



آغا خان یونیورسٹی ایگزامینیشن بورڈ
AGA KHAN UNIVERSITY EXAMINATION BOARD

Secondary School Certificate
Examination Syllabus

Computer Science

Grades IX - X

(based on National Curriculum 2009)

Published by
Aga Khan University Examination Board
Block - C, IED - PDC, 1-5/B-VII
Federal B. Area, Karimabad, Karachi, Pakistan.

Last Revision July 2009
Latest Revision December 2018

© The Aga Khan University Examination Board, 2018

All rights and entitlements reserved.

This syllabus is developed by Aga Khan University Examination Board for distribution to all its affiliated schools only. No part of this syllabus may be copied, reproduced or used for any other purpose whatsoever without prior written permission of the Aga Khan University Examination Board.

**Secondary School Certificate
Examination Syllabus**

**COMPUTER SCIENCE
GRADES IX-X**

**This syllabus will be examined in both
May and September Examination sessions from
May 2020 for Grade IX and May 2021 for Grade X**

Table of Contents	Page No.
Preface	5
Introduction to AKU-EB Syllabi	7
Aims/ Objectives of the National Curriculum (2009)	9
Subject Rationale	13
Concept Map	16
Student Learning Outcomes	17
Summary of Student Learning Outcomes	41
Scheme of Assessment	42
Annex A: List of Acronyms and Their Full Forms	44
Annex B: Example Problems for Algorithms, Flowcharts and Programming	46
Annex C: Practical Activities	47
Acknowledgements	52

For queries and feedback

Address: Aga Khan University Examination Board
 Block - C, IED - PDC, 1-5/B-VII
 Federal B. Area, Karimabad, Karachi, Pakistan.
Phone: (92-21) 3682-7011
Fax: (92-21) 3682-7019
E-mail: examination.board@aku.edu
Website: <http://examinationboard.aku.edu>
Facebook: [www.facebook.com/ akueb](http://www.facebook.com/akueb)

Preface

Established in 2002 through Ordinance CXIV, Aga Khan University Examination Board (AKU-EB) is Pakistan's first private autonomous examination body for secondary (SSC) and higher secondary (HSSC) school certifications. Its vision is to be a model of excellence and innovation in education in Pakistan and the developing world.

One of the ways in which AKU-EB achieves its vision is by developing syllabi which inculcates conceptual thinking and higher order learning based on the National Curriculum. AKU-EB revises its syllabi every 4 years so that they continue to meet the needs of students, teachers and examiners.

The aims of the current syllabus review of SSC and HSSC in 2018 were to:

- Ensure continued compatibility with the goals of the National Curriculum of Pakistan.
- Review the content for inclusion of new knowledge and deletion of obsolete knowledge.
- Review the content for clarity and relevance as per the changing needs of students, teachers and examiners.
- Enhance and strengthen continuation and progression of content both within and across grades IX - XII (SSC and HSSC).
- Ensure the readiness of students for higher education.

During this syllabus review, the needs of all the stakeholders were identified through a needs-assessment survey. Students and teachers of AKU-EB affiliated schools from across Pakistan participated in the survey. Thereafter, a revision panel, which consisted of examiners, schools teachers of affiliated and non-affiliated schools, teacher trainers and university academics, reviewed and revised the syllabus following a planned, meticulous and standardised syllabi review process.

This year, AKU-EB took the initiative of introducing a 'Concept Map' for each syllabus which represents links among the key concepts of the syllabus. These have been designed to improve students' interest in the subject, facilitate conceptual thinking and make the learning and teaching experience more memorable.

The syllabus is organised into topics and subtopics. Each subtopic is further divided into achievable student learning outcomes (SLOs). The SLOs of the cognitive domain are each assigned a cognitive level on which they have to be achieved. These cognitive levels are 'knowledge', 'understanding' and 'application', the latter also including other higher order skills. This is followed by the Exam Specification which gives clear guidance about the weightage of each topic and how the syllabus will be assessed.

The development of the revised syllabus have been made possible by the creativity and relentless hard work of Curriculum and Examination Development unit and the constant support provided by all the other units of AKU-EB. We are particularly thankful to Dr Sohail Qureshi for his very useful feedback on revising the syllabus review process, to Dr Naveed Yousuf for his continued guidance and support throughout the syllabus revision process and to Raabia Hirani for leading the syllabi revision. We are also thankful to all the students and teachers who took part in the needs-assessment survey and to the principals of AKU-EB affiliated schools who made this endeavour possible by facilitating and encouraging their teachers to be a part of the survey and the syllabus revision panel.

With your support and collective hard work, AKU-EB has been able to take the necessary steps to ensure effective implementation of the National Curriculum of Pakistan through this syllabus. We are confident that this syllabus will continue to provide the support that is needed by students to progress to the next level of education and we wish all the best to students and their teachers in implementing this syllabus.



Dr Shehzad Jeeva
Director, Aga Khan University Examination Board
Assistant Professor, Faculty of Arts and Sciences, Aga Khan University

Introduction to AKU-EB Syllabi

1. Aga Khan University Examination Board (AKU-EB) has a mandate by Ordinance CXIV of 2002 ‘to test the attainment of the objectives of the national curriculum, for the purpose of enhancing student learning, and to do all such things that may be considered appropriate for the improvement of education in respect to teaching and learning, institutional effectiveness and all things ancillary and incidental thereto’.
2. The AKU-EB syllabi are an important tool in the achievement of this mandate. These syllabi are based on the National Curriculum of Pakistan 2009 and the National Scheme of Studies 2006 – 2007. The syllabi bring together all those cognitive outcomes of the National Curriculum statement which can be reliably and validly assessed. Moreover, the syllabi aim to achieve the pedagogically desirable objectives of the National Curriculum which encourage ‘observation, creativity and other higher order thinking skills’, better meeting the needs of the students of the twenty-first century.
3. The syllabi guide the students, teachers, parents and other stakeholders regarding the topics that will be taught and examined in each grade (IX, X, XI and XII). In each syllabus document, the content progresses from simple to complex, thereby, facilitating a gradual, conceptual learning of the content.
4. The topics of the syllabi are grouped into themes derived from the national curriculum. The connection between various themes and topics is highlighted in the ‘**concept map**’ provided at the beginning of each syllabus. This ensures that students begin to understand the interconnectedness of knowledge, learn conceptually and think critically.
5. The topics of the syllabi are divided into subtopics and **student learning outcomes (SLOs)**. The subtopics and the SLOs define the depth and the breadth at which each topic will be taught, learnt and examined. The syllabi complement the national curriculum by providing enabling SLOs where needed to scaffold student learning.
6. Each SLO starts with an achievable and assessable **command word** such as describe, relate, evaluate, etc. The purpose of the command words is to direct the attention of teachers and students to specific tasks that the students are expected to undertake in the course of their studies. The examination questions are framed using the same command words or their connotations to elicit evidence of these competencies in students’ responses.
7. The SLOs are classified under three **cognitive levels**: knowledge (K), understanding (U) and application and other higher order skills (A) for effective planning during teaching and learning and deriving multiple choice questions (MCQs) and constructed response questions (CRQs) and extended response questions (ERQs) on a rational basis from the subject syllabi, ensuring that the intentions of the national curriculum are also met during examinations.

8. By focusing on the achievement of the SLOs, these syllabi aim to counter the culture of rote memorisation as the preferred method of examination preparation. While suggesting relevant, locally available textbooks for achieving these outcomes, AKU-EB recommends that teachers and students use multiple teaching and learning resources for achieving these outcomes.
9. The syllabi follow a uniform layout for all subjects to make them easier for students and teachers to follow. They act as a bridge between students, teachers and assessment specialists by providing a common framework of student learning outcomes and **exam specifications**.
10. On the whole, the AKU-EB syllabi for Secondary School Certificate (SSC) provide a framework that helps students to acquire conceptual understanding of the content of the National Curriculum and learn to critically engage with it. This lays a solid foundation for HSSC and beyond.

Aims/ Objectives of the National Curriculum (2009)¹

Aims

Information technology has opened new avenues that enable unprecedented access to vast bodies of knowledge and possibilities of collaboration among researchers and scientists. In order to safeguard the entitlement in this important sphere our children need to be exposed to information and communication technology at an early stage.

The intent of the curriculum is to prepare students achieve the following goals:

- Computer and Information Literacy
- Productivity through Technology
- Computer Hardware and Software
- Communication and Computer Networks Literacy
- Algorithmic Thinking and Problem-Solving
- Developing Programming Skills
- Database Systems
- Operating Systems
- System Development

The design of the curriculum combines theory and practice into a learning experience. It will provide the students with the first building blocks of computer and information literacy. They will learn to use computers effectively and incorporate the idea of algorithmic thinking into their daily problem-solving vocabulary. The students will be able to acquire information from electronic resources in a variety of formats.

Standards and Benchmarks of the National Curriculum

National Curriculum for Computer Science is comprised of nine standards which serve to define the skills and knowledge to be acquired by every student of grade level IX-X. The benchmarks, thereafter, serve as a guide indicating how competencies are to be attained in order to meet the standards. They provide indicators of expectations from students at completion of the said grade level.

Standard – 1 Computer and Information Literacy

To know the fundamentals of computer and IT, possess computing skills for speedy information handling and check virus attacks and authentication loopholes to take appropriate remedial measures

¹Government of Pakistan (2009), Page 1, *National Curriculum for Computer Science IX-XII*, Islamabad, Ministry of Education (Curriculum Wing)

Benchmarks

The students are expected to:

- 1.1 know operations of computer using various hardware components and software modules.
- 1.2 use and manage Windows Operating System.
- 1.3 use computers realising moral and ethical values.
- 1.4 identify careers in IT/ computing industry.
- 1.5 configure latest anti-virus software and incorporate secure authentication mechanism to safeguard the machine.

STANDARD – 2 Productivity through Technology

To have the knowledge and ability to use productivity tools appropriate to the task.

Benchmarks

The students are expected to:

- 2.1 use productivity tools (like Word Processor, Spreadsheet and Urdu editor) which help to enhance learning, to increase productivity and to promote creativity.

STANDARD – 3 Computer Hardware and Software

To have the knowledge of computer system and its operation utilizing various hardware components and different types of software.

Benchmarks

The students are expected to:

- 3.1 identify and use different types of computer hardware components.
- 3.2 recognise components in computer casing such as motherboard, power supply, ports, slots, memory chips, processor and expansion cards and know their functions.
- 3.3 know CPU components and their working.
- 3.4 describe different types of computer memory, measuring units and their performance.
- 3.5 identify and explain operation/ working of commonly used I/ O devices.
- 3.6 explain basic logic gates and their operations with the help of Truth Table.
- 3.7 simplify Boolean expressions/ functions using Karnuagh Map (K-map) up to four variables.

STANDARD – 4 Communication and Computer Network Literacy

To have knowledge of communication using transmission media and devices with various technologies, describe communication in different types of networks, know communication standards and identify commonly used protocols and technologies in wired and wireless networks.

Benchmarks

The students are expected to:

- 4.1 recognise communication medium and devices.
- 4.2 understand transmission impairments associated with appropriate communication technologies.
- 4.3 describe communication in different types of networks.
- 4.4 describe communication standards.
- 4.5 explain TCP/ IP protocol sites used on the internet.
- 4.6 illustrate understanding of wireless technologies and protocols.

STANDARD – 5 Algorithmic Thinking and Problem Solving

To analyse given problems, develop flowcharts and algorithms for solving problems methodically.

Benchmarks

The students are expected to:

- 5.1 write algorithms using various I/ O requirements for solving problems.
- 5.2 draw flowcharts for given problems.

STANDARD – 6 Developing Programming Skills

To write codes to solve problems using high level programming languages and understand the concept of Object Oriented Programming (OOP).

Benchmarks

The students are expected to:

- 6.1 program in C/ C++ languages using standard structures.

STANDARD – 7 Database Systems

To understand database fundamentals, types, terminologies, entities and relationships, normalization up to 3NF (Normalisation Form) and ER-models and develop database application in MS Access/ SQL Server/ Open Access creating tables and forms and generating queries and reports.

Benchmarks

The students are expected to:

- 7.1 know database system and its operation.
- 7.2 build entity relationship (ER) data models.
- 7.3 develop relational schema.
- 7.4 understand the use of database management system (DBMS).

- 7.5 create, populate and manage tables.
- 7.6 build forms with different methods and manipulate them for data management.
- 7.7 create different types of queries.
- 7.8 generate reports of various layouts and styles.

STANDARD – 8 Operating Systems

To describe different types of operating systems and their functions and understand process management.

Benchmarks

The students are expected to:

- 8.1 explain various types of Operating Systems.
- 8.2 describe functions of different Operating Systems.
- 8.3 know the process management.

STANDARD – 9 System Developments

To describe software development life cycle (SDLC), its importance and objectives covering various terminologies, management terms, process models and risk analysis and management.

Benchmarks

The students are expected to:

- 9.1 explain Software or System Development Life Cycle and its phases.
- 9.2 describe software process models.
- 9.3 know the role of different personals in SDLC.

Subject Rationale of AKU-EB Computer Science

Why study AKU-EB Computer Science?

Computer Science is a field of study that will help you as a student to learn theoretical and practical concepts of computation. You must have used the computer for playing games, surfing the internet, streaming the videos, using media networking websites, preparing presentation and reports, etc. However, this syllabus would add to your knowledge, understanding and skills about some advance uses of computer such as programming, web designing, computer networking, etc.

While learning through the AKU-EB syllabus of Computer Science, you will learn theoretical concepts of computer hardware and software, programming languages and different methods and models to solve the real-life problem.

To be more specific, you will learn the following content areas in the syllabus:

- Computer Hardware
- Computer Software
- Data Communication
- Computer Networks
- Web Designing
- Problems Solving using Flowchart
- Programming Languages
- Computer Security and Ethics

Where will it take you?

The subject will take you from simple real life problems to different computational solutions and from basic computing technologies to emerging advance hardware and software technologies. The set of skills learned in this syllabus will help you to select your career in the areas of computer science such as:

- Software Development
- Database Administration
- Computer Hardware Engineering
- Computer System Analyst
- Computer Network Engineering
- Web Development
- Web Designing
- Information Security Engineer
- Mobile Applications Development
- Software Quality Assurance
- Content Creation and Blogging
- Graphic Designing

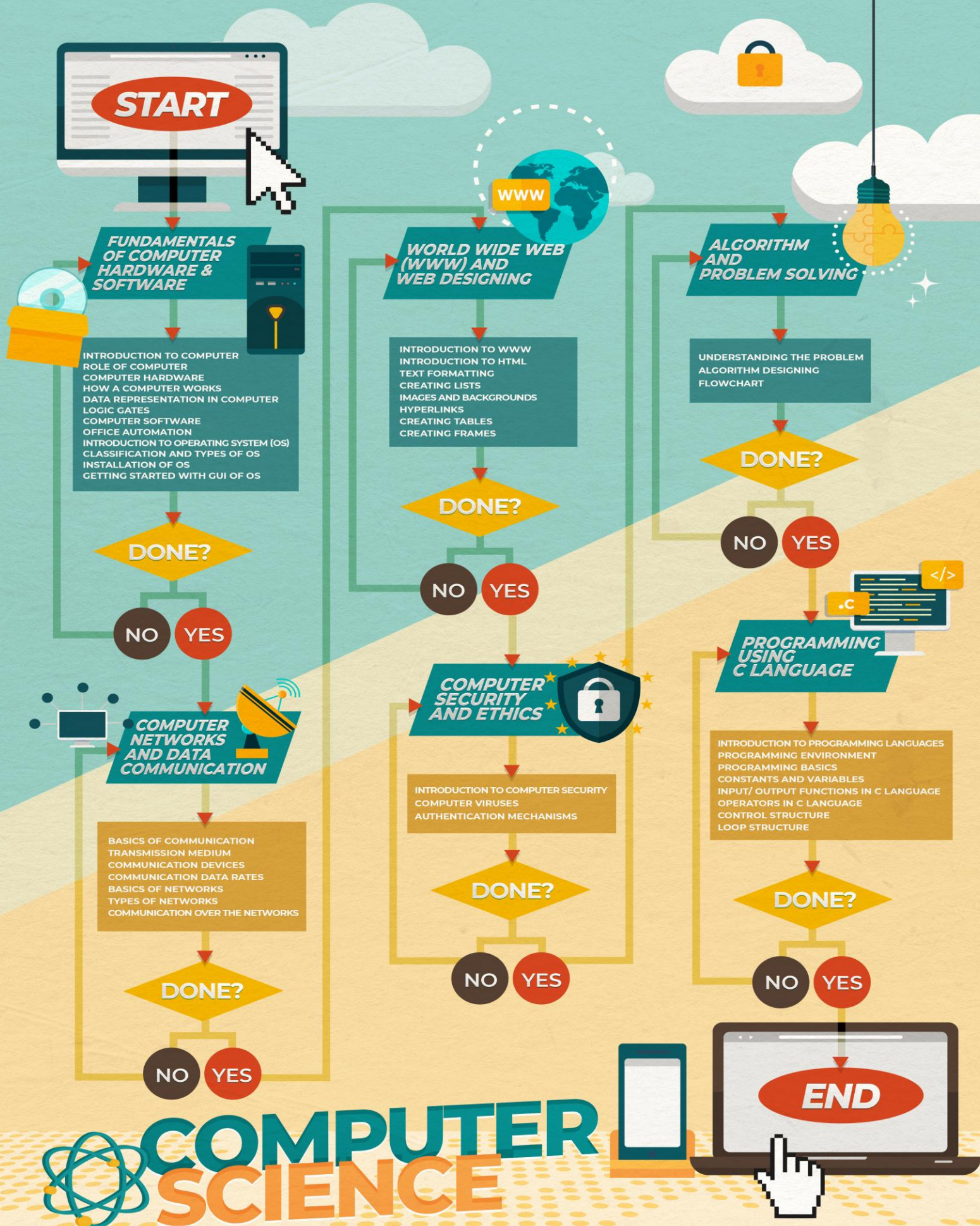
How to approach the syllabus?

The concept map of the syllabus gives an overview of the entire syllabus to teachers and learners. The topics and Student Learning Outcomes (SLOs) guide in details about what has to be achieved through this syllabus. And finally, the Exam Specification guides regarding what will be expected in the examinations.

What is the concept map telling you?

In problem solving, a program flowchart depicts the correct sequence of different processes occurring in a program. For AKU-EB's SSC Computer Science syllabus, the concept map is a program flowchart that shows the recommended sequence of study.

The flowchart begins from START icon and finishes at END icon, showing between it the recommended flow of study. The input/ output boxes depict the key concepts of the syllabus while the process boxes show the important components of each concept. Hence, during the two years of SSC, it is suggested for you to start from the basic concept of Fundamentals of Computer Hardware and Software and finally move towards the relatively complex application in Programming Using C Language. While traversing through flowchart, look at the decision boxes to check that whether you can move ahead or not. Good luck!



Concept Map - SSC I & II
© Aga Khan University Examination Board

Student Learning Outcomes of AKU-EB SSC Computer Science

Part I (Grade IX)

Topics and Sub-topics	Student Learning Outcomes		Cognitive Level ²		
			K	U	A
1. Basics of Computer	Students should be able to:				
1.1 Introduction to Computer	1.1.1	compare the five generations of computers;		*	
	1.1.2	describe the types of computer on the basis of: a. purpose (general and special) b. technology (analog, digital and hybrid);		*	
	1.1.3	describe the conventional classification of digital computers, i.e. supercomputer, mainframe computer, minicomputer and microcomputer;		*	
1.2 Significance of Computer	1.2.1	describe the uses of computers in: a. education (distance and online) b. business (retailing and banking) c. defence (radar system) d. media (social media, entertainment) e. manufacturing (automobile industry);		CA ³	

² K = Knowledge, U = Understanding, A = Application and other higher-order cognitive skills

³ CA = Classroom Activity, not to be assessed under examination conditions

Topics and Sub-topics	Student Learning Outcomes		Cognitive Level		
			K	U	A
	Students should be able to:				
	1.2.2	describe the scope of following careers in information technology (IT): a. software engineer b. hardware engineer c. network administrator d. database administrator e. web designer f. multimedia designer g. information security analyst h. blogger i. ICT/ computer science teacher;		CA	
1.3 Computer Hardware	1.3.1	compare input devices, i.e. key board, mouse, light pen, joystick, track ball, touchpad, scanner, sensors, Magnetic Ink Character Reader (MICR), Barcode Reader (BCR), Optical Mark Reader (OMR), Optical Character Recognition (OCR) reader, microphone, and digital camera;		*	
	1.3.2	identify the use of types of sensors, i.e. temperature, moisture, light, infra-red, pressure, sound/ acoustic, gas, pH;		*	
	1.3.3	explain diagrammatically (block diagram) the components of the computer system, i.e. input unit, output unit, storage unit/ memory unit, control unit and arithmetic logic unit;		*	
	1.3.4	describe the function of components of computer system mentioned in SLO 1.3.3;		*	
	1.3.5	compare primary and secondary storage devices on the basis of location with respect to Central Processing Unit (CPU), cost, storage capacity, average access time, direct/ indirect data processing, means of storing information such as semiconductor, magnetic disks, magnetic tape and optical discs;		*	

Topics and Sub-topics	Student Learning Outcomes		Cognitive Level		
			K	U	A
	Students should be able to:				
	1.3.6	differentiate between the types of primary memory, i.e. Random Access Memory (RAM) and Read Only Memory (ROM);		*	
	1.3.7	describe cache memory and its three types diagrammatically;		*	
	1.3.8	describe the two types of secondary storage devices, i.e. hard disk drive and Universal Serial Bus (USB) flash drive;		*	
	1.3.9	compare the types of output devices, i.e. speaker, Liquid Crystal Display (LCD), Light Emitting Diode (LED) display, printers and their types, plotter, actuators and their types, cutters;		*	
	1.3.10	differentiate between serial and parallel ports;		*	
1.4 Working of a Computer	1.4.1	differentiate between data and information;		*	
	1.4.2	describe the basic operations of the data processing cycle using block diagram: a. input operation b. processing operation c. storage operation d. output operation;		*	
1.5 Computer Software	1.5.1	differentiate between the types of software, i.e. system software and application software;		*	
	1.5.2	differentiate among the following types of system software: a. operating system b. device drivers c. utility programs d. language processors;		*	

Topics and Sub-topics	Student Learning Outcomes		Cognitive Level		
			K	U	A
	Students should be able to:				
	1.5.3	describe the use of the following application software: a. word processor b. spreadsheet c. database management d. presentation/ desktop publication e. communication f. entertainment;		CA	
	1.5.4	differentiate among open source software, shareware and freeware.		*	

Topics and Sub-topics	Student Learning Outcomes		Cognitive Level		
			K	U	A
2. Basics of Operating System	Students should be able to:				
2.1 Introduction of Operating System	2.1.1	define Operating System (OS);	*		
	2.1.2	describe the functions of OS, i.e. memory management, I/ O management, files management, resource management, users management and process management;		*	
	2.1.3	differentiate among the following three types of user interfaces provided by OS: a. Command Line Interface (CLI), e.g. DOS and UNIX b. Menu Driven Interface (MDI), e.g. Novel c. Graphical User Interface (GUI), e.g. Macintosh, Linux and Windows;		*	
2.2 Classification and Types of Operating System	2.2.1	classify OS into single user and multiuser OS;		*	
	2.2.2	differentiate among the following types of OS: a. batch processing system b. time sharing system c. real time system;		*	
2.3 Getting Started with GUI OS	2.3.1	identify the basic icons of GUI OS;		CA	
	2.3.2	manage data (files / folders);			CA
2.4 System Installation	2.4.1	install operating system;			CA
	2.4.2	install office automation software;			CA
	2.4.3	install antivirus.			CA

Topics and Sub-topics	Student Learning Outcomes		Cognitive Level		
			K	U	A
3. Office Automation I (MS Word 2007 or Above)	Students should be able to:				
3.1 Word Processing	3.1.1	describe the essential features of word processor;		*	
	3.1.2	apply document managing options, i.e. Create, Open, Save, Save As, Print;			*
	3.1.3	apply Home Menu tools, i.e. Select, Copy, Cut, Paste, Move, Delete, Find and Replace Text, Format Text, Format Paragraph Line Spacing and Indentation;			*
	3.1.4	apply Insert Menu tools, i.e. Page Break, Number, Header, Footer, Symbols, Table, Clip Art, Picture, Hyperlink and Word Art;			*
	3.1.5	apply table tools, i.e. Add, Delete, Resize Rows and Columns, Border Lines and Shading, Merging and Splitting Cells;			*
	3.1.6	apply Picture tools, i.e. Colour, Size, Position and Cropping;			*
	3.1.7	apply page layout options, i.e. Orientation, Size and Margins;			*
3.2 Urdu Editor (Inpage 2018)	3.2.1	identify the tools of Urdu Editor.		CA	

Topics and Sub-topics	Student Learning Outcomes	Cognitive Level		
		K	U	A
4. Fundamentals of Data Communication	Students should be able to:			
4.1 Basics of Communication	4.1.1 define data communication; 4.1.2 differentiate between data and data transmission; 4.1.3 differentiate between analog and digital signals; 4.1.4 identify the components of a communication system, i.e. sender, receiver, message, protocol and transmission medium; 4.1.5 describe the following characteristics of a good communication system: a. delivery b. accuracy c. timeliness; 4.1.6 differentiate between the synchronous and asynchronous data transmission methods;	*	*	
4.2 Transmission Medium	4.2.1 compare guided (wired) and unguided (wireless) media with examples, i.e. twisted pair cable, coaxial cable, optic fibre cable, radio waves, microwave, infra-red, Bluetooth and satellite; 4.2.2 differentiate among the following transmission impairments in communication media: a. attenuation b. amplification c. distortion d. cross talk;		*	
4.3 Communication Devices	4.3.1 identify the purpose of the following communication devices: a. dialup modem b. network interface card (NIC) c. router d. switch e. hub;		*	

Topics and Sub-topics	Student Learning Outcomes	Cognitive Level		
		K	U	A
	Students should be able to:			
4.4 Communication Data Rates	4.4.1 define the terms data rate, baud rate, bandwidth and signal-to-noise ratio;	*		
	4.4.2 convert baud rate to data rate and vice versa;			*
	4.4.3 convert one unit of data rate into other such as bit per second (bps), kilobit per second (kbps), kilobyte per second (kBps), kibibyte per second (KiBps), Megabit per second (Mbps), Megabyte per second (MBps), Mebibyte per second (MiBps) Gigabit per second (Gbps), Gigabyte per second (GBps) and Gibibyte per second (GiBps).			*

Topics and Subtopics	Student Learning Outcomes		Cognitive Level		
			K	U	A
5. Fundamentals of Computer Networks	Students should be able to:				
5.1 Basics of Networks	5.1.1	define a computer network;	*		
	5.1.2	describe the uses of networks;		*	
	5.1.3	describe advantages of computer networks;		*	
	5.1.4	differentiate among three data transmission modes simplex, half-duplex and full-duplex with examples;		*	
	5.1.5	explain the following types of network architecture, i.e. client/ server network, peer-to-peer network, point-to-point network;		*	
5.2 Types of Networks	5.2.1	differentiate among the following types of networks: a. Local Area Network (LAN) b. Metropolitan Area Network (MAN) c. Wide Area Network (WAN) d. Personal Area Network (PAN) e. Bluetooth network f. internet;		*	
	5.2.2	define a network topology;	*		
	5.2.3	explain the following network topologies with the help of diagrams, i.e. bus topology, ring topology, star topology and mesh topology;		*	
5.3 Communication over the Networks	5.3.1	describe the following types of technologies which use the telephone networks for data communications: a. dial-up b. digital subscriber line (DSL) c. integrated services digital network (ISDN) d. code-division multiple access (CDMA);		*	

Topics and Sub-topics	Student Learning Outcomes		Cognitive Level		
			K	U	A
	Students should be able to:				
	5.3.2	compare the data communication lines mentioned in SLO 5.3.1 on the basis of: a. transfer rates b. costs per month c. advantages d. disadvantages.		*	

Topics and Subtopics	Student Learning Outcomes		Cognitive Level		
			K	U	A
6. World Wide Web (WWW) And Hypertext Markup Language (HTML)	Students should be able to:				
6.1 Introduction to World Wide Web (WWW)	6.1.1	differentiate among the following terms: a. World Wide Web (WWW) b. web page c. web site d. web browser e. web server f. Uniform Resource Locator (URL) g. search engine h. home page i. web hosting;		*	CA
	6.1.2	categorise the different types of web sites, i.e. portal, news, informational, educational, personal, business, entertainment, communication;			
6.2 Introduction to Hypertext Markup Language (HTML)	6.2.1	define Hypertext Markup Language (HTML);	*		
	6.2.2	describe the steps involved to: a. create and save an HTML file b. display a webpage;		*	
6.3 Designing Webpage I: Text Formatting	6.3.1	write HTML code to: a. specify a page title b. create a paragraph c. insert line breaks d. insert spaces e. add headings/ sub-headings;			*
	6.3.2	apply appropriate text formatting tags, i.e. bold, underline, italic, strikethrough, superscript, subscript, center, font size, font color and font face;			*

Topics and Subtopics		Student Learning Outcomes		Cognitive Level		
				K	U	A
		Students should be able to:				
6.4	Designing Webpage II: Creating Lists	6.4.1	write HTML code to create: a. ordered list b. unordered list c. definition list;			*
6.5	Designing Webpage III: Images and Backgrounds	6.5.1	write HTML code to: a. insert an image b. apply border to an image;			*
		6.5.2	write HTML code to select: a. width of an image b. height of an image c. an alternate text for an image;			*
		6.5.3	write HTML code to: a. apply background colour to a web page b. apply foreground colour to a web page c. assign a background image to the web page;			*
6.6	Designing Webpage IV: Hyperlinks	6.6.1	write HTML code to create a hyperlink to a web page;			*
		6.6.2	create an 'anchor' in the context of hyperlinks;			*
		6.6.3	create an anchor to hyperlink within a web page;			*
		6.6.4	create a graphical hyperlink;			*
6.7	Designing Webpage V: Creating Tables	6.7.1	write HTML code to create a table in the webpage with the following table attributes: a. table border b. border colour c. background colour d. table width e. table height f. table row <tr>			*

Topics and Subtopics		Student Learning Outcomes		Cognitive Level		
				K	U	A
		Students should be able to:				
			g. standard cell <td> h. header cell <th>;			
6.8	Designing Webpage VI: Creating Frames	6.8.1	define a frame;	*		
		6.8.2	differentiate between a frame and a frameset;		*	
		6.8.3	create a frameset with multiple frames.			*

Part II (Grade X)

Topics and Subtopics	Student Learning Outcomes	Cognitive Level		
		K	U	A
7. Algorithm and Flowchart	Students should be able to:			
7.1 Understanding the Problem	7.1.1 describe the following steps of problem solving process: a. define the problem b. analyse the problem c. planning the solution of the problem d. find candid solutions of the problem e. select the best solution;		*	
7.2 Algorithm	7.2.1 define an algorithm; 7.2.2 describe the following four essential parts of an algorithm: a. inputs b. processing c. decision d. outputs; 7.2.3 write algorithms for solving problems, i.e. ⁴ a. performing arithmetic, relational and logical operations b. calculating the volume of geometrical shapes c. finding the area of various geometrical shapes d. converting from one unit to another unit of physical quantities e. finding the maximum and minimum from input values f. performing the counting and totaling on given values g. applying the repetition process h. applying the selection process;	*	*	*

⁴ Refer to Annex B.

Topics and Sub-topics	Student Learning Outcomes	Cognitive Level		
		K	U	A
	Students should be able to:			
7.3 Flowchart	7.3.1	define a program flowchart;	*	
	7.3.2	describe the importance of a program flowchart for solving a problem;	*	
	7.3.3	identify the flowchart symbols for the following: a. input b. process c. decision making d. outputs e. terminator/ terminal point f. connectors;	*	
	7.3.4	draw flowcharts for the problems mentioned in SLO 7.2.3;		*
	7.3.5	complete the trace table for a given flowchart.		*

Topics and Sub-topics	Student Learning Outcomes	Cognitive Level		
		K	U	A
8. Programming in C Language	Students should be able to:			
8.1 Introduction to Programming Languages	8.1.1	define a computer program;	*	
	8.1.2	differentiate between program syntax and program semantic;		*
	8.1.3	differentiate among the following levels of programming languages: a. low level languages i. machine language ii. assembly language b. high level languages i. procedural language ii. structured language iii. object oriented language;		*
	8.1.4	discuss the characteristics of a high level language;		*
	8.1.5	differentiate among assembler, compiler and an interpreter;		*
8.2 Programming Environment	8.2.1	define integrated development environment (IDE);	*	
	8.2.2	use the following menus in C programming IDE: a. file b. edit c. search d. compile e. debug f. project g. options h. window i. help;		CA

Topics and Sub-topics	Student Learning Outcomes		Cognitive Level		
			K	U	A
	Students should be able to:				
8.3 Programming Basics	8.3.1	define header files;	*		
	8.3.2	describe the structure of a C program consisting of: <ul style="list-style-type: none"> a. pre-processor directives <ul style="list-style-type: none"> i. include ii. define b. main () function c. body of main { } d. global and local variables; 		*	
	8.3.3	describe the purpose of comments in a C program;		*	
8.4 Constants and Variables	8.4.1	differentiate between a constant and a variable in C programming language;		*	
	8.4.2	list the rules for specifying variable names;	*		
	8.4.3	define the following data types offered by C programming language and the number of bytes taken by each data type: <ul style="list-style-type: none"> a. integer data type b. floating-point data type c. character data type; 	*		
	8.4.4	write the C language code to declare and initialise variables and constant qualifiers having data types mentioned in SLO 8.4.3;			*
	8.4.5	write a C program to perform implicit and explicit typecasting.			*

Topics and Sub-topics	Student Learning Outcomes		Cognitive Level		
			K	U	A
9. Fundamentals of Input and Output Handling in C Programming	Students should be able to:				
9.1 Input and Output Functions in C Programming	9.1.1	apply output functions putchar(), puts() and printf() to display the output;			*
	9.1.2	write a C program containing the following data types and format specifiers: a. decimal b. integer c. float (decimal notation) d. float (exponential notation) e. char f. long int g. string;			*
	9.1.3	write a C program that uses input functions scanf(), getch(), getche(), getchar() and gets() function;			*
	9.1.4	define an escape sequence;	*		
	9.1.5	write a C program using the following escape sequences: a. alert b. backspace c. newline d. carriage return e. tab f. backslash g. single quotation marks h. double quotation mark i. question mark;			*
9.2 Operators in C Language	9.2.1	write a C program involving use of arithmetic operators, e.g. addition, subtraction, multiplication, division and remainder;			*

Topics and Sub-topics	Student Learning Outcomes	Cognitive Level		
		K	U	A
	Students should be able to:			
	9.2.2 convert given arithmetic expression into C language code;			*
	9.2.3 use the arithmetic operators of C language to solve an arithmetic problem;			*
	9.2.4 use the following assignment operators in a C program: a. assignment operator (=) b. compound assignment operator (+ =, - =, * =, / =, % =);			*
	9.2.5 use the increment (++) and decrement (--) operators in a C program;			*
	9.2.6 use the following relational operators in a C program: a. less than (<) b. greater than (>) c. less than or equal to (<=) d. greater than or equal to (>=) e. equal to (==) f. not equal to (!=);			*
	9.2.7 use the following logical operators in a C program: a. AND (&&) b. OR () c. NOT (!);			*
	9.2.8 differentiate between the assignment operator (=) and equal to operator (==);		*	
	9.2.9 differentiate between the unary and binary operators;		*	
	9.2.10 use the conditional (ternary) operator in a C program;			*
	9.2.11 apply the order of precedence of operators to evaluate an expression.			*

Topics and Sub-topics	Student Learning Outcomes	Cognitive Level		
		K	U	A
10. Control Structure	Students should be able to:			
10.1 Control Structure	10.1.1 define a control statement;	*		
	10.1.2 define a conditional statement;	*		
	10.1.3 write the structure of if statement;			*
	10.1.4 write C programs for the problems mentioned in 7.2.3 involving the use of if statement;			*
	10.1.5 write the structure of if-else statement;			*
	10.1.6 write C programs for the problems mentioned in 7.2.3 involving the use of if-else statement;			*
	10.1.7 write the structure of if-else-if statement;			*
	10.1.8 write C programs for the problems mentioned in 7.2.3 involving the use of if-else-if statement;			*
	10.1.9 write the structure of switch statement;			*
	10.1.10 describe advantages and disadvantages of switch statement;		*	
	10.1.11 write C programs for the problems mentioned in 7.2.3 involving the use of switch statement.			*

Topics and Sub-topics	Student Learning Outcomes	Cognitive Level		
		K	U	A
11. Loop Structure	Students should be able to:			
11.1 Loop Structure	11.1.1 differentiate among three types of loops;		*	
	11.1.2 write the for loop structure in C language;			*
	11.1.3 write C programs for the problems mentioned in 7.2.3 involving use of for loop;			*
	11.1.4 write the while loop structure in C language;			*
	11.1.5 write C programs for the problems mentioned in 7.2.3 involving use of while loop;			*
	11.1.6 write the do while loop structure in C language;			*
	11.1.7 write C programs for the problems mentioned in 7.2.3 involving use of do while loop;			*
	11.1.8 write the output of a given program having loop and control structures;			*
	11.1.9 use break and continue statements in a C program.			*

Topics and Sub-topics	Student Learning Outcomes		Cognitive Level		
			K	U	A
12. Computer Logic and Gates	Students should be able to:				
12.1 Data Representation	12.1.1	show the binary data representation using binary pulses i.e. 0/ low/ off and 1/ high/ on;			*
12.2 Logic Gates	12.2.1	define digital logic and logic gates;	*		
	12.2.2	differentiate between sequential and combinational logic circuits;		*	
	12.2.3	define a truth table;	*		
	12.2.4	explain the following logic gates in terms of number of inputs and outputs using truth tables: a. AND b. OR c. NOT d. NAND e. NOR f. Exclusive OR (XOR) g. Exclusive NOR (XNOR);		*	
	12.2.5	identify logic gates from the truth table;			*
	12.2.6	construct truth table for logic circuits;			*
	12.2.7	construct logic circuit to solve a given real life problem;			*
12.3 Karnaugh Map (K-Map)	12.3.1	simplify two-variable and three-variable Boolean functions using Karnaugh map.			*

Topics and Sub-topics	Student Learning Outcomes		Cognitive Level		
			K	U	A
13. Office Automation II (MS Excel 2007 or Above)	Students should be able to:				
13.1 Spreadsheet	13.1.1	apply the basic tools on a spreadsheet: a. naming cell and sheets b. filling column and rows c. addressing cells (relative and absolute addresses) d. paste special (value, format and formula) e. print a spreadsheet;			*
	13.1.2	format spreadsheet (border, colour, highlight);			*
	13.1.3	apply functions and formulae (sum, average, count, minimum, maximum) on given data;			*
	13.1.4	represent the data graphically;			*
	13.1.5	show manipulation and formatting of data, i.e. filtering data, data validation, protecting a worksheet, unlocking cells and conditional formatting.			*

Topics and Sub-topics	Student Learning Outcomes		Cognitive Level		
			K	U	A
14. Computer Security and Ethics	Students should be able to:				
14.1 Introduction to Computer Security	14.1.1	explain the importance of computer security;		*	
	14.1.2	explain cybercrime, hacking and cracking;		*	
	14.1.3	differentiate among the types of hackers, i.e. script kiddie, white hat hackers, black hat hackers, grey hat hacker, green hat hackers, red hat hackers, blue hat hackers;		*	
	14.1.4	differentiate among the types of malware, i.e. virus, worm, adware, spyware, Trojan horses;		*	
14.2 Computer Viruses	14.2.1	discuss the ways in which a malware can spread via: a. infected flash drives/ CD's b. pirated software c. local area network d. internet e. e-mail attachments;		*	
	14.2.2	identify common symptoms of an attack by a malware on a computer system;		*	
	14.2.3	identify the precautions to safeguard computer systems against the ways through which malware can spread mentioned in SLO 14.2.1;		*	
14.3 Authentication Mechanisms	14.3.1	differentiate between authentication and authorisation;		*	
	14.3.2	differentiate between Two Factor Authentication (2FA) and Multifactor Authentication (MFA);		*	
	14.3.3	describe the following authentication methodologies: a. username and password b. Personal Identification Number (PIN) c. access cards d. biometrics.		*	

Summary of Students Learning Outcomes

Grade IX

Table 1: Number of Student Learning Outcomes by Cognitive level

Topic No.	Topic	No. of Sub-Topics	SLOs			Total SLOs
			K	U	A	
1.	Basics of Computer	5	0	21	0	21
2.	Basics of Operating System	4	1	5	5	11
3.	Office Automation I (MS Word 2007 or Above)	2	0	2	6	8
4.	Fundamentals of Data Communication	4	2	8	2	12
5.	Fundamentals of Computer Networks	3	2	8	0	10
6.	World Wide Web (WWW) and Hyper Text Markup Language (HTML)	8	2	3	13	18
Total		26	7	47	26	80
Percentage			9	59	32	100

Grade X

Table 2: Number of Student Learning Outcomes by Cognitive level

Topic No.	Topic	No. of Sub-Topics	SLOs			Total SLOs
			K	U	A	
7.	Algorithms and Flowcharts	3	2	4	3	9
8.	Programming in C Language	4	5	7	3	15
9.	Fundamentals of Input and Output Handling in C Programming	2	1	2	13	16
10.	Control Structure	1	2	1	8	11
11.	Loop Structure	1	0	1	8	9
12.	Computer Logic and Gates	3	2	3	4	9
13.	Office Automation II (MS Excel 2007 or Above)	1	0	0	5	5
14.	Computer Security and Ethics	3	0	10	0	10
Total		18	12	28	44	84
Percentage			14	33	53	100

Scheme of Assessment

Grade IX

Table 3: Exam Specification

Topic No.	Topics	Marks Distribution			Total Marks
		MCQs	CRQs	ERQs	
1.	Basics of Computer	7 Marks	5 Marks	ERQ 1 @ 7 marks (Choose any ONE from TWO)	19
2.	Basics of Operating System	2 Marks	3 Marks	-	5
3.	Office Automation I (MS Word 2007 or Above)	3 Marks	-	-	3
4.	Fundamentals of Data Communication	9 Marks	6 Marks	ERQ 1 @ 8 marks will be asked from Topic 4 and 5 (Choose any ONE from TWO)	23
5.	Fundamentals of Computer Networks				
6.	World Wide Web (WWW) and Hyper Text Markup Language (HTML)	9 Marks	6 Marks	-	15
Total		30	20	15	65
Practical					10
Total					75

Grade X

Table 4: Exam Specification

Topic No.	Topics	Marks Distribution			Total Marks
		MCQs	CRQs	ERQs	
7.	Algorithms and Flowcharts	5 Marks	6 Marks	-	11
8.	Programming in C	5 Marks	2 Marks	-	7
9.	Fundamentals of Input and Output Handling in C	13 Marks	5 Marks	ERQ 1 @ 8 marks will be asked from Topic 9, 10 and 11 (Choose any ONE from TWO)	26
10.	Control Structure				
11.	Loop Structure				
12.	Computer Logic and Gates	3 Marks	7 Marks	-	10
13.	Office Automation II (MS Excel 2007 or Above)	3 Marks	-	-	3
14.	Computer Security and Ethics	1 Mark	-	ERQ 1 @ 7 marks (Choose any ONE from TWO)	8
Total		30	20	15	65
Practical					10
Total					75

- * Extended response questions (ERQs) will require answers in more descriptive form. The answers will be in a paragraph form rather than a word or a single sentence.
- There will be two examinations, one at the end of grade IX and one at the end of grade X.
 - In each class, the theory paper will be in two parts: paper I and paper II. Both papers will be of total duration of 3 hours.
 - Paper I theory will consist of 30 compulsory, multiple choice items. These questions will involve four response options.
 - Paper II theory will carry 35 marks and consist of a number of compulsory, structured questions and two extended response questions. Each extended response question will be presented in an either/or form.
 - Practical examination will be conducted separate from the theory paper. It will be based on the practical activities listed in the **Annex C** of the syllabus.
 - All constructed response questions will be in a booklet which will also serve as an answer script.
 - Practical exams to assess performance skills will carry 10 marks in grade IX and 10 marks in grade X.
 - It is essential for each school to equip its laboratories with software and hardware according to the requirements of the practical activities. Each school will be responsible to make sure that each student is provided the opportunity to do the practical activities.

Annex A: List of Acronyms and Their Full Forms

Acronym	Full Form
2FA	Two Factor Authentication
BCR	Barcode Reader
CD	Compact Disc
CLI	Command Line Interface
CPU	Central Processing Unit
DOS	Disc Operating System
DSL	Digital Subscriber Line
DVD	Digital Versatile Disc
DVD RAM	Digital Versatile Disc Random Access Memory
GiB	Gibibyte
Gb	Gigabit
GB	Gigabyte
GUI	Graphical User Interface
HTML	Hypertext Markup Language
I/ O	Input/ Output
ICT	Information Communication Technology
IDE	Integrated Development Environment
ISDN	Integrated Services Digital Network
IT	Information Technology
KiB	Kibibyte
Kb	Kilobit
KB	Kilobyte
LAN	Local Area Network
LCD	Liquid Crystal Display
LED	Light Emitting Diode
MAN	Metropolitan Area Network
MiB	Mebibyte
Mb	Megabit
MB	Megabyte
MDI	Menu Driven Interface
MFA	Multifactor Authentication

MICR	Magnetic Ink Character Reader
NIC	Network Interface Card
OCR	Optical Character Recognition
OMR	Optical Mark Reader
OS	Operating System
PIN	Personal Identification Number
RAM	Random Access Memory
ROM	Read Only Memory
UNIX (UNICS)	UNiplexed Information and Computing System
URL	Uniform Resource Locator
USB	Universal Serial Bus
WAN	Wide Area Network
WWW	World Wide Web

Annex B: Example Problems for Algorithms, Flowcharts and Programming⁵

1. Find the sum, product and average of five given numbers.
2. Find acceleration of a moving object with given mass and the force applied.
3. Find the volume of a cube, cylinder or sphere.
4. Find the area of a triangle, parallelogram, rhombus or trapezium.
5. Convert Celsius to Fahrenheit temperature and vice versa.
6. Prepare an electricity bill including number of units consumed, price per unit, government sales tax (GST) and total amount to be paid within due date and 10% surcharge after due date.
7. Display the larger one out of the three given unequal numbers.
8. Assign grade to a subject based on the achieved marks.
9. Find the interest on an amount.
10. Determine whether a given number is prime number or not.
11. Generate a sequence of odd numbers starting from a given number.
12. Generate a sequence of even numbers starting from a given number.
13. Produce a multiplication table for a given number.

⁵Government of Pakistan (2009), Page 14, *National Curriculum for Computer Science IX-X, Islamabad*, Ministry of Education (Curriculum Wing)

Annex C: List of Practical

Class IX

S.No	SLO No	Practical Activity	Equipment	Software
		Topic 3: Office Automation I (MS Word 2007 or Above)		
1.	3.1.2	Create, Open, Save, Save As and Print a document.	Computer and Printer	MS Word 2007 or Above
2.	3.1.3	Add text with font, font colour, font size.		
3.	3.1.3	Alignment (right, left, centre, justify)		
4.	3.1.3	Apply line spacing (double, 1.5) , indentation (hanging and first line) and bullets		
5.	3.1.3	Use find and replace tool		
6.	3.1.4	Insert page number, header, footer, symbols, equations, hyperlink and word art.		
7.	3.1.5	Insert tables, adjust border lines, merge and split cells of table.		
8.	3.1.6	Insert picture, crop it and adjust its position.		
9.	3.1.7	Adjust margin, size and orientation of page.		

S.No	SLO No	Practical Activity	Equipment	Software
		Topic 6: World Wide Web (WWW) and Hypertext Markup Language (HTML)		
10.	6.3.1	Create an HTML file and preview it in a browser.	Computer	Notepad and Google Chrome
11.	6.3.2	Apply the basic HTML text formats, i.e. heading, bold, italic, underline, strike-out, superscript, subscript, center, font size, font color and font face.		
12.	6.4.1	Create ordered, unordered and definition lists.		
13.	6.5.3	Add an image.(background and foreground)		
14.	6.5.2	Adjust height and width of an image.		
15.	6.5.2	Add alternate text on an image.		
16.	6.5.1	Add border to an image.		
17.	6.6.1	Add a hyperlink to a web page.		
18.	6.6.4	Add a graphical hyperlink.		
19.	6.6.3	Add anchor to hyperlink within a web page.		
20.	6.7.1	Create table and adjust its attributes.		
21.	6.8.4	Add a frameset with multiple frames.		

Class X

S.No	SLO No	Practical Activity	Equipment	Software
		Topic 9: Fundamentals of Input and Output Handling in C		
1.	9.2.2	To find the volume of a cube , cylinder or sphere	Computer	Dev-C ++ 5.11 or Any Other C Compiler
2.	9.2.2	To find the area of a triangle, parallelogram, rhombus and trapezoid		
3.	9.2.2	To calculate the exponent of a given number		
4.	9.2.2	To convert Celsius to Fahrenheit temperature and vice versa		
5.	9.2.2	To Prepare an electricity bill		
6.	9.2.2	To Calculate GCD of given two numbers		
7.	9.2.2	To find the interest in an amount		
8.	9.2.3	To find the sum, product, and average of five given numbers		
9.	9.2.3	To find acceleration of a moving object with given mass and the force applied		

S.No	SLO No	Practical Activity	Equipment	Software
		Topic 10: Control Structure		
10.	10.1.6	To find even numbers in integers ranging from n_1 and n_2 (where n_1 is greater than n_2)	Computer	Dev-C ++ or Any Other C Compiler
11.	10.1.6	To determine prime numbers in integers ranging from n_1 to n_2 (where n_1 is greater than n_2)		
12.	10.1.6	To count multiple of a given number lying between two numbers		
13.	10.1.6	To find the maximum number from input values.		
14.	10.1.6	To find the minimum number from input values.		
15.	10.1.6	To determine whether a given number is prime or not		
16.	10.1.8	To display the larger one out of the three given unequal numbers		
17.	10.1.8	To assign grade to a subject based on the achieved marks		
		Topic 11: Loop Structure		
18.	11.1.3	To generate the sequence of even or odd numbers starting from a given number	Computer	Dev-C ++ or Any Other C Compiler
19.	11.1.3	To produce a multiplication table for a given number		

S.No	SLO No	Practical Activity	Equipment	Software
		Topic 13: Office Automation II (MS Excel 2007 or Above)		
20.	13.1.1	Prepare a spreadsheet by naming cells and sheets.	Computer and Printer	Microsoft Excel 2007 or Above
21.	13.1.1	Use different options of paste special, i.e. value, format and formula.		
22.	13.1.1	Print a spreadsheet.		
23.	13.1.2	Apply cell formatting tools like; number, alignment, font, border, fill.		
24.	13.1.3	Apply different functions to the data, i.e sum, average, count, minimum and maximum.		
25.	13.1.4	Insert a pie chart and bar graph in the data sheet.		
26.	13.1.5	Apply filter and data validation on spreadsheet data.		
27.	13.1.5	Protect a worksheet.		
28.	13.1.5	Lock/ unlock cells of spreadsheet.		

Acknowledgements

Aga Khan University Examination Board (AKU-EB) would like to acknowledge the contributions of all those who played an important part in the revision of the AKU-EB SSC Computer Science syllabus.

We would like to thank **Fahad Ahmad Khan, Specialist, Computer Science**, AKU-EB, for taking the **subject lead** during the entire process of revising the **Computer Science** syllabus.

We are particularly thankful to the **syllabus revision panel** for their time, commitment and effort in revising the syllabus. The panel included:

- **Sobia Zeeshan**
Bai Virbaijee Soparivala Parsi High School, Karachi
- **Rana Azam Faruqui**
The Mama Parsi Girls' Secondary School, Karachi
- **Muhammad Azeem**
Habib Public School, Karachi
- **Inqilab Patel**
The City School PAF Chapter, Karachi
- **Mohammad Uwais**
Aga Khan Higher Secondary School Karimabad, Karachi

We also thank the following **post-revision reviewer** for her feedback on relevance of the content, skills and resources of the syllabus:

- **Farhana Tabassum**
PECHS Girls School, Karachi

Furthermore, we thank the following for reviewing the syllabus for **higher education preparedness**, ensuring that the syllabus includes adequate skills and content to effectively prepare students for the next level of education.

- **Dr Zulfiqar Ali Memon**
Professor, Computer Science, National University of Computer and Emerging Sciences, Karachi

In-house Team

- **Final Reviewer and Advisor: Dr Shehzad Jeeva**
Director, AKU-EB
- **Mentor and Guide for Syllabi Review: Dr Naveed Yousuf**
Associate Director, Assessment
- **Syllabi Review Lead: Raabia Hirani**
Manager, Curriculum Development
- **Syllabi Review Facilitator: Banazeer Yaqoob**
Associate, Curriculum Development
- **Lead Specialist Reviewer: Abid Sohail**
Lead Specialist, Curriculum & Exam Development
- **Administrative Support: Hanif Shariff**
Associate Director, Operations
Raheel Sadrudin
Assistant Manager, Administration
- **Syllabi Feedback Data Analysts: Tooba Farooqui**
Lead Specialist, Assessment
Muhammad Kashif and Muhammad Faheem
Specialists, Assessment
- **Design Support: Hatim Yousuf**
Associate, Communications

We would like to thank the students and teachers of affiliated schools from across Pakistan who gave their valuable feedback at various stages of the review process.

We also thank **Shahid Arwani**, **Anusha Aslam** and **Tabassum Ali**, Assistants, AKU-EB, for their support during data compilation and content compilation. In addition, we thank **Naveed Ashiq Ali** for his support during formatting.