Tulsiramji Gaikwad-Patil College of Engineering & Technology, Nagpur

(An Autonomous Institution Affiliated to RTM Nagpur University, Nagpur)

SCHEME OF INSTRUCTION & SYLLABI

Programme: B. Tech Computer Science and Engineering

Scheme of Instructions: Second Year B. Tech. in Computer Science and Engineering (As Per NEP 2020)

Semester – III

SN	Sem	Type	BoS/ Dept	Sub Code	Subject	T/P	Contact Hours			Credits	% Weightage			ESE Duration	Total Marks
							L	P	Hrs		CT/IA	CA	ESE		
1	III	PCC	CS	BCS32301	Object Oriented Programming	T	2	-	2	2	14	06	30	2 Hrs	50
2	III	PCC	CS	BCS32302	Data Structures	T	3	-	3	3	30	10	60	3 Hrs	100
3	III	PCC	CS	BCS32303	Computer Organization and Architecture	T	3	-	3	3	30	10	60	3 Hrs	100
4	III	OEC	CS	B$$323XX	Open Elective-I	T	4	-	4	4	30	10	60	3 Hrs	100
5	III	VEC	SH	BSH32308	Ethics in Engineering Practices	T	2	-	2	2	14	6	30	2 Hrs	50
6	III	MDM	SH	BSH32303	Numerical Method & Statistical Analysis	T	2	-	2	2	14	6	30	2 Hrs	50
7	III	EEMC	BA	BBA32301	Principles of Project Management	P	-	4	4	2	-	50	-	2 Hrs	50
8	III	PCC	CS	BCS32304	Object Oriented Programming Lab	P	-	2	2	1	-	25	25	2 Hrs	50
9	III	PCC	CS	BCS32305	Data Structures Lab	P	-	2	2	1	-	25	25	2 Hrs	50
10	III	CEP	CS	BCS32309	Community Project	P	-	4	4	2	-	50	-	2 Hrs	50
Total							16	12	28	22	132	198	320	23 Hrs	650

Course Category	BSC/ESC (BasicScience Course/ Engineering Science Course.)	PCC (ProgrammeCore courses)	PEC (Programme Elective courses)	OEC (Open Elective Course)	Multidisciplinary courses	VSEC (Skill Course)	Humanities Social Science & Management	Experiential Learning Courses	CC (Liberal Learning Courses
Credits	--	10	-	04	02	--	04	02	--
Cumulative Sum	16 / 13	10	-	04	02	04	04	02	04

PROGRESSIVE TOTAL CREDITS: 43+22=65

				June, 2024	**1.00**
Chairperson	**Dean Academics**	**Vice Principal**	**Principal**	**Date of Release**	**Version**

Applicable for AY 2024-25 Onwards

Programme: Computer Science and Engineering
List of **Program Electives** offered By Computer Science and Engineering Department

Program Elective- I	Program Elective-II	Program Elective- III	Program Elective- IV	Program Elective- V
Semester V	Semester VI	Semester VI	Semester VII	Semester VIII
BCS33506 - Artificial Intelligence	BCS33605- Neural Network and Fuzzy Logic	BCS33609 – TCP/IP	BCS34702 - MOOC's - 1	BCS34805 Natural Language Processing
BCS33507 - Principles of Distributed Systems	BCS33606- Cloud Computing	BCS33610 - Computer Graphics	BCS34703 - MOOC's – 2	BCS34806 Parallel and Distributed Database
BCS33508 - Design Patterns	BCS33607- Software Project Management	BCS33611 - Network Security	BCS34704 - MOOC's – 3	BCS34807 Software Testing and Quality Assurance
BCS33509 - Introduction to Data Science	BCS33608- Data Visualization Techniques	BCS33611 - Blockchain and Distributed Ledger Technology	BCS34705 - MOOC's - 4	BCS34808 Big Data Analytics

Program: Computer Science and Engineering
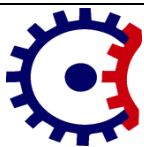## List of **Open Electives** offered By Computer Science and Engineering Department

Open Elective-I	Open Elective-II	Open Elective-III
Semester-III	Semester-IV	Semester-V
BCS32306: Object Oriented Programming	BCS32406: Introduction DBMS	BCS32504: Software Engineering

Course Category	BSC (Basic Science Course)	ESC (Engineering Science Course.)	PCC (Programme Core courses	PEC (Programme Elective courses)	OEC (Open Elective Course)	Multidisciplinary courses	VSEC (Skill Course)	Humanities SocialScience & Management	Experiential Learning Courses	CC (Liberal Learning Courses	Semester WiseCredits
Semester -I	10	05	02	--	--	--	02	--	-	02	21
Semester -II	08	08	--	--	--	--	02	02	-	02	22
Semester -III	--	--	10	--	04	02	--	04	02	--	22
Semester -IV	--	--	10	--	02	02	02	06	-	--	22
Semester -V	--	--	11	04	02	04	--	--	-	--	21
Semester -VI	--	--	08	08	--	02	02	--	-	--	20
Semester -VII	--	--	04	04	--	--	--	--	12	--	20
Semester -VIII	--	--	04	06	--	02	--	--	08	--	20
Cumulative Sum	18	13	47	20		22	08	12	22	04	166

Chairperson	Dean Academics	Vice Principal	Principal	Date of Release	Version	Applicable for AY 2024-25 Onwards
Deptt. (CSE), Tulsiramji Gaikwad-Patil College of Engineering & Technology, Mohagaon, Wardha Road, Nagpur	Dean Academics Tulsiramji Gaikwad-Patil College Of Engineering and Technology, Nagpur	Vice Principal Tulsiramji Gajkwad-Patil College Of Engineering &	Principal Tulsiramji Gaikwad-Patil College Of Engineering &	June, 2024	1.00	

	Tulsiramji Gaikwad-Patil College of Engineering and Technology
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Second Year (Semester-III) B.Tech. (CSE)

Course Code: BCS32301 (Object Oriented Programming)

Teaching Scheme			Examination Scheme	
Lectures	2Hrs/week		**CT-1**	7 Marks
Tutorial	-		**CT-2**	7 Marks
Total Credit	2		**CA**	6 Marks
			ESE	30 Marks
			Total	50 Marks
			Duration of CSE: 02Hrs 00Min.	

Course Objective:

1	To understand the basic concepts of object-oriented programming, creation and usage of classes, objects.
2	To understand the methods and analyze the concepts of Inheritance, Interface, Exception and Packages.
3	To study how to handle events and multi-threaded in object oriented programming.
4	Demonstrate the use of a file-based I/O and collections.
5	To learn how GUI applications can be designed and developed in Java using Swings and JDBC.

Course Contents

Unit I	**Introduction to JAVA-**Introduction to Java, Java Virtual Machine, Object Oriented Principle, Object and Classes, Java Keywords, Variable, Data types and Literals in Java, String, Operators and Casting, Control of Flow, (Selection Statements, Iteration Statements), Command Line Argument.
Unit II	**Classes and inheritance:** Introduction to Class and Object, Method Overloading, this Keyword, Constructor, Multilevel Hierarchy, Abstract class. **Package and Interface:** Package (Defining Package, Finding Package), Introduction to Interface, Defining, and Implementing of Interface, Predefined Package.
Unit III	**Exception Handling and Threads:** Exception Handling, Type of Exception, Try, Catch, and Finally. Multiple Catch blocks, Nested Try Statements, throw, throws, Thread Model. **Java – Generics:** Advantage of Java Generics, **Types of Java Generics:** Generic Methods, Bounded Type Parameters, Generic Classes.

Text Books

1	The Complete Reference (8th Edition) by Herbelt Scheldt, Tata McGrawHill Publications
2	Head First Java,2nd Edition by Kathy Sierra, Bert Bates,O'Reilly Media
3	Programming in Java(Fifth edition) by E Balguruswami, McGraw Hill Education

Reference Books

1	Sun Certified Java Programmer for Java 6 by Kathy Sierra
2	The JavaTM Programming Language (3rd Edition) by Arnold, Holmes, Gosling, Goteti
3	Core Java for Beginners by Rashmi Kanta Das (III Edition) Vikas Publication

Useful Links

1	https://nptel.ac.in/courses/106/105/106105191/
2	https://www.nptelvideos.com/video.php?id=1472

	Course Outcomes	CL	Class Session
1	**Define** the Principle of Object-oriented approach to design software.	1	9
2	**Identify** Classes, objects and use of inheritance in programs.	3	9
3	**Make Use** of Exception handling, multithreading in real time situations and Generic Programming.	3	9

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Second Year (Semester-III) B.Tech. (CSE)

Course Code: BCS32302 (Data Structure)

Teaching Scheme			Examination Scheme	
Lectures	3Hrs/week		**CT-1**	15 Marks
Tutorial	-		**CT-2**	15 Marks
Total Credit	3		**TA**	10 Marks
			CSE	60 Marks
			Total	100 Marks
			Duration of CSE :03Hrs 00Min.	

Course Objective:

1	Understanding Fundamental Data Structures: Students should grasp the fundamental concepts of various data structures such as arrays, linked lists, stacks, queues, trees, and graphs.
2	Analyzing Algorithm Efficiency: Students should learn how to analyze the efficiency of algorithms concerning time complexity and space complexity.
3	Implementing Data Structures: Students should be able to implement various data structures using programming languages such as C, C++, Java, or Python.
4	Understanding Advanced Data Structures: Beyond the basics, students may delve into more advanced data structures such as hash tables, heaps, AVL trees, B-trees, and advanced graph algorithms.
5	Working with Abstract Data Types (ADTs): Students should understand the concept of ADTs and how they relate to data structures. This involves understanding how to encapsulate data and operations within abstract data types, providing clear interfaces for interacting with the data.

Course Contents

Unit I	**Introduction to data structure:** General concepts of data structures, Types of Data Structure with its properties and Operations, Time and space analysis of algorithms, Big oh, theta, and omega notations, Average, best and worst case analysis, Abstract data structure . **Searching & Sorting techniques:** Selection Sort, Insertion Sort, Merge Sort, Shell Sort, Linear and Binary Search.
Unit II	**Stack & Queue:** Representation of Stack & queue using array, Application of stacks, Conversion from infix to postfix and prefix expressions, Evaluation of postfix expression using stacks, Linear Queues, Circular Queues, and Priority Queues.
Unit III	**Linked List**: Definition and representation in memory, Implementation of Linked List, Types of linked list: Singly linked list, circular Singly linked list, Doubly linked list and circular doubly linked list, operations: insertion, deletion, searching, traversing. Application of linked list such as polynomial expression, comparisons of linked lists.
Unit IV	**Trees:** Definition and basic terminology, Representation of tree. Basic operations of binary trees and binary search trees (traversals of trees, insertion and deletion of elements). Threaded Binary Trees, the concept of balancing, AVL Trees, B-Trees, B+ Trees,
Unit V	**Graphs:** Representation of Graph, Matrix Representation of Graph, List Representation of Graph, Directed Graphs, graph traversal (BFS and DFS) with complexity analysis, shortest path , Spanning trees. **Hashing:** Hash tables, hash functions, hashing techniques, Collision resolution techniques.

Text Books

1	Classical Data Structure, D. Samanta, Prentice Hall of India.

	2	Fundamentals of Computer Algorithms by Sartaj Sahni and Sanguthevar Rajasekaran Ellis Horowitz
	3	Data Structures using C, Aaron M. Tanenbaum, Pearson Education

Reference Books

	1	An Introduction to Data Structures and Applications, Jean-Paul Tremblay, Paul G. Sorenson, P. G. Sorenson, Tata McGraw Hill Publication
	2	Data Structures using C and C++, Y. Langsam, Pearson Education.
	3	Prof.P.S.Deshpande & Prof. O.G.Kakde,"C & Data structures",dreamtech

Useful Links

	1	https://nptel.ac.in/courses/106/105/106105183/
	2	https://nptel.ac.in/courses/106/106/106106091/

	Course Outcomes	CL	Class Session
1	**Analyze** different ADTs and their operations and analyze their complexities.	4	9
2	**Understand and Implement** linear data structures like stack and queue.	2	9
3	**Implement** various types of Linked list.	6	9
4	**Summarize** different types of trees, their operations and applications.	2	9
5	**Design** traversal and path finding algorithms for Graphs.	6	9

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Second Year (Semester-III) B.Tech. (CSE)

Course Code: BCS32303 (Computer Architecture and Organization)

Teaching Scheme			Examination Scheme	
Lectures	3Hrs/week		**CT-1**	15Marks
Tutorial	-		**CT-2**	15 Marks
Total Credit	3		**TA**	10Marks
			CSE	60 Marks
			Total	100 Marks
			Duration of CSE :03Hrs 00Min.	

Course Objective:

1	Understanding Computer Architecture Fundamentals: Students will gain a solid understanding of the fundamental principles and components of computer architecture, including CPU, memory, I/O devices, and bus systems.
2	Exploring Instruction Set Architecture (ISA): Students will delve into the concepts of instruction sets, including instruction formats, addressing modes, and types of instructions.
3	Understanding CPU Design: Students will learn about the design and operation of the central processing unit (CPU), including its components such as the arithmetic logic unit (ALU), control unit (CU), registers, and instruction pipeline.
4	Memory Hierarchy and Organization: Students will explore the memory hierarchy, including primary and secondary storage devices, cache memory, and virtual memory systems. They will understand memory organization techniques for efficient data access.
5	Input/Output Systems: Students will learn about input/output systems, including I/O interfaces, controllers, and devices.

Course Contents

Unit I	**BASIC STRUCTURE OF COMPUTERS**: Functional units, Basic operational concepts, Bus architecture, Instruction formats: Three- address Instructions, Two-address instructions, One- address instructions, and Zero-address instructions. **BASIC PROCESSING UNIT**: Execution of a complete instruction, Hardwired control. Microprogrammed control, Addressing modes.
Unit II	**ARITHMETIC and Control:** Addition and Subtraction with signed-magnitude, Design of Fast Adders, Array multiplier, Signed multiplication: Booth's Algorithm, Fast Multiplication, Bit-pair recoding, Integer Division, Floating-point Arithmetic operations, Guard bits and rounding.
Unit III	**THE MEMORY SYSTEM:** Basic concept, semiconductor RAM, memories static and dynamic RAMs, ROMs, Memory hierarchy, Main memory, Auxiliary memory, Virtual Memory, Cache memory, Address mapping, cache optimization techniques.
Unit IV	**INPUT/OUTPUT ORGANIZATION:** I/O mapped I/O and memory mapped I/O, Interrupts and Interrupts handling mechanisms, Synchronous vs. Asynchronous data transfer, Direct Memory Access.

Unit V	**PIPELINING**: Pipelining, basic concepts in pipelining, delayed branch, influence of pipelining on instruction set design, multiple execution units

Text Books

	1	Carl Hamacher, Zvonko Vanadic and Safety Zaky Computer Organization, McGraw Hill 5th Ed, 2002
	2	Computer Architecture and organization III Ed- J. P. Hayes.
	3	Computer Organization, Design and Architecture (IV Ed), Sajjan G. Shiva, CRC Press Computer Architecture & Organization III Ed- J. P. Hayes.

Reference Books

	1	M Mano, "Computer System and Architecture", PHI, 1993
	2	W. Stallings, "Computer Organization & Architecture", PHI, 2001

Useful Links

	1	https://nptel.ac.in/courses/106/105/106105163/
	2	https://nptel.ac.in/courses/106/102/106102062/

	Course Outcomes	CL	Class Session
1	**Examine** the basics of organizational and architectural issues of a digital computer and Classify and compute the performance of machines, Machine Instructions.	4	9
2	**Apply** logic to perform binary operation and multiplication and Division Algorithms.	3	9
3	**Analyze** the performance of various classes of Memories, build large memories using small memories for better performance and analyze arithmetic for ALU implementation	4	9
4	**Identify** various data transfer techniques in digital computer and the I/O interfaces	3	9
5	**Determine** the concept of parallel processing and classification of parallel architectures	5	9

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Second Year (Semester-III) B.Tech. (CSE)

Course Code: BCS32306 (OEC Object Oriented Programming)

Teaching Scheme			Examination Scheme	
Lectures	4 Hrs/week		CT-1	15 Marks
Tutorial	-		CT-2	15 Marks
Total Credit	4		TA	10 Marks
			CSE	60 Marks
			Total	100 Marks
			Duration of CSE :03Hrs 00Min.	

Course Objective:

1	To understand the basic concepts of object-oriented programming, creation and usage of classes, objects.
2	To understand the methods and analyze the concepts of Inheritance, Interface.
3	To study how to handle events and multi-threaded in object oriented programming C++.
4	Demonstrate the use of a file-based I/O and collections.

Course Contents

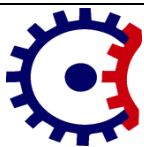| Unit I	**Elements of Programming and Function Introduction:** Basic Elements of Programming, Console I/O Operations, Function: Function Prototyping, Call and Return By Reference, Inline Function, Default and Const Arguments, Function Overloading, Arrays and Enumeration.
Unit II	**Object Oriented Methodology:** Basic Concepts/Characteristics of OOP. Advantages and Application of Oops, Procedural Programming Vs OOP. **Classes and Objects:** Specifying a Class, Creating Objects, Private & Public Data Members and Member Functions, Defining Inline Member Functions, Static Data Members and Member Functions. Arrays within Class, Arrays of Objects, Objects as Function Arguments, Returning Objects.
Unit III	**Constructors and Destructors:** Introduction, Parameterized Constructors, Multiple Constructors in A Class, Constructors With Default Arguments, Dynamic Initialization of Objects, Copy Constructors, Dynamic Constructors, Const Objects, Destructors
Unit IV	**Operators Overloading:** Definition, Unary and Binary Overloading, Rules for Operator Overloading. **Inheritance:** Defining Derived Classes, Types of Inheritance, Constructors and Destructors In Derived Classes.
Unit V	**Pointers**: Pointer to Objects, This Pointer, 'New' and 'Delete' Operators, Virtual Function, Friend Functions. Opening, Closing A File, File Modes, File Pointers and Their Manipulation. **Exception Handling**: Exception Handling , Types of Exceptions, Exception Handling Keywords, Exception Handling Techniques, throw keyword .

Text Books

1	K.R.Venugopal, Rajkumar, T. Ravishankar, "Mastering C++", TMH ,ISBN:0-07- 463454-2.
2	Farrel,"Object-Oriented Programming using C++",Cenage Pub, ISBN: 9788131505175

Reference Books

1	Parimala N.," Object Orientation through C++", Macmillan India Ltd. Publication, ISBN:-0333 93202-1
2	E Balagurusamy, "Object Oriented Programming with C++ ", Tata McGraw Hill Publishing Company

	Limited, New Delhi, ISBN:- 13- 978-07-066907-9

	Course Outcomes	CL	Class Session
1	**Understand** basic Elements of Programming and Function	2	9
2	**Understand** OOPs concepts, Classes and objects	2	9
3	**Classify** the Constructors and Destructors using C++ Programming	3	9
4	**Explore** the purpose of operator overloading and inheritance.	3	9
5	**Analyze** dynamic memory allocation with 'new' and 'delete' operators, and the usage of virtual functions and friend functions.	4	9

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Second Year (Semester-III) B.Tech. (CSE)

Course Code: BSH32308 (VEC Ethics in Engineering Practices)

Teaching Scheme			Examination Scheme	
Lectures	2Hrs/week		**CT-1**	7 Marks
Tutorial	-		**CT-2**	7 Marks
Total Credit	2		**CA**	6 Marks
			ESE	30 Marks
			Total	50 Marks
			Duration of CSE: 02Hrs 00Min.	

Course Objective:

1	To understand the Human Values, Ethics and Engineering Ethics.
2	To understand Professional practices in Engineering for Engineers.
3	To understand types of ethical violations and consequence of their influence on business practice, economy and society in general.

Course Contents

Unit I	**Introduction to Engineer Ethics:** Morals, Values, Integrity & Ethics, What is Engineering Ethics, Importance of Engineering Ethics, Code of Ethics, Potential Moral Problems of Engineering Ethics.
Unit II	**Professional Practices in Engineering:** Happiness, Prosperity & Harmony, Professional Ethics, Engineering Ethics, Principles of Engineering Ethics, Environmental Ethics, Public Interest Litigation (PIL), Intellectual property Rights (IPR).
Unit III	**An Overview of Engineering Ethics:** Ethics in Industry, Professional Practices in Engineering, Ethical behavior, Industry professional malpractices , Workplace Safety, Responsibility and Rights, Basics of business ethics - Corporate Social Responsibility – Issues of Management – Crisis Management.

Text Books

1	A New Look into Social Science : Shabbir, Sheikh and Dwadashiwar, S. Chand Publisher
2	Constitution of India and Professional Ethics: Reddy, G.B. and Mohd. Suhaib, IK International Publishing House. 2006
3	Introduction to Engineering Ethics : Martin, Mik , Roland Schinzinger, 2nd edition (16 February 2009) McGraw-Hill Education;

Reference Books

1	Human Resource Development and Management : A. M. Sheikh, 3rd Revised Edition, S Chand & Co Ltd.
2	"A Gift of Fire: Social, Legal and Ethical Issues, for Computing and the Internet": Sara Baase, 3rd Edition PHI Publications.
3	"Case study in Information Technology Ethics" :Richard A. Spinello, 2nd Edition PHI Publications.
4	"Internet Ethics": Duncan Lanford, Macmillan Education UK.
5	"Computer and Ethics in the Cyber age": D. Micah Hester and Paul J. Ford.

Useful Links

1	https://nptel.ac.in/courses/110/105/110105079/

2	https:://nptel/courses/video/1101323279/L54.html		
3	https:://nptel/courses/video/110105079/L54.html		

	Course Outcomes	**CL**	**Class Session**
1	**Describe** Basic Human Values, Ethics & Importance of Engineering Ethics.	2	9
2	**Illustrate the** Basic Ethics for Engineers, Principles of Engineering Ethics & Fundamental Rights of individuals of society.	2	9
3	**Discuss** Ethics for Engineer Professionals, and their Safety, Responsibility & Rights.	2	9

Program: B. Tech Second Year Semester-III (CSE/IT)
Course Code:BSH32303 (Numerical Method & Statistical Analysis)

Teaching Scheme		Examination Scheme (Th)		Examination Scheme(P)	
Theory (Th)	2 Hrs/week	**CT-I**	7 Marks	-	-
Practical (P)		**CT-II**	7 Marks	-	-
Total Credits	**2**	**CA**	6 Marks	**-**	-
Duration of ESE: 2Hrs		**ESE**	30 Marks	**-**	-
		Total Marks	**50 Marks**	-	**-**

Course Outcome:

1.	**Analyze** numerical techniques to find the roots of equations different types of equations.
2.	**Apply** the concept of probability and mathematical expectation to real-world Phenomena.
3.	**Apply** the most appropriate Stochastic and sampling techniques for a given applied problem

Course Contents

Unit I	**Numerical Methods**: Error in numerical calculations, Errors in series approximation, Rounding off errors. **Solution of Algebraic and Transcendental Equation:** Bisection method, False position method, Newton –Raphson method, Solution of system of simultaneous linear equations: Gauss elimination method, Gauss Jordon method. Gauss Seidel method.
Unit II	**Probability Distributions & Mathematical Expectation:** Random variables, discrete and continuous random variable, joint distributions. **Mathematical Expectations:** Definition of mathematical expectation, the variance and standard deviations, moment generating function Binomial, Geometric distribution, Poisson distribution.
Unit III	**Stochastic Process & Sampling Techniques-** **Stochastic Process:** Introduction of Stochastic Process, Classification of Random Process, Stochastic Matrix. Markov Chain, Transition Matrix and state transition Diagram. **Sampling Techniques:** Population, sample, standard error, confidence intervals, Testing a hypothesis, Null hypothesis, Alternative hypothesis, t-test and Chi-square test.

Text Books

T.1	Higher Engineering Mathematics by B.S. Grewal, 40th Edition, Khanna Publication
T.2	Advanced Engineering Mathematics by Erwin Kreyszig, 8th Edition, Wiley India
T.3	Applied Mathematics for Engineers & Physicist by L.R. Pipes and Harville
T.4	Probability, Statistics and Random Processes T. Veerarajan.
T.5	Fundamentals of Mathematical Statistics (Modern Approach) S.C. Gupta and V. K. Kapoor 10th Edition

Reference Books

R.1	A Text Book of applied Mathematics, Volume I &II, by P.N. Wartikar& J.N. Wartikar, Poona Vidyarthi Griha Prakashan
R.2	Introductory methods of Numerical Analysis, by S.S. Sastry, PHI
R.3	Mathematics for Engineers by Chandrika Prasad
R.4	A text book of Engineering Mathematics by N. P. Bali & M. Goyal, Laxmi Publication