mechanical systems

Outcomes : Learner will be able to...

1. Demonstrate working Principles of different types of governors and Gyroscopic effects on the mechanical systems
2. Illustrate basic of static and dynamic forces
3. Determine natural frequency of element/system
4. Determine vibration response of mechanical elements /systems
5. Design vibration isolation system for a specific application
6. Demonstrate basic concepts of balancing of forces and couples

Module	Details	Hrs.
1	<p>Governors and Gyroscopes</p> <p>1.1 Governors : Introduction to Centrifugal and Inertia governors, Study and Force analysis of Porter and Hartnell governors including Performance characteristics, Governors effort and power. (Refer chapter 1)</p> <p>1.2 Gyroscope : Introduction, Gyroscopic couple and its effect on spinning bodies, naval ships during steering, pitching, rolling and their stabilization. (Refer chapter 2)</p>	09
2	<p>2.1 Static and Dynamic force analysis of Slider crank mechanism (neglecting mass of connecting rod and crank), Turning moment on crank shaft</p> <p>2.2 Dynamically equivalent systems to convert rigid body into two mass with and without correction couple (Case study - Connecting rod) (Refer chapter 3)</p>	06
	<p>3.1 Basic Concepts of Vibration : Vibration and oscillation, causes and effects of vibrations, Importance of study of vibrations, Vibration parameters - springs, mass, damper, Motion-</p>	

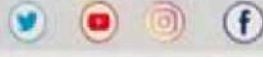
Module	Details	Hrs.
3	<p>periodic, non-periodic, degree of freedom, static equilibrium position, vibration classification, steps involved in vibration analysis (Refer chapter 4)</p> <p>3.2 Free Undamped Single Degree of Freedom Vibration System : Longitudinal, transverse, torsional vibration system, Methods for formulation of differential equations by Newton, Energy, Lagrangian and Rayleigh's method (Refer chapter 5)</p>	08
4	<p>4.1 Free Damped Single Degree of Freedom Vibration System : Introduction to different methods of damping, Study and analysis of (1) Viscous damped system (under damped, critically damped, over damped; Logarithmic decrement) (2) Coulomb's damping (Combined Viscous and Coulomb damping excluded) (Refer chapter 6)</p> <p>4.2 Equivalent Single Degree of Freedom Vibration System : Conversion of multi- springs, multi masses, multi-dampers into a single spring and damper with linear or rotational co-ordinate system (Refer chapters 4 and 7)</p>	07
5	<p>5.1 Forced Single Degree of Freedom Vibratory System : Analysis of linear and torsional systems subjected to harmonic force excitation and harmonic motion excitation (excluding elastic damper) (Refer chapter 8)</p> <p>5.2 Vibration Isolation and Transmissibility : Force Transmissibility, motion transmissibility, typical isolators & mounts. (Refer chapter 8)</p> <p>5.3 Vibration Measuring Instruments: Principle of seismic instruments, vibrometer, accelerometer - undamped and damped, Introduction to conditioning monitoring and fault diagnosis. (Refer chapter 9)</p>	10
6	<p>6.1 Rotor Dynamics : Critical speed of single rotor, undamped and damped (Refer chapter 10)</p> <p>6.2 Balancing : Static and Dynamic balancing of multi rotor system(up to four rotors), balancing of reciprocating masses in In-line engines(up to four cylinders) , Introduction to V-engines (excluding other radial engines) (Refer chapter 11)</p>	08

□□□



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MEC502	Thermal Engineering
MEC503	Dynamics of Machinery
MEC504	Finite Elements Analysis

Course Code	Departmental Elective
MEDLO5011	Optimization Techniques
MEDLO5012	Design of Experiments
MEDLO5013	Computational Methods



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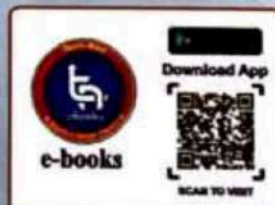
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MEC603	Heating, Ventilation, Air conditioning & Refrigeration
MEC604	Automation and Artificial Intelligence
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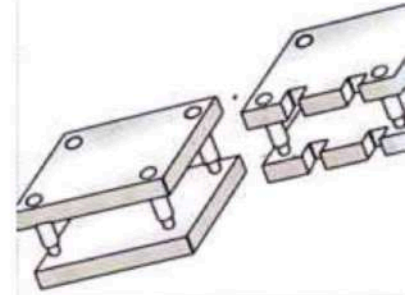
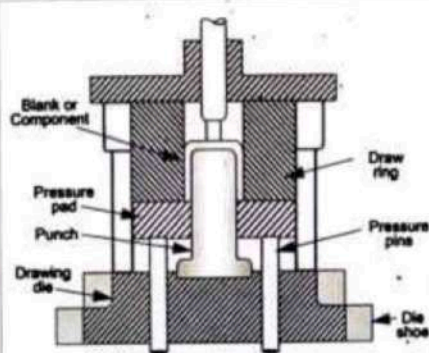
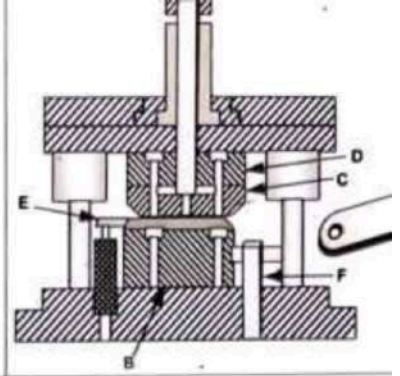
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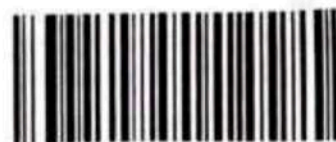
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Hari Vasudevan
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Proceedings of International Conference on Intelligent Manufacturing and Automation

ICIMA 2020

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Proceedings of International Conference on Intelligent Manufacturing and Automation

ICIMA 2020

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Preface

Advanced technologies in the current era ensure that we are in turbulent and challenging times as we attempt for wealth creation and business in the fields of manufacturing and automation. Industries are currently looking up to manufacturing and automation engineers for their assistance in increasing the overall productivity in their organizations. It is also the time when policymakers across the globe have started to focus more of their attention on the manufacturing sector due to the presence of disruptive technologies in manufacturing. The International Conference on Intelligent Manufacturing and Automation 2020 (ICIMA 2020) was therefore designed to encourage discussions and research on advancements and applications in the areas of manufacturing and automation. The primary focus of this conference was to bring together academicians, researchers and scientists for knowledge sharing in various areas of manufacturing, automation and other allied domains. This conference covered topics encompassing automation, mechatronics, robotics, manufacturing processes, management and other related areas, such as product design and development, green manufacturing and smart materials with the objective of brainstorming and with specific emphasis on the applications in the field of intelligent manufacturing and automation. The response to the call for papers was overwhelming with 181 articles submitted for this conference. Finally, 82 articles, covering a wide spectrum of topics related to the theme of this conference, were accepted after a thorough review process. We express our sincere appreciation to the authors for their contribution to this book. We would also like to express our sincere gratitude to all the experts and referees for their valuable comments and support extended during the review process. Thank you everyone once again!

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Mumbai, India
Aachen, Germany

Hari Vasudevan
Vijaya Kumar N. Kottur
Amool A. Raina

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