



# BACHELOR OF SCIENCE

## B.Sc.

### Computer Science Syllabus

(SIX - SEMESTER PROGRAM)

Effective from session (2018-19)



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DEPARTMENT OF COMPUTER SCIENCE  
UNIVERSITY OF LUCKNOW  
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**Department of Computer Science**  
**University of Lucknow, Lucknow**  
B.Sc (Computer Science) Semester-wise Syllabus 2018-19

B.Sc. (Semester-I)			
S.N	Paper Code	Paper Name	Marks
1.	B.Sc.-101	Computer Fundamentals	80
2.	B.Sc.-102	System Analysis and Design	80
B.Sc. (Semester-II)			
S.N	Paper Code	Paper Name	Marks
1.	B.Sc.-201	Programming in C	80
2.	B.Sc.-202	Practical (C Language, Ms-Office)	100
B.Sc. (Semester-III)			
S.N	Paper Code	Paper Name	Marks
1.	B.Sc.-301	Data Structure Using C++	80
2.	B.Sc.-302	Practical (Data Structure using C++, Python)	100
B.Sc. (Semester-IV)			
S.N	Paper Code	Paper Name	Marks
1.	B.Sc.-401	Operating System	80
2.	B.Sc.-402	Management Information system	80
B.Sc. (Semester-V)			
S.N	Paper Code	Paper Name	Marks
1.	B.Sc.-501	Database and Software Engineering	80
2.	B.Sc.-502	Computer Architecture and Microprocessor	80
3.	B.Sc.-503	Advanced Computing Technologies	80
B.Sc. (Semester-VI)			
S.N	Paper Code	Paper Name	Marks
1.	B.Sc.-601	Application Development With java and .NET framework	80
2.	B.Sc.-602	Data Communication and Computer Network	80
3.	B.Sc.-603	Practical (Java, .NET framework, Microprocessor 8086, Database)	100
<b>Total Marks</b>			<b>1400</b>

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**Department of Computer Science**  
**University of Lucknow, Lucknow**  
**B.Sc (Computer Science) Third Semester Syllabus**

<b>Paper Title:</b> Data Structure Using C++	<b>Paper Number:</b> First
<b>Paper Code:</b> B.Sc.-301	<b>Maximum Marks:</b> 80

**Unit -I**

OOPs concept, Procedural vs OOP programming, OOP terminology and features, Tokens, Character set, Keywords, Data-types, Data Types declarations, Constants and variables, expressions, Standard Library and header files, Classes and Objects, Operator and Expression: Arithmetic Operator, Increment/Decrement Operator, Relational Operator, Logical Operator and conditional operators, library functions, Logical Expressions, C++ shorthand.

**Unit -II**

While, Do-while, For statements nested loops. If-else, switch, break, continue and Go to statements, Classes and Objects: Need for Classes, Declaration of Classes, referencing class Members, Scope of class and its members Nested Classes, Functions in a class: Inline Functions, Constant Member functions, Nesting of Member Functions, Memory allocation of objects, Arrays of objects, Static Class Member, Constructor, Destructor, inheritance, Polymorphism, encapsulation, friend function, this operator, inline function.

**Unit -III**

Data Structure definition and its classification, objective to study data structure, Algorithms and their complexity related issues, Dynamic Memory Allocation, Malloc () Vs Calloc () functions, Abstract Data Types (ADT), Stack definition, application and Implementation, Polish Notation, Queue definition, application and Implementation, Doubly Ended queue, Circular Queue, Priority Queue, Linked list, Single Linked list and Doubly Linked List, Circular Linked list, Disadvantages of Queue and Stacks, Advantages of Linked list over Queue and Stacks.

**Unit -IV**

Searching, linear and non-linear searching, Binary searching, sorting, Internal Sorting Vs External Sorting, Insertion sort, selection sort, bubble sort, Hashing and Collision Resolution techniques, Graph, Basic Terminology, Graph Traversal, Minimal Spanning Tree, Binary Trees, In order Traversal, Post order Traversal, Preorder Traversal, Binary Search Trees, Operations on a BST, Complete Binary tree, Strictly Binary tree, AVL tree.

**Referenced Books:**

- [1] Bjarne Stroustrup, "A Tour of C++", C++ in Depth Series.
- [2] E. Balagurusamy, "Object Oriented Programming with C++", Mcgraw Hill publication.
- [3] Barbara Johnston, "C++ Programming Today", Pearson Education.
- [4] R B Patel, "Expert Data Structure with C", Khanna Publication, Fourth Edition.
- [5] Seymour Lipschutz, "Data Structures with C", Schaum's Outlines, Mc Graw Hill Publication.
- [6] S. K Srivastava and Deepali Srivastava "Data Structure through C In Depth", BPB publication.

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Department of Computer Science  
University of Lucknow, Lucknow

B.Sc (Computer Science) Semester-wise Syllabus 2018-19

B.Sc. -302

Practical (Data Structure Using C++, Python Basics)

MM-100

List of Exercise based on Data Structure using C++, Python:

**Data Structure using C++:**

1. Implementation of dynamic memory allocation
2. Implementation of single dimensional and multidimensional arrays
3. Structure implementation
4. Stack Implementation with all operations
5. Stack Implementation as abstract data type
6. Stack application for In-fix, Post-fix and Pre-fix polish expression.
7. Implementation of Recursion
8. Queue Implementation with insertion and deletions of elements.
9. De-queue Implementation
10. Circular Queue Implementation
11. Priority Queue Implementation
12. Single linked Creation with all kind of operations in all conditions
13. Implementation of pointers
14. Stack Implementation using linked list
15. Queue Implementation using Linked list
16. Doubly Linked list creation with all kind of operations in all possible conditions.
17. Circular Linked list creation with all kind of operations in all possible conditions.
18. Creation of tree and performing insertion and deletion of nodes.
19. Creation of Binary tree.
20. Traversal of Binary tree (In Order, Pre Order, Post Order)
21. Implementation of sequential search.
22. Implementation of Binary search.
23. Implementation of Insertion sort
24. Implementation of Selection sort
25. Implementation of Bubble sort

**Python:**

1. Implementation of Standard input and output statement
2. Implementation of variables and operators
3. Implementation of conditional and decision making statement
4. Implementation of control and looping structure
5. Implementation of strings and text

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**Department of Computer Science**  
**University of Lucknow, Lucknow**  
B.Sc (Computer Science) Fourth Semester Syllabus

<b>Paper Title:</b> Operating System	<b>Paper Number:</b> First
<b>Paper Code:</b> B.Sc.-401	<b>Maximum Marks:</b> 80

**Unit -I**

Definition of operating system (OS), History of OS, Different types of OS, GUI Vs CLI Interface, Kernel and Shells architecture, Simple Batch Systems, Multiprogramming Vs Multitasking operating system, Multi-programmed Batched Systems, Time-Sharing Systems, Distributed Systems and Real-Time Systems, Operating System Structures-Command Interpreter System, Operating System Services, System Calls, System Programs, Process Concept, Process control Block, process Scheduling,

**Unit -II**

CPU scheduling-Basic Concepts, Scheduling Criteria, Shortest Job First (SJF) Scheduling, First-Come First-Serve Scheduling (FCFS), Priority Scheduling, Round Robin Scheduling, Multilevel Queue Scheduling.

**Unit -III**

Memory Partitioning Basic Concepts, Logical and Physical Address Space, Swapping, Contiguous Allocation, Paging, Segmentation, Virtual Memory, Demand Paging, Paging Replacement, Fragmentation and its types, Thrashing and Demand Segmentation, File Concept, Access Methods, Directory Structure, Protection, File System Structure. Allocation methods, Free Space Management.

**Unit -IV**

Deadlock, Deadlock Characterizations, method for Handling Deadlocks, Deadlock prevention, Avoidance, Detection, recovery from Deadlock, Safe state.

**Referenced Books:**

- [1] Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, "Operating System Concepts", WILEY Publication, Ninth Edition.
- [2] Andrew S. Tanenbaum, "Modern Operating Systems", Pearson Prentice Hall, Third Edition

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**Department of Computer Science**  
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B.Sc (Computer Science) Fourth Semester Syllabus

<b>Paper Title:</b> Management Information System	<b>Paper Number:</b> Second
<b>Paper Code:</b> B.Sc.-402	<b>Maximum Marks:</b> 80
<b>Unit –I</b>	
Information concepts, classification of information, methods of data and information collection, value of information, information: A quality product, General model of a human as information processor, Knowledge, MIS: Concept, Definition, Role of the MIS, Impact of MIS, MIS and the user, Management as a control system, MIS support to the management, Management effectiveness and MIS, Organization as system.	
<b>Unit –II</b>	
Information system, Major areas of information system, Component of Information system, Information system resource, Fundamental roles of Information system in Business, Trends in information system, Role of e-Business in Business, Classification of Information system, Managerial challenges in information technology, success and failure with information technology.	
<b>Unit –III</b>	
MIS: Organization effectiveness, Concept of corporate planning, Essentiality of strategic planning, Development of the business strategies, Type of strategies, short-range planning, tools of planning, MIS: strategic business planning.	
<b>Unit –IV</b>	
Competitive Strategy Concepts, Strategic Uses of Information technology, Value chain and strategic Information system, Agility and its major types, Creating a virtual company, knowledge management system	

**Referenced Books:**

- [1] James A O'Brien, George M Marakas "Management Information System", McGrawHill, Tenth Edition.
- [2] Leonard Jessup, Joseph Valacich, "Information System TODAY", PHI Publication.

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2.	B.Sc.-402	Management Information system	80
B.Sc. (Semester-V)			
S.N	Paper Code	Paper Name	Marks
1.	B.Sc.-501	Database and Software Engineering	80
2.	B.Sc.-502	Computer Architecture and Microprocessor	80
3.	B.Sc.-503	Advanced Computing Technologies	80
B.Sc. (Semester-VI)			
S.N	Paper Code	Paper Name	Marks
1.	B.Sc.-601	Application Development With java and .NET framework	80
2.	B.Sc.-602	Data Communication and Computer Network	80
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<b>Total Marks</b>			<b>1400</b>

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**Department of Computer Science**  
**University of Lucknow, Lucknow**  
**B.Sc (Computer Science) Fifth Semester Syllabus**

<b>Paper Title:</b> Database and Software Engineering	<b>Paper Number:</b> First
<b>Paper Code:</b> B.Sc.-501	<b>Maximum Marks:</b> 80

**Unit -I**

Data, Information and Knowledge, Introducing Databases and Different kinds of database users, Concept of a Database, Interacting with a Database, Architecture of a Database, Using Relational Databases, Basics of Relational Databases, Using Relational Databases, Identifiers For Relations, characteristics of database, database system concepts and Data Independence, Content of Data Dictionary, Data administration function, DBMS, Concurrency control, Database security, Database recovery.

**Unit -II**

Traditional Data Model – ANSI/SPRC 3-level Architecture, Overview of three Traditional models, Hierarchical, Network and Relational Models, Comparison of these models, File organization technique—Random file organization technique, Multi key file organization technique, Entity relationship Model, (ER Model), Structured Query Language- Introduction, Data definition, views and queries in SQL, Specifying constraints and indexes in SQL, Data Manipulation, Data maintenance, Multiple Table Operations, Transaction integrity facilities.

**Unit -III**

Why Software Engineering? Software processes-Software Process model (Water Fall model, iterative, spiral model, Prototype Model, COCOMO Model) Software Requirements: Functional and non-functional requirements user requirements, system requirements Software requirement document, DFD, PERT Chart, ER Diagram.

**Unit -IV**

Software Testing –System testing, Component testing, Integration testing, Black Box testing, White Box testing, alpha testing, Beta testing, Validation VS Verification, Software requirement specification (SRS) and its characteristics, Cohesion and its types, Coupling and its major types.

**Referenced Books:**

- [1] Korth Silberschatz, Sudarshan, "Database System Concepts", McGraw-Hill Publication.
- [2] Bipin C. Desai, "An Introduction to Database System", Galgotia publication.
- [3] Pankaj Jalote, " Software Engineering: A Precise Approach", Wiley publication.
- [3] Rajib Mall, " Fundamentals of Software Engineering", PHI publication.

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**Department of Computer Science**  
**University of Lucknow, Lucknow**  
B.Sc (Computer Science) Fifth Semester Syllabus

<b>Paper Title:</b> Computer Architecture and Microprocessor	<b>Paper Number:</b> Second
<b>Paper Code:</b> B.Sc.-502	<b>Maximum Marks:</b> 80
<b>Unit –I</b>	
Sequential circuit, Combinational Circuit, Flip-Flops (RS, Clocked RS, T, D, JK, Master Slave), Counters and its types, Registers, Encoder and Decoder, Half Adder, Full Adder, Half Sub-tractor, Multiplexer, De-Multiplexer.	
<b>Unit –II</b>	
Introduction of Microprocessor: Evolution of microprocessor, Embedded microprocessor, Bit-Slice Processor, RISC and CISC Processor, Vector Processor Array processor, Intel 8086 Microprocessor: Pin description of Intel 8086, operating model of 8086, Register organization of 8086, Bus Interface and Execution Unit (BIU and EU), Interrupts 8086 Read and write Bus Cycle.	
<b>Unit –III</b>	
8086 Instruction Group: Data transfer Instruction, Arithmetic Instruction, Logical Instruction processor Control Instructing, string Instructions, Interrupts instructions, Addressing modes of 8086 Micro-Processor	
<b>Unit –IV</b>	
Synchronous Data Transfer, Asynchronous Data Transfer, Interrupt Driven Data Transfer DMA Controller Address space partitioning – Memory mapped I/O scheme, I/O mapped I/O scheme.	

**Referenced Books:**

- [1] V. Rajaraman and T. Radhakrishnan, "Digital Logic and Computer Organization", PHI Publication, Fourth Edition.
- [2] B. Ram, "Fundamentals of Microprocessor and Microcomputers", Dhanpat Rai Publications, Sixth Edition.
- [3] M. Morris Mano, "Computer System Architecture", PHI publication, Third Edition.

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**Department of Computer Science**  
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**B.Sc (Computer Science) Fifth Semester Syllabus**

<b>Paper Title:</b> Advanced Computing Technologies	<b>Paper Number:</b> Third
<b>Paper Code:</b> B.Sc.-503	<b>Maximum Marks:</b> 80

**Unit -I**

Cloud Computing, Characteristics of Cloud Computing, Service models, Deployment Models, Benefits, Characteristics and adoption of IaaS, PaaS and SaaS, Cloud based Services and Application.  
 Image processing, Element of visual perception, a simple image model, sampling and quantization, some basic relationships between pixel, image geometry in 2D, image enhancement in the spatial domain, Image Compression.

**Unit -II**

Artificial Intelligent, underlying assumptions, AI techniques, Problem as a state space search, Production system, Neural network, Artificial Neural Networks, Biological Neural Network, Neural Network Application: Signal Processing, Control, Pattern Recognition, Medicine, Speech Production, Speech Recognition, Typical Architectures: Single Layer Net, Multilayer Net, Competitive layer Net.

**Unit -III**

Grid Computing, benefits and services, Grid computing architecture, Green computing and its need, Green computing and saving money, Green computing and Environment, Steganography, Data Compression, Entropy encoding, Source encoding, JPEG standards.

**Unit -IV**

Cyber security, cyber crimes, major categories of cybercrimes, cyber terrorism, challenges in cyber security, cyber warfare, cybersecurity legal provisions, major cyber security agencies in India.

**Referenced Books:**

- [1] Arshdeep Bahga and Vijay Madisetti, "Cloud Computing: A Hands on Approach", University Press.
- [2] Bud E. Smith, "Green Computing", CRC Press Taylor and Francis group Publications.
- [3] Brijendra Singh, "Data Communication and Computer Networks", PHI Publication, Fourth Edition.
- [4] Brijendra Singh, "Network Security and Management", PHI Publication, Third Edition.
- [5] Elaine Rich, Kevin Knight and Shivshankar B Nair, "Artificial Intelligence", McGraw Hill publication, Third Edition.
- [6] Laurence Fausett, "Fundamentals of Neural Networks", CRC Press Taylor and Francis group Publications.
- [7] Andrew S. Tanenbaum, "Computer Network", PHI publication, Third Edition.

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**Department of Computer Science**  
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**B.Sc (Computer Science) Sixth Semester Syllabus**

<b>Paper Title:</b> Application Development With Java and .NET framework	<b>Paper Number:</b> First
<b>Paper Code:</b> B.Sc.-601	<b>Maximum Marks:</b> 80

**Unit -I**

Introduction, The Origin of .Net Technology, Common Language Runtime (CLR), Common Type System (CTS), Common Language Specification (CLS), Microsoft Intermediate Language (MSIL), Just-In -Time Compilation, Framework Base Classes

**Unit -II**

HTML Tags, Paragraphing, line Break tag, Bullet and Numbering tag, Text formatting tags, (Bold, Italic, Underline, strike through, subscript, superscript) Marquee tag, Hyperlink tag, Inserting Back ground image, Horizontal Rule, Changing the Background and fore ground color, Creating table, merging cells, splitter cells, Inserting Colum heading table caption etc. Java Script, Cascading Style Sheet (CSS).

**Unit -III**

Control Flow Statements, Iterations, looping Structure, Array : Accessing Array elements, Multidimensional Arrays, Dynamic Arrays, Lbound and Ubound statements Option Base Statement, Interacting with the basic Controls, Forms, Form Collection, Controlling one form within another MDI form, command Buttons, Label Control, Text Box Control, Capturing the Key Strokes, List Box Controls, Combo Box Controls, more Controls : Radio Buttons, Scrollbars, timer Control, Running Lights Application, Image Control, Drive List Box, Searching a drive the directory list box, file Box copying a file, Deleting a File, Renaming a File, Moving a File.

**Unit -IV**

Java Programming Language and its oops features, Java features, java and world wide web, java environment and JDK (Java Development toolkit), Process of compilation, Java tokens, Identifiers, operators, variables and its declaration rules, data types, type-casting, java operators, control statement and looping structure in java, exception handling in java, servlet life cycle, swing and java Beans.

**Referenced Books:**

- [1] Christian Nagel, Bill Evjen, Jay Glynn, Karli Watson, Morgan Skinner "Professional C# 2012 and .NET 4.5", Wiley Publication.
- [2] Conrad Akunga, "Mastering C# 7.2 and .NET core 2.1 Application Development, Kindle Edition.
- [3] Ivan Bayross, "Web enabled commercial application Development using HTML, Javascript, DHTML and PHP", BPB Publication, 4<sup>th</sup> Revised Edition.
- [3] E Balagurusamy, "Programming with Java a primer", McGraw Hill Publication, 3<sup>rd</sup> Edition.

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**Department of Computer Science**  
**University of Lucknow, Lucknow**  
B.Sc (Computer Science) Sixth Semester Syllabus

<b>Paper Title:</b> Data Communication and Computer Network	<b>Paper Number:</b> Second
<b>Paper Code:</b> B.Sc.-602	<b>Maximum Marks:</b> 80

**Unit -I**

Data, Information, Data Vs Information, Data Communication and its Component, Communication Media, Data transmission Modes, Modem and its major types, Computer network and its advantages, World Wide Web, Internet, LAN, MAN, WAN, Bridge, router, Switch, Repeater.

**Unit -II**

OSI reference Model, TCP/IP Model, OSI Model Vs TCP/IP Model, Network topologies, IEEE Standards for Local Area Networks, IEEE 802.3 Ethernet Technologies, IEEE 802.4 Token Bus, IEEE 802.5 Token Ring, IEEE 802.6 Distributed, Queue Dual Bus, FDDI.

**Unit -III**

Sliding Window Protocols, Point-to-Point Protocol (PPP), Multiple Access Protocols, Error Detection and Error Correction, IPV6, IPV4, FTP, SMTP.

**Unit -IV**

Network Security and AIC triad (availability, integrity and confidentiality), Cryptography: Notion of Plain Text, Encryption, Key, Cipher Text, Decryption and cryptanalysis, Public Key Encryption, digital Signatures and Authentication.

**Referenced Books:**

- [1] Brijendra Singh, "Data Communication and Computer Networks", PHI Publication, Fourth Edition.
- [2] Brijendra Singh, "Network Security and Management", PHI Publication, Third Edition.
- [3] Behrouz A Forouzan, "Data Communication and Networking", McGraw Hill Publication, Fifth Edition.

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Department of Computer Science  
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B. Sc (Computer Science) Semester-wise Syllabus 2018-19

B.Sc - 603 Practical (Java, .NET framework, Microprocessor 8086, Database) MM-100

List of Exercise based on Java, .NET framework, Microprocessor 8086, Database:

**Java:**

1. Input output based simple java program
2. Control statement based java program
3. Looping structure based java program
4. Implementation of arrays and strings
5. Implementation nested loops.
6. Implementation of OOPs Concepts ,
7. Implementation of access modifiers.

**HTML and CSS implementation using .NET framework:**

1. Implementation of single and paired tags
2. Implementation of tables and frames
3. Implementation of cell spacing and cell padding
4. Implementation of marquee
5. Implementation of row span and column span
6. Implementation of java with HTML
7. CSS attachment and Implementation

**Exercise based on Database (Oracle latest version):**

1. Database, record and field creation.
2. Schema building
3. Implementation of DDL command
4. Implementation of DML command
5. Primary key, foreign key and composite key Implementation
6. Records insertion and retrieval through queries
7. Database connection to HTML page and inserting and retrieval of records through HTML pages.

**Exercise based on Microprocessor 8086:**

1. Implementation of Data transfer instructions
2. Implementation of Arithmetic Instructions
3. Implementation of logical instructions
4. Implementation of Branching Instructions
5. Implementation of Adders and Subtractors

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