

SEMESTER-I

**Paper:** Fundamental of Computing – using C Language (including Lab)

**Code:** *CYS-101*

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

**Credits:** 4

**Module 1-Computer fundamentals:** Computing systems: hardware & software, Architecture & organization history: von Neumann Architecture: memory, processor, I/O; Data vs Information: Bit, byte number system: binary, octal, hexadecimal, 1's, 2's complement arithmetic, digital logic: AND, OR etc. BIOS, Booting, Application software, system software, Introduction of Operating systems, program, process; introduction of programming languages: brief overview of Pascal, FORTRAN, and BASIC. [6L]

**Module 2- General problem Solving concepts:** Algorithm and Flowchart for problem solving with Sequential Logic Structure, Decisions and Loops, time & space complexity; Imperative languages: Introduction to imperative language; syntax and constructs of a specific language (ANSI C). [4L]

**Module 3- Types Operator and Expressions with discussion of variable naming and Hungarian Notation:** Variable Names, Data Type and Sizes (Little Endian Big Endian), Constants, Declarations, Arithmetic Operators, Relational Operators, Logical Operators, Type Conversion, Increment Decrement Operators, Bitwise Operators, Assignment Operators and Expressions, Precedence and Order of Evaluation, proper variable naming and Hungarian Notation [4L]

**Module 4- Control Flow with discussion on structured and unstructured programming:** Statements and Blocks, If-Else-If, Switch, Loops – while, do, for, break and continue, Goto Labels, structured and un- structured programming [4L]

**Module 5- Functions and Program Structure with discussion on standard library:** Basics of functions, parameter passing and returning type, C main return as integer, External, Auto, Local, Static, Register Variables, Scope Rules, Block structure, Initialisation, Recursion, Preprocessor, Standard Library Functions and return types [4L]

**Module 6- Arrays and Pointers:** Arrays, Pointers and address, Pointers and Function Arguments, Pointers, Address Arithmetic, character Pointers and Functions, Pointer Arrays, Pointer to Pointer, Multi-dimensional array and Row/column major formats, Initialization of Pointer Arrays, Command line arguments, Pointer to functions, complicated declarations and how they are evaluated. [8L]

**Module 7- Structures:** Basic Structures, Structures and Functions, Array of structures, Pointer of structures, Self-referral Structures, Table look up, Typedef, Unions, Bit-fields [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)

**Module 8- Input and Output:** Standard I/O, Formatted Output – printf, Formated Input – scanf, Variable length argument list, file access including FILE structure, fopen, stdin, sdtout and stderr, Error Handling including exit, perror and error.h, Line I/O, related miscellaneous functions, scope of advance C, a brief introduction of VDU basics, Mouse programming, C-assembly. [6L]

**Laboratory Outcomes**

- To formulate the algorithms for simple problems
- To translate given algorithms to a working and correct program
- To be able to correct syntax errors as reported by the compilers
- To be able to identify and correct logical errors encountered at run time
- To be able to write iterative as well as recursive programs
- To be able to represent data in arrays, strings and structures and manipulate them through a program
- To be able to declare pointers of different types and use them in defining self-referential structures.
- To be able to create, read and write to and from simple text files.

**Programming Method:** Debugging, macro, User defined Header, User defined Library Function, make file

**Competitive Programming Laboratory**

1. Algorithm and flowcharts of small problems like GCD
2. Structured code writing with:
  - a. Small but tricky codes
  - b. Proper parameter passing
  - c. Command line Arguments
  - d. Variable parameter
  - e. Pointer to functions
  - f. User defined header
  - g. Make file utility
  - h. Multi file program and user defined libraries
  - i. Interesting substring matching / searching programs
  - j. Related assignments
    - Familiarization of Computer Hardware & Components

**Text Books:**

1. Herbert Schildt, “C: The Complete Reference”, Fourth Edition, McGraw Hill.
2. B. Gottfried, “Programming in C”, Second Edition, Schaum Outline Series.
3. R.S. Salaria, “Problem Solving and Programming in C”, Khanna Publishing House

**Reference Books:**

1. B. W. Kernighan and D. M. Ritchi, The ‘C Programming Language’, Second Edition, PHI.
2. Yashavant Kanetkar, “Let Us C”, BPB Publications.
3. R.S. Salaria, “Computer Concepts and 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)

**Paper: Mathematics for Computing Professionals**

**Code: CYS(M)-101**

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

**Credits: 4**

**Module-1:** Prime numbers, unique factorization, finite fields, powers and primitive roots in finite fields, Greatest common divisors, modular arithmetic, Introduction to Matrices and Determinants; Solution of Linear Equations; Cramer's rule; Inverse of a Matrix, Vectors and linear combinations; Rank of a matrix; Gaussian elimination; LU Decomposition, Vector space; Gram-Schmidt orthogonalization and QR decomposition Eigenvalues and Eigenvectors; Positive definite matrices; Linear transformations; Hermitian and unitary matrices [10L]

**Module-2: Calculus:** Basic concept of Differential calculus and integral calculus, application of double and triple integral. [6L]

**Module-3: Abstract algebra & Combinatorics:** Set, relation, group, ring, field; Basic combinatorics, Basic counting, balls and bins problems, generating functions, recurrence relations. Proof techniques, principle of mathematical induction, pigeonhole principle. [8L]

**Module-4: Graph-Theory:** Graph-terminology, Handshaking, lemma, Connectivity, Planarity of graphs, Graph coloring, Using graphs to represent social relationships, graphs and sociograms, levels of measurement [6L]

**Module-5: Discrete logarithm problem,** Analysis of discrete logarithm problem, collision algorithms, Chinese remainder theorem, Pohlig-Hellman algorithm, Euler's formula, Pollard's p-1 factorization algorithm, Factorization by difference of squares and the quadratic sieve, Index calculus for discrete logarithms, quadratic residues and quadratic reciprocity, Overview of information theory and complexity theory [10L]

**Text Books:**

1. I. N. Herstein, "Topics in Algebra", John Wiley and Sons.
2. M. Morris Mano, "Digital Logic & Computer Design", Pearson
3. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publication, Delhi.
4. Chandrika Prasad & Reena Garg, "Advanced Engineering Mathematics", Khanna Publishing House, Delhi

**Reference Books:**

1. Gilbert Strang: Introduction to linear algebra
2. Reena Garg, Engineering Mathematics, Khanna Publishing House
3. Peter V. O'Neil, "Advanced Engineering Mathematics", Seventh Edition, Thomson Learning.
4. M. D. Greenberg, "Advanced Engineering Mathematics", Second Edition, Pearson Education.
5. P. N. Wartikar and J. N. Wartikar, "Applied Mathematics". Vol. I & II, Vidyarthi Prakashan.

**Paper:** English Communication

**Code:** *CYS(HU)-101*

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

**Credits:** 4

**Unit/ Module 1:** Vocabulary Enhancement –Synonyms, Antonyms, Prefixes and suffixes. Understanding the proper way of letter writing. Comprehension, Passage reading and question answer handling. Noun, Verb, Adjective. Construction of sentences and passages with proper grammar.(8L)

**Unit/ Module 2:** Spelling and Punctuation/ Spelling Pitfalls, Grammar Revisited - Review of parts of speech. Proper pronunciation from language lab. Hearing fluent English and identifying and answering questions. Understanding the proper way to utilize punctuation and spelling Pitfalls. (8L)

**Unit/ Module 3:** Functional English - Language functions: descriptive, expressive and social, Types of language functions: to inform, enquire, attract, influence, regulate and entertain. Understanding the importance of communication. Communication in an organization. Types of communication (8L)

**Unit/ Module 4:** Reading Skills - Strategies for developing reading skills, Skimming and scanning, Predicting, Inferring, Reading critically. Reading passages, comprehension and letters. Reading with proper pronunciation. (6L)

**Unit/ Module 5:** Book reading, Shakespearian Literature reading. Reading silently, sub-vocalization, Reading at speeds of at least 250 words per minute, Inferring meaning or content after reading the heading, Guessing meaning of unfamiliar words from context, Identifying the central idea as well as supporting ideas, Spelling pitfalls, Preparing notes in diagrammatic form after reading a text, showing the central idea and supporting ideas and the relationships between them. (10L)

**Text Books:**

1. Scot Ober, Contemporary business communication, fifth edition, biztantra.
2. Lesiler & Flat lay, Basic Business communication. Tata McGrawHill.
3. Kulbhushan Kumar, Effective Business Communications, Khanna Publishing House

**Reference Books:**

1. Alan Mc'Carthy and O'dell ; English vocabulary in use
2. APAART: Speak Well 1 (English language and communication)

3. APAART: Speak Well 2 (Soft Skills)

4. Dr. Saroj Hiremath -Business Communication

**Paper: Programming using Python (including Lab)**

**Code: CYS-102**

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

**Credits: 4**

**Module 1:** Introduction: History , Features, Setting up path, Working with Python, Basic Syntax, Variable and Data Types, Operator, Conditional Statements, If , If- else, Nested if-else, Looping, For, While, Nested loops, Control Statements, Break, Continue, Pass; String Manipulation: Accessing Strings, Basic Operations, String slices, Function and Methods, Lists: Introduction, accessing list, Operations, Working with lists, Function and Methods; Tuple: Introduction, accessing tuples, Operations, Working, Functions and Methods, Dictionaries: Introduction, Accessing values in dictionaries, Working with dictionaries, Properties [12L]

**Module 2:** Functions: Defining a function, Calling a function Types of functions, Function Arguments, Anonymous functions, Global and local variables, Modules: Importing module, Math module, Random module, Packages, Composition, Input-Output: Printing on screen, Reading data from keyboard, Opening and closing file, Reading and writing files, Functions, Exception Handling: Exception, Exception Handling, Except clause, Try ? finally clause, User Defined Exceptions [10L]

**Module 3:** OOPs concept: Class and object, Attributes, Inheritance, Overloading, Overriding, Data hiding Regular expressions: Match function, Search function, Matching VS Searching, Modifiers, Patterns CGI: Introduction, Architecture, CGI environment variable, GET and POST methods, Cookies, File upload. Database: Introduction, Connections, Executing queries, Transactions, Handling error; [8L]

**Module 4:** Networking: Socket, Socket Module, Methods, Client and server, Internet modules; Multithreading: Thread, starting a thread, threading module, synchronizing threads, Multithreaded Priority Queue; GUI Programming: Introduction, Tkinter programming, Tkinter widgets, Sending email. [10L]

**Python Programming Laboratory:**

1. Writing simple code using if-else, loop etc.
2. String manipulation
3. Operations on Lists, Tuple, Dictionaries
4. Using functions
5. File Handling - processing CSV files and generate report.
6. Object Oriented Concepts
7. CGI GET, POST, File Upload using Python
8. Database Connectivity – execute simple query
9. Socket Programming using Python
10. Thread handling using Python
11. GUI Programming

**Text Books:**

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

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

1. Jose, Jeeva and Lal, P. Sojan, Introduction to Computing and Problem Solving with Python
2. Jose, Jeeva; Taming Python by Programming
3. Thareja, Reema; Python Programming: using problem solving approach
4. Rao, K. Nageswara Akbar, Shaik and Krishna, Immadi M.; Problem solving and Python Programming

**Reference Books:**

1. Lutz, Mark; Learning Python; 5th ed.
2. Beazley, David and Jones, Brian K.; Python Cookbook

**Paper: Computer Network (including Lab)**

**Code: CYS-103**

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

**Credits: 4**

**Module 1: Network Fundamentals** - Compare and contrast OSI and TCP/IP models, Compare and contrast TCP and UDP protocols. Impact of infrastructure components in an enterprise network – Firewalls, Access points, Wireless controllers. Effects of cloud resources on enterprise network architecture - Traffic path to internal and external cloud services, Virtual services, Basic virtual network infrastructure. Collapsed core and three-tier architectures. Network topologies – Star, Mesh, Hybrid. Cabling – type, troubleshooting - fault isolation. [10L]

**Module 2: LAN Switching Technologies** - Switching concepts - MAC learning and aging, Frame switching, Frame flooding, MAC address table. Ethernet frame format. Troubleshoot interface and cable issues (collisions, errors, duplex, speed). [5L]

**Module 3: IP Address:** Configure, verify, and troubleshoot IPv4 addressing and subnetting. IPv4 address - Types - Unicast, Broadcast, Multicast. Private & Public IP Address. Configure, verify, and troubleshoot IPv6 addressing - Stateless Address Auto Configuration. IPv6 address types - Global unicast, Unique local, Link local, Multicast, Modified EUI 64, Autoconfiguration, Anycast. [8L]

**Module 4: VLAN:** Configure, verify, and troubleshoot VLANs (normal/extended range) spanning multiple switches - Access ports (data and voice), Default VLAN. Configure, verify, and troubleshoot inter-switch connectivity. Trunk ports, Add and remove VLANs on a trunk, DTP, VTP (v1&v2), and 802.1Q, Native VLAN. [5L]

**Module 5: Routing Technologies:** Routing concepts - route lookup, Frame rewrite, routing table, Prefix, Network mask, Next hop, Routing protocol. Configure, verify, and troubleshoot inter-VLAN routing. Router on a stick – SVI. Static routing and Dynamic routing. Distance vector and link state routing protocols. Interior and exterior routing protocols. Configure, verify, and troubleshoot IPv4 and IPv6 static routing - Default route, Network route, Host route. [12L]

**Computer Network Laboratory:**

1. Physical Network Configuration

**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. ARP – MAC address mapping.
3. Configuration – IPv4 Address, Netmask, Gateway, DNS.
4. Configuration – Ipv6 Address.
5. Communication between LANs.
6. VLAN Configuration
7. Routing Configuration – Static & Dynamic.
8. Troubleshooting – IP, VLAN, Routing.

**Text Books:**

1. Forouzan, Behrouz A.; Data Communications and Networking; 4th ed.
2. Sidhu, Bhavneet; An Integrated Approach to Computer Networks
3. Comer, Douglas E.; Internetworking with TCP/IP; Vol. 1: Principles, Protocols and Architecture;

**Reference Books:**

1. Freer, John R.; Computer Communications and Networks
2. Shay, William A.; Understanding Data Communications and Networking; 3rd ed.

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