



MECHANICS OF MACHINES

SHAMSUL ANUAR SHAMSUDIN
MD FAHMI ABD SAMAD @ MAHMOOD
MOHD FADZLI ABDOLLAH
MOHD AZMAN ABDOLLAH
MOHD NIZAM SUDIN
SITI NORBAYA SAHADAN
NUR FATHIAH MOHD NOR
RAINAH ISMAIL

PERPUSTAKAAN Universiti Teknikal Malaysia Melaka	
87516940	No. Peruntukan TJ 170 853 2023 9
Tarikh 26 JAN 2024	nmn/310124

MECHANICS OF MACHINES

SHAMSUL ANUAR SHAMSUDIN
 MD FAHMI ABD SAMAD @ MAHMOOD
 MOHD FADZLI ABDOLLAH
 MOHD AZMAN ABDULLAH
 MOHD NIZAM SUDIN
 SITI NORBAYA SAHADAN
 NUR FATHIAH MOHD NOR
 RAINAH ISMAIL

Penerbit UTeM Press
 Universiti Teknikal Malaysia Melaka
 2023

© Universiti Teknikal Malaysia Melaka
ISBN: 978-967-2792-77-2

FIRST PUBLISHED 2023

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, electronic, mechanical photocopying, recording or otherwise, without the prior permission of the Penerbit UTeM Press, Universiti Teknikal Malaysia Melaka.

Member of the Malaysian Scholarly Publishing Council (MAPIM)
Member of the Malaysian Book Publishers Association (MABOPA)

Manuscript Editor:
Fatonah Salehuddin

Book Cover Designer and Typesetter:
Ahmad Mastuliyadi Mohd Yusof

Published and Printed in Malaysia by:
Penerbit UTeM Press
Universiti Teknikal Malaysia Melaka

Hang Tuah Jaya, 76100 Durian Tunggal, Melaka, Malaysia.
Tel: +606 270 1241 Faks: +606 270 1038



Cataloguing-in-Publication Data

Perpustakaan Negara Malaysia

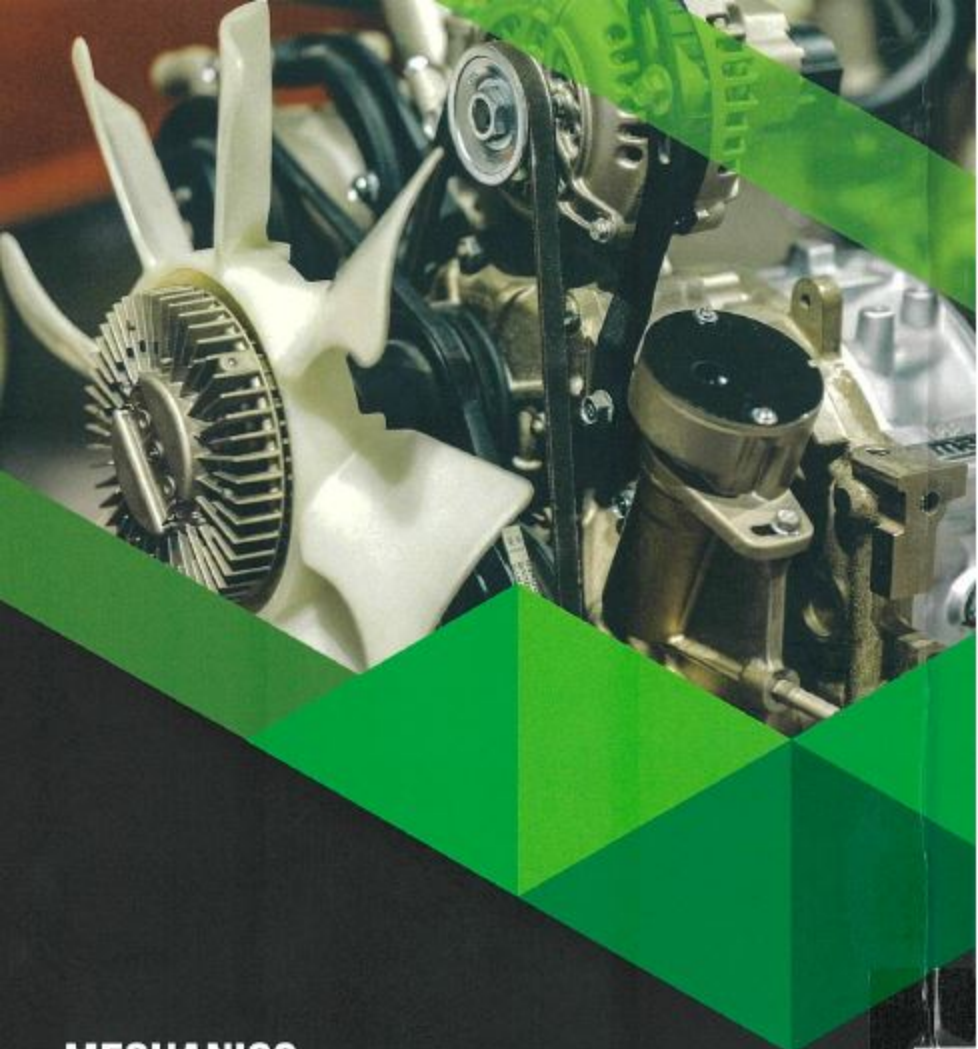
A catalogue record for this book is available
from the National Library of Malaysia

ISBN 978-967-2792-77-2

TABLE OF CONTENTS

Preface.....	vii
Chapter 1: Power Transmission.....	1
1.0 Chapter Outcomes.....	1
1.1 Centripetal and Centrifugal Forces.....	1
1.2 Belts.....	3
1.3 Gears.....	25
1.4 Problems.....	57
1.5 References.....	61
Chapter 2: Balancing.....	63
2.0 Chapter Outcome.....	63
2.1 Balancing in a Single Plane.....	63
2.2 Balancing in Multiple Planes.....	67
2.3 Solving by Analytical Method.....	80
2.4 In-Line Engine Balancing.....	84
2.5 Radial Engine Balancing.....	93
2.6 Problems.....	99
2.7 References.....	102
Chapter 3: Flywheel.....	103
3.0 Chapter Outcome.....	103
3.1 Flywheel.....	103
3.2 Problems.....	113
3.3 References.....	115
Chapter 4: Governor.....	117
4.0 Chapter Outcome.....	117
4.1 Governor.....	117
4.2 Centrifugal Governor.....	118
4.3 Watt Governor.....	121
4.4 Porter Governor.....	123

4.5	Proell Governor	124
4.6	Hartnell Governor.....	125
4.7	Sensitiveness of Governor.....	127
4.8	Problems.....	138
4.9	References	141
Chapter 5: Gyroscope		143
5.0	Chapter Outcome.....	143
5.1	Gyroscope	143
5.2	Problems.....	151
5.3	References	154
Chapter 6: Free Vibration		155
6.0	Chapter Outcomes	155
6.1	Fundamentals of Free Vibration	155
6.2	Simple Pendulum.....	156
6.3	Spring-Mass System	159
6.4	Shaft-Inertia System.....	162
6.5	Equivalent Method	166
6.6	Free Damped Vibration.....	176
6.7	Equivalent Damping Coefficient C'	180
6.8	Problems.....	186
6.9	References	190



MECHANICS OF MACHINES

FACULTY OF MECHANICAL ENGINEERING



PENERBIT
UTeM
Press

Website : <https://penerbit.utem.edu.my>
Books Online : <https://utembooks.utem.edu.my>
Email : penerbit@utem.edu.my

ISBN 978-967-2792-77-2



9 789672 792772