

Government of Nepal
Teacher Service Commission
Teacher Licensing Curriculum for Secondary Level (Grade 9-12), 2075

First Paper: Computer Science

65 marks

Introduction

This course is designed for knowledge related to computer science. This course is specially designed to understand fundamentals knowledge of computer and the terminologies associated with computer science. It is focused on computer fundamentals, computer system, computer programming, web development and database and network and internet.

Objectives

- To acquire basic knowledge and skills related to computer Science
- To develop knowledge of computer system and its hardware and software
- To develop the knowledge of how computer language works and how they are used in the home, school , workplace and community
- To develop the good command in computer programming and database management system
- To acquire the knowledge of different types of networks, its types and its applications

Part : I

40 Marks

1. Introduction and Evolution of computer

- 1.1. Concept and Characteristics of Computer
- 1.2. Application of Computers
- 1.3. History of Computer: Mechanical Calculating era, Electro-Mechanical era, Electronic computers era
- 1.4. Generation of Computers: First, second, Third, Fourth and Fifth Generation(AI) and its features
- 1.5. Computer speed and Measurement Unit

2. Classification of Computer

- 1.1. On the basis of working principle- Analog, Digital and Hybrid Computers
- 1.2. On the basis of size- Super, Mainframe, Mini and Microcomputers
- 1.3. On the basis of brand- IBM PC, IBM Compatible and Apple/Macintosh
- 1.4. Mobile Computing

3. Number system and their conversion

- 1.1. Decimal, Binary, Octal, Hexadecimal Number system & conversion
- 1.2. 3.2 9's and 10's complements decimal subtraction
- 1.3. Calculation in Binary-addition, subtraction, One's and two's Complement Methods binary subtraction

4. Digital Logic fundamental

- 1.1. Logic Function and boolean Algebra
- 1.2. Introduction of Truth Table, Boolean Expression

- 1.3. Logic gates- AND, OR, NOT, NAND, NOR, XOR and XNOR- its definition, use, truth table, logic symbol
- 1.4. Duality principle
- 1.5. Laws of Boolean Algebra- Associative, Commutative, Distributive, Identity, Complement laws
- 1.6. De Morgan's Theorem: Statement and logic Expression
- 1.7. Venn diagram and its represent of logic gates (AND, OR, NOT)

5. Computer Systems

- 1.1. Concept of Computer Architecture
- 1.2. Concept of Computer Organization
- 1.3. Components of Computer System-Input, Output, Processor and Storage
- 1.4. Microprocessor- Concepts, Components of Processor, Functions
- 1.5. Concept of System Buses: Data Bus, Address Bus, Control Bus
- 1.6. Memory- Primary and Secondary, Cache (L1, L2), Buffer, RAM, ROM
- 1.7. Storage Device- Definition, Use, Types: Hard Disk, Floppy Disk, Magnetic Tape, Flash Memory, Optical Disk (CD, VCD, DVD) External storage device
- 1.8. Input Device- Keyboard, Mouse, Scanner, Light pen, OMR, OCR, BCR, Scanner Touch pad Kiosk, Microphone and Digital Camera
- 1.9. Output Devices-Monitor, printer, plotter, Speaker
- 1.10. Computer peripherals
- 1.11. Interfaces- Parallel Port, Serial Port, USB ports
- 1.12. Identification of PC Accessories and Peripherals
- 1.13. Specification of PC
- 1.14. Software and classification
 - 1.14.1. System software: OS, Language Processor
 - 1.14.2. Application software including Utilities Software
 - 1.14.3. Computer Virus and Antivirus

6. Operating System

6.1. Fundamental Concept

- 6.1.1. Introduction to operating system
- 6.1.2. Role of Operating System
- 6.1.3. Functions of an Operating System
- 6.1.4. Types of Operating System:

6.2. Based on Processing Method (Batch, Multitasking, Multiprocessing)

- 6.2.1. Timesharing, Real Time), Based on user Interface (GUI, CUI), Based on Mode of
- 6.2.2. User (Single-user & Multi-user)
- 6.2.3. Disk Operating System (DOS)
- 6.2.4. Introduction to CUI and it's feature
- 6.2.5. Common DOS Commands (External and Internal Commands)

- 6.2.6. Concept of file and Directory
- 6.2.7. Wildcards and pathname
- 6.2.8. System Files: Config.sys, IO.sys, MSDOS.sys. autoexec.bat
- 6.2.9. windows operating system
- 6.2.10. Introduction to GUI and its features
- 6.2.11. working with a window Environment
- 6.2.12. Working with a windows Application Program
- 6.2.13. Working with files and folders
- 6.2.14. Customizing the task bar and Desktop
- 6.2.15. Customizing windows
- 6.2.16. Use of Accessories
- 6.2.17. Concept of Open Sources Operating System
- 6.2.18. Introduction to open sources operating system
- 6.2.19. Introduction to Linux, UNIX

7 Introduction to Programming

Programming Languages (Low level, High level, 4GL)

- 7.1. Compiler, Interpreter and Assembler
- 7.2. List of high level programming Language
- 7.3. Difference between program and software
- 7.4. Concept of Programming statement
- 7.5. Syntax and semantics errors
- 7.6. Program control structures: Sequence, Selection and Iteration
- 7.7. Program Design tools- Algorithm, Flowchart and pseudo code
- 7.8. Introduction to data type
- 7.9. Codes: Absolute Binary, BCD, ASCII, EBCDIC, Unicode

8 Application Package

8.1. Word Processor

- 8.1. Concept of Word Processor
- 8.2. Types of Word Processing
- 8.3. Basic terms of word processing
- 8.4. Working and editing text
- 8.5. Formatting Characters and paragraphs
- 8.6. Formatting pages
- 8.7. Working with tables
- 8.8. Working with templates and styles
- 8.9. Drawing and working with graphics
- 8.10. performing a Mail Merge
- 8.11. Document Collaboration
- 8.12. Working with outlines and long Documents

- 8.13. Working with word Art and Charts
- 8.14. Project work on Word processor

8.2 Spread Sheet

- 8.2.1 Concept and use of spread sheet
- 8.2.2 Types of spread sheet
- 8.2.3 Basic fundamentals of spread sheet
- 8.2.4 Formatting a worksheet
- 8.2.5 Creating and working with charts
- 8.2.6 Managing workbooks
- 8.2.7 General functions and formulas
- 8.2.8 Data filter and sorting
- 8.2.9 Working with other objects
- 8.2.10 Data Analysis and Pivot tables
- 8.2.11 What-If Analysis
- 8.2.12 Project work on Spread sheet

8.3. Presentation

- 8.3.1 Concept of Presentation
- 8.3.2 Types and use of presentation Program
- 8.3.3 Basic fundamental of presentation
- 8.3.4 Editing a presentation
- 8.3.5 Design and formatting Presentation
- 8.3.6 Transition of presentation
- 8.3.7 Animation and Custom Animation
- 8.3.8 Working with Tables, Graphics and Word Art
- 8.3.9 Working with Graphs and Organization Charts
- 8.3.10 Working with Multimedia
- 8.3.11 Project work on Presentation

9. Internet and E-mail

9.1. Internet

- 9.1.1 Introduction of Internet
- 9.1.2 Uses of Internet
- 9.1.3 Concept of Protocols
- 9.1.4 Web Browser, Web page, Website, Web server, URL, DNS
- 9.1.5 Search Engine, Messenger services
- 9.1.6 Setting Browser properties
- 9.1.7 Setup Network Connection

9.2 E-mail

- 9.2.1. Concept of E-mail
- 9.2.2. Uses of E-mail
- 9.2.3. Different types of E-mail Account

9.2.4. Web Based E-mail and POP E-mail

10. Web page Designing

- 10.1. Introduction to HTML
- 10.2. Types of Tags
- 10.3. Basic Structure of HTML
- 10.4. Character Formatting (Paragraphs, Heading, Text format)
- 10.5. Create an Ordered and Unordered List
- 10.6. Insert Images and Objects
- 10.7. Create Hyper Link
- 10.8. Create Table
- 10.9. Design Frames and Form
- 10.10. Concept of CSS and Script Language
- 10.11. Webpage Design and Editing Tools

11. Computer Security

- 11.1. Introduction
- 11.2. Hardware
- 11.3. Data and software security
- 11.4. Introduction of virus
- 11.5. Cause of creating computer viruses
- 11.6. Symptoms of Computer viruses
- 11.7. Method of Protection of viruses
- 11.8. Antivirus software

12. Information System Development

- 12.1. Introduction: System, Information System
- 12.2. Types of information System
- 12.3. System Analyst - roles, responsibilities and characteristics
- 12.4. System development Life Cycle (SDLC)
- 12.5. Importance and the necessity of SDLC
- 12.6. System Development Models: Waterfall, Prototype, S
- 12.7. System Development Phases
 - 12.7.1 System Study
 - 12.7.2 System Analysis Feasibility Analysis
 - 12.7.3 Feasibility Study: Technical, Economical, Operational
 - 12.7.4 System Design
 - 12.7.5 System Development
 - 12.7.6 System Testing
 - 12.7.7 Implementation
 - 12.7.8 Maintenance and Reviews
- 12.8. Concept of System Design Tools (Context Diagram, DFD, E- R Diagram System Flow Chart, Decision Table, Decision Tree, Use Case, UML)
- 12.9. Case Study

13. Database

- 13.1 Introduction: Data, Information, Database and DBMS
- 13.2 Objectives of DBMS
- 13.3 Database Model: Relational Model ,Network Model, Hierarchical Model Entity Relational Data Model
- 13.4 Concept of Normalization
- 13.5 Types of Normalization 1NF, 2NF, 3NF
- 13.6 Structured Query Language
- 13.7 Centralized Vs. Distributed Database
- 13.8 Data Security
- 13.9 MS Access 2007
 - 13.9.1 Table,Query,Form,Report
 - 13.9.2 Primary key, Foriegn Key
 - 13.9.3 Data types of Ms Access
 - 13.9.4 Field properties

14. Design Database using DBMS Software

- 14.1 Create a Database
- 14.2 Create Tables and Fields and its properties
- 14.3 Create a Relational Databases
- 14.4 Create and Run Queries
- 14.5 Working with Forms
- 14.6 Generate Reports
- 14.7 Formatting Forms and Reports

15. Communication and Networking

- 15.1. Introduction: Definition, Purpose of networking
- 15.2. Analog and Digital Signal, Modulation(AM, FM, PM)
- 15.3. Direction of communication flow(Simplex, Halfduplex,)
- 15.4. Types of Network: Peer-to-peer and Client/Server, LAN, MAN and WAN
- 15.5. LAN Topologies :Bus, Star, Ring, Tree, Mesh Topologies (Its definition, structure, advantages & disadvantages)
- 15.6. Transmission Media: Bound Media (Coaxial Cable, Twisted Pair cable andOptical Fiber Cable- its description, structure, advantages and disadvantages),Unbound Media (Satellite, Wireless Media, Microwave Transmission)
- 15.7. Network Connecting Device: Modem, NTC, Switch/Hub, Router, Gateway, Repeater, Bluetooth, IR, WiFi
- 15.8. OSI Reference Model- Layer wise use and function
- 15.9. Communication Protocol: TCP/IP, SMTP, POP3, FTP, HTTPs, Telnet protocol
- 15.10. Demonstration of Communication Media and Connecting Devices

16. Programming in C

- 16.1. Introduction:

- 16.2. Overview, History, Features, Advantages and Disadvantages of C Language
- 16.3. Structure of C program
- 16.4. Compiling Process
- 16.5. C Preprocessor and Header Files
- 16.6. 4.2 Fundamentals of C
- 16.7. 4.2.1 Character Set used in C
- 16.8. 4.2.2 Use of Comments
- 16.9. 4.2.3. Identifiers and Keywords and Tokens
- 16.10. Data Types in C
- 16.11. Constants and Variables
- 16.12. Type of Specifier
- 16.13. Statements- Simple and Compound Statements
- 16.14. Operators and Expressions
- 16.15. Operators : Precedence & Associativity
- 16.16. Expressions
- 16.17. Type Casting and Conversions
- 16.18. Introduction to Library Functions
- 16.19. Input/Output (I/O) Functions
- 16.20. Control Structures
- 16.21. Decisions (if, if- else, else if, switch, ?; operator)
- 16.22. Looping (while, do while, for)
- 16.23. Array and String
- 16.24. Definition of array and string
- 16.25. Types of Array- One-Dimensional and Two-Dimensional(definition,declaration, and initialization.)
- 16.26. String Function : strlen(), strstr(), strcmp(), Strrev(), strcpy(), strlen(), strlwr()strupr()
- 16.27. Functions
- 16.28. Concept of Function, function definition, function
- 16.29. Return and Void statements of a function
- 16.30. Accessing a Function - Function Call(by value, by reference)
- 16.31. Concept of Recursion
- 16.32. Structures and Unions
- 16.33. Definition and Difference between Structure and Union
- 16.34. Structure: Declaration, Initialization and Size of Structure
- 16.35. Pointers
- 16.36. Definition of Pointer
- 16.37. Address(&) and indirection(*) operator
- 16.38. Pointer Expression and Assignment
- 16.39.4.10. Working with Files
- 16.40.4.11. Concept of Data File

16.41.4.12. Sequential and Random File

16.42.4.13 Opening, Reading, Writing and Appending on/from Data File

17. Object-Oriented Programming (OOP)

17.1. Concept of OOP

17.2. Features of OOP: Class, Object, Polymorphism and Inheritance

17.3. Application of OOP

17.4. Difference between OOP and Structured Programming Language

18. Information Communication Technology and Cyber Law

18.1. Social Impact of the ICT

18.2. Digital Divide

18.3. Computer Ethics

18.4. Intellectual Properties Right

18.5. Privacy, Anonymity

18.6. Computer Crime

18.7. Concept of Cyber Law

18.8. Area of Cyber Law

18.9. Cyber Law in Nepal

18.10. IT Policy in Nepal

19. Multimedia

19.1. Introduction to Multimedia

19.2. Component of Multimedia: Text, Graphics, Audio, Video and Animation

19.3. Application of Multimedia

20. Artificial Intelligence

20.1. Concept of AI

20.2. Component of AI

20.3. Uses of AI

20.4. Ethical Aspect of AI

21. Contemporary Technology

21.1. e- Business

21.2. e- Learning

21.3. e-Governances

21.4. e-Medicine

21.5. Virtual Reality

21.6. Robotics

22. Q-BASIC

22.1. Introduction to QBASIC Programming

22.2. Elements of -basic programming language

22.3. Q-basic statements

22.4. Control Statements of Q-basic

22.5. Library Function in basic

- 22.6. Using Array in basic
- 22.7. Modular programming in Q-basic
- 22.8. File handling in Q-basic

Part : II

25 Marks

23. Curriculum related Knowledge

- 23.1. Space of the computer science subject in Secondary school curriculum
- 23.2. Breadth ,depth and organization of knowledge of the content
- 23.3. Competencies and learning outcomes.
- 23.4. Resources material n computer science
- 23.5. Knowledge of computer science teaching manuals.

24.: Class Room Teaching Skill

- 24.1 Effective presentation skill
- 24.2 Class room management skill
- 24.3 Visual and demonstration method
- 24.4 Problem based learning strategies
- 24.5 Small group discussion /Whole class discussion
- 24.6 Observation as an instructional strategy

25. Project Work

- 25.1 Use of project and field work
- 25.2 Designinig project
- 25.3 Implementing and communicating
- 25.4 Exhibition skill

26. Assignment

- 26.1 Assignment in teaching computer science
- 26.2 knowledge of the assessment plan and specification grd n the school case.
- 26.3 Developing test and appropriate tool for student assessment
- 26.4 Authentic assessment to measure performance
- 26.5 Use of Rubrics to evaluate performance.

27. Use of ICT in computer Science

- 27.1 Email/ internet/social network
- 27.2 Familiar of Virtual Lab, Learning Management System(LMS)
- 27.3 Skill of Smart Board/Power point presentation
- 27.4 Virtual classroom/ google class room

Specification Grid (Question making plan)

Section	Question Unit	Multiple Choice Questions			Short Questions			Total Question	Full Marks
		No. of Questions	Marks	Total marks	No. of Questions	Marks	Total marks		
A	1	1	1	1	-	-	-	1	1
	2	1	1	1	-	-	-	1	1
	3	1	1	1	-	-	-	1	1
	4	1	1	1	-	-	-	1	1
	5	3	1	3	-	-	-	1	3
	6	2	1	2	-	-	-	1	2
	7	3	1	3	-	-	-	1	3
	8	3	1	3	-	-	-	1	3
B	9	2	1	2	-	-	-	1	2
	10	2	1	2	-	-	-	1	2
	11	1	1	1	-	-	-	1	1
	12	1	1	1	-	-	-	1	1
	13	2	1	2	-	-	-	1	2
	14	2	1	2	-	-	-	1	2
	15	2	1	2	-	-	-	1	2
	16	4	1	4	-	-	-	1	4
	17	1	1	1	-	-	-	1	1
	18	1	1	1	-	-	-	1	1
	19	1	1	1	-	-	-	1	1
	20	1	1	1	-	-	-	1	1
	21	1	1	1	-	-	-	1	1
	22	4	1	4	-	-	-	1	4
	23	-	-	-	1	5	5	1	5
	24	-	-	-	1	5	5	1	5
	25	-	-	-	1	5	5	1	5
	26	-	-	-	1	5	5	1	5
	27	-	-	-	1	5	5	1	5
Total		40	1	40	5	5	25	45	65

Note:

1. Total 3 hours time is allocated for testing: forty five minutes for objective questions and two hours and fifteen minutes for subjective questions.
2. The objective and subjective tests will be conducted in the same setting, and the subjective test will begin as soon as the objective test is completed.
3. The questions will be asked covering all the levels of cognitive domain.
4. The short questions will focus on knowledge, skills and application, and the long questions will focus on creativity and the pragmatic aspects related to teaching.

5. The priority will be given to those answers which are creative and based on the critical analysis of the practical aspects of learning facilitation.