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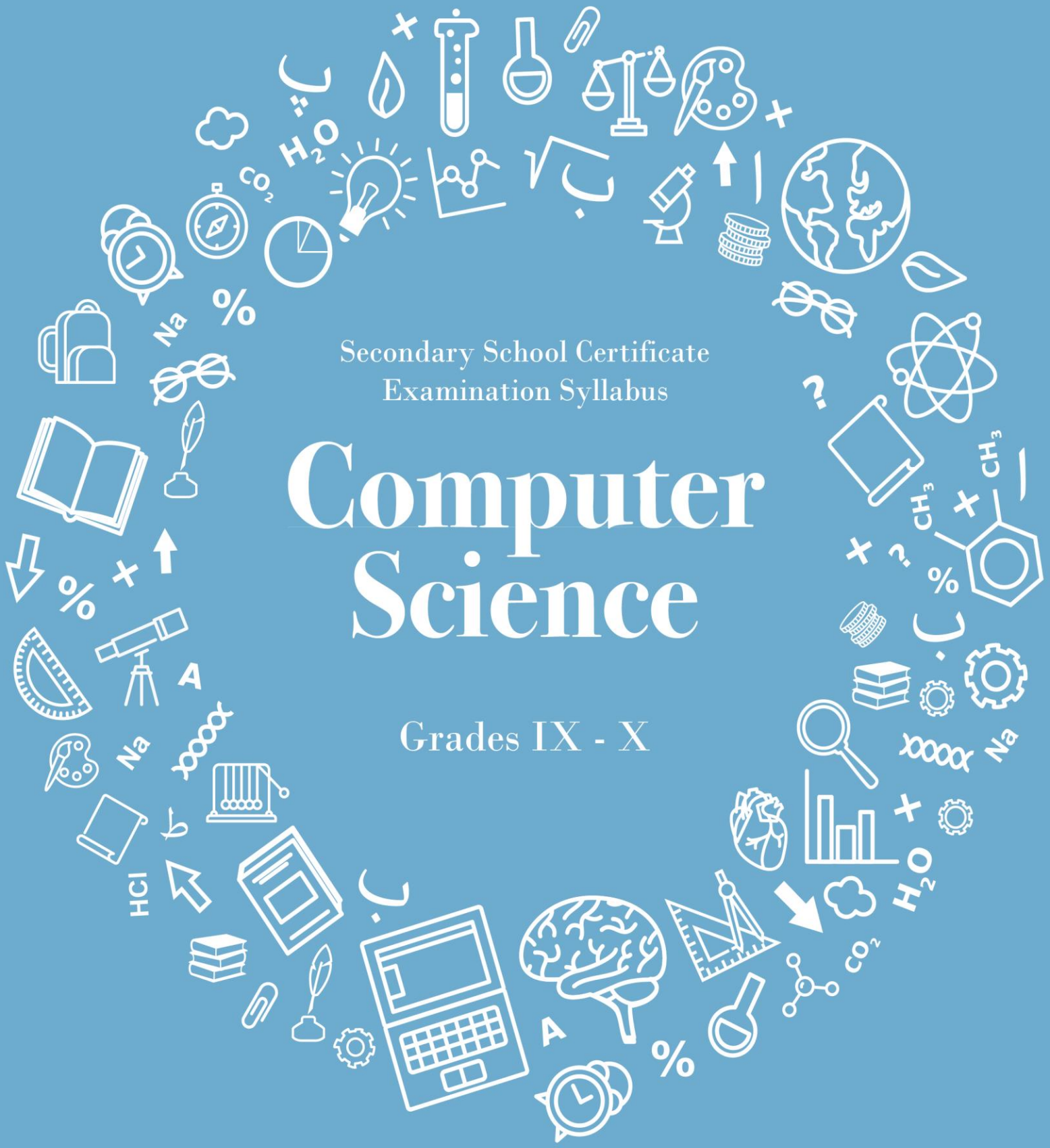

Secondary School Certificate
Examination Syllabus

Computer Science

Grades IX - X

FOR ACADEMIC YEAR 2023 AND ONWARDS

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Secondary School Certificate Examination Syllabus

COMPUTER SCIENCE

GRADES IX-X

This syllabus will be examined in both Annual and Re-sit Examination sessions from Annual Examinations 2024

FOR ACADEMIC YEAR 2023 AND ONWARDS

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FOR ACADEMIC YEAR 2023 AND ONWARDS

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Preface

Established in 2002 through the Pakistan government's ordinance, the Aga Khan University Examination Board (AKU-EB) is country's first private autonomous qualification awarding 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.

AKU-EB achieves its vision by developing examination syllabi which inculcate conceptual thinking and higher order learning and are aligned with National/ trans-provincial curricula and international standards. AKU-EB revises its syllabi periodically to support the needs of students, teachers and examiners.

The aims of the syllabus review of SSC and HSSC are to:

- Ensure continued compatibility with the goals of the trans-provincial curricula 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 (SCC and HSSC).
- Ensure the readiness of students for higher education.

During the 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, teachers of affiliated and non-affiliated schools, teacher trainers and university academicians, reviewed and revised the syllabus following a planned, meticulous and standardised syllabi review process.

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 has 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.

FOR ACADEMIC YEAR 2023 AND ONWARDS

With your support and collective hard work, AKU-EB has been able to take the necessary steps to ensure effective implementation of the best international and trans-provincial standards 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 the very best to our students and teachers in implementing this syllabus.

Dr Shehzad Jeeva
Chief Executive Officer (CEO), Aga Khan University Examination Board
Associate Professor of Practice, Faculty of Arts and Sciences, Aga Khan University

FOR ACADEMIC YEAR 2023 AND ONWARDS

Understanding of AKU-EB Syllabi

1. The AKU-EB 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.

2. 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 also provide enabling SLOs where needed to scaffold student learning.

3. 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.

4. The topics of the syllabi are grouped into themes derived from the national/ trans-provincial curricula. 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 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. Furthermore, it will help to derive multiple choice questions (MCQs), constructed response questions (CRQs) and extended response questions (ERQs) on a rational basis from the subject syllabi.

6. 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.

7. 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**.

8. On the whole, the AKU-EB syllabi for Secondary School Certificate (SSC) provide a framework that helps students to acquire conceptual understanding and learn to critically engage with it. This lays a solid foundation for HSSC and beyond.

FOR ACADEMIC YEAR 2023 AND ONWARDS

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

FOR ACADEMIC YEAR 2023 AND ONWARDS

How to approach the syllabus?

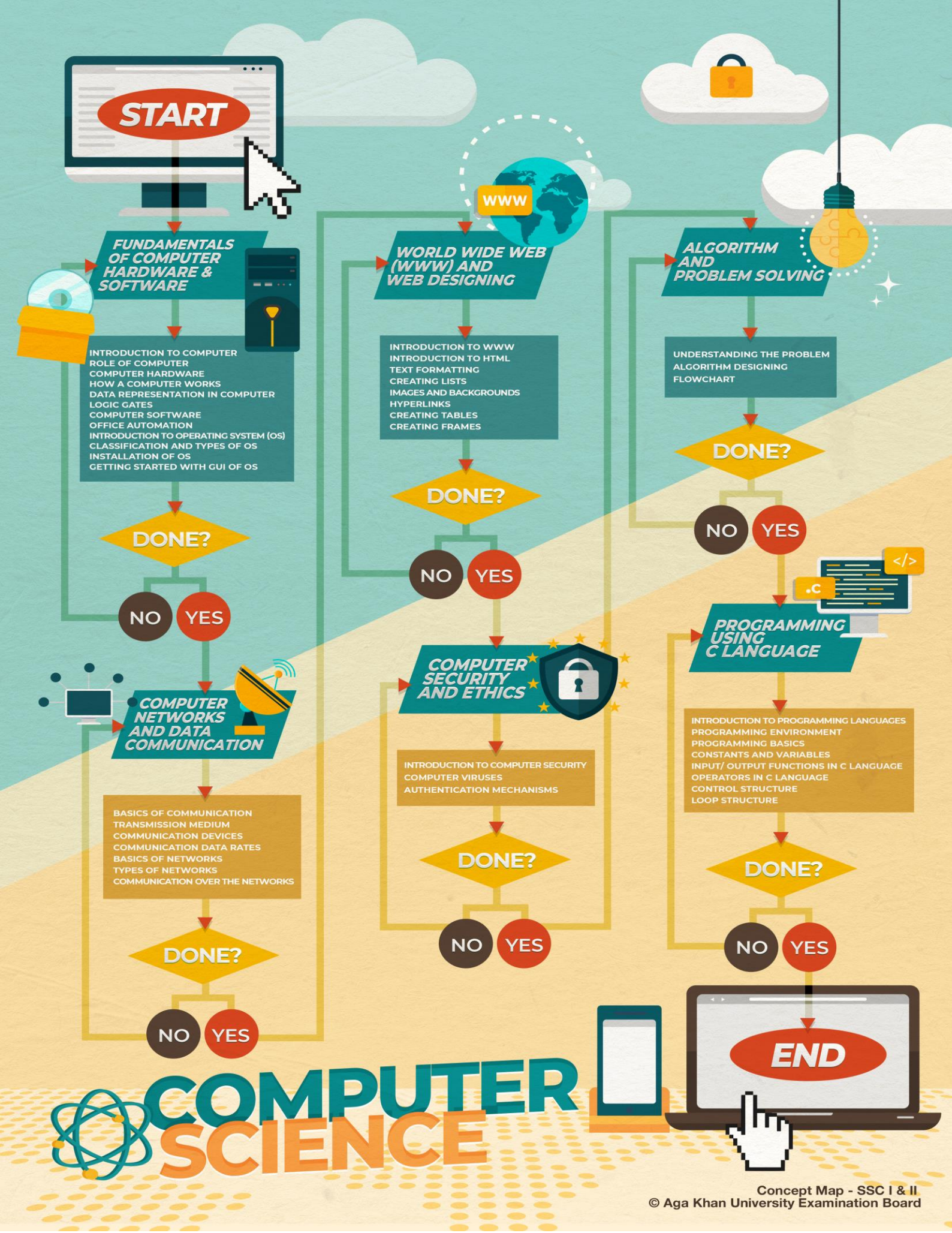
The concept map of the syllabus gives an overview of the entire syllabus to teachers and learners. The topics and Student Learning Outcomes (SLOs) guide in details about what has to be achieved through this syllabus. And finally, the Exam Specification guides regarding what will be expected in the examinations.

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!

FOR ACADEMIC YEAR 2023 AND ONWARDS


START
FUNDAMENTALS OF COMPUTER HARDWARE & SOFTWARE
INTRODUCTION TO COMPUTER
ROLE OF COMPUTER
COMPUTER HARDWARE
HOW A COMPUTER WORKS
DATA REPRESENTATION IN COMPUTER
LOGIC GATES
COMPUTER SOFTWARE
OFFICE AUTOMATION
INTRODUCTION TO OPERATING SYSTEM (OS)
CLASSIFICATION AND TYPES OF OS
INSTALLATION OF OS
GETTING STARTED WITH GUI OF OS
DONE?
NO
YES
COMPUTER NETWORKS AND DATA COMMUNICATION
BASICS OF COMMUNICATION
TRANSMISSION MEDIUM
COMMUNICATION DEVICES
COMMUNICATION DATA RATES
BASICS OF NETWORKS
TYPES OF NETWORKS
COMMUNICATION OVER THE NETWORKS
DONE?
NO
YES
WWW
WORLD WIDE WEB (WWW) AND WEB DESIGNING
INTRODUCTION TO WWW
INTRODUCTION TO HTML
TEXT FORMATTING
CREATING LISTS
IMAGES AND BACKGROUNDS
HYPERLINKS
CREATING TABLES
CREATING FRAMES
DONE?
NO
YES
COMPUTER SECURITY AND ETHICS
INTRODUCTION TO COMPUTER SECURITY
COMPUTER VIRUSES
AUTHENTICATION MECHANISMS
DONE?
NO
YES
ALGORITHM AND PROBLEM SOLVING
UNDERSTANDING THE PROBLEM
ALGORITHM DESIGNING
FLOWCHART
DONE?
NO
YES
PROGRAMMING USING C LANGUAGE
INTRODUCTION TO PROGRAMMING LANGUAGES
PROGRAMMING ENVIRONMENT
PROGRAMMING BASICS
CONSTANTS AND VARIABLES
INPUT/ OUTPUT FUNCTIONS IN C LANGUAGE
OPERATORS IN C LANGUAGE
CONTROL STRUCTURE
LOOP STRUCTURE
DONE?
NO
YES
END
COMPUTER SCIENCE
Concept Map - SSC I & II
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Student Learning Outcomes of AKU-EB SSC Computer Science

Part I (Grade IX)

Topics and Sub-topics		Student Learning Outcomes		Cognitive Level[1]		
				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[2]	

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[1] K = Knowledge, U = Understanding, A = Application and other higher-order cognitive skills
[2] 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;		*	

FOR ACADEMIC

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;		*	

FOR ACADEMIC

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.		*	

FOR ACADEMIC YEAR 202

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

FOR ACADEMIC YEAR

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	

FOR ACADEMIC

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;		*	

FOR ACADEMIC

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 (Mbs), Megabyte per second (MBps), Mebibyte per second (MiBps) Gigabit per second (Gbps), Gigabyte per second (GBps) and Gibibyte per second (GiBps).			*

FOR ACADEMIC YEAR 202

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);		*	

FOR ACADEMIC YEAR 2023

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.		*	

FOR ACADEMIC YEAR 2023 AN

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;		*	
		6.1.2	categorise the different types of web sites, i.e. portal, news, informational, educational, personal, business, entertainment, communication;			CA
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;			*

FOR ACADEMIC YEAR 20

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;			*

FOR ACADEMIC

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

FOR ACADEMIC YEAR 2023

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.[3] 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;			*

[3] Refer to Annex B.

FOR ACADEMIC

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.			*

FOR ACADEMIC YEA

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

FOR ACADEMIC

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: a. pre-processor directives 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: 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.			*

FOR ACADEMIC

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. carrage 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;			*

FOR ACADEMIC

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.			*

FOR ACADEMIC

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.			*

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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.			*

FOR ACADEMIC YEA

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.			*

FOR ACADEMIC PURPOSE

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.			*

FOR ACADEMIC YE

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.		*	

FOR ACADEMIC

Scheme of Assessment

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**

FOR ACADEMIC YEAR 2023 AND ONWARDS

Table 2: Exam Specification

Topic No.	Topics	Marks Distribution			Total Marks
		MCQs	CRQs	ERQs	
1.	Basics of Computer	11		6 Marks Choose any ONE from TWO	17
2.	Basics of Operating System	5	Total 4 Marks (1 CRQ)		9
3.	Office Automation I (MS Word 2007 or Above)	4			4
4.	Fundamentals of Data Communication	7	Total 2 Marks (1 CRQ)	6 Marks Choose any ONE from TWO	24
5.	Fundamentals of Computer Networks	7	Total 2 Marks (1 CRQ)		
6.	World Wide Web (WWW) and Hyper Text Markup Language (HTML)	6	Total 5 Marks (1 CRQ)		11
	Total	**40**	**13**	**12**	**65**
	Practical*				**10**
	Total				**75**

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Grade X

Table 3: 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**

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Table 4: Exam Specification

Topic No.	Topics	Marks Distribution			Total Marks
		MCQs	CRQs	ERQs	
7.	Algorithms and Flowcharts	6	Total 2 Marks (1 CRQ)		8
8.	Programming in C	7			7
9.	Fundamentals of Input and Output Handling in C	8		6 Marks Choose any ONE from TWO	30
10.	Control Structure	3	Total 3 Marks (1 CRQ)		
11.	Loop Structure	7	Total 3 Marks (1 CRQ)		
12.	Computer Logic and Gates	3	Total 5 Marks (1 CRQ)		8
13.	Office Automation II (MS Excel 2007 or Above)	4			4
14.	Computer Security and Ethics	2		6 Marks Choose any ONE from TWO	8
	Total	**40**	**13**	**12**	**65**
	Practical*				**10**
	Total				**75**

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- Multiple Choice Question (MCQ) requires candidates to choose one best/ correct answer from four options for each question. Each MCQ carries ONE mark.
- Constructed Response Question (CRQ) requires students to respond with a short text (few phrases/ sentences), calculations or diagrams.
- Extended Response Question (ERQ) requires students to answer in a more descriptive form. The answer should be in paragraph form, with diagrams where needed, and address all parts of the question.

- Tables 1 and 3 indicate the number and nature of SLOs in each topic in grades IX and X respectively. This will serve as a guide in the construction of the examination paper. It also indicates that more emphasis has been given to the Understanding (59% in IX and 33% in X), Application and higher order skills (32% in IX and 53% in X) to discourage rote memorisation. Tables 1 and 3, however, do not translate directly into marks.

- There will be two examinations, one at the end of grade IX and one at the end of grade X.

- In each grade, the theory paper will be of 3 hours and will consist of two parts: paper I and paper II.

- Paper I theory will consist of 40 compulsory, multiple choice items. These questions will involve four response options.

- Paper II theory will carry 25 marks and consist of a number of compulsory, structured questions and a number of extended response questions. Each extended response question will be presented in an either/or form.

- All constructed response questions will be in a booklet which will also serve as an answer script.

***Practical:**

- In each grade, practical examination will be conducted separate from the theory paper and will consist of 10 marks.
- Practical examination will be based on the list of practical activities given in the examination syllabus. Schools may design their own practical manuals based on these activities.
- Practical journal/ portfolio should be developed by students and endorsed by a figure of authority, such as a teacher or principal, and submitted at the time of the practical examination.
- It is essential for each school to equip its computer laboratories with necessary devices, software etc. to meet the requirements of the practicals in the examination syllabus. Each school will be responsible to make sure that each student is provided the opportunity to do the practicals.

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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

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Acronym	Full Form
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

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Annex B: Some of the examples of Algorithms, Flowchart and C Programming[4]

Fundamentals
1. Find the sum, product and average of given numbers. 2. Find acceleration of a moving object with given mass and the force applied. 3. Find the volume of a cube, cylinder, sphere or any other geometrical shape. 4. Find the area of a triangle, parallelogram, rhombus, trapezium or any other geometrical shape. 5. Convert Celsius to Fahrenheit temperature and vice versa. 6. Calculate the profit, loss, profit percentage and loss percentage of a business.
Selection Statement
1. Calculate the grades of students on the basis of marks. The score sheet should contain name of the student, father's name and class. 2. Show whether a number is positive, negative or zero. 3. Find the maximum and minimum values from inputted numbers. 4. Show whether a number is even or odd. 5. Generate the utility bill on the basis of charges allocated to each unit range. The bill should contain meter number and consumer name. 6. Determine whether a given number is prime number or not.
Loops
1. Generate a number series (even, odd, prime etc.) by taking input of starting and ending point. 2. Generate sum of series using loops. 3. Generate table of any inputted number up to the inputted range. 4. Calculate factorial of any inputted number. 5. Generate Fibonacci series starting from an inputted number and ending till the inputted range. 6. Print pyramid, rectangle, square or any geometrical shape using nested loops. 7. Input multiple values using loop and calculate average, maximum or minimum value using selection statement.

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[4] Government of Pakistan (2009), Page 48, *National Curriculum for Computer Science IX-XII, 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 and format 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.		

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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.		

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Class X

S.No	SLO No	Practical Activity	Equipment	Software
		Topic 13: Office Automation II (MS Excel 2007 or Above)		
1.	13.1.1	Prepare a spreadsheet by naming cells and sheets.	Computer	Microsoft Excel 2007 or Above
2.	13.1.1	Use different options of paste special, i.e. value, format and formula.		
3.	13.1.1	Print a spreadsheet.		
4.	13.1.2	Apply cell formatting tools like; number, alignment, font, border, fill.		
5.	13.1.3	Apply different functions to the data, i.e sum, average, count, minimum and maximum.		
6.	13.1.4	Insert a pie chart and bar graph in the data sheet.		
7.	13.1.5	Apply filter and data validation on spreadsheet data.		
8.	13.1.5	Protect a worksheet.		
9.	13.1.5	Lock/ unlock cells of spreadsheet.		

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S.No	SLO No	Objective	Equipment	Software
		Topic 9: Fundamentals of Input and Output Handling in C		
10.	8.4.4 8.4.5 9.1.1 9.1.3	Write C programs to declare and initialise **variables** using different **data types** (char, int, float. char [ ]).	Computer	Dev-C ++ or Any Other C Compiler
11.	9.1.2 9.1.5	Write C programs that use **format specifiers** (%d, %f, %s, %c), **escape sequences** (alert, backspace, newline, carriage return, tab, backslash, single quotation mark, double quotation mark, question mark), **comments** (//, /* */).		
12.	9.2.1 9.2.2 9.2.3 9.2.4 9.2.5 9.2.6 9.2.7 9.2.10 9.2.11	Write C programs that use **operators** and its types.		
		Topic 10: Control Structure		
13.	10.1.4 10.1.6 10.1.8	Write C programs for each **if**, **if-else** and if-**else-if**.	Computer	Dev-C ++ or Any Other C Compiler
14.	10.1.11	Write C programs using **switch** statement.		

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		Topic 11: Loop Structure		
15.	11.1.3	Write C programs that uses **for** loop.	Computer	Dev-C ++ or Any Other C Compiler
16.	11.1.5	Write C programs that uses **while** loop.		
17.	11.1.7	Write C programs that uses **do while** loop.		

Note: For examples of programming related practical activities, please refer to Anne

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