# NATIONAL UNIVERSITY

Second Year Third Semester Syllabus

Department of Computer Science and Engineering

Four Year B.Sc. Honours Course

# National University

**Subject: Computer Science and Engineering**
**Syllabus for Four Year B.Sc. Honours Course**
**Year wise courses and marks distribution**

**SECOND YEAR THIRD SEMESTER**

| Course Code | Course Title | Credit Hours |
|---|---|---|
| 520201 | Data Structure | 3.0 |
| 520202 | Data Structure Lab | 1.5 |
| 520203 | Object Oriented Programming | 3.0 |
| 520204 | Object Oriented Programming Lab | 1.5 |
| 520205 | Computer Architecture | 3.0 |
| 520207 | Ordinary Differential Equation | 3.0 |
| 520209 | Fundamental of Business Studies | 3.0 |
| | **Total Credits in 3rd Semester** | **18.0** |

| Course Code : 520201 | Marks : 80 | Credits : 3 | Class Hours : 45 |
|---|---|---|---|
| Course Title : | Data Structure | | |

**Introduction:** Basic Terminology; Elementary Data Organization; Data Structures; Data Structure Operations; Control Structures; Algorithms: Complexity, Time-Space Tradeoff, Mathematical Notation and function, String Processing: String Operations, word processing, and Pattern Matching Algorithms.

**Arrays, Records and Pointers:** Linear Arrays; Representation of linear array in memory; Traversing linear arrays, Inserting and Deleting; Sorting; (Bubble sort), Searching (linear, binary), Multidimensional Arrays; Pointer Arrays; Record Structures; Matrices.

**Linked lists:** Representation of Linked lists in memory, Traversing a linked list, Searching a linked list, insertion, deletion; Header and two-way lists.

**Stacks, Queues, Recursion:** Array Representation of Stacks, Polish Notation; Quicksort, Recursive definition; Towers of Hanoi, Implementation of Recursive procedures, Queue Dequeue, Priority Queues.

**Trees:** Binary Trees; Representing Binary Trees in memory, traversing binary tree, Header Nodes; Threads , binary search trees, Heap tree, heap sort, Huffman's Algorithm.

**Graphs:** Sequential Representation of Graph; Adjacency Matrix; Path Matrix; Warshall's Algorithm; Linked representation of Graphs.

**Reference languages:** *C/C++.*

**Reference Books:**


1) *Seymour Lipschutz* ( Schaum's outline series), Data Structure (International Edition) 2) *Ellis Horowitz & Sartaj Sahni*, Data Structure and Algorthm.

3) *Robers L Kruse*, Data Structure & Programming Design, 2nd Ed.

4) Nell Dale, *C++ Plus Data Structure, Published by Jones and Bartlett Publishers Inc, 5th Edition.*

5) Seymour Lipschutz, *Theory and Problems of Data Structure, Published by McGraw Hill Inc.*


| Course Code : 520202 | Marks : 40 | Credits : 1.5 | Class Hours : -- |
|---|---|---|---|
| Course Title : | Data Structure Lab | | |

Laboratory classes are based on course CSE 520201. Students will be able to implement different data structures, like array, string, linked list, tree and graph using C/C++ programming language. They will be introduced with different sorting algorithms and advanced data structures such as heap, Fibonacci heap, storage management.

| Course Code : 520203 | Marks : 80 | Credits : 3 | Class Hours : 45 |
|---|---|---|---|
| **Course Title :** | **Object Oriented Programming** | | |

Principles of Object-Oriented Programming; Beginning with C++; Tokens, Expressions and Control Structure; Functions in C++; Classes and objects; Constructors and Destructors; Operator Overloading and Type conversions; Inheritance: Extending classes; Pointers, Virtual Functions and Polymorphism; Managing console I/O operations; Working with Files; Exception Handling; Template functions and classes; Multi-threaded Programming.

Introduction to java, comparison between java and c++, Applets and Servlets, basic of java.lang, java.util and java.io;.

**Reference languages:** *C++ or Java.*

**Reference Books:**


1) *E Balagurusamy* "Object- oriented programming with C++"

2) Robert Lafore, *Object Oriented Programming*, Published by MacMillan Computer Publishing, 3rd Edition.
3) Herbert Schildt, *Teach Yourself C++*, Published by McGraw Hill, 3rd Edition.
4) Paul Deitel and Harvey Deitel, *Java™ How to Program*, Published by Prentice Hall, 9th Edition.
5) Cay S. Horstmann and Gary Cornell, *Core Java™ Volume* 1 & 2, Published by Prentice Hall, 9th Edition.


| Course Code : 520204 | Marks : 40 | Credits : 1.5 | Class Hours : -- |
|---|---|---|---|
| **Course Title :** | **Object Oriented Programming Lab** | | |

Laboratory classes are based on course CSE 520203. The goal of this lab is to provide students with the skills needed to effectively design, develop, implement, debug, test, and maintain object oriented programs and more generally to solve problems using C++ or Java programming languages. They will exercise different advanced programming techniques of C++ and JAVA, like swing, socket programming, and windows programming. At the end of the course, students will have to develop a simple real-life programming project.

| Course Code : 520205 | Marks : 80 | Credits : 3 | Class Hours : 45 |
|---|---|---|---|
| Course Title : | Computer Architecture | | |

**Introduction:** Organisation and Architecture, Instruction sets- formats, cycle, timing etc; Addressing modes; Types of Instruction; RISC characteristics; CISC characteristics.

**Computer System:** System Buses, Components, Functions, Bus Interconnection,

**Computer Arithmetic:** Different types of data representation; Addition and Subtraction; Multiplication Algorithms; Division Algorithms.

**Memory Organization:** Main memory, Auxiliary memory, Associative memory, Cache memory, Virtual memory, Memory management requirements and hardware.

**Input-Output Organization:** Input-Output Interfaces; Data transfer, Interrupts; Direct Memory Access (DMA); Input-Output channel.

**Central Processing Unit(CPU):** ALU, CPU structure and Functions

**Control Unit:** Control Unit operation, Micro-operation, Control of processor, Hardwired Implementation.

**Fundamentals of parallel processing:** Parallel processing; Pipelining; Vector processing; Multiprocessors; Array processor, Bit-slice processor Interconnection structures

**Reference Books:**


1. William Stallings, Computer Organisation and Architecture
2. V. Hamcher, Z.Vranesic and S.Zaky, Computer Organisation
3. J.P. Hayes, Computer Architecture and Organisation
4. Dr. M. Rafiquzzaman, Fundamentals of Computer System Architecture


| Course Code : 520207 | Marks : 80 | Credits : 3 | Class Hours : 45 |
|---|---|---|---|
| Course Title : | Ordinary Differential Equation | | |

**Ordinary differential equations and their solutions :** Classification of differential equations. Solutions. Implicit solutions. Singular solutions. Initial value problems, boundary value problems. Basic existence and uniqueness theorems (statement and illustration only). Direction fields. phase line.

**Solution of first order equations :** Separable equations and equations reducible to this form. Linear equations, exact equations, Special integrating factors, Substitutions and transformations. **Modeling**

**with first order differential equations:** Constructions of differential equations as mathematical models (exponential growth and decay, heating and cooling, mixture of solutions, series circuit, logistic growth, chemical reaction, falling bodies). model solutions and interpretation of results. orthogonal and oblique trajectories.

**Solutions of higher order linear differential equations :** Linear differential operators. Basic theory of linear differential equations. Solution space of homogeneous systems. Reduction of order. Homogeneous linear equations with constant coefficient. Non homogeneous equation. Method of undetermined coefficient. Variation of parameters. Euler-cauchy differential equations.

**Modeling with second-order equations:** Vibration of a mass on a spring, free and undamped motion, free and damped motion, forced motion, resonance phenomena, electric problems, motion of a rocker.

## Reference Books:


1. Abu Yusuf, *Differential Equations.*
2. Dr. Abdul Matin, *Differential Equations.*
3. Kuddus, Hafiz, *Ordinary Differential Equation*, Titas Publications.


| Course Code : 520209 | Marks : 80 | Credits : 3 | Class Hours : 45 |
|---|---|---|---|
| Course Title : | Fundamental of Business Studies | | |

**The Business Enterprise:** Foundation of Business, Forms of Business Ownership,

Entrepreneurship, Franchising and Small Business, International Business.

**The Environment of Business:** Social responsibility and Business Ethics, Business Law and Government.

**Management and Organization:** Fundamentals of Management, Organization of Business, Managing production and operation.

**Human Resources:** Human Relations and Motivation, Managing Human Resources, Labor Management Relations.

**Marketing:** Marketing Strategies, Product and Price, Distribution and Promotion,

**Financial Management:** Money and Banking, Financial Management, Investment and Personal Finance, Risk Management and Insurance.

**Accounting and Information Systems:** Accounting Fundamentals, Computer and Management Information Systems.

## Reference Books:


1. Harman, Edwards and Maher, *Accounting a Business Perspective.*
2. Prof. Md. Khalequzzaman and Prof. Mosharraf H Chowdhury, *Introduction to Business.*
3. Md. Hafiz Uddin, *Basic Accounting* (English Version), The Angel Publications.