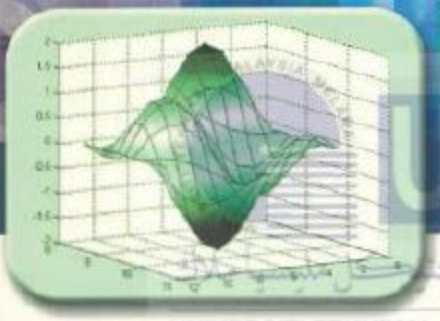
NUMERICAL METHODS



BACS 2222

STUDY GUIDE

اونيۏرسيتي تيکنيکل ملائسيا ملاکا
UNIVERSITI TEKNIKAL MALAYSIA MELAKA

PEARSON
Prentice Hall

KHOO CHIN FOON

KI/HIFT/a/on
UPKD AN: 87516113

Numerical Methods

BACS 2222 Study Guide

UTeM
اونيۏرسيتي تيكنيكل مليسيا ملاك

KHOO CHIN FOON
Department of Science & Mathematics,
Center for Academic Services
Kolej Universiti Teknikal Kebangsaan Malaysia

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

PEARSON
Prentice Hall

Published by

Prentice Hall
Pearson Malaysia Sdn. Bhd.
Lot 2, Jalan 215, Off Jalan Templer,
46050 Petaling Jaya,
Selangor, Malaysia
Tel: 03-77820466 Fax: 03-77853435

Pearson Education offices in Asia: *Bangkok, Beijing, Hong Kong, Jakarta, Manila, Kuala Lumpur, New Delhi, Seoul, Singapore, Taipei, Tokyo.*

Printed in Malaysia, DIM

Fourth print 2006

ISBN: 983-3205-63-1
Numerical Methods
Khoo Chin Foon

PERPUSTAKAAN
Universiti Teknikal Malaysia Melaka
No. Aksesan 87516113
No. Panggilan
Tarikh 11 SEP 2023

SprintPrint is a publishing service specially offered to lecturers to assist them in presenting their lectures to their students professionally and has not undergone the full Prentice Hall editorial process. For more information, please contact your Pearson Education representative or email us at publish@pearsoned.com.my

Copyright © 2005 Pearson Malaysia Sdn. Bhd.
All rights reserved. This publication is protected by Copyright and permission should be obtained from the Publisher prior to any prohibited reproduction, storage in a retrieval system, or transmission in any form or by any means, electronic, mechanical, photocopying, recording or otherwise. For information regarding permission(s), write to: Rights and Permissions Department.

CONTENTS

Chapter I	**Computer Representation of Numbers**	**1**
	1.1 Decimal system	1
	1.2 Binary system	1
	1.2.1 Converting a binary number to decimal number	2
	1.2.2 Converting a decimal number to binary number	3
	1.2.3 Converting a decimal fraction to binary fraction	3
	1.2.4 Addition in binary notation	4
	1.2.5 Subtraction in binary notation	4
	1.2.6 Multiplication in binary notation	4
	1.3 Octal system	4
	1.3.1 Converting a decimal number to octal number	5
	1.4 Hexadecimal system	5
	1.5 Floating-point numbers	5
	Exercise 1	7
Chapter II	**Error**	**8**
	2.1 Round-off error	8
	2.2 Truncation error	9
	Exercise 2	11
Chapter III	**The Solution of Nonlinear Equations**	**12**
	3.1 Bisection method	12
	3.2 Simple fixed-point iteration	16
	3.3 Newton-Raphson method	17
	3.4 Root location with MATLAB	19
	Exercise 3	21
Chapter IV	**The Solution of Linear Systems**	**22**
	4.1 Gaussian elimination	22
	4.2 Gaussian elimination with partial pivoting	24
	4.3 LU decomposition	26
	4.4 Gauss-Seidel method	32
	4.5 Linear algebraic equations with MATLAB	35
	Exercise 4	36

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

Chapter V	**Interpolation**		**37**
	5.1 Newton's interpolating polynomials	37	
	5.1.1 Linear interpolation	38	
	5.1.2 Quadratic interpolation	39	
	5.1.3 Third-order Newton's interpolating polynomial	40	
	5.2 Lagrange interpolating polynomials	42	
	5.3 Interpolation with MATLAB	44	
	Exercise 5	47	
Chapter VI	**Curve Fitting**		**48**
	6.1 Linear regression	48	
	6.2 Polynomial regression	49	
	6.3 Multiple linear regression	51	
	6.4 Curve fitting with MATLAB	53	
	Exercise 6	56	
Chapter VII	**Numerical Differentiation**		**57**
	7.1 Finite difference approximations of first derivative	58	
	7.1.1 Forward difference approximation of first derivative	58	
	7.1.2 Backward difference approximation of first derivative	58	
	7.1.3 Centered difference approximation of first derivative	58	
	7.1.4 High-accuracy differentiation formulas	61	
	7.2 Finite difference approximations of second derivatives	64	
	7.2.1 Forward difference approximation of second derivative	64	
	7.2.2 Backward difference approximation of second derivative	65	
	7.2.3 Centered difference approximation of second derivative	65	
	7.1.4 High-accuracy differentiation formulas	65	
	7.3 Numerical differentiation with MATLAB	68	
	Exercise 7	72	
Chapter VIII	**Numerical Integration**		**73**
	8.1 Trapezoidal rule	73	

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

NUMERICAL METHODS

BACS 2222

STUDY GUIDE

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

ISBN 983-3205-63-1

9 789833 205639

PEARSON Education