



INDIAN INSTITUTE OF INFORMATION TECHNOLOGY, UNA [HP]

An Institute of National Importance under MHRD
NIT Campus, Hamirpur [HP]-177005

Website: www.iiitu.ac.in



GUEST FACULTY (ON CONTRACT BASIS) RECRUITMENT – JUNE 2019

SYLLABUS FOR WALK IN WRITTEN TEST ON 15, June'19

COMPUTER SCIENCE AND ENGINEERING

1. Data Structures and Algorithms

Development of Algorithms - Notations, Concepts - Arrays - Linked lists - Stacks and queues Trees
-Tree Traversing - Operations on Binary Trees – Sorting and Searching techniques - Graphs - BFS, DFS
-Shortest path problems.

2. Operating Systems

Basic OS Concepts - Thread and process scheduling - Synchronization - Semaphores - Critical regions -
Deadlock prevention and recovery - Memory Management - File Management - I/O Management – Case
Studies on Windows and Linux OS.

3. Computer Organization and Architecture

Basic structure of Computers - Arithmetic - Addition & subtraction of signed numbers - Multiplication -
Integer division - Floating point operations - Pipelining - Multiple bus organization
-Micro programmed control – Hazards - Memory System - Semiconductor RAM memory - Cache
memory - Virtual memory - Secondary storage - I/O Organization - Interrupts - DMA - Buses - Interface
circuits - Serial communication links.

4. C Programming

C programming – Memory Concepts – Arithmetic Operations - Control Statements – Functions - Pointers
– Structures – User Defined Data types - File handling.

5. Microprocessors

8085 processor - Architecture - Bus organization - Registers - ALU - Instruction set of 8085 - Instruction
format - Addressing modes - System design using controllers - Microprocessor Interfacing Techniques
- Segmented memory concepts - Bus concepts.

6. Computer Networks

Goals of networking, well-known applications such as email, ftp, and need for layered architecture OSI
and Internet. Host-to-host communication: RS 232 over serial line; handshaking and error handling; packet
switching; reliable transmission stop and wait, sliding window; logical connections. Multiple collocated
hosts: addressing, LAN access methods; CSMA/CD, Ethernet, Token passing.



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ELECTRONICS AND COMMUNICATION ENGINEERING

1. Fundamentals

Devices and Electronic Circuits, Network Analysis and Synthesis.

2. Signals, System, and Microwave

Signals & Systems, DSP, ADSP, Electromagnetic Theory, Transmission lines, Antennas and Wave Propagations, Metamaterial Antennas, MIC, MICROSTRIP and STRIPLINE fundamentals, Microwave electronics, Microwave Components and Circuits.

3. Communication

Statistical theory of Communication, Analog and Digital Communication, Wireless Communication, Broadband Access Technologies, Fiber optics and Optical communication, Satellite Communication.

4. Digital Systems

Digital Systems, Analog Integrated Circuits, Microprocessors, Microcontrollers, Embedded systems, ARM system, DSP Processors.

5. VLSI

Basics of VLSI, Digital VLSI, Analog IC Design, Verilog HDL, ASIC, DSP for VLSI, VLSI Testing, Low Power VLSI, EDA Tools.

6. Computer Architecture and Networks

Computer Architecture and Organization, Computer Networks and Protocols, Ad Hoc Networks.



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MATHEMATICS

List of topics (at the level of M. Sc.)

Algebra, Matrix, Calculus, Differential Equations, Partial Differential Equations, Real Analysis, Complex Analysis, Integral Transforms, Numerical Methods, Fourier Series, Probability and Statistics.



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BIOTECHNOLOGY

Unit I: Biochemistry

Biomolecules and their conformation; Weak inter-molecular interactions in biomacromolecules; Chemical and functional nature of enzymes; Kinetics of single substrate and bi-substrate enzyme catalyzed reactions; Bioenergetics; Metabolism (Glycolysis, TCA and Oxidative phosphorylation); Membrane transport and pumps; Cell cycle and cell growth control; Cell signaling and signal transduction, conformational analysis of proteins and peptides, Metabolic breakdown of amino acids, transamination, deamination, Fatty acid oxidation- major and minor pathways of fatty acid oxidation, Transport mechanisms- active and passive transport, ATP-driven active transport and Ion gradient driven active transport.

Unit II: Microbiology and Bioprocess Technology

Microbial classification and diversity (bacterial, algal and fungal); Methods in microbiology; Microbial growth and nutrition; Aerobic and anaerobic respiration; Nitrogen fixation; Microbial diseases and host-pathogen interaction; Proteomics, Structural Genomics, Bioprocess technology for the production of cell biomass and primary/secondary metabolites, Microbial production, purification and bioprocess application(s) of industrial enzymes; Production and purification of recombinant proteins on a large scale; Chromatographic and membrane based bio-separation methods; Immobilization of enzymes and cells and their application for bioconversion processes. Aerobic and anaerobic biological processes, Bioremediation; Fermentation technology – Design of various commercial media for industrial fermentations– Applications of fermentation.

Unit III: Immunology

Innate, humoral and cell mediated immunity; Antigen; Antibody structure and function; Molecular basis of antibody diversity; Synthesis of antibody and secretion; Antigen-antibody reaction; Complement; Primary and secondary lymphoid organ; B and T cells and macrophages; Major histocompatibility complex (MHC); Antigen processing and presentation; Polyclonal and monoclonal antibody and its applications; Regulation of immune response; Immune tolerance; Hypersensitivity; Autoimmunity; Graft versus host reaction. Vaccines– Types, Principles and practice of vaccine production– Role and properties of adjuvant. Immunization– Types and methods- Vaccination– Types- vaccination schedule– reverse vaccinology- Vaccines for infectious diseases. Antigens and epitopes– Types and methods of analysis, DNA vaccine, Plant vaccine.

Unit IV: Molecular Biology and Advanced Genetic Engineering

Cell organization and sub-cellular structure, structure and properties of nucleic acids, organization of prokaryotic and eukaryotic genomes, mechanisms of DNA replication, mutagenesis, DNA repair, transcription, translation, mechanisms of DNA recombination, regulation of gene expression, eukaryotic RNA splicing and processing, cell cycle, programmed cell death, cell transformation, genes in differentiation and development, oncogenes. Genetic engineering: Principles of recombinant DNA technology and its applications: identification, isolation, amplification and cloning of genes, High throughput analysis of genome and proteome, Recombinant protein expression systems: design of different expression systems, Gene probes and DNA fingerprinting for diagnosis, identification of biomarkers, gene silencing using antisense and siRNA technology, gene therapy systems, application of stem cells in therapy, recombinant vaccines and antibodies. Gene bank, human genome project, Gene therapy and Biochips.

Unit V: Plant Biotechnology and Animal Biotechnology

Organization of plant cells; Totipotency; Regeneration of plants; Plant products of industrial importance, Plant growth regulators and elicitors; Cell suspension culture development: methodology, kinetics of growth and production formation, nutrient optimization; Production of secondary metabolites by plant suspension cultures. Characteristics of animal cells: Metabolism, regulation and nutritional requirements for mass cultivation of animal cell cultures; Kinetics of cell growth, Micro & macro-carrier culture, Live stock improvement; Cloning in animals.
