

COMPUTER SCIENCE

TEXTBOOK FOR CLASS XI



11120

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एन सी ई आर टी
NCERT

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FOREWORD

Computer science as a discipline has evolved over the years and has emerged as a driving force for socio-economic activities. It has made continuous inroads into diverse areas — be it business, commerce, science, technology, sports, health, transportation or education. With the advent of computer and communication technologies, there has been a paradigm shift in teaching learning at the school level. The role and relevance of this discipline is in focus because the expectations from the school pass-outs have grown to be able to meet the challenges of the twenty-first century. Today, we are living in an interconnected world where computer-based applications influence the way we learn, communicate, commute or even socialise!

There is a demand for software engineers in various fields like manufacturing, services, etc. Today, there are a large number of successful startups delivering different services through software applications. All these have resulted in generating interest for this subject among students as well as parents.

Development of logical thinking, reasoning and problem-solving skills are fundamental building blocks for knowledge acquisition at the higher level. Computer plays a key role in problem solving with focus on logical representation or reasoning and analysis.

This book focuses on the fundamental concepts and problem-solving skills while opening a window to the emerging and advanced areas of computer science. The newly developed syllabus has dealt with the dual challenge of reducing curricular load as well as introducing this ever evolving discipline.

As an organisation committed to systemic reforms and continuous improvement in the quality of its products, NCERT welcomes comments and suggestions which will enable us to revise the content of the textbook.

HRUSHIKESH SENAPATY
Director

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PREFACE

In the present education system of our country, specialised or discipline-based courses are introduced at the higher secondary stage. This stage is crucial as well as challenging because of the transition from general to discipline-based curriculum. The syllabus at this stage needs to have sufficient rigour and depth while remaining mindful of the comprehension level of the learners. Further, the textbook should not be heavily loaded with content.

Computers have permeated in every facet of life. Study of basic concepts of computer science has been desirable in education. There are courses offered in the name of Computer Science, Information and Communication Technology (ICT), Information Technology (IT), etc., by various boards and schools up to secondary stage, as optional. These mainly focus on using computer for word processing, presentation tools and application software.

Computer Science (CS) at the higher secondary stage of school education is also offered as an optional subject. At this stage, students usually opt for CS with an aim of pursuing a career in software development or related areas, after going through professional courses at higher levels. Therefore, at higher secondary stage, the curriculum of CS introduces basics of computing and sufficient conceptual background of Computer Science.

The primary focus is on fostering the development of computational thinking and problem-solving skills. This book has 11 chapters covering the following broader themes:

- Fundamentals: basic understanding of computer system, hardware components and software, data representation, number system, encoding as well as awareness of emerging trends in computer science.
- Problem-solving: problem analysis, algorithm, flowchart, implementation, testing and maintenance.
- Programming: basic constructs of a program using Python programming language — program structure, identifiers, variables, flow of control, advanced data types, functions.
- Societal impact: awareness of digital footprints, data privacy and protection, cyber crime, etiquettes in a digital society and implications on security, privacy, piracy, ethics, values and health concerns.
- Chapters 1, 2, 3, 4 and 11 have two additional components — (i) activities and (ii) think and reflect for self assessment while learning as well as to generate further interest in the learner.

Python programming language is introduced that is easy to learn in interactive and script mode. A number of hands-on examples are given to gradually explain methodology to solve different types of problems across the Chapters 5 to 10. The programming examples as well as the exercises in these chapters are required to be solved in a computer and verify with the given outputs.

Group projects through case studies are proposed to solve complex problems. Peer assessment of these projects will promote peer-learning, team spirit and responsiveness. Some exercises have been made in case-study format to promote problem-finding and problem-solving skills.

Box items (light green background) are pinned inside the chapters either to explain related concepts or to provide additional information related to the topic covered in that section. However, these box items are not to be assessed through examinations.

Unicode encoding scheme for Indic scripts have also been introduced to motivate students to solve problems in public services and the local micro or small businesses in India.

These chapters have been written by involving practicing teachers as well as subject experts. These have been iteratively peer-reviewed.

I would like to place on record appreciation for Professor Om Vikas for leading the review activities of the book as well as for his guidance and motivation to the development team throughout. Several iterations have resulted into this book. Thanks are due to the authors and reviewers for their valuable contribution.

Comments and suggestions are welcome to make this endeavour of par excellence.

New Delhi
9 August 2018

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CONTENTS

FOREWORD	iii
PREFACE	v
CHAPTER 1 : COMPUTER SYSTEM	1
1.1 Introduction to Computer System	1
1.2 Evolution of Computer	3
1.3 Computer Memory	5
1.4 Data Transfer between Memory and CPU	7
1.5 Microprocessors	8
1.6 Data and Information	10
1.7 Software	14
1.8 Operating System	20
CHAPTER 2 : ENCODING SCHEMES AND NUMBER SYSTEM	27
2.1 Introduction	27
2.2 Number System	30
2.3 Conversion between Number Systems	34
CHAPTER 3 : EMERGING TRENDS	45
3.1 Introduction	45
3.2 Artificial Intelligence (AI)	45
3.3 Big Data	49
3.4 Internet of Things (IoT)	51
3.5 Cloud Computing	53
3.6 Grid Computing	55
3.7 Blockchains	56
CHAPTER 4 : INTRODUCTION TO PROBLEM SOLVING	61
4.1 Introduction	61
4.2 Steps for Problem Solving	62
4.3 Algorithm	64
4.4 Representation of Algorithms	65
4.5 Flow of Control	70
4.6 Verifying Algorithms	77
4.7 Comparison of Algorithm	79

4.8 Coding	80
4.9 Decomposition	81
CHAPTER 5 : GETTING STARTED WITH PYTHON	87
5.1 Introduction to Python	87
5.2 Python Keywords	90
5.3 Identifiers	91
5.4 Variables	91
5.5 Comments	92
5.6 Everything is an Object	93
5.7 Data Types	94
5.8 Operators	99
5.9 Expressions	104
5.10 Statement	106
5.11 Input and Output	107
5.12 Type Conversion	108
5.13 Debugging	112
CHAPTER 6 : FLOW OF CONTROL	121
6.1 Introduction	121
6.2 Selection	122
6.3 Indentation	126
6.4 Repetition	127
6.5 Break and Continue Statement	132
6.6 Nested Loops	136
CHAPTER 7 : FUNCTIONS	143
7.1 Introduction	143
7.2 Functions	145
7.3 User Defined Functions	146
7.4 Scope of a Variable	158
7.5 Python Standard Library	160
CHAPTER 8 : STRINGS	175
8.1 Introduction	175
8.2 Strings	175
8.3 String Operations	177
8.4 Traversing a String	180
8.5 String Methods and Built-in Functions	180
8.6 Handling Strings	184

CHAPTER 9 : LISTS	189
9.1 Introduction to List	189
9.2 List Operations	190
9.3 Traversing a List	192
9.4 List Methods and Built-in Functions	193
9.5 Nested Lists	195
9.6 Copying Lists	196
9.7 List as Arguments to Function	197
9.8 List Manipulation	199
CHAPTER 10 : TUPLES AND DICTIONARIES	207
10.1 Introduction to Tuples	207
10.2 Tuple Operations	209
10.3 Tuple Methods and Built-in Functions	211
10.4 Tuple Assignment	212
10.5 Nested Tuples	213
10.6 Tuple Handling	213
10.7 Introduction to Dictionaries	215
10.8 Dictionaries are Mutable	216
10.9 Dictionary Operations	217
10.10 Traversing a Dictionary	217
10.11 Dictionary Methods and Built-in functions	218
10.12 Manipulating Dictionaries	219
CHAPTER 11 : SOCIETAL IMPACT	229
11.1 Introduction	229
11.2 Digital Footprints	229
11.3 Digital Society and Netizen	231
11.4 Data Protection	235
11.5 Cyber Crime	239
11.6 Indian Information Technology Act (IT Act)	242
11.7 Impact on Health	242



Empowerment of Girl Child, Responsibility of All