Course Structure and Syllabi

B. Sc. Computer Science

Academic Programmes

July, 2013
## BSc-CS Syllabus at JECRC University

### Semester – I

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
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<th>T (Hr.)</th>
<th>P (Hr.)</th>
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**Total**: 25
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## Semester – III

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## BSc-CS Syllabus at JECRC University

### Semester – VI

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**Total** 25
Course Code: CA-1021  
Course Name: Computer Fundamentals & Internet  

L  T  P  C  
3  1  0  4

**Fundamentals of Computer & Internet:**  
Introduction to Computer and Problem Solving: Information and Data  
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.
Course Code: CA-1022
Course Name: Digital System Design

Digital System Design:
Boolean algebra: Fundamentals of Boolean algebra, Switches and inverters, Functionally Complete Gates (AND, OR, NOT), NAND, NOR, switching function and Boolean function. De Morgan’s Theorem. Application of Boolean algebra: Minterm, Truth Table and minimization of switching function up to four variables. Algebraic K-map method of Logic circuit Synthesis: two level and multi level, 2 variables Boolean functions, 3 variables Boolean function
Combinational Circuits: Standard Gate assemblers, IC chips packaging nomenclature, Comparators, Decoders, Demultiplexers, 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.
Course Code: CA-1023
Course Name: Circuit Theory & Basic Electronics

L T P C
3 1 0 4

Circuit Theory & Basic Electronics:
Course Code: CA-1024
Course Name: Software Laboratory

**Software Laboratory**
PC S/W & Programming & Problem solving through C.
Course Code: CA-1025
Course Name: Hardware Laboratory

Hardware Laboratory
Digital – 1.
Course Code: CA-2021  
Course Name: Computer Organization  

L T P C  
3 1 0 4  

**Instruction:** Operation Code and Operand. 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.
Course Code: CA-2022  
Course Name: Data Structures  

L T P C  
3 1 0 4

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

**Complexity:** Advantages and Disadvantages. Big 0 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, Quicksort. Merge sort. Heap, Partition Exchange, Radix with iterative and recursive description).
Course Code: CA-2023  
Course Name: Mathematics  

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


Introduction to probability: Combinatorics, binomial coefficients, Random walks, Conditional probability and independence, Binomial, Poisson and normal distributions.
Course Code: CA-2024
Course Name: Software Laboratory

Software Laboratory
Data Structures - 1
Course Code: CA-2025
Course Name: Hardware Laboratory

Hardware Laboratory
Digital – 2.
Course Code: CA-3021
Course Name: Operating System

What is OS? Multiprogramming OS (Concurrent Processing System), Concepts of process & Threads, Concept of Interrupts, System Calls, OS is an interrupt driven system. Files, Shell, Introduction to shell programming, Structures of OS: Monolithic, Layered, Virtual, Client Server and Distributed Model.


Processor Management: Scheduling, Round-robin, Priority Queue. I/O management: Device Management.

Memory Management: Multiprogramming, Swapping, Paging, Virtual memory, Page Replacement Techniques.

Course Code: CA-3022
Course Name: Formal Languages & Automata Theory

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Course Code: CA-3023
Course Name: 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.

Course Code: CA-3024
Course Name: Software Laboratory

Software Laboratory
Data Structures – 2

Course Code: CA-3025
Course Name: Software Laboratory

Software Laboratory
Linux & Shell Programming

Course Code: CA-4021
Course Name: Theory of DBMS


Course Code: CA-4022
Course Name: Numerical and Optimization Techniques

System of Linear Equations: Gaussian Elimination, Gauss-Jordan Elimination, Gauss-Seidel Iteration, Matrix Inversion

Nonlinear Equation: Iterative Methods, Newton-Raphson.


Queuing Theory: Basic concepts, Queuing models, Poisson Statistics, M/M/1 queue; Applications.

Course Code: CA-4023
Course Name: Object-Oriented Programming Concepts - Java


Course Code: CA-4024
Course Name: Software Laboratory

Software Laboratory
Object oriented programming through Java

Course Code: CA-4025
Course Name: Software Laboratory

Software Laboratory
SQL, PL-SQL, Forms & Reports.

Course Code: CA-5021
Course Name: Computer Graphics

L T P C
3 1 0 4


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

Course Code: CA-5022
Course Name: Software Engineering


Books: Software Engineering by Roger S Pressman – TMH
Software Engineering by Ian Sommerville

Course Code: CA-5023
Course Name: Microprocessor


Books: Introduction to Microprocessor by Gaonkar – PHI
Introduction to Microprocessor by Mukhopadhyay
Advanced Microprocessor by Tabak
Course Code: CA-5024
Course Name: Design & Analysis of Algorithm

L T P C
3 1 0 4


Sorting and order statistics: Heap sort, Merge Sort, Quick sort, sorting in linear time, Median and order statistics.

Design and analysis Techniques: Divide and conquer; Dynamic programming; Greedy Algorithms; Back tracking.

Advanced data structures: Threaded Binary Tree, Binary Search Tree, AVL Tree, B Tree

Graph Algorithms: Breadth First Search, Depth First Search, Topological Sort, Connected Components, Minimal spanning Tree algorithms, shortest paths.

Computational Geometry: Convex Hulls, Closest pair of points

Notion of NP-completeness P class, NP-hard class, NP-complete class, Circuit Satisfiability problem

Books: Fundamentals of Computer Algorithms by Horowitz Ellis, SahaniSartaz, R Sanguthevar
Introduction to Algorithms, Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, PHI
Design and Analysis of Algorithms, Dexter C.Kozen - Springler-Verlag.
Course Code: CA-5025
Course Name: Software Laboratory

Software Laboratory
Software Lab: MATLAB
Course Code: CA-5026
Course Name: Software Laboratory

Software Laboratory
Software Lab: Advanced RDBMS (Oracle 9i).
Course Code: CA-5027
Course Name: Hardware Lab

Hardware Lab: Microprocessor Application
Course Code: CA-6021
Course Name: Compiler

L T P C
3 1 0 4

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
Course Code: CA-6022
Course Name: 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.
Course Code: CA-6023
Course Name: Current Technologies

L T P C
3 1 0 4

Course Code: CA-6024
Course Name: Software Laboratory

Software Laboratory
Software Lab : Web Technologies
Course Code: CA-6025
Course Name: Software Laboratory

Software Laboratory
Software Lab : VB .net
Course Code: CA-6026
Course Name: Major Project

L  T  P  C
3  1  2  5

The allotment of the project will be held after fifth semester. The major project will be in the following organization: R & D organization, Govt. Sector, BSNL, ITI, RDSO, NIC, PNB and it will be by supervised & Evaluated by Department teacher / Examiner appointed by the concerned University only.