CHAPTER 7: LEARNING CONTENTS AND STUDENTS' LEARNING OUTCOMES Grade IX

Contents	Students' Learning Outcomes	R	U	AP	AN	E	C
	Students will be able to:						
Unit # 1 Introduction to Data Encoding							

Introduction to Data Encoding	1. Students should be able to distinguish among the following
	    a. Little Endian vs. Big Endian representation
	    b. ASCII vs. Unicode Representation
	    c. Textual vs. Binary data
	    d. Different image representations, RGB/JPG (only basic idea should be discussed) and their effect on storage requirements
	2. Student should be able to understand the effect of data representation on the communication
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Unit # 2 Computer Networks							

Introduction Computer Network	1. Introduction to Computer Network
	2. Types of Computer Networks
	3. Data Transmission
	    a. Analog data
	    b. Digital data
	4. Network Topologies
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Network Concepts*	1. Network Protocols
	    a. LAN Protocols
	    b. WAN Protocols
	2. Network Models
	    a. OSI Model
	    b. Internet Model
	3. Public and Private Network
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Network Devices	1. Understand the working of network devices a. Switches and Hub b. Routers		*				
Unit 3 Internet and Security							

Internet	1. Introduction to Internet
	 a. History
	 b. Network of Networks
	
	2. Applications of Internet
	 a. Sending emails
	 b. Looking up news, weather, health information
	 c. Government information and forms
	 d. Ordering groceries, electronics, online stores.
	 e. Searching for information
	 f. Online banking, taxes and business
	 g. Sharing photos and videos
	 h. Talking or video chatting
	 i. Making friends
	 j. Working collaboratively
	 k. Participating in discussions with people from around the world
	 l. Downloading and watching movies, reading book
	
	3. Impacts of Internet
	 a. Positive Impacts
	    i. Faster communication
	    ii. Earn while working from home
	    iii. Faster business transactions and cheaper products
	    iv. Savings on travel cost
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	v. Easier to do research
	b. Negative Impacts
	    i. Addiction to games online
	    ii. Loss of the human touch
	    iii. Physical Inactivity
	    iv. Cyber Crimes
	       1. Identity Theft
	       2. Privacy breach
	       3. Cyber Bullying
	       4. Online Scams
	    v. Information Epidemic and Fake NEWS					

Security and Privacy	1. Define Security, Privacy and Risk
	2. Need for online security and privacy
	3. Ways to achieve online Security and Privacy
	    a. Secure personal devices
	    b. Use licensed software
	    c. Install software updates
	    d. Install antivirus software
	    e. Mindful of free or cracked application software's
	    f. Encrypt data
	    g. Use end to end encryption for messaging
	    h. Secure network connection (use firewall)
	    i. Secure online browsing
	    j. Set strong passwords
	    k. Reduce online footprint
	    l. Delete unused online accounts
	    m. Do not volunteer personal information
	    n. Protect your webcam and mic
	4. What is wrong with tech giants
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	a. Facebook b. Google						
Unit # 4 Introduction to Data Analysis							

Data Collection	1. Students should be able to perform the following
	   a. Collect data by interviewing classmates, e.g. their age, hobbies, number of hours spent each day on study, etc.
	   b. The above activity can be done using online forms (e.g. google forms)
	   c. Enter the data into a spreadsheet
	   d. Some values of the above data will be missing, use a method to fill the missing values. One method could be the average of all values, other methods can also be used
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Data Analysis	1. Apply following functions of the spreadsheet on the collected data. Based upon these values students should be able to predict the new values
	   a. Mean
	   b. Mode
	   c. Median
	   d. Average
	   e. Weighted Average
	   f. Correlation of two columns
	   g. Covariance of two columns
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Data Storage	1. Be able to use online data storage mediums e.g. a. Google drive or Sky drive or Twiddla 2. Be able to store the collected data in the above activity (Data Collection) into one of the options mentioned above.			* *			

	Note: In case of internet bandwidth issues, a common network drive can be made available in place of the above storage mediums						
Unit # 5 Introduction to Software Development		R	U	AP	AN	E	C

Introduction to Software Development	1. Define Software Development
	2. Explain the steps of Software Development
	    a. Requirement Gathering
	    b. Analysis
	    c. Design
	    d. Development
	    e. Testing and Documentation
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Requirement Gathering	1. Understand the Process of Requirement Gathering 2. Enlist Different Strategies 3. Collect Requirements for Some Problem	*	*	*			
Analysis	1. Understand Analysis 2. Explain Strategies used for Analysis		* *				

Design	1. Explain techniques used for Software Design
	2. Design a problem through
	    a. Pseudocode
	    b. Flowchart
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Development	1. Understand Development
	2. Elaborate Development Environment
	    a. Integrated Development Environment (IDE)
	3. Explain Development Process Cycle
	    a. Editing/ Writing
	    b. Compiling
	    c. Linking
	    d. Loading
	    e. Executing
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Topic	Learning Outcomes						
Testing and Documentation	1. Understand and Explain need of Testing and Documentation		*				
	2. Identify and Enlist Test Data for some Problem				*		
	3. Draw Trace Table for Test Data (Input Variables)			*			
	4. Trace an Algorithm			*			
	5. Understand that Documentation is an Umbrella activity and done throughout		*				
Unit # 6 Programing in C Language							
Programming Languages	1. Define Program	*					
	2. Define Computer/ Programming Language	*					
	a. Explain Syntax						
	b. Differentiate between Compiler and Interpreter						
	3. Explain 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						
C Program Structure	1. Understand Basic Program Structure in C through Printing "Hello World" Program		*				
	2. Define header files	*					
	3. Identify and Understand reserved words			*			
	4. Describe Pre-processor Directives		*				
	a. include						
	b. define						
	5. Explain main ( ) function		*				
	a. Body of main { }						

Topic	Objectives						
	6. Apply Compile and Execution Steps of the Program			*			

Comments	1. Explain the purpose of comments and their syntax
	   a. Single Line Comments
	   b. Multi Line Comments
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Input/ Output Functions	1. Understand and Apply Output functions in C
	2. Understand and Apply Input functions in C
	3. Explain Statement Terminator (Semicolon)
	4. Elaborate Format specifiers
	   a. Decimal - %d
	   b. Integer - %i
	   c. Float - %f
	   d. char - %c
	5. Explain the use of the following escape sequences using programming examples:
	   a. Backspace – \b
	   b. Newline – \n
	   c. Tab – \t
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Variables and Constants	1. Explain the difference between a constant and a variable
	2. Explain the rules for specifying variable names
	3. Know the following data types offered by C and the number of bytes taken by each data type
	   a. Integer – int (signed/unsigned), short/long
	   b. Floating point – float
	   c. Double precision – double
	   d. Character – char
	4. Use of type casting.
	5. Define Constant qualifier – const
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	6. Explain the process of declaring and initializing variables and constant qualifiers						
Unit # 7 Operators in C Language							
Introduction	1. Define Operator	*					
	2. Differentiate between Operators, Operands					*	
	3. List Types of Operators	*					

Arithmetic Operators	1. Understand and Apply Arithmetic Operators in C
	  a. Addition (+)
	  b. Subtraction (-)
	  c. Multiplication (*)
	  d. Division (/)
	  e. Remainder (%)
			*	*			

	2. Understand and Apply
	  a. Assignment operator (=)
	  b. Compound assignment operators (+ =, -, =, * =, / =
	  c. Increment operator (++)
	  d. Decrement operator (--)
			*	*			

Relational Operators	1. Define and Use Relational operators.
	  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 (! =)
		*					

	2. Differentiate between the assignment operator (=) and equal to operator (==).					*	
Logical Operators	1. Define and Use Logical operators. a. AND (&&)	*					

	b. OR (||) c. NOT (!)						
Operator Precedence and Associativity	1. Define and explain the order of precedence of operators (Precedence and Associativity) and		*				
	2. Apply Precedence and Associativity in Expression Evaluation			*			
	3. Differentiate between the unary and binary and ternary operator					*	
Unit # 8 Conditional Logic							
Introduction	1. Define a control statement		*				
	2. Know Types of Control Structure	*					
If Control Structure	1. Understand if Control Structure in C		*				
	2. Apply if Control Structure in C			*			
If else Control Structure	1. Understand if-else Control Structures in C		*				
	2. Apply if-else Control Structures in C			*			
Multiple If else Control Structure	1. Understand Multiple if-else Control Structures in C		*				
	2. Apply Multiple if-else Control Structures in C			*			
Switch Control Structure	1. Understand the Switch Control Structure in C		*				
	2. Apply the Switch Control Structure in C			*			
Unit # 9 Emerging Technologies							
Artificial Intelligence and Robotics	1. Explain Artificial Intelligence and its impact		*				
	2. How robotics are connected to Artificial intelligence		*				
	3. Schools of thought in Artificial intelligence		*				
	3.1. Think Humanely						
	3.2. Act Humanely						
	3.3. Think Rationally						
	3.4. Act Rationally						
Bioinformatics	Students will be able to: 1. Define Bioinformatics and its significance		*				

	2. Understand following:
	    2.1. Biological data
	    2.2. Sequence analysis
	3. Tools and software used for Bioinformatics
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Modelling and Simulation	Students will be able to:
	1. Define and differentiate between modeling and simulation
	2. Understand significance of modeling and simulation
	3. Applications of modelling and simulation
	    a. Scientific discovery
	    b. Forecasting for a longer period of time
	    c. Training and education
	    d. Social simulation and alternative policy analysis
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Big Data	Students will be able to describe following 1. Big data 2. Role of data in analyzing systems 3. Types of data 4. Recent technologies used in Big data 5. Case study: Facebook recommendation system OR amazon recommender system		*				

Cloud Computing	Students will be able to describe following
	1. Concept of cloud computing
	2. Infrastructure as a service
	    2.1. Example amazon free VMs
	3. Software as a service
	    3.1. Example google drive
	    3.2. Example google docs
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Internet of Things	Students will be able to describe following
	1. Hardware used for IoT
	   1.1. Raspberry Pi
	   1.2. Arduino
	2. Example: Lahore safe city project and IoT used in Cameras
	3. Communication technologies in IoT
	   3.1. Wireless sensor networks
	   3.2. Wireless ad-hoc networks
	   3.3. Disaster area networks
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Mobile Computing	Students will be able to describe following 1. Android operating system 2. iOS operating system 3. Location based services 4. Software repositories like Playstore, iTunes		* * * *				