Syllabus for B.Sc. Computer Science Honours (1st Year)

<table>
<thead>
<tr>
<th>Sem</th>
<th>Paper</th>
<th>Topic</th>
<th>Period</th>
<th>Marks</th>
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<tbody>
<tr>
<td>Sem-I</td>
<td>CMSA3101</td>
<td>Computer Fundamentals &amp; Internet</td>
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<td>Digital System Design</td>
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<td>Circuit Theory &amp; Basic Electronics</td>
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<td>Software Lab : PC S/W &amp; C Programming</td>
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<td>Data Structure</td>
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<td>CMSA3252</td>
<td>Software Lab : Data Structures - 1</td>
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<td>Hardware Lab : Digital - 2</td>
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SEMESTER-I

Group-A: Fundamentals of Computer & Internet:

Introduction to Computer and Problem Solving: Information and Data
Hardware: CPU, Primary and Secondary storage, I/O devices, Bus structure, Computer Peripherals - VDU, Keyboard, Mouse, Printer.

Software: System and Application. Different System Software.

Programming Languages: Machine Language, Assembly Language, High Level Language, Object Oriented Language.

Problem solving: Algorithm, Flow charts, Decision tables & Pseudo codes.

Number systems and Codes: Number representation: Weighted codes, Non-weighted codes, Positional, Binary, Octal, Hexadecimal, Binary Coded Decimal (BCD), Conversion of bases. Complement notations, Binary Arithmetic, Binary Codes: Gray, Alphanumeric, ASCII, EBCDIC, Single Error-Detecting and Correcting Codes, Hamming Codes.

Basic Computer Organization - IAS Computer, Von Neumann Computer, System Bus. Instruction Cycle, Data Representation, Machine instruction and Assembly Language, CPU Organization, Arithmetic and Logic Unit, Control Unit, CPU Registers, Instruction Registers, Program Counter, Stack Pointer.

Introduction to Networking, Advantages of Networking; Basic Features, LAN, MAN and WAN; simple PC Based Network: Example, block diagram. Mode of operation and characteristic features.
Intranet and Internet; Servers and Clients; Ports; Domain Name Server (DNS); WWW, Browsers Connections: Guided and Unguided media - Dial up, ISDN, ADSN; Cable, Modem; E-mail, Voice and Video Conferencing.

Group-B: Digital System Design:

Combinational Circuits: Standard Gate assemblers, IC chips packaging nomenclature, Comparators, Decoders, De-multiplexers, Data selectors/multiplexer, Encoder, Seven segment display unit. Multiplexed display, Keyboard encoder.

Sequential Circuits: Flip-Flop (1 bit)SR, JK, D, T, Shift Register, Counter. Finite State Model-State diagram, Synchronous and Asynchronous system (Illustrative counter design), Single and two phase clocks. Successive approximation, Basic ladder circuits, D/A and A/D converter, Counter Ramp, ROM & PLA (basic idea).

Logic Circuit design using TTL, MOS and CMOS circuits, Relative comparison. Integrated Circuits: SSI, MSI, LSI, VLSI classification.

**Group-C: Circuit Theory & Basic Electronics:**


**Semester I: PAPER CMSA3151: 50 MARKS (PRACTICAL)**

**Group - A: Software Laboratory**
PC S/W & Programming & Problem solving through C. Assignment list to be provided.

**Group - B: Hardware Laboratory**
Digital – 1. Assignment list to be provided.
GROUP - A: COMPUTER ORGANIZATION

**Instruction:** Operation Code and Operands. Zero, One, Two and Three address instruction. Instruction types. Addressing modes. Stack organization.

**Memory:** Types of Memory. Memory Hierarchy: CPU Register. Cache Memory, Primary Memory, Secondary Memory. Virtual Memory (Introduction only). Memory organization - Linear two-dimensional Von Neumann vs Harvard Architecture, Different storage technology.

**I/O System Organization and Interfacing:** Bus: SCSI, PCI, USB (introduction and comparative study); Tri State Devices, Bus Arbitration.

**Fixed and Floating Point Arithmetic:** Addition, Subtraction, Multiplication & Division.

**ALU:** Combinational ALU, Two’s Complement Addition, Subtraction unit

**Control Unit:** Control Structure and Behavior, Hardwired Control and Micro programmed Control: Basic Concept, Parallelism in Microinstruction

**I/O:** Polling, Interrupts, DMA, I/O Bus and Protocol.

GROUP - B: DATA STRUCTURES

**Definition:** Concepts of data types. Elementary structures, Data types and their interpretation.

**Complexity:** Advantages and Disadvantages. Big O Notation, Big-omega and Big-theta notations, Growth of Functions.

**Arrays:** Types, Memory representation. Address translation. Functions of single and multi dimensional arrays with examples.

**Linked Structures:** Single and doubly linked list (non-circular and circular). List manipulation with pointers: Insertion and deletion of elements.

**Stacks and Queues:** Definition. Representation. Uses and Applications, Infix notation to postfix notation: conversion and evaluation. Application of queues.

**Recursion:** Divide and Conquer, Elimination of Recursion, When not to use recursion?

**Binary Trees:** Definition, Quantitative properties, Internal and external. Properties, Minimum and maximum path length of a binary tree. No of nodes, height.

**Searching:** Linear and binary search, Performance and complexity.

**Hashing:** Concepts, Advantages and disadvantages. Different types of hash functions, Collision and Collision Resolution Techniques - Open addressing with probing, Linear Chaining, Coalesced Chaining, Application.

**Sorting:** Terminology, Performance Evaluation, Different Sorting Techniques (Bubble, Insertion, Selection, Quick sort. Merge sort. Heap, Partition Exchange, Radix with iterative and recursive description).

GROUP - C: MATHEMATICS

**Logic:** Propositions; Predicates and Quantifiers. Sets, Functions, Relation, Equivalence Relation.


**Constructions on Sets:** Cartesian product. Disjoint union (connection with data types). Relations as a subset of a product. Binary relations. Functions and partial functions.

**Relations on a Set:** Reflexive, symmetric and transitive properties of a relation on a set. Equivalence relations. Orders, partial and total. Examples.

Introduction to probability: Combinatorics, binomial coefficients, Random walks, Conditional probability and independence, Binomial, Poisson and normal distributions.

Semester-II: PAPER CMSA3252: 50 MARKS (PRACTICAL)

Group - A: Software Laboratory
Data Structures - 1
Assignment list to be provided.

Group - B: Hardware Laboratory
Digital – 2.
Assignment list to be provided.
Syllabus for B.Sc. Computer Science Honours (2nd Year):

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<thead>
<tr>
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<th>Paper</th>
<th>Topic</th>
<th>Periods</th>
<th>Marks</th>
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<tr>
<td>Sem-III (July-Nov)</td>
<td>CMSA3303</td>
<td>Operating System</td>
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<td>Formal Language &amp; Automata Theory</td>
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<td>CMSA3353</td>
<td>Software Lab : Data Structures - II</td>
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<td>Software Lab : Linux &amp; Shell Programming</td>
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<td>Theory of DBMS</td>
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<td>Numerical and Optimizing Techniques</td>
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<td>Object-Oriented Programming Concepts</td>
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<td>Object Oriented Programming – Concepts</td>
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<td>SQL, PL-SQL, Forms &amp; Reports</td>
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**SEMESTER-III**

**Paper CMSA3303 (Theoretical)**

**Group - A: Operating System**

**Group - B: Formal Languages & Automata Theory**

**Group C: Data Communication & Computer Network**
Data Communications; Transmission media; Network: Protocol and standards; Analog & Digital Signals, Periodic & Non-Periodic Signals, Time and Frequency Domain; Multiplexing: FDM, TDM and Application, Encoding D/A and A/D Encoding; Concepts of Centralized and Distributed Computing; Advantages of Networking; Layered architecture: OSI Architecture, Basic Features, LAN, MAN and WAN; simple PC Based Network: Example, block diagram. Mode of operation and characteristic features. IP addressing, Flow Control: Stop-and-wait, Sliding Window, and ARQ.
Semester-III:

PAPER – CMSA3353: 50 MARKS (PRACTICAL)

Group - A: Software Laboratory
Data Structures - 2
Assignment list to be provided.

Group - B: Software Laboratory
Linux & Shell Programming
Assignment list to be provided.

SEMESTER-IV

Group - A: Theory of DBMS

Group - B: Numerical and Optimization Techniques

Group - C: Object-Oriented Programming Concepts

Semester-IV:

PAPER – CMSA3454: 50 MARKS (PRACTICAL)

Group - A: Software Laboratory
Object oriented programming through Java
Assignment list to be provided.

Group - B: Software Laboratory
SQL, PL-SQL, Forms & Reports.
Assignment list to be provided.
Syllabus for B.Sc. Computer Science Honours (3rd Year):

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<td>Computer Graphics</td>
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<td>Software Engineering &amp; UML</td>
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<td>Microprocessor</td>
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<td>Design &amp; analysis of algorithm</td>
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<td>Hardware Lab : Microprocessor Application</td>
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<td>CMSA3606</td>
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<td>Web technologies &amp; Multimedia</td>
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<td>Current Technologies</td>
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<td>CMSA3457</td>
<td>Software Lab : VB .net</td>
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<td>Project Work – under supervision of project guide</td>
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**SEMESTER-V:**

**Paper: CMSA3505 (Theoretical)**

**Group-A: Computer Graphics**

Fundamentals of Introductive Computer Graphics by J D Foley & A Van Dam – Adison Wesely

**Group - B: Software Engineering**

*Books:* Software Engineering by Roger S Pressman – TMH
Software Engineering by Ian Sommerville
Group - C: Microprocessor


Books: Introduction to Microprocessor by Gaonkar – PHI
   Introduction to Microprocessor by Mukhopadhyay
   Advanced Microprocessor by Tabak

Group - D: Design & Analysis of Algorithm


Books: Fundamentals of Computer Algorithms by Horowitz Ellis, Sahani Sartaz, R Sanguthevar
   Introduction to Algorithms, Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, PHI
   Design and Analysis of Algorithms, Dexter C.Kozen - Springer-Verlag.

SEMESTER-VI

Paper CMSA3606 (Theoretical)

Group A: Compiler

Basic concepts of compilers and interpreters. Different phases of compilation. Lexical analyzer concept; Design using FSM. Parser: Top down and Bottom up; Recursive descent; LL (1); LR (1); LALR (1); Comparison, Symbol tables: organization and management techniques. Runtime storage management - static allocation; dynamic allocation, activation records; heap allocation, recursive procedures. Semantic Analysis - attributed translation: procedure calls. Syntax directed translation and intermediate codes. Code Optimization: Basic blocks, loop optimization, flow graph. Machine dependent optimization, code generation. Error handling - detection, reporting, recovery and repair. Compiler Writing Tools: LEX; YACC.

Books: Principles of Compiler Design by Aho & Ullman
Group B: Web technologies & Multimedia

Web pages – types and issues, Comparison of different technologies (eg. Microsoft, Sun-Micro systems, etc). WWW- basic concepts, web-client & web-server, application server, http protocol(frame format), universal resource locator (URL), HTML-different tags, sections, images & pictures, listings, tables, frames and forms..

Basic concepts on Multimedia, Different forms of multimedia- text, audio, image & video. Sound- types, computer representation of sound & sampling. Examples of audio tools (Sound forge, etc.). Animations – Tweening, Morphing in multimedia with examples.

Group C: Current Technologies (Any two of the following topics are to be offered)

**Distributed System**: Architectures of distributed system, Issues in designing a distributed system. Overview of concurrency control and recovery distributed database. Distributed Data Storage.


**Image Processing**: Image acquisition and digital image representation – sampling, quantization, pixel, gray level values Image transformations in spatial domain – contrast enhancement, brightness enhancement, image averaging – use in smoothing ; Colour image representation using RGB model, CMY model. Image Compression – Lossy vs Lossless, few lossy compression techniques – RLE Applications of image processing