Syllabus for the Post of Assistant Professor

(*Electrical Engineering, Computer Engineering, Electronics Engineering***)**

S.N.	Paper	Question Format	Full Marks	Number of Questions	Exam Time
1.	**Paper I**	**Section A :** Aptitude (Objective)	50	50	50 minutes
		Section B: Core Course (Objective)	50	50	50 minutes
2.	**Paper II**	Core Course, Research, and Teaching-Learning (Subjective)	100	10	3hrs
Total Written Exam Full Marks:			**200**		

Paper I: Section A: Aptitude Test (Objective) Marks: 1 × 50 = 50

S.N.	Area of Questions Aptitude Test	Number Questions	Details
1.	Teaching and Communication Aptitude	15	Objectives and Perspectives, Essential Qualities for Higher Education, Teaching Rolls: Individual, Social, and Professional, Teaching Methods, Student Evaluation and Assessment
2.	Research Aptitude, Publication Ethics, and Data Interpretation	15	Definition and Importance of Research, Objectives, Types, and Methods of Research, Research and Publication Ethics, Data Sources, Accessibility, Availability, and Presentation. Research-Based Articles, Journal Quality, Dissertation/Thesis Framework
3.	Information and communication Technology	10	Benefits and Risk, Use of ICT in teaching-Learning and research, Virtual Learning Platforms, Digital Education Resources, Tools and Applications
4.	Higher Education System, Tribhuvan University	10	Higher Education Policy 2076, Tribhuvan University Acts, Laws, and Bylaws

Assistant Professor

(*Computer Engineering*)

(Detail Syllabus)

Paper I: Section B: Core Course (Objective) Marks: 1 × 50 = 50

Unit	Area of Questions	Number Questions
1.	Basic Electrical and Electronics Engineering	5
2.	Programming (Procedural & Object Oriented)	5
3.	Data Structure and Algorithms	4
4.	Digital Logic, Microprocessor and Computer Organization & Architecture	6
5.	Computer Graphics	4
6.	Theory of Computation	4
7.	Software Engineering	4
8.	Computer Networks and Security	6
9.	Operating System	4
10.	Database Management System	4
11.	Artificial Intelligence	4

1. Basic Electrical and Electronics Engineering

1.1. DC circuits, Basic Laws: Ohm's law, Kirchoff's law

1.2. Network Theorems: Superposition theorem, Thevninn's theorem, Norton's theorem, Maximum power transfer theorem

1.3. Inductance & Capacitance in electric circuits

1.4. Single phase AC circuits and Power in AC circuits

1.5. Diodes, Transistors, MOSFETs

1.6. Operational amplifier

2. Programming (Procedural & Object Oriented)

2.1. Programming with C, C++

2.2. Keywords, Identifiers, Data types, Preprocessor Directives, Operators and Statements

2.3. Input/Output, Control statements

2.4. Procedure/Functions

2.5. Array, String and Pointer

2.6. Structure and Union
2.7. File handling, Objects and Classes
2.8. Operator Overloading
2.9. Encapsulation, Inheritance, Polymorphism, Template

3. Data Structure and Algorithms

3.1. Data structures and Abstract data types, Stack and Queue
3.2. Lists, Linked Lists and Trees
3.3. Recursion
3.4. Sorting and Searching
3.5. Graphs

4. Digital Logic, Microprocessor and Computer Organization & Architecture

4.1. Number Systems, Basic Logic Elements, Combinational Logic Circuits, Arithmetic Circuits
4.2. Sequential Logic, Counters, Registers, Shift registers
4.3. State machines, Design procedure, State table and State diagram
4.4. Intel 8085 and 8086 microprocessors: architecture, programming and interfacing
4.5. Addressing modes
4.6. Interfacing with Memory and I/O devices, Memory devices and hierarchies
4.7. Interrupt system in microprocessors
4.8. Representation of data, Arithmetic operations, Basic operational concepts, bus structures, instruction cycle and execution cycle
4.9. CPU structure and function, Arithmetic and Logic Unit and Control Unit
4.10. Von Neumann and Harvard architecture, RISC & CISC architecture
4.11. Memory system, Cache memory and Cache mapping
4.12. Input Output Organization: I/O programming, memory mapped I/O, basic interrupt system, DMA
4.13. Pipelining
4.14. Multiprocessors and Multicore Architecture

5. Computer Graphics

5.1. Computer graphics and its applications
5.2. 2D and 3D transformations
5.3. Curve and Surface Modelling
5.4. Visible Surface Determination
5.5. Illumination and Surface Rendering methods

6. Theory of Computation

6.1. Finite Automata and Regular Language
6.2. Context free language and push down automata
6.3. Turing machine
6.4. Undecidability
6.5. Computational Complexity

7. Software Engineering

7.1. Software Engineering and its importance
7.2. Software Process models
7.3. Requirement engineering
7.4. System models, Architectural design
7.5. Software Reuse, Software Testing, Verification and validation
7.6. Software Estimation
7.7. Quality Management
7.8. Configuration Management

8. Computer Networks and Security

8.1. Computer networks, Different types of networks and Applications of networks
8.2. Physical layer, Transmission media, Switching and Multiplexing, Data Encoding Techniques
8.3. Data Link Layer and its services, Addressing, Error control and Flow control, Multiple access protocols, CSMA/CD, CSMA/CA, Hubs, Bridges and Switches
8.4. Network Layer and its services, IP addressing, IP, ICMP, ARP protocols, Router and its functions, Routing principles, Classification of Routing Algorithms, Routing Protocols: RIP, OSPF and BGP,
8.5. Transport Layer and its functions, Multiplexing & Demultiplexing, Flow Control and Error Control, TCP and UDP
8.6. Application Layer protocols and functions, HTTP & HTTPS, FTP, DNS, SMTP, POP, IMAP
8.7. Distributed system, Clusters, Network Security, Disaster Recovery, Data Storage Techniques: Clustering, NAS, SAN
8.8. Network Security and its importance, Traditional Ciphers
8.9. Symmetric Encryption, DES, AES
8.10. Asymmetric encryption
8.11. Diffie and Hellman algorithm, RSA Algorithm
8.12. Cryptographic Hash Functions, MAC, Digital Signature, IDS and IPS

9. Operating System

9.1. Operating system and its functions
9.2. Process and Threads, Process Management, Process Communication, Mutual Exclusion and Synchronization
9.3. Memory Management, File Systems
9.4. I/O Management & Disk Scheduling
9.5. Deadlock, Security
9.6. Distributed Systems: Distributed Message passing, RPC, Client-server computing, Clusters
9.7. Common Operating Systems and Their Features

10. Database Management System

10.1. Database Management System and its Applications

10.2. ER modeling
10.3. Relational Languages and Relational Model
10.4. Database Constraints and Normalization
10.5. Query Processing and Optimization
10.6. Database storage, File organization, indexing and Hashing
10.7. Transactions processing and Concurrency Control
10.8. Crash Recovery
10.9. Distributed Database Systems and Object-oriented database system
10.10. Data Mining and Data Warehousing

11. Artificial Intelligence

11.1. Artificial intelligence and its Applications
11.2. Search techniques
11.3. Knowledge representation, inference and reasoning
11.4. Structured knowledge representation
11.5. Machine learning, neural networks and other machine learning algorithms, GA

Paper II: Core Course Marks: $10 \times 10 = 100$

Subjective Knowledge, Research, and Teaching-Learning Questions

S.N.	Area of Questions	Number of Questions
1.	**Unit 2 :** Programming (Procedural & Object Oriented)	**1**
2.	**Unit 3:** Data Structure and Algorithms **Unit 11:** Artificial Intelligence	**1**
2.	**Unit 4:** Digital Logic, Microprocessor and Computer Organization & Architecture	**1**
3.	**Unit 5:** Computer Graphics **Unit 6:** Theory of Computation	**1**
	Unit 7: Software Engineering	**1**
4.	**Unit 8:** Computer Networks and Security	**1**
5.	**Unit 9:** Operating System	**1**
	Unit 10: Database Management System	**1**
6.	Research Methodology, Applications; Problem - Solving	**1**
7.	Teaching Learning and Student Evaluation; Syllabus Structure (Bachelors and Masters, TU)	**1**