COMPUTER SCIENCE

TEXTBOOK FOR CLASS XI

11120

विद्यया ऽमृतमश्नुते

एन सी ई आर टी
NCERT

राष्ट्रीय शैक्षिक अनुसंधान और प्रशिक्षण परिषद्
NATIONAL COUNCIL OF EDUCATIONAL RESEARCH AND TRAINING

2022-23

11120 – COMPUTER SCIENCE
Textbook for Class XI

ISBN 978-93-5292-117-1

First Edition
May 2019 Vaishakha 1941

Reprinted
June 2021 Jyeshtha 1943
November 2021 Agrahayana 1943

PD 30T RSP

₹ 195.00

Printed on 80 GSM paper

Published at the Publication Division by the Secretary, National Council of Educational Research and Training, Sri Aurobindo Marg, New Delhi 110 016 and printed at Goyal Stationers, B-36/9, G.T. Karnal Road Industrial Area, Delhi 110 033

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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
National Council of Educational
Research and Training

New Delhi
8 August 2018

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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Acknowledgements

The National Council of Educational Research and Training acknowledges the valuable contributions of the individuals and organisations involved in the development of *Computer Science Textbook* for Class XI.

The Council expresses its gratitude to the syllabus development team including MPS Bhatia, *Professor*, Netaji Subhas Institute of Technology, Delhi; T.V. Vijay Kumar, *Professor*, School of Computer and Systems Sciences, Jawaharlal Nehru University, New Delhi; Zahid Raza, *Associate Professor*, School of Computer and Systems Sciences, Jawaharlal Nehru University, New Delhi; Vipul Shah, *Principal Scientist*, Tata Consultancy Services, and the CSpathshala team; Aasim Zafar, *Associate Professor*, Department of Computer Science, Aligarh Muslim University, Aligarh; Faisal Anwer, *Assistant Professor*, Department of Computer Science, Aligarh Muslim University, Aligarh; Smruti Ranjan Sarangi, *Associate Professor*, Department of Computer Science and Engineering, Indian Institute of Technology, Delhi; Vikram Goyal, *Associate Professor*, Indraprastha Institute of Information Technology (IIIT), Delhi; Tabrez Nafis, *Assistant Professor*, Jamia Hamdard, New Delhi and Mamur Ali, *Assistant Professor*, Central Institute of Educational Technology, NCERT, New Delhi.

The Council is thankful to the following resource persons for editing, reviewing and refining the manuscript of this book — Mukesh Kumar, DPS RK Puram, Delhi; Gurpreet Kaur, G.D. Goenka Public School, Vasant Kunj, Delhi; Gautam Sarkar, Modern School, Barakhamba Road, Delhi; Aswin K. Dash, Mother's International School, Delhi; Nancy Sehgal, Mata Jai Kaur Public School, Delhi; Ashish Kumar Srivastava, *Assistant Professor*, Department of Education in Science and Mathematics, NCERT, New Delhi; Neelima Gupta, *Professor*, Department of Computer Science, University of Delhi; Anamika Gupta, *Assistant Professor*, Shaheed Sukhdev College of Business Studies, University of Delhi. The Council further acknowledges the contributions of Anuja Krishn, *Freelance Editor*, for language editing.

The Council also gratefully acknowledges the contributions of Meetu Sharma, *Graphic Designer*; Kanika Walecha, *DTP Operator*; and Pooja, *Junior Project Fellow*, in shaping this book. The contributions of the office of the APC, DESM and Publication division, NCERT, New Delhi, in bringing out this book are also duly acknowledged.

The Council also acknowledges the contribution of Shilpa Mohan, *Assistant Editor* (Contractual) Publication Division, NCERT for copy editing this book. The efforts of Sadiq Saeed, *DTP Operator* (Contractual) and Sachin Tanwar, *DTP Operator* (Contractual), Publication Division, NCERT, are also acknowledged.

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