

Proposed Number of Periods for Units

No	Units	No. of periods
1	Concept of ICT	28
	Introduction to Computer	22
3	Data Representation	18
4	Fundamental of Digital Circuits	26
5	Computer Operating System	22
6	Data Communication and Networking	50
7	System Analysis and Design	68
8	Database Management	50
9	Programming	74
10	Web Development	60
11	Internet of Things	15
12	ICT in Business	12
13	New trends and Future Directions of ICT	12
14	Project	30

Competency	Competency Level	Contents	Learning outcomes	Periods
<p>Competency 1: Explores the basic concepts of ICT together with its role and applicability in today's knowledge based society</p>	<p>1.1 Investigates the basic building blocks of information and their characteristics</p>	<ul style="list-style-type: none"> • Life cycle of data <ul style="list-style-type: none"> ○ Data creation ○ Management ○ Removal of obsolete data • Data vs. Information • Definition of information • Characteristics of valuable information: timeliness, accuracy, presented within the context, enhanced understandability and less uncertainty • The need to handle large volumes and other complexities of data <ul style="list-style-type: none"> - Introduction 	<ul style="list-style-type: none"> • Defines data and outlines its life cycle • Recognizes the need of a process to define data and information • Recognizes the strong inter relationship between data, process and information • Describes data, process and information • Lists various forms of data and their characteristics • Describes the characteristics of quality data • Distinguishes data from information • Illustrates the value of information • Describes the characteristics of valuable information • Recognizes big data, their needs and analysis 	<p>6</p>

Competency	Competency Level	Contents	Learning outcomes	Periods
	1.2 Investigates the need of technology to create, disseminate and manage data and information	<ul style="list-style-type: none"> • Applicability of information in day to day life <ul style="list-style-type: none"> ○ Decision making ○ Policy making ○ Predictions ○ Planning, scheduling and monitoring • Drawbacks of manual methods in manipulating data and information <ul style="list-style-type: none"> ○ Inconsistency and duplication in data, room for errors, human errors and delay in processing ○ Lack of sharing information and reduced customer services • Infeasibility of applying manual methods where they can be harmful to humans • Emergence of ICT era <ul style="list-style-type: none"> ○ Use of IT to overcome the drawbacks of manual methods of data manipulation • Usage of information in various domains • Availability of technologies related to information retrieval and sharing • Development of computer networks, the Internet and WWW • Development of mobile communication, mobile computing and cloud computing 	<ul style="list-style-type: none"> • Identifies the drawbacks of manual data processing methods • Describes the importance of information in day to day life • Lists the available technologies related to information dissemination • Investigates the development of computer networks, the Internet and WWW • Describes the development of mobile communication, mobile computing and cloud computing • Appreciates the use of technology to create, disseminate and manage, data and information • Recognizes the usage of information in 	6

Competency	Competency Level	Contents	Learning outcomes	Periods
			various domains <ul style="list-style-type: none"> • Investigates the safety issues of human operators in various applications 	
	1.3 Formulates an abstract model of information creation and evaluates its compliance with ICT	<ul style="list-style-type: none"> • Abstract model of information creation <ul style="list-style-type: none"> ○ Input, process, output ○ Its appropriateness to Computer and ICT 	<ul style="list-style-type: none"> • Identifies the components of an abstract model of information creation • Defines a system • Analyses various systems using the system definition • Relates the abstract model to information systems • Matches the abstract model of information creation to the main functions of the computer • Recognizes the role of ICT in the abstract model of information creation 	2
	1.4 Selects and classifies the basic components of a computer system	<ul style="list-style-type: none"> • Hardware <ul style="list-style-type: none"> ○ Classification of hardware components • Software <ul style="list-style-type: none"> ○ Classification of software 	<ul style="list-style-type: none"> • Defines and classifies hardware and software components • Distinguishes 	2

Competency	Competency Level	Contents	Learning outcomes	Periods
		<ul style="list-style-type: none"> • Human Operators <ul style="list-style-type: none"> ○ Need of human operators in information systems 	<ul style="list-style-type: none"> proprietary software and open source software • Describes the advantages and disadvantages of proprietary and open source software • Identifies the role of human operators in the ICT enabled information systems 	
	1.5 Analyses the activities of data processing	<ul style="list-style-type: none"> • Steps in data processing: <ul style="list-style-type: none"> ○ Data gathering ○ Data validation ○ Data processing ○ Data output ○ Data storage • Data gathering methods <ul style="list-style-type: none"> ○ Manual methods ○ Semi-automated and automated methods • Tools - (OMR, OCR, MICR, card/tape readers, magnetic strip readers, bar code readers, sensors and loggers) • Data validation methods <ul style="list-style-type: none"> ○ Data type check ○ Presence check ○ Range check • Modes of data input 	<ul style="list-style-type: none"> • Lists and briefly describes the data processing steps • Identifies data gathering methods • Identifies data validation methods • Lists data input methods • Describes data processing methods • Lists data output methods • Describes data storage methods 	4

Competency	Competency Level	Contents	Learning outcomes	Periods
		<ul style="list-style-type: none"> ○ Direct and remote ○ Online and offline ● Data processing <ul style="list-style-type: none"> ○ Batch and real time ● Output methods <ul style="list-style-type: none"> ○ Direct presentation to the user ○ Storing for further processing ● Storage methods ● Local and remote storage (cloud) ● Short and long term storage 		
	1.6 Investigates the application of ICT in different domains	<ul style="list-style-type: none"> ● Application of ICT in: <ul style="list-style-type: none"> ○ Education ○ Healthcare ○ Agriculture ○ Business and finance ○ Engineering ○ Tourism ○ Media and journalism ○ Law enforcement 	<ul style="list-style-type: none"> ● Identifies appropriate tools, skills and knowledge needed in different application domains ● Discusses the benefits of ICT in different domains 	4
	1.7 Evaluates the impact of ICT in the society	<ul style="list-style-type: none"> ● Benefits caused by ICT <ul style="list-style-type: none"> ○ Social benefits ○ Economic benefits ● Issues caused by ICT <ul style="list-style-type: none"> ○ Social ○ Economical ○ Environmental ○ Ethical ○ Legal ○ Privacy ○ Digital divide ● Confidentiality 	<ul style="list-style-type: none"> ● Explains the benefits of ICT in terms of social and economic aspects ● Explains briefly the issues caused by advancement of ICT in terms of social, economic, environmental, ethical and legal aspects 	4

Competency	Competency Level	Contents	Learning outcomes	Periods
		<ul style="list-style-type: none"> • Stealing / Phishing • Piracy • Copyright / intellectual property laws • Plagiarism • Licensed / unlicensed software 	<ul style="list-style-type: none"> • Investigates the legal situation connected with the usage of ICT • Explains the environmental issues associated with ICT • Explains safe disposal methods of e-waste • Explains briefly the ethical, Legal and social issues in the usage of ICT • Briefly explains the role of ICT in achieving Sustainable Development Goals (SDGs) • Investigates the approaches to eliminate digital divide 	
<p>Competency 2: Explores the evolution of computing devices, so as to be able to</p>	<p>2.1 Elicits the significant changes occurred in the computers from generation to generation with more emphasis on the evolution of</p>	<ul style="list-style-type: none"> • History of computing <ul style="list-style-type: none"> ○ Early calculating aids <ul style="list-style-type: none"> ❖ mechanical ❖ electromechanical ○ Electronic age of computing 	<ul style="list-style-type: none"> • Categorizes the early calculating aids with examples • Describes the generations of 	4

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describe and compare the performance of modern computers	processors	<ul style="list-style-type: none"> • Generation of computers <ul style="list-style-type: none"> ○ 1G, 2G, 3G, 4G and future • Different types of classifications <ul style="list-style-type: none"> ○ Technology <ul style="list-style-type: none"> ❖ analog, digital ○ Purpose <ul style="list-style-type: none"> ❖ special /general ○ Size <ul style="list-style-type: none"> ❖ super, mainframe, mini, micro (mobile devices –smart phones, tablet devices and phablets) 	<ul style="list-style-type: none"> computers with their features in a table • Categorizes computers in terms of technology, purpose and size with examples 	
	2.2 Explores the functionality of a computer in relation to the hardware and their interfaces	<ul style="list-style-type: none"> • Major hardware components <ul style="list-style-type: none"> ○ Input devices: keyboard entry and direct entry (keyboard, pointing devices, touch pad, remote control, touch screen, magnetic strip reader, barcode reader, smart card reader, scanner, digital camera, microphone, sensors, graphic tablets, MICR, OMR and OCR readers, video camera, digitizer, web cam) • Advantages of direct entry input devices over keyboard entry input devices • Output devices and their features (CRT monitor, TFT monitor, LED monitor, dot matrix printer, inkjet printer, laser printer, 3D printer, graph plotter, speakers) • CPU and its compatibility with motherboard 	<ul style="list-style-type: none"> • Identifies hardware peripherals and their relevant interfaces • Identifies the advantages of direct entry input devices over keyboard entry input devices • Describes the evolution of CPU and its compatibility with motherboard • Categorizes the Storage devices • Briefly explains the features of each storage device • Identifies the need 	6

Competency	Competency Level	Contents	Learning outcomes	Periods
		<ul style="list-style-type: none"> • Storage devices(fixed internal hard disk, portable external hard disk, magnetic tape, Optical discs(CD Rom/DVD Rom, CD-R/DVD-R, CD-RW/DVD-RW, DVD-RAM, Blu-Ray) flash memory card, mini disk) • Parallel and grid computing 	for parallel and grid computing	
	2.3 Explores the Von-Neumann Architecture	<ul style="list-style-type: none"> • Von-Neumann Architecture <ul style="list-style-type: none"> ○ Stored program control concept ○ Components (input, output, memory, Processor control unit and processing ALU unit) • Fetch-execute cycle • Central processing unit (CPU) <ul style="list-style-type: none"> ○ Arithmetic and logic unit (ALU) ○ Control unit (CU) ○ Memory (Registers) ○ Data and control bus ○ Multi-core processors 	<ul style="list-style-type: none"> • Describes the stored program concept • Names the major components of Von-Neumann architecture • Describes fetch-execute cycle • Briefly describes ALU, CU, Memory (Registers), data and control bus • Draws the Von-Neumann Architecture model and names its components • Describes the need of multi-core processors 	6

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	2.4 Examines PC memory system to identify different types of memory and their main characteristics	<ul style="list-style-type: none"> • Memory hierarchy <ul style="list-style-type: none"> ○ Need of memory hierarchy ○ Comparison criteria <ul style="list-style-type: none"> ❖ Physical size / density of data ❖ Access method ❖ Access time (elapsed time/delay) ❖ Capacity ❖ Cost • Volatile memory and their characteristics <ul style="list-style-type: none"> ○ Registers ○ Types of cache memory ○ Main memory – RAM ○ Types of RAM <ul style="list-style-type: none"> ❖ SRAM, DRAM, SDRAM • Non-volatile memory and their characteristics <ul style="list-style-type: none"> ○ Types of ROMs <ul style="list-style-type: none"> ❖ PROM, EPROM and EEPROM ○ Secondary storage <ul style="list-style-type: none"> ❖ magnetic, optical and flash memory 	<ul style="list-style-type: none"> • Briefly explains the memory hierarchy with a suitable diagram • Describes the need for different types of memory and their characteristics • Briefly explains the volatile and non-volatile memory • Lists volatile and non-volatile memories in computer • Describes the characteristics of memory in terms of performance, location, capacity, access method, cost, physical type and physical arrangement of data (bits into words) • Lists and briefly explains the types and characteristics of ROMs 	6

Competency	Competency Level	Contents	Learning outcomes	Periods
			<ul style="list-style-type: none"> • Compares and contrasts each type of memory in terms of access time, cost / MB, capacity (typical amount used) 	
<p>Competency 3: Investigates how instructions and data are represented in computers and exploit them in arithmetic and logic operations</p>	<p>3.1 Analyses how numbers are represented in computers</p>	<ul style="list-style-type: none"> • Need for instruction and data representation in digital devices • Methods of instruction and data representation in computers <ul style="list-style-type: none"> ○ Representation of data in two states (0,1) • Number systems used in computing <ul style="list-style-type: none"> ○ Binary, octal, hexadecimal ○ Conversion between number systems • Representation of decimal numbers (signed and unsigned) <ul style="list-style-type: none"> ○ Signed integer representations <ul style="list-style-type: none"> ❖ Signed magnitude ❖ One's complement ❖ Two's Complement 	<ul style="list-style-type: none"> • Describes that instruction and data are represented using two states in computers • Explains the need of different number systems • Describes how different types of decimal numbers are stored in computers • Converts decimal integers into binary, octal and hexadecimal numbers and vice versa • Converts binary numbers to octal and hexadecimal, and vice versa • Converts octal 	<p>10</p>

Competency	Competency Level	Contents	Learning outcomes	Periods
			numbers to binary and hexadecimal, and vice versa <ul style="list-style-type: none"> • Explains that the MSB is used to indicate the sign when converting the given binary value to one's complement • Converts the given binary value to two's complement • Explains the usage of one's complement and two's complement 	
	3.2 Analyses how characters are represented in computers	<ul style="list-style-type: none"> • Methods of character representation <ul style="list-style-type: none"> ○ BCD ○ EBCDIC ○ ASCII ○ Unicode 	<ul style="list-style-type: none"> • Lists the methods of character representation in computer • Converts given symbols into a representation scheme • Describes the advantage and disadvantage of different data representation schemes 	4

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	3.3 Uses basic arithmetic and logic operations on binary numbers	<ul style="list-style-type: none"> • Binary arithmetic operations - (integers only) <ul style="list-style-type: none"> ○ Addition, subtraction • Logical operations <ul style="list-style-type: none"> ○ Bitwise logical operations 	<ul style="list-style-type: none"> • Works out additions (multiple numbers with or without carryovers) – in binary numbers • Works out subtraction (with or without borrowing) – in binary numbers • Works out NOT, AND, OR, XOR bitwise operations 	4
Competency 4: Uses logic gates to design basic digital circuits and devices	4.1 Analyzes basic digital logic gates in terms of their unique functionalities	<ul style="list-style-type: none"> • Digital logic gates and truth tables <ul style="list-style-type: none"> ○ Basic logic gates <ul style="list-style-type: none"> ❖ NOT, AND, OR, and XOR ○ Combinational gates <ul style="list-style-type: none"> ❖ NAND, NOR, and XNOR ○ Universal gates <ul style="list-style-type: none"> ❖ NAND, NOR 	<ul style="list-style-type: none"> • Names basic logic gates and draws the appropriate symbols of them • Draws the truth tables for the basic logic gates • Identify symbols that represent negations of basic logic gates • Creates truth tables for given expressions (maximum three inputs) • Explains the need of universal gates • Explains the 	6

Competency	Competency Level	Contents	Learning outcomes	Periods
			fabrication of any gate using universal gates	
	4.2 Simplifies logic expressions using laws of Boolean algebra and Karnaugh map	<ul style="list-style-type: none"> • Two state logic and Boolean Algebra • Postulates (Axioms) • Laws/theorems <ul style="list-style-type: none"> ○ Commutative, associative • Distributive <ul style="list-style-type: none"> ○ Identity, redundancy ○ De Morgan's • Standard logical expressions <ul style="list-style-type: none"> ○ Sum of products and product of sums ○ Transform SOP into POS and vice versa • Simplify logic expressions using <ul style="list-style-type: none"> ○ Boolean theorems ○ Karnaugh map 	<ul style="list-style-type: none"> • Describes the need for simplifying Boolean expressions • Represents logical expressions in standard forms (SOP and POS) according to the given truth table • Transforms SOP into POS and vice versa • Simplifies logic expressions using Boolean theorems, axioms, De Morgan's Laws and Karnaugh map 	8
	4.3 Designs simple digital circuits using logic gates	<ul style="list-style-type: none"> • Truth tables and logic expressions for their designs (up to three inputs) • Digital circuit design 	<ul style="list-style-type: none"> • Identifies situations to apply logic circuits in day to day life • Designs logic expressions and truth table for identified 	6

Competency	Competency Level	Contents	Learning outcomes	Periods	
			applications <ul style="list-style-type: none"> • Designs digital circuits 		
	4.4	Explores how combinational Logic circuits are used in CPU and sequential circuits in physical memory	<ul style="list-style-type: none"> • Building blocks of CPU <ul style="list-style-type: none"> ○ Half adder ○ Full adder • Storing bits in digital circuits <ul style="list-style-type: none"> ○ Feedback loop ○ Flip-flops 	<ul style="list-style-type: none"> • Identifies the major building blocks of CPU • Creates truth table and logical expressions for half adder circuit • Creates truth table and logical expressions for full adder circuit • Briefly describes the usage of Flip-Flops 	6
Competency 5 : Uses operating systems to manage the functionality of computers	5.1	Defines the term computer operating system (OS) and investigates its need in computer systems	<ul style="list-style-type: none"> • Introduction to computer operating system • Evolution of OS • Main functions of an operating system <ul style="list-style-type: none"> ○ Providing interfaces ○ Process management ○ Resource management ○ Security and protection • Classification of operating systems <ul style="list-style-type: none"> ○ Single user – single task ○ Single user – multi task ○ Multi user – multi task ○ Multi-threading 	<ul style="list-style-type: none"> • Defines the computer operating system • Briefly describes the evolution of OS • Identifies the main functions and the abstractions (directories, files and data) provided by the operating system to the user • Describes how the 	4

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		<ul style="list-style-type: none"> ○ Real time ○ Time sharing systems 	<ul style="list-style-type: none"> operating system manages the resources of a computer ● Classifies the operating systems based on their users and tasks 	
	<p>5.2 Explores how an operating system manages directories/folders and files in computers</p>	<ul style="list-style-type: none"> ● File types <ul style="list-style-type: none"> ○ Need for file types (.exe, .jpg .txt, etc) ● Directory and file organization <ul style="list-style-type: none"> ○ File hierarchy ○ File systems – FAT etc ● File security <ul style="list-style-type: none"> ○ Passwords and access privileges ● File storage management <ul style="list-style-type: none"> ○ Storage allocation <ul style="list-style-type: none"> ❖ Contiguous allocation ❖ Linked allocation ❖ Indexed allocation ● Defragmentation ● Maintenance of secondary storage <ul style="list-style-type: none"> ○ Need and outcome of disk formatting 	<ul style="list-style-type: none"> ● Describes files and directories ● Briefly describes the need of disk formatting ● Identifies the need for file types ● Lists attributes of file and directories ● Describes the structure of the file systems ● Illustrates the organization of files and directories ● Briefly describes the methods used in file security ● Briefly describes how an operating system manages 	<p style="text-align: center;">6</p>

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			file security <ul style="list-style-type: none"> • Briefly explains <ul style="list-style-type: none"> ○ Contiguous allocation ○ Linked allocation ○ Indexed allocation • Describes defragmentation and explains how it occurs 	
	5.3 Explores how an operating system manages processes in computers	<ul style="list-style-type: none"> • Definition of process • Interrupts and interrupts handling • Process management • Process states • Process Transitions • Process control block • Context switching • Process schedulers 	<ul style="list-style-type: none"> • Explains processes • Lists the operating system tasks when a process is created • Lists the types of processes • Lists the process states • Explains process termination • Distinguishes a process and a program • Explains process states using the seven state process transition diagrams • Describes process schedulers and 	6

Competency	Competency Level	Contents	Learning outcomes	Periods
			<ul style="list-style-type: none"> scheduling policies • Compares long, short and medium term schedulers • Describes multi programming and its needs • Describes time sharing systems • Compares multi programming vs. time sharing systems • Defines context switch • Briefly explains turnaround time, response time, throughput time and waiting time • Briefly explains the process control block and lists its contents 	
	5.4 Explores how an operating system manages the resources	<ul style="list-style-type: none"> • Memory management <ul style="list-style-type: none"> ○ Memory Management Unit(MMU) ○ Physical Memory ○ Virtual memory • Input and output device management <ul style="list-style-type: none"> ○ Device drivers ○ Spooling 	<ul style="list-style-type: none"> • Briefly explains the need of memory management and Memory Management Unit (MMU) • Briefly explains the 	

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			virtual memory <ul style="list-style-type: none"> • Briefly explains paging and mapping • Briefly describes how an OS manages Input and output devices • Briefly describes device drivers • Briefly describes the need of device drivers • Briefly describes spooling • Installs appropriate device drivers when connecting a peripheral 	6
Competency 6: Explores the data communication and computer networking technologies to share information effectively	6.1 Explores signals and their properties	<ul style="list-style-type: none"> • Signal Types <ul style="list-style-type: none"> ○ Digital ○ Analog • Properties <ul style="list-style-type: none"> ○ Amplitude ○ Frequency ○ Wave length ○ Phase • Propagation speed in a media 	<ul style="list-style-type: none"> • Graphically represents digital and analog signals and their properties • Solves problems related to the relationship between signal properties 	4
	6.2 Explores signal	<ul style="list-style-type: none"> • Wires – Guided media (Twisted pair, 	<ul style="list-style-type: none"> • Classifies media as 	4

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	transmission media	coaxial cable, Fiber optics etc.) <ul style="list-style-type: none"> • Free space – Unguided media • Properties <ul style="list-style-type: none"> ○ Latency ○ Bandwidth ○ Noise ○ Attenuation ○ Distortion • Simple topology: point-to-point connection 	guided and unguided media <ul style="list-style-type: none"> • Describes how latency, bandwidth, noise, attenuation, and distortion affects signal transmission 	
	6.3 Investigates how digital data is encoded using signal elements	<ul style="list-style-type: none"> • Agreeing on signal elements to represent data (a protocol) <ul style="list-style-type: none"> ○ Two simple elements – two voltage levels (amplitudes) ○ Other possibilities (briefly) <ul style="list-style-type: none"> ❖ Frequency ❖ Phase ○ Changing speed of signal elements ○ Need for synchronization <ul style="list-style-type: none"> ❖ Timing/Clocks ❖ Manchester encoding ○ Handling errors <ul style="list-style-type: none"> ❖ Example: Parity 	<ul style="list-style-type: none"> • Graphically represents encoding of digital data using two voltage levels as well as Manchester encoding • Describes the possibility of using the changes in frequency and phase as signal elements • Explains the need for synchronization and describes the problems that arise when the transmitter and the receiver are not synchronized 	4

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			<ul style="list-style-type: none"> • Compares and contrasts the relationship between how fast the signal elements are changed and the bit rate in simple two voltage encoding and Manchester encoding • Describes how the parity bit enables detecting a bit error 	
	<p>6.4 Explores the use of Public Switched Telephone Network (PSTN) to connect two remote devices</p>	<ul style="list-style-type: none"> • Public Switched Telephone Network <ul style="list-style-type: none"> ○ Providing a circuit between two points that can carry analog voice • Modulation, Demodulation and Modems <ul style="list-style-type: none"> ○ Encoding data using analog signal elements • Connecting two devices using Modems 	<ul style="list-style-type: none"> • Describes a PSTN as an analog voice carrying line • Describes how modems modulate analog signals so that they can be sent along a PSTN line • Draws a schematic diagram depicting two computers connected using modems via a PSTN line 	4
	<p>6.5 Investigates how the problem of connecting</p>	<ul style="list-style-type: none"> • All-to-all connections are impractical • A solution: Bus Topology 	<ul style="list-style-type: none"> • Demonstrates the impracticality of 	4

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	multiple devices into a network is addressed	<ul style="list-style-type: none"> ○ Simple ○ Problem: Controlling access to the bus (media) ● Other topologies <ul style="list-style-type: none"> ○ Star ○ Ring ○ Mesh ● Simplifying wiring <ul style="list-style-type: none"> ○ Hubs ○ Switches 	<ul style="list-style-type: none"> connecting large number of devices in all-to-all topology ● Demonstrates the simplicity of a Bus ● Draws diagrams of different topologies ● Describes the use of Hubs and Switches to simplify the wiring of a network and compares/contrasts their functionalities 	
	6.6 Explores the role of Media Access Control (MAC) protocol	<ul style="list-style-type: none"> ● Local Area Network (LAN) ● Identifying devices <ul style="list-style-type: none"> ○ Addresses – MAC addresses ● Frames ● Orderly access to the media <ul style="list-style-type: none"> ○ Very simple protocol as an example – ALOHA ○ Improvements from ALOHA to Ethernet ● Broadcasting and Uni -casting messages 	<ul style="list-style-type: none"> ● Describes the need to uniquely name devices (addresses) so that the sender and the receiver can be identified ● Explains the role of frames as the unit of transmission ● Describes the need of a protocol to ensure orderly access to media with respect to a bus ● Briefly describes the evolution of MAC 	4

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			protocols from ALOHA to Ethernet	
	6.7 Explores how the multiple networks are interconnected to form the Internet	<ul style="list-style-type: none"> • A device to connect two or more networks – gateway • Need for globally unique uniform addressing independent of MAC addresses and LAN technology <ul style="list-style-type: none"> ○ IPv4 addresses ○ Assigning IPs to networks <ul style="list-style-type: none"> ❖ Sub-netting ❖ Subnet masks ❖ CIDR notation ❖ Private IP addresses ❖ DHCP ○ Scarcity of IPv4 addresses and IPv6 as a solution(an overview) • Finding the path to the destination <ul style="list-style-type: none"> ○ Routing and routers ○ Packet switching • Best effort delivery 	<ul style="list-style-type: none"> • Explains the role of a gateway device in inter connecting two LANs • Explain the need for a uniform, MAC protocol independent addressing scheme and how IP addresses play that role • Describes the role of subnet masks • Calculates subnet masks and IP address ranges for a given block of IP addresses and network sizes • Describes how DHCP is used to dynamically assign IP addresses • Describes the role of routers in finding a suitable path from the sender to the receiver 	6

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			<ul style="list-style-type: none"> Explains packet switching and best effort delivery in IP networks 	
	6.8 Explores the role of transport protocols in the Internet	<ul style="list-style-type: none"> Delivering data from an application process to another application process <ul style="list-style-type: none"> Multiple applications at a host identified by an IP <ul style="list-style-type: none"> Multiplexing – multiple end points at the same IP Ports and port numbers UDP <ul style="list-style-type: none"> Properties Applications TCP <ul style="list-style-type: none"> Properties Applications 	<ul style="list-style-type: none"> Explains that it is not sufficient to deliver a message from one IP address to another by demonstrating that the communication is from process to a process Explains the need for multiplexing messages and how port numbers identify the end points Briefly describes the functionality of UDP and lists applications that use it Briefly describes the functionality of TCP and lists applications that use it 	4
	6.9 Explores some applications on the	<ul style="list-style-type: none"> Domain Name System (DNS) <ul style="list-style-type: none"> IP addresses are hard to remember 	<ul style="list-style-type: none"> Describes the need for human friendly 	4

Competency	Competency Level	Contents	Learning outcomes	Periods
	Internet	<ul style="list-style-type: none"> ○ Human friendly names ○ Hierarchical name space ○ Each domain is responsible for managing the names under it ○ Top level domains ● HTTP ● Client Server model 	<ul style="list-style-type: none"> names instead of IP addresses ● Explains the role of DNS in translating names to IP addresses ● Graphically represent the hierarchical and distributed structure of the DNS ● Describes a simple GET request and its response in HTTP ● Describes the client server model using DNS and HTTP 	
	6.10 Investigates the role of reference models to describe the network architecture	<ul style="list-style-type: none"> ● TCP/IP model <ul style="list-style-type: none"> ○ Application ○ Transport ○ Internet ○ Host to network ● OSI model <ul style="list-style-type: none"> ○ Application ○ Presentation ○ Session ○ Transport ○ Network ○ Data link ○ Physical 	<ul style="list-style-type: none"> ● Describes the functions of layers of TCP/IP and OSI models ● Describes the data units in different layers(packet, frame and bit) ● Describes the data flow in a network using TCP/IP and OSI models 	4

Competency	Competency Level	Contents	Learning outcomes	Periods
	6.11 Investigates the security aspects of the communication and protection of devices connected to the Internet	<ul style="list-style-type: none"> • Encryption and digital signature – basic idea <ul style="list-style-type: none"> ○ Public Key ○ Private Key ○ Signing • Threats <ul style="list-style-type: none"> ○ Viruses ○ Trojans ○ Malware ○ Phishing • Protection <ul style="list-style-type: none"> ○ Firewalls ○ Antivirus software ○ Education/ better awareness/ good practices 	<ul style="list-style-type: none"> • Identifies the need for confidentiality and authentication of messages and notes that the Internet does not provide • Briefly explains the use of the public and private keys to encrypt and sign messages • Describes different threats faced by networked systems and protection against them 	4
	6.12 Explores the role of ISPs and technologies used for connecting Home Networks to the Internet	<ul style="list-style-type: none"> • ISPs • Connecting to ISP <ul style="list-style-type: none"> ○ Modems ○ DSL/ADSL • A home LAN that uses private IPs <ul style="list-style-type: none"> ○ Network Address Translation /Proxies 	<ul style="list-style-type: none"> • Describes the role of an ISP • Explains the use of modems and dialup lines to connect a home machine to an ISPs network • Explains the advantages of DSL/ADSL lines • Explains the roles of NATs and Proxies in a LAN that uses 	4

Competency	Competency Level	Contents	Learning outcomes	Periods
			private IPs	
Competency 7: Explores the systems concept and uses systems analysis and design methodology in developing information systems	7.1 Explores Characteristics of Systems	<ul style="list-style-type: none"> • System concept • Classification of systems <ul style="list-style-type: none"> ○ Open and closed systems ○ Natural and manmade systems ○ Living and physical systems 	<ul style="list-style-type: none"> • Recalls the definition of systems • Lists and describes the characteristics of systems • Classifies and describes systems with examples 	4
	7.2 Compares and contrasts different types of manmade systems in terms of their objectives and functionality	<ul style="list-style-type: none"> • Information systems <ul style="list-style-type: none"> ○ Office Automation Systems (OAS) ○ Transaction Processing Systems (TPS) ○ Management Information Systems (MIS) ○ Decisions Support Systems (DSS) ○ Executive Support Systems (ESS) ○ Geographical information systems (GIS) ○ Knowledge Management Systems (KMS) ○ Content Management Systems (CMS) ○ Enterprise Resource Planning Systems (ERPS) ○ Smart systems 	<ul style="list-style-type: none"> • Compares the objectives and functionality of different types of manmade systems • Distinguishes the different types of manmade systems in terms of objectives and functionality 	4
	7.3 Explores different information system	<ul style="list-style-type: none"> • System Development Life Cycle models <ul style="list-style-type: none"> ○ Waterfall 	<ul style="list-style-type: none"> • Lists and briefly describes system 	08

Competency	Competency Level	Contents	Learning outcomes	Periods
	development models and methods	<ul style="list-style-type: none"> ○ Spiral ○ Agile ○ Prototyping <ul style="list-style-type: none"> ❖ Rapid Application Development (RAD) ● System development methodologies <ul style="list-style-type: none"> ○ Structured ○ Object Oriented 	<ul style="list-style-type: none"> development models ● Investigates the applicability of each model ● Lists and describes the stages of System Development Life Cycle (SDLC) in Waterfall model ● Lists and describes phases of the SDLC in Spiral model ● Lists and briefly describes system development methodologies 	
	7.4 Examines the Structured System Analysis and Design Methodology (SSADM)	<ul style="list-style-type: none"> ● Introduction to SSADM ● Stages of the system development life cycle 	<ul style="list-style-type: none"> ● Defines SSADM ● Lists and briefly describes the stages of SDLC covered by SSADM 	2
	7.5 Investigates the need for a new information system and its feasibility	<ul style="list-style-type: none"> ● Preliminary investigation <ul style="list-style-type: none"> ○ Identification of the problems in the current system ○ Suggest alternative solutions ○ Prioritizing information systems needs ● Feasibility study <ul style="list-style-type: none"> ○ Technical feasibility 	<ul style="list-style-type: none"> ● Describes the tasks in preliminary investigation stage ● Identifies information problems in an organization ● Identifies priorities 	4

Competency	Competency Level	Contents	Learning outcomes	Periods
		<ul style="list-style-type: none"> ○ Economic feasibility ○ Operational feasibility ○ Organizational feasibility 	<ul style="list-style-type: none"> of the problems to be solved • Describes the need of feasibility study • Lists and briefly describe the types of feasibility 	
	7.6 Uses different methods to analyze the current system	<ul style="list-style-type: none"> • Requirement analysis <ul style="list-style-type: none"> ○ Functional requirements ○ Non – functional requirements • Analytical Tools <ul style="list-style-type: none"> ○ Business Activity Modeling <ul style="list-style-type: none"> ❖ Business activity model ○ Data Flow Modeling (DFM) <ul style="list-style-type: none"> ❖ Data Flow Diagrams (DFD) ❖ Elementary processes and Elementary Process Descriptions (EPD) ❖ Document flow diagram ○ Logical Data Modeling (LDM) <ul style="list-style-type: none"> ❖ Logical Data Structure (LDS) • Business System Options (BSO) 	<ul style="list-style-type: none"> • Describes the need for requirement analysis • Describes type of requirements with examples for a given system • Defines requirements in IEEE standard • Lists the analytical tools and describes the purpose of them • Draws business activity model, context diagram, document flow diagram, data flow diagrams and logical data structure for a given system • Writes elementary process 	18

Competency	Competency Level	Contents	Learning outcomes	Periods
			descriptions <ul style="list-style-type: none"> • Describes the need for business system options • Proposes business system options • Selects the most appropriate business system option 	
	7.7 Designs the proposed system	<ul style="list-style-type: none"> • Logical design tools <ul style="list-style-type: none"> ○ Logical Data flow modeling <ul style="list-style-type: none"> ❖ Logical Data flow diagrams for proposed system ❖ Elementary processes and elementary process description ❖ User Interface design ○ Logical Data modeling <ul style="list-style-type: none"> ❖ Logical data structure for the proposed system ○ Physical design of database <ul style="list-style-type: none"> ❖ Table and record specifications ❖ Data dictionary ❖ Database design 	<ul style="list-style-type: none"> • Describes the logical design • Describes the activities involve in the logical design stage • Reconstructs logical design of the proposed system starting from elementary processes to context diagram • Writes elementary process description in pseudo code • Specifies table and record specifications 	14
	7.8 Develops and tests the proposed system	<ul style="list-style-type: none"> • Program development • Database development 	<ul style="list-style-type: none"> • Lists the testing methods for a newly 	6

Competency	Competency Level	Contents	Learning outcomes	Periods
		<ul style="list-style-type: none"> • Testing <ul style="list-style-type: none"> ○ Test cases ○ White box testing ○ Black box testing ○ Unit testing ○ Integrated testing ○ System testing ○ Acceptance testing 	<p>designed system</p> <ul style="list-style-type: none"> • Describes the testing methods for a newly designed system 	
	7.9 Deploys the developed system	<ul style="list-style-type: none"> • Deployment methods <ul style="list-style-type: none"> ○ Parallel ○ Direct ○ Pilot ○ Phase • Hardware/Software installation, data migration and user training • Review, support and maintenance 	<ul style="list-style-type: none"> • Describes the methods of deployment of the developed system. • Describes the activities involved after implementation of a system 	4
	7.10 Describes system implementation with off-the-shelf packaged systems	<ul style="list-style-type: none"> • Advantages and disadvantages of using off- the-shelf packages • Identification of package capabilities, work flows etc. • Business process gap analysis • Business process mapping • Business process reengineering 	<ul style="list-style-type: none"> • Describes the costs and benefits of off-the-shelf packages in terms of investment, operational and maintenance cost • Describes the features and capabilities of packaged solutions related to standard business 	4

Competency	Competency Level	Contents	Learning outcomes	Periods
			applications <ul style="list-style-type: none"> • Identifies and describes differences between a given business process and features of off-the-shelf packages • Maps business process activities onto work flow of the off-the-shelf packaged solution • Identifies changes required in the current business process • Identifies customization requirements of off-the-shelf packaged solutions 	
Competency 8: Designs and develops database systems to manage data efficiently and effectively.	8.1 Learns the basics of information and data, and the need for databases	<ul style="list-style-type: none"> • Data vs. information • Structured Vs. unstructured data • Definition of database • Database models <ul style="list-style-type: none"> ○ Flat file system ○ Hierarchical model ○ Network model ○ Relational model ○ Object relational model 	<ul style="list-style-type: none"> • Distinguishes data and information • Defines database • Lists and briefly describes the database models • Compares and contrasts database models in terms of 	2

Competency	Competency Level	Contents	Learning outcomes	Periods
		<ul style="list-style-type: none"> • Comparison of database models 	<ul style="list-style-type: none"> • their features 	
	8.2 Describes the main components of the relational database model	<ul style="list-style-type: none"> • Relations / Tables <ul style="list-style-type: none"> ○ Attributes / Columns ○ Tuples / Rows ○ Relationships • Types of Constraints <ul style="list-style-type: none"> ○ A NOT NULL Constraint ○ A Unique Constraint ○ A Primary Key Constraint ○ A Foreign Key Constraint ○ A (Table) Check Constraint 	<ul style="list-style-type: none"> • Defines relations / tables • Names and describes main components of a relational database • Describes the relationships in terms of relational database model • Briefly explains the types of constrains 	4
	8.3 Analyzes the main components of a database system	<ul style="list-style-type: none"> • Data Base Management System • Data definition language (DDL) <ul style="list-style-type: none"> ○ Introduction to SQL ○ Classification of SQL ○ Creating, using relational database using DDL <ul style="list-style-type: none"> ❖ Creating table ❖ Alter table <ul style="list-style-type: none"> - Inserting and deleting attributes - Adding and deleting foreign key and primary key ❖ Drop tables ❖ Drop databases • Data manipulation Language (DML) <ul style="list-style-type: none"> ○ DML Features in SQL 	<ul style="list-style-type: none"> • Lists and briefly describes the component of a database system • Describes the database management system • Defines SQL • Distinguishes between DDL vs. DML • Uses appropriate SQL commands for creating and using database 	14

Competency	Competency Level	Contents	Learning outcomes	Periods
		<ul style="list-style-type: none"> ❖ Inserting, modifying, retrieving, updating deleting data ○ Select Query <ul style="list-style-type: none"> ❖ Extracting rows and columns from single table ❖ Extracting rows and columns from multiple tables using inner join operation ❖ Insert Query ❖ Update Query ❖ Delete Query 	<ul style="list-style-type: none"> • Uses appropriate commands to create tables with suitable fields and data types • Sets primary key and foreign key while creating table • Uses primary key and foreign key after completion of a table • Creates relationships among tables • Uses appropriate SQL commands to Insert and delete columns, delete foreign key / primary key and to drop table • Uses appropriate SQL commands to drop database • Uses appropriate commands to Insert, modify retrieve, update and delete data. • Uses appropriate DML commands to 	

Competency	Competency Level	Contents	Learning outcomes	Periods
			query data according to the requirements	
	8.4 Designs the conceptual schema of a database	<ul style="list-style-type: none"> • ER (Entity Relationship) diagrams <ul style="list-style-type: none"> ○ Entities, attributes ○ Entity identifiers ○ Relationships ○ Cardinality • Introduction to EER (Extended ER) diagrams 	<ul style="list-style-type: none"> • Describes ER diagram • Describes the components of an ER diagram (entities, attributes) • Describes entity identifiers • Lists and describes relationships • Describes cardinality • Identifies the requirements of a given scenario • Selects entities, attributes and according to the requirement • Draws the ER diagram • Explains the EER diagrams 	12

Competency	Competency Level	Contents	Learning outcomes	Periods
	8.5 Designs the logical schema of a database	<ul style="list-style-type: none"> • Definition of the logical schema • Database schema design <ul style="list-style-type: none"> ○ Relational schema ○ Relation instances ○ Candidate key ○ Primary key ○ Alternate key ○ Foreign key • Domain 	<ul style="list-style-type: none"> • Defines logical schema of a database • Describes relational schema • Describes relational instances • Briefly describes Candidate key, primary key, alternate key and foreign key 	6
	8.6 Transforms ER diagrams to logical schema	<ul style="list-style-type: none"> • Entity transformation • Attribute transformation • Relationship transformation 	<ul style="list-style-type: none"> • Describes the methods of transformation ER diagram to logical schema • Transforms ER diagrams (entity, attribute, relationships) to logical schema 	6
	8.7 Normalizes database schema to improve performance	<ul style="list-style-type: none"> • Need for normalization- <ul style="list-style-type: none"> ○ Redundancies and anomalies <ul style="list-style-type: none"> ❖ Insert ❖ Update ❖ Delete • Functional dependencies <ul style="list-style-type: none"> ○ Full dependency ○ Partial dependency 	<ul style="list-style-type: none"> • Describes the functional dependencies and categorizes them • Describes abnormalities of an improperly designed table when 	6

Competency	Competency Level	Contents	Learning outcomes	Periods
		<ul style="list-style-type: none"> ○ Transitive dependency ● Levels of normalization <ul style="list-style-type: none"> ○ Zero normal form ○ First normal form ○ Second normal form ○ Third normal form 	<p>modifying in terms of insert, update and delete</p> <ul style="list-style-type: none"> ● Describes the zero normal form ● Explains the abnormalities which are reduced after the first normal form ● Lists the conditions for executing the second normal form ● Explains the abnormalities which are reduced after the second normal form ● Explains the abnormalities which are reduced after the third normal form 	
<p>Competency 9 : Develops algorithms to solve problems and uses python programming language to encode</p>	<p>9.1 Uses problem-solving process</p>	<ul style="list-style-type: none"> ● Understanding the problem ● Defining the problem and boundaries ● Planning solution ● Implementation 	<ul style="list-style-type: none"> ● Describes the steps of problem solving process ● Implements the solution 	<p>2</p>

Competency	Competency Level	Contents	Learning outcomes	Periods	
algorithms					
	9.2	Explores the top down and stepwise refinement methodologies in solving problems	<ul style="list-style-type: none"> • Modularization • Top down design and stepwise refinement • Structure charts 	<ul style="list-style-type: none"> • Uses stepwise refinement methodology to solve problems • Draws structures charts to illustrate a solution for a system 	4
	9.3	Uses algorithmic approach to solve problems	<ul style="list-style-type: none"> • Algorithms <ul style="list-style-type: none"> ○ Flow charts ○ Pseudo codes ○ Hand traces 	<ul style="list-style-type: none"> • Briefly describes algorithms • Identifies the standard symbols used to draw flow charts • Draws flow charts to illustrate solutions to a given problem • Writes pseudo codes to illustrate solutions to a given problem • Uses hand traces to verify the solutions 	6
	9.4	Compares and Contrasts different programming paradigms	<ul style="list-style-type: none"> • Evolution of programming languages • Programming paradigms <ul style="list-style-type: none"> ○ Imperative languages ○ Declarative languages ○ Object oriented languages 	<ul style="list-style-type: none"> • Describes the evolution of programming language in terms of generations • Compares and 	2

Competency	Competency Level	Contents	Learning outcomes	Periods
			contrasts imperative, declarative, object oriented languages	
	9.5 Explores the need of program translation and the type of program translators	<ul style="list-style-type: none"> • Need of program translation • Source program • Object program • Program translators <ul style="list-style-type: none"> ○ Interpreters ○ Compilers ○ Hybrid approach • Linkers 	<ul style="list-style-type: none"> • Describes the need of translation of a program • Compares the source and object program • Lists and briefly describes the types of program translators • Briefly describes the function of linkers 	2
	9.6 Explores integrated development environment (IDE) to identify their basic features	<ul style="list-style-type: none"> • Basic features of IDE • Instructions to use <ul style="list-style-type: none"> ○ Opening and saving files ○ Compiling, executing programs • Debugging facilities 	<ul style="list-style-type: none"> • Identifies the basic features of IDE • Practices the instructions to <ul style="list-style-type: none"> ○ Open and save files ○ Compile, execute programs • Uses the debugging facilities in IDE 	4
	9.7 Uses an imperative programming language to encode algorithms	<ul style="list-style-type: none"> • Structure of a program • Comments • Constants and Variables • Primitive data types • Operator categories 	<ul style="list-style-type: none"> • Identifies the structure of a program • Uses comments to identify the usage of 	10

Competency	Competency Level	Contents	Learning outcomes	Periods
		<ul style="list-style-type: none"> ○ Arithmetical, relational, logical, bitwise ● Operator precedence ● Input / output <ul style="list-style-type: none"> ○ Input from keyboard ○ Output to standard devices 	<ul style="list-style-type: none"> code for future reference ● Uses constants and variables in a program appropriately ● Identifies the primitive data types of a given program language ● Identifies and uses operators in a program ● Identifies precedence of operators ● Writes programs with the facilities of input from keyboard and output to standard devices 	
	9.8 Uses control structures in developing programs	<ul style="list-style-type: none"> ● Control Structures <ul style="list-style-type: none"> ○ Sequence ○ Selection ○ Repetition <ul style="list-style-type: none"> ❖ Iteration ❖ Looping 	<ul style="list-style-type: none"> ● Briefly describes control structures ● Lists and briefly describes the types of control structures ● Uses control structures appropriately in programming ● Applies nested 	12

Competency	Competency Level	Contents	Learning outcomes	Periods
			control structures in programs	
	9.9 Uses sub-programs in programming	<ul style="list-style-type: none"> • Types of subprograms <ul style="list-style-type: none"> ○ Built in ○ User defined <ul style="list-style-type: none"> ❖ Structure ❖ Parameter passing ❖ Return values ❖ Default values ❖ Scope of variables 	<ul style="list-style-type: none"> • Briefly describes the functions • Lists and briefly describes the types of functions • Identifies the structure of a function • Compares local and global variables • Identifies the behavior of a variable in terms of life time • Identifies the need of return values and writes functions to obtain the appropriate return value • Writes functions using relevant parameters and arguments • Uses user defined functions 	10
	9.10 Uses data structures in programs	<ul style="list-style-type: none"> • Data structures <ul style="list-style-type: none"> ○ Strings ○ Lists 	<ul style="list-style-type: none"> • Briefly explains the use of data structures 	8

Competency	Competency Level	Contents	Learning outcomes	Periods
		<ul style="list-style-type: none"> ○ Tuples ○ Dictionaries 	<ul style="list-style-type: none"> • Uses relevant data structures in programming 	
	9.11 Handles files and databases in programs	<ul style="list-style-type: none"> • File handling <ul style="list-style-type: none"> ○ Basic file operations 	<ul style="list-style-type: none"> • Uses basic file operations (open, close, read write and append) 	6
	9.12 Manages data in databases	<ul style="list-style-type: none"> • Connecting to a database • Retrieve data • Add, modify and delete data 	<ul style="list-style-type: none"> • Embeds SQL statements in programming languages to retrieve, add, modify and delete data 	4
	9.13 Searches and sorts data	<ul style="list-style-type: none"> • Searching techniques <ul style="list-style-type: none"> ○ Sequential search • Sorting techniques <ul style="list-style-type: none"> ○ Bubble sort 	<ul style="list-style-type: none"> • Uses sequential searching technique appropriately • Implements bubble sort technique appropriately 	4
Competency 10: Develops websites incorporating multi-media technologies (using HTML 5)	10.1 Explores the need for web	<ul style="list-style-type: none"> • The world wide web (www) • Types of web sites <ul style="list-style-type: none"> ○ Information, news ○ Personal, educational, commercial, Research ○ Web portals 	<ul style="list-style-type: none"> • Describes www • Analyses the systematic arrangements of contents and structure of a web 	8
	10.2 Analyses user requirements(multimedia	<ul style="list-style-type: none"> • Defining the objectives of a website • Contents to be displayed 	<ul style="list-style-type: none"> • Creates effective and appropriate 	4

Competency	Competency Level	Contents	Learning outcomes	Periods
	contents)		information layout of a website <ul style="list-style-type: none"> • Identifies the web pages of a website • Identifies the contents of a web page • Identifies navigation structure 	
	10.3 Identifies appropriate HTML tags to design a single web page	<ul style="list-style-type: none"> • Building blocks of a web page <ul style="list-style-type: none"> ○ Page definition <ul style="list-style-type: none"> ❖ <html></html> ○ Head section <ul style="list-style-type: none"> ❖ <head></head> ❖ <title></title> ○ Body section <ul style="list-style-type: none"> ❖ <body></body> • Background color <ul style="list-style-type: none"> ○ Text formatting <ul style="list-style-type: none"> ❖ <h1>...<h6>tags ❖ <p></p> ❖
 ❖ Underline, bold, italic ❖ <ul style="list-style-type: none"> - Size and color • Adding comments 	<ul style="list-style-type: none"> • Analyses the arrangement of contents of a web page • Analyses the organization of contents in a web page • Creates a simple web page 	4
	10.4 Uses HTML to create linked web pages	<ul style="list-style-type: none"> • Contents of a website <ul style="list-style-type: none"> ○ Home page ○ Linked pages ○ Hyperlink <ul style="list-style-type: none"> ❖ Different sections of the same 	<ul style="list-style-type: none"> • Explains hypertext markup language • Identifies the standards of HTML • Saves the source 	16

Competency	Competency Level	Contents	Learning outcomes	Periods
		<ul style="list-style-type: none"> page(book mark) ❖ Different pages of a same site(local link) ❖ Pages of different sites (External link) • Lists <ul style="list-style-type: none"> ○ Ordered lists ○ Unordered lists ○ Definition lists • Image • Tables <ul style="list-style-type: none"> ○ <table></table> ○ <th></th> ○ <tr></tr> ○ <td></td> ○ <caption> ○ Merging columns and rows • Multimedia objects <ul style="list-style-type: none"> ○ Audio ○ Video 	<ul style="list-style-type: none"> document with suitable extensions • Designs the web page by inserting appropriate multimedia objects according to user requirements • Organizes data using lists and tables in the web page • Links pages and multimedia objects to the web page 	
	10.5 Uses Style sheet to change the appearance of web pages	<ul style="list-style-type: none"> • Introduction to style sheet • CSS <ul style="list-style-type: none"> ○ Syntax, comments • CSS selectors <ul style="list-style-type: none"> ○ element, id, class, group • Ways of inserting CSS <ul style="list-style-type: none"> ○ Internal, external, inline • Appearance formatting <ul style="list-style-type: none"> ○ Background (color, image) ○ Text and fonts ○ Links 	<ul style="list-style-type: none"> • Briefly explains style sheet and its usage • Uses the comments and correct syntax in CSS • Uses appropriate selectors to select elements in CSS • Inserts CSS in HTML web pages to 	8

Competency	Competency Level	Contents	Learning outcomes	Periods
		<ul style="list-style-type: none"> ○ Lists ○ Tables 	<p>improve the appearance</p> <ul style="list-style-type: none"> ● Applies various CSS formatting in HTML web pages to improve the appearance 	
	10.6 Uses an authoring tool to create web pages	<ul style="list-style-type: none"> ● Introduction to web authoring tools 	<ul style="list-style-type: none"> ● Briefly explains web authoring tools ● Creates web pages using a web authoring tool 	10
	10.7 Creates dynamic web pages using PHP and MySQL	<ul style="list-style-type: none"> ● Introduction to dynamic web pages ● Embedding PHP code into web page <ul style="list-style-type: none"> ○ Variables ○ Arrays ○ Control structures ○ Functions ○ Database connectivity ○ Working with databases ● Forms <ul style="list-style-type: none"> ○ Input element <ul style="list-style-type: none"> ❖ Type attribute ❖ Name attribute ❖ Value attribute ○ Text input (Password) ○ Radio buttons ○ Check box ○ Selection 	<ul style="list-style-type: none"> ● Defines dynamic web pages ● Creates data source and enters data ● Creates PHP code to save/retrieve data to and from MySQL ● Develop simple web based information systems 	6

Competency	Competency Level	Contents	Learning outcomes	Periods
		<ul style="list-style-type: none"> ○ Submit buttons ○ Reset button ○ Action attribute ○ Method attribute ❖ Get ❖ Post ○ Grouping form data using <fieldset> tag ○ Saving form data into database ● Creating data source and entering data ● Creating PHP code to retrieve data from MySQL database ● Set form values using retrieved data 		
	10.8 Publishes and maintains web sites	<ul style="list-style-type: none"> ● Local publishing <ul style="list-style-type: none"> ○ Own computer, intranet ● Internet publishing <ul style="list-style-type: none"> ○ Connecting to the web Service provider ○ Publishing web Pages on web server ● Factors affecting performance of website 	<ul style="list-style-type: none"> ● Publishes the developed website locally ● Identifies free web hosting sites from the Internet ● Publishes the developed website through a free web hosting site ● Investigates the factors affecting performance of website 	4

Competency	Competency Level	Contents	Learning outcomes	Periods
<p>Competency 11:</p> <p>Explores IoT and identify the building blocks of embedded systems to develop simple applications</p>	<p>11.1 Acquires the knowledge of basic building blocks of embedded systems</p>	<ul style="list-style-type: none"> • Microcontroller - Based Development Systems (Arduino and other similar systems) <ul style="list-style-type: none"> ○ Introduction <ul style="list-style-type: none"> ❖ Microcontroller based Development Systems vs. microprocessor based systems ○ Features <ul style="list-style-type: none"> ❖ Analog Input ❖ Digital Input ❖ Microcontroller ❖ Digital Output ❖ Receiver and Transmitter Pins ❖ Communication Port ❖ Power supply ○ Connect to the computer <ul style="list-style-type: none"> ❖ USB Connectivity ❖ IDE Software (code editor, compiler and programmer) ○ Simple applications <ul style="list-style-type: none"> ❖ Switch on/off a LED ❖ Sensing ambient light intensity with a LDR and switching a LED on and off depending on the light intensity ❖ Sensing the room temperature with temperature sensor and switching a fan on and off 	<ul style="list-style-type: none"> • Identifies and lists Microcontroller based Development Systems • Describes available features on Microcontroller based Development Systems • Identifies necessary software and download them from the Internet to design and write programs into Microcontroller based Development Systems • Develops simple applications using to Microcontroller based Development Systems <ul style="list-style-type: none"> - Switch on/off LEDs on ambient light intensity - Run a fan on high temperature - Door open/close detection using a read switch 	<p>8</p>

Competency	Competency Level	Contents	Learning outcomes	Periods
		<p>depending on the temperature</p> <ul style="list-style-type: none"> ❖ Detection of opening/closing a door using a read switch 		
	<p>11.2 Explores the Internet of Things (IoT) to create a simple application</p>	<ul style="list-style-type: none"> ● Introduction to IoT <ul style="list-style-type: none"> ○ Definition ○ Needs ○ IoT applications ○ Enabling technologies ● Simple IoT application to construct a remote switch 	<ul style="list-style-type: none"> ● Defines IoT (Internet of Things) ● Identifies the needs of IoT to make day to day smart ● Discusses the various applications of IoT ● Identifies the enabling technologies for IoT ● Designs and Implements an IoT application to remotely control a device through Internet Example :- ON/OFF a light ● Uses IoT based system while knowing the social 	<p>7</p>

Competency	Competency Level	Contents	Learning outcomes	Periods
			and security consequences of IoT	
<p>Competency 12: Explores applicability of ICT to business organizations and the competitive marketplace</p>	<p>12.1 Explores the role of ICT in the world of business</p>	<ul style="list-style-type: none"> • Digital economy <ul style="list-style-type: none"> ○ New business methods in digital economy <ul style="list-style-type: none"> ❖ Reverse auctions ❖ Group purchasing ❖ e-Marketplace • Pure brick, brick and click, and pure click organizations • Business functions and the role of ICT <ul style="list-style-type: none"> ○ Accounting and ICT ○ Human resource and ICT ○ Production and ICT ○ Marketing & sales and ICT ○ Supply chain management and ICT ○ Business communication and ICT ○ Secure payment mechanisms <ul style="list-style-type: none"> ❖ Payment gateways ❖ Secure credit card payments ❖ Third party systems <ul style="list-style-type: none"> - PayPal etc ❖ Mechanisms 	<ul style="list-style-type: none"> • Defines digital economy • Lists and describes new business methods in digital economy • Identifies the concepts behind pure brick, brick and click, and pure click organizations • Describes the role of ICT in business functions of an organization 	4

Competency	Competency Level	Contents	Learning outcomes	Periods	
		<ul style="list-style-type: none"> - Data encryption - Micro credit payments (bit coin etc.) • Threats and opportunities in ecommerce <ul style="list-style-type: none"> ○ Privacy ○ Product commercialization 			
	12.2	Analyses the relationship between ICT and business operations	<ul style="list-style-type: none"> • E-Commerce and e-business <ul style="list-style-type: none"> ○ The scope of e-commerce and e-business ○ Types of e-business transactions <ul style="list-style-type: none"> ❖ B2B, B2C, C2C, C2B, B2E, G2C • E-Business <ul style="list-style-type: none"> ○ Virtual storefronts ○ Information brokers ○ Online marketplace ○ Content provider ○ Online service provider ○ Portal ○ Virtual Community • Advantages and disadvantages of e-business 	<ul style="list-style-type: none"> • Distinguishes the e-commerce and e-business • Investigates the scope of e-commerce and e-business • Lists and briefly describes the types of e-business transactions • Identifies the advantages and disadvantages of e-business 	4
	12.3	Analyses the ICT in terms of generating and delivering an improved products and services to consumers	<ul style="list-style-type: none"> • E-marketing <ul style="list-style-type: none"> ○ Concepts of marketing ○ Use of ICT in marketing <ul style="list-style-type: none"> ❖ Web advertising etc • Databases in marketing <ul style="list-style-type: none"> ○ Predicting customer behavior with AI tools and techniques 	<ul style="list-style-type: none"> • Defines e-marketing • Identifies the role of ICT in e-marketing • Investigates the usage of database in marketing 	4

Competency	Competency Level	Contents	Learning outcomes	Periods
		<ul style="list-style-type: none"> ○ Gaining competitive advantages through ICT ● Mobile Marketing 	<p>activities to improve the product and services according to the requirements of the customers</p> <ul style="list-style-type: none"> ● Identifies the ways of gaining competitive advantages using ICT 	
<p>Competency 13: Explores new trends and future directions of ICT</p>	<p>13.1 Explores new trends and future directions in computing</p>	<ul style="list-style-type: none"> ● Intelligent and emotional computing ● Artificial intelligence ● Man-machine coexistence ● Machine to machine coexistence 	<ul style="list-style-type: none"> ● Describes intelligent and emotional computing. ● Explains artificial intelligences ● Appreciates man-machine coexistences 	4
	<p>13.2 Explores the fundamentals and applications of agent technology</p>	<ul style="list-style-type: none"> ● Software agents ● Multi-agent systems ● Applications of Agent systems 	<ul style="list-style-type: none"> ● Briefly describes software agents and their characteristics ● Briefly describes multi-agent systems and their characteristics ● Identifies the applications of agent systems 	4

Competency	Competency Level	Contents	Learning outcomes	Periods
	13.3 Analyzes the existing models of computing and proposes new models	<ul style="list-style-type: none"> • Beyond von-Neumann computer • Nature inspired computing • Biology inspired computing • Fundamentals of quantum computing • Applications 	<ul style="list-style-type: none"> • Predicts the technologies beyond von-Neumann computers 	4
Competency 14: Designs and Implements a simple Information system project	14.1 Conducts a project on designing an information system	<ul style="list-style-type: none"> • Examples of projects • Stakeholders <ul style="list-style-type: none"> ○ Roles and responsibilities of the following stakeholders: <ul style="list-style-type: none"> • senior management • customer/client • user • project manager • team member • peer reviewer • supplier • Project planning <ul style="list-style-type: none"> ○ The phases of the project ○ The activities to be carried out in each phase ○ Start date and end date of each activity ○ Dependencies ○ Resources required for each activity ○ Dates of key milestones ○ Potential risks, their effect on the plan and how their impact can be minimized 	<ul style="list-style-type: none"> • Identifies the characteristics and reasons of projects with examples • Identifies the role of stakeholders • Identifies the reasons of project plan and the planning criteria • Identifies a simple problem to be carryout as a project • Prepares project proposal • Presents the proposal • Organizes the project • Carryout the project according to the SDLC 	<p style="text-align: center;">25</p> <p style="text-align: center;">One period per week for a duration of one year</p>

Competency	Competency Level	Contents	Learning outcomes	Periods
		<ul style="list-style-type: none"> ○ Gantt charts ● Identification of a simple problem for the project ● Project proposal <ul style="list-style-type: none"> ○ Proposal preparation ○ Getting approval ● Project organization <ul style="list-style-type: none"> ○ Storing documents relating to a project (project folder) ○ Protecting information from accidental damage ○ Communicating with stakeholders ○ Reporting on progress ○ Holding reviews ● Phases of a project <ul style="list-style-type: none"> ○ Preliminary investigation ○ Feasibility study ○ Requirement analysis ○ Design ○ Coding ○ testing ○ Documentation 	<ul style="list-style-type: none"> phases ● Handovers the outcomes of each phase to documentation after evaluate by the teacher 	
	14.2 Implements and demonstrates the Information system	<ul style="list-style-type: none"> ● Project presentation and demonstration of the system 	<ul style="list-style-type: none"> ● Presents the finished project and demonstrates the system to all the class 	05