



SARDAR PATEL UNIVERSITY, MANDI (H.P.)

SPU Mandi PhD Entrance Test (2024-2025)

The proposed criteria for Entrance Test are as under: –

- a. Written Test will be of 80 marks.
- b. Qualifying marks (Percentage) for all the candidates for Ph.D. program shall be 50% for General Category and 45% for reserved categories (SC/ST/PwD).
- c. Weightage will be maximum of 10% of the marks obtained in the Entrance Test and will give as under: –
 - i. NET-JRF, other equivalent fellowship, NET and GATE-10% of the marks obtained in the Entrance Test by the Candidate.
 - ii. SLET/M.Phil-5% of the marks obtained in the Entrance Test by the Candidate.
 - iii. Research Aptitude – 12 Marks through personal interview based on research proposal.

Computer Science syllabus

Section 1: Computer Organization and Architecture

Digital Logic: Boolean algebra. Combinational and sequential circuits. Minimization: Number representations and computer arithmetic (fixed and floating point)

Computer Organization: Machine instructions and addressing modes. ALU, data-path and control unit; Instruction pipelining; Memory hierarchy: cache, main memory and secondary storage; I/O interface (interrupt and DMA mode).

Section 2: Programming Languages

Programming in C: Elementary Data Types; Tokens, Identifiers, DataTypes, Sequence Control, Subprogram Control, Arrays, Structures, Union, String, Pointers, Functions, File Handling, Command Line Arguments, Preprocessors

Programming in C++ : Class, Object, Instantiation, Inheritance, Encapsulation, Abstract Class, Polymorphism, Tokens, Identifiers, Variables and Constants; Data types, Operators, Control statements, Functions Parameter Passing, Virtual Functions;

Programming in Java: The Java Virtual Machine, Datatypes, Conditional and looping statements, Arrays, Methods and functions, Constructors, Overloading methods, Garbage collection, Packages

Section 3: Data Structures and Algorithms

Data Structures: Arrays, Stacks, Queues, Linked Lists, Trees, Forests, Binary Tree, Threaded Binary Tree, Binary Search Tree, AVL Tree, B Tree, B+ Tree, B*Tree, Graphs, Sorting, Searching.

Algorithms: Performance Analysis of Algorithms – Time and Space complexities, Divide and Conquer, Dynamic Programming, Greedy Algorithms, Backtracking, Branch and Bound, Breadth-First Search, Depth-First Search, Shortest Path, Minimum Spanning Tree, P and NP Class Problems.

Section 4: Database Management Systems

Database System Concepts: Data Models, Schemas, Architecture, ER Model, Relational Model, Relational Algebra, Relational Calculus, Functional Dependency, Multivalued Dependency, Join Dependency and Normalization Forms. SQL: Types of commands, Constraints, Views, Stored Procedures, Functions, Triggers, Deadlock-Prevention and Avoidance, Heap File Organization, ISAM, Hashing and Indexing

Section 5: Theory of Computation and Compiler Design

Theory of Computation: Regular expressions and finite automata, Context-free grammars and push-down automata, Regular and context-free languages, Turing machines.

Compiler Design: Lexical analysis, parsing, syntax-directed translation.

Section 6: System Software and Operating System

System Software: Machine, Assembly and High-Level Languages; Compilers and Interpreters; Loading, Linking and Relocation; Macros, Debuggers

Operating System: Processes, threads, inter-process communication, concurrency and synchronization; Multicore Programming, Multithreading Models, Deadlock; CPU scheduling; Memory management and virtual memory; Filesystems

Section 7: Software Engineering

Software Engineering: The Waterfall Model, Incremental Process Models, Evolutionary Process Models, Concurrent Models, Agility and the Cost of Change, Agile Process, Extreme Programming (XP), Adaptive Software Development (ASD), Scrum; Requirements Modelling: Requirements Analysis, Scenario-Based Modelling, UML Models, Design Concepts: The Design Process, Design Concepts, the Design Model, Architectural design, and component-level design, Quality management

Section 8: Data Communication and Computer Networks

Data Communication: simplex, half-duplex and full-duplex mode of data transmission,

packet switching and circuit switching, Analog and Digital Signals: Noiseless and Noisy Channels: Digital and Analog Transmission: Data Encoding and Modulation Techniques: switching: Flow and error control techniques

Computer Networks: Network Hardware, LAN, MAN, WAN, OSIR reference Model.- Protocol IPv4/ IPv6, routers and routing algorithms (distance vector, linkstate): TCP/ UDP and sockets, congestion control, Application layer protocols (DNS, SMTP, POP, FTP, HTTP). Network Security: authentication, basics of public key and private key cryptography

Section 9: Computer Graphics

Computer Graphics: Video-Display Devices, Raster-Scan and Random-Scan Systems: Graphics Monitors, Input Devices, Points and Lines: Line Drawing Algorithms, Translation, Scaling, Rotation, Reflection and Shear Transformations: Matrix Representations and Homogeneous Coordinates, Polygon Surfaces, Quadric Surfaces, Spline Representation, Bezier and B-Spline Curves: Bezier and B-Spline Surfaces.

Section 10: Advanced Technologies

Artificial Intelligence & Machine Learning:

Artificial Intelligence: Intelligent Agent, State Space Representation, Heuristic Search Techniques, Adversarial Search Techniques, Knowledge Representation, Uncertain Knowledge Representation, Planning, Linear and Non-Linear, Goal Stack, Hierarchical, STRIPS.

Machine Learning: Machine Learning, Types of Learning, Supervised, Unsupervised, Semi-Supervised, Reinforcement Learning Techniques, Models, Tree, Rule, Linear, Distance-Based, Probabilistic.

IoT: Introduction, Characteristics, Elements, Transducers and types, Applications

Verbal
6/6/24