

**Paper: Computer Architecture & Organization**

**Code: CYS-201**

**Contacts Hours / Week: 3L + 1T**

**Credits: 4**

**Module-1:** Principles of Computer design - Software, hardware interaction layers in computer architecture. Central processing unit. Machine language instructions, Addressing modes, instruction types, Instruction set selection, Instruction cycle and execution cycle. (10L)

**Module-2:** Control unit, Data path and control path design, Microprogramming V s hardwired control, RISC Vs CISC, Pipelining in CPU design: Superscalar processors. (8L)

**Module-3:** Memory system, Storage technologies, Memory array organization, Memory hierarchy, interleaving, cache and virtual memories and architectural aids to implement these. (8L)

**Module-4:** Input-output devices and characteristics, Input-output processing, bus interface, data transfer techniques, I/O interrupts, channels. (8L)

**Module-5:** Performance evaluation - SPEC marks, Transaction Processing benchmarks. (6L)

**Text Books:**

1. Mano, M, "Computer System and Architecture", (3rd edition) Prentice Hall of India, New Delhi, 1994.
2. Pal Chauduri, P., "Computer Organisation and Design", Prentice Hall of India, New Delhi, 1994.

**Reference Books:**

1. Rajaraman,V., and Radhakrishnan, T., "Introduction to Digital Computer Design" (4th edition). Prentice Hall of India, New Delhi, 1997.
2. Stallings. W, "Computer Organization and Architecture, (2nd edition) Prentice Hall of India, New Delhi

**MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WB**  
**Syllabus for B.Sc.in Cyber Security**  
(Effective for Students Admitted in Academic Session 2019-2020)

**Paper: Data Structures and Algorithms (including Laboratory)**

**Code: CYS-202**

**Contacts Hours / Week: 3L + 2P**

**Credits: 4**

**Module-1: Basic Terminologies & Introduction to Algorithm and Data Organisation:**

Algorithm specification, Recursion, Performance analysis, Asymptotic Notation - The Big-O, Omega and Theta notation, Programming Style, Refinement of Coding - Time-Space Trade Off, Testing, Data Abstraction (4L)

**Module-2: Linear Data Structure:** Array, Stack, Queue, Linked-list and its types, Various Representations, Operations & Applications of Linear Data Structures (10L)

**Module-3: Non-linear Data Structure:** Trees (Binary Tree, Threaded Binary Tree, Binary Search Tree, B & B+ Tree, AVL Tree, Splay Tree) and Graphs (Directed, Undirected), Various Representations, Operations (search and traversal algorithms and complexity analysis) & Applications of Non-Linear Data Structures (12L)

**Module-4: Searching and Sorting on Various Data Structures:** Sequential Search, Binary Search, Breadth First Search, Depth First Search, Insertion Sort, Selection Sort, Shell Sort, Divide and Conquer Sort, Merge Sort, Quick Sort, Heap Sort, Introduction to Hashing (10L)

**Module-5: File:** Organisation (Sequential, Direct, Indexed Sequential, Hashed) and various types of accessing schemes. (4L)

**Laboratory:**

1. Towers of Hanoi using user defined stacks.
2. Reading, writing, and addition of polynomials.
3. Line editors with line count, word count showing on the screen.
4. Trees with all operations.
5. All graph algorithms.
6. Saving / retrieving non-linear data structure in/from a file

**Text Books:**

1. E. Horowitz and S. Sahni , *Fundamentals of Data Structures*, 1977.
2. R.S. Salaria, *Data Structures*, Khanna Publishing House, 2018.
3. Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman, *Data Structures and Algorithms*.

**Reference Books:**

1. *Donald E. Knuth, The Art of Computer Programming: Volume 1: Fundamental Algorithms*
2. H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, *Introduction to Algorithms*, Thomas,
3. *Pat Morin-Open Data Structures: An Introduction (Open Paths to Enriched Learning)*, 31st ed. Edition
4. *R.B. Patel, Expert Data Structures with C*, Khanna Publishing House

**Paper: Environmental Science**

**Code: CYS(HU)-201**

**Contacts Hours / Week: 3L + 1T**

**Credits: 4**

**Module-1:** Definition, Principles and scope of Environmental Science. Earth, Man and Environment. Ecosystems, Mass and Energy transfer across the various interfaces, material balance. First and Second law of thermodynamics, heat transfer processes. Scale of Meteorology, pressure, temperature, precipitation, humidity, radiation and wind. Atmospheric stability, inversions and mixing height, windroses. Natural resources, conservation and sustainable development. (4L)

**Module-2:** Fundamentals of Environmental Chemistry, Chemical composition of Air : Classification of elements, chemical speciation. Particles, ions and radicals in the atmosphere. Chemical processes for formation of inorganic and organic particulate matter. Thermochemical and photochemical reactions in the atmosphere. Oxygen and ozone chemistry. Chemistry of air pollutants, Photochemical smog. Water Chemistry, Principles of Analytical Methods : Titrimetry, Gravimetry, Colourimetry, Spectrophotometry. Chromatography, Gas Chromatography, Atomic Absorption Spectrophotometry, GLC, HPLC, Electrophoresis, X-ray fluorescence, X-ray diffraction, Flame photometry. (5L)

**Module-3:** Definition, Principles and scope of ecology, Human ecology and Human settlement, Evolution, Origin of life and speciation. Ecosystem, Common flora and fauna in India Aquatic Microflora of Atmosphere : Air Sampling techniques, Identification of aeroallergens. Air-borne diseases and allergies. Environmental Biotechnology : Fermentation Technology, Vermiculture technology, Biofertilizer technology. (5L)

**Module-4:**

Environmental Geosciences, Earth's Processes and Geological Hazards, Mineral Resources and Environment : Resources and Reserves, Minerals and Population. Oceans as new areas for exploration of mineral resources. Ocean ore and recycling of resources. Environmental impact of exploitation, processing and smelting of minerals. Water Resources and Environment, Resources of oceans. Ocean pollution by toxic wastes. Human use of surface and groundwaters. Groundwater pollution. Landuse Planning, Environmental Geochemistry, Biogeochemical factors in environmental health. Human use, trace elements and health. Possible effects of imbalance of some trace elements. Diseases induced by human use of land. Principles of Remote sensing and its application of Environmental Sciences. Application of GIS in Environmental Management. (6L)

**Module-5:**

Sun as source of energy; solar radiation and its spectral characteristics; Fossil fuels-classification, composition, physico-chemical characteristics and energy content of coal, petroleum and natural gas. Principles of generation of hydroelectric power, nuclear energy-fission and fusion; magnetohydrodynamic power, bio-energy-energy from biomass and biogas, anaerobic digestion; energy use pattern in different parts of the world. Environmental implication of energy use; impacts of large-scale exploitation of Solar, Wind, Hydro and Ocean energy (3L)

**Module-6:**

Air : Natural and anthropogenic sources of pollution. Acid Rain, Air Quality Standards. Water : Types, sources and consequences of water pollution. Physico-chemical and Bacteriological sampling and analysis of water quality. Standards, sewage and waste water treatment and recycling. Water quality standard. Soil, Soil Pollution Control. Industrial waste effluents and heavy metals, Noise : Sources of noise pollution, measurements of noise and Indices. Marine : Sources of marine pollution and control. Criteria employed for disposal of pollutants in marine system–coastal management. Radioactive and Thermal Pollution. (4L)

**Module-7:**

Introduction to environmental impact analysis, Environmental impact Statement and Environmental Management Plan. EIA guidelines 1994, Notification of Government of India. Impact Assessment Methodologies. Generalized approach to impact analysis. Procedure for reviewing Environmental impact analysis and statement. Guidelines for Environmental audit. Introduction of Environmental planning. Base line information and predictions (land, water, atmosphere, energy, etc.) Restoration and rehabilitation technologies. Landuse policy for India. Urban planning for India. Rural planning and landuse pattern. Concept and strategies of sustainable development. Cost-Benefit analysis. Environmental priorities in India and sustainable development. (3L)

**Module-8:**

Sources and generation of solid wastes, their characterization, Hazardous Waste Management and Handling Rules, 1989, Resource Management, Disaster Management and Risk analysis. Environment protection–issues and problems, International and National efforts for Environment Protection, Provision of Constitution of India regarding Environment (Article 48A and 58A) Environmental Policy Resolution, Legislation, Public Policy Strategies in Pollution Control, Wildlife Protection Act, Forest Conservation Act, Indian Forests Act (Revised) 1982, Air (Prevention and Control of Pollution) Act, Motor Vehicle Act. 1988, The Water (Prevention and Control of Pollution) Act, 1974, Public Liability Insurance Act, 1991 and Rules 1991. (3L)

**Module-9:**

Basic elements and tools of statistical analysis; Probability, sampling, measurement and distribution of attributes; Distribution– Normal, t and  $\chi^2$ , Poisson and Binomial; Arithmetic, Geometric and Harmonic means; Introduction to environmental system analysis; Approaches to development of models; linear simple and multiple regression models, validation and forecasting. Models of population growth and interactions–Lotka-Volterra model, Leslie's matrix model, point source stream pollution model, box model, Gaussian plume model. (3L)

**Module-10:**

Environmental Education and Awareness. Environmental Ethics and Global imperatives. Context : Narmada Dam, Tehri Dam, Almetti Dam, Soil Erosion, Formation and reclamation of Usar, Alkaline and Saline Soil. Waste lands and their reclamation, Vehicular pollution and urban air quality. Depletion of Nature resources. Biodiversity conservation and Agenda-21. Waste disposal, recycling and power generation, Fly ash utilization. Rain water harvesting. Wet lands conservation. Epidemiological issues (e.g., Goitre, Fluorosis, Arsenic) (4L)

**MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WB**  
**Syllabus for B.Sc.in Cyber Security**

(Effective for Students Admitted in Academic Session 2019-2020)

**Text Books:**

1. Enger, E. and Smith, B., Environmental Science: A Study of Interrelationships, Publisher: McGraw-Hill Higher Education; 12th edition, 2010.
2. Pepper, I.L., Gerba, C.P. & Brusseau, M.L. 2011. Environmental and Pollution Science. Academic Press.
3. M.P. Poonia & S.C. Sharma, Environmental Studies, Khanna Publishing House, 2018.

**Reference Books:**

1. Richard T Wright, Environmental Science: Towards a Sustainable Future, Prentice-Hall Inc., 2008.
2. O.P. Gupta, Elements of Environmental Pollution Control, Khanna Publishing House, 2018.
3. Keshav Kant & Rajni Kant, Air Pollution and Control, Khanna Publishing House, 2018.

**Paper: Ethical Hacking and Systems Defence (including Lab)**

**Code: CYS-203**

**Contacts Hours / Week: 3L + 2P**

**Credits: 4**

**Module 1:** Introduction to Ethical Hacking, Legality and Ethics, Networking & Basics, Foot Printing, Google Hacking, Scanning, Enumeration, System Hacking, Windows Hacking, Trojans & Backdoors, Virus & Worms, Sniffers, Social Engineering, Proxy Server & Packet Filtering, Denial of Service Attack, Phishing, Session Hijacking, Penetration Testing. [10L]

**Module 2:** Vulnerability Assessment., Linux Hacking, Physical Security, Hacking Webservers, Web Application Vulnerabilities, Web Based password Cracking Techniques, SQL Injection Vulnerabilities. Cryptography. [10L]

**Module 3:** Wireless Network Hacking and Countermeasures, Evading IDS, Firewalls and Detecting Honey Pots, Buffer Overflows, Reverse Engineering. Hacking Database Servers. [10L]

**Module 4:** Steganography, Spying Technologies, Hacking Routers and Firewalls, Computer Forensics and Incident Handling, Botnets, Hacking emails, Privacy on the Internet, Creating Security Policies, Exploit Writing, Patch Management, Covering Tracks. [10L]

**Laboratory:**

ISOEH - Ethical Hacking

**Text Books:**

1. Bothra, Harsh; Hacking: Be a hacker with ethics
2. Ankit Fadia; The Unofficial Guide to Ethical Hacking
3. Patrick Engebretson; The Basics of Hacking and Penetration Testing: Ethical Hacking and Penetration Testing Made Easy

**MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WB**  
**Syllabus for B.Sc.in Cyber Security**

(Effective for Students Admitted in Academic Session 2019-2020)

**Reference Books:**

1. Harsh Bothra, Mastering Hacking: The Art of Information Gathering & Scanning, Khanna Publishing House, 2019.
2. Conway, Richard Cordingley, Julian; Code Hacking: a developer's guide to Network Security
3. Jon Erickson; Hacking: The Art of Exploitation 2e

**Paper: Object Oriented Concepts (including Laboratory)**

**Code: CYS-204**

**Contacts Hours / Week: 3L + 2P**

**Credits: 4**

**Module-1:** Object oriented programming concepts objects-classes, Methods and messages, abstraction and encapsulation, Inheritance, abstract classes, Polymorphism [4L]

**Module-2:** Introduction to C++ objects-classes, Constructors and destructors, Operator overloading, Operator overloading through member functions, Operator overloading, Unary operator overloading, Binary operator overloading, Overloading through friend functions and assignment Operator, Friend Function, Type Conversions [8L]

**Module-3:** Function Templates, Function Templates with single arguments, Function Templates with multiple arguments, Function Templates with 2 generic arguments, non – generic parameters [5L]

**Module-4:** Class template, Defining functions outside Class template, Inheritance, Multiple Inheritance, Virtual Function, Runtime Polymorphism [4L]

**Module-5:** Exception handling, Streams, formatted I/O, File handling, opening & closing files Text files, Binary files, End of file, namespaces- std namespace.[5L]

**Module-6:** String Objects, Standard template library, Introduction, principles, Working of STL, Function & predicate objects, Allocators. [4L]

**Module-7:** Introduction to JAVA, Byte code, Virtual Machines, Objects-Classes, Javadoc, Packages, Arrays, Strings, Inheritance, Single and Multilevel Inheritance, Interfaces, Inner Classes, Exception Handling, Threads, Multi-threaded programming, thread states – thread properties – thread synchronization, Streams, I/O [10L]

**Laboratory:**

1. Assignments on class, constructor, overloading, inheritance, overriding
2. Assignments on wrapper class, arrays
3. Assignments on developing interfaces- multiple inheritance, extending interfaces
4. Assignments on creating and accessing packages
5. Assignments on multithreaded programming
6. Assignments on applet programming

**Text Books:**

1. R.S. Salaria, Mastering Object Oriented Programming in C++, Khanna Publishing House

**MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WB**  
**Syllabus for B.Sc.in Cyber Security**

(Effective for Students Admitted in Academic Session 2019-2020)

2. B. Trivedi, "Programming with ANSI C++", Oxford University Press, 2007.
3. Cay S. Horstmann, Gary Cornell, "Core JAVA volume 1", Eighth Edition, Pearson Education, 2008.

**Reference Books:**

1. ISRD Group, "Introduction to Object-oriented Programming and C++", Tata McGraw-Hill Publishing Company Ltd., 2007.
2. ISRD Group, "Introduction to Object-oriented programming through Java", Tata McGraw-Hill Publishing Company Ltd., 2007.
3. S. B. Lippman, Josee Lajoie, Barbara E. Moo, "C++ Premier", Fourth Edition, Pearson Education, 2005.
4. D. S. Malik, "C++ Programming: From Problem Analysis to Program Design", Third Edition, Thomson Course Technology, 2007.
5. K. Arnold and J. Gosling, "The JAVA programming language", Third edition, Pearson Education, 2000.
6. C. Thomas Wu, "An introduction to Object-oriented programming with Java", Fourth Edition, Tata McGraw-Hill Publishing Company Ltd., 2006.
7. R.S. Salaria, The Complete Reference C++, Khanna Publishing House, 2016.