

Core Course

CC-201 Computer Organization & Advanced Microprocessor

Course Introduction:

The purpose of this course is to study and understand the basic organization of computers and the working of each component. It gives a brief overview about the microprocessors and its types. It also introduces the assembly language and the current microprocessors in the market.

Objectives:

The student would be able to:

- 1.) Understand the working of basic computer components and CPU operation.
- 2.) Data Representation in computers.
- 3.) Understand the concepts related to computer memory.
- 4.) Understand Microprocessors, their working and current microprocessors.

No. of Credits: 3

Theory Sessions per week: 4

Teaching Hours: 40 hours

UNIT	TOPICS / SUBTOPICS	TEACHING HOURS
1	Computer Operation	10 hours
	<ul style="list-style-type: none"> • Introduction • Computer Organization • Von Neumann architecture 	1 hrs
	<ul style="list-style-type: none"> • Device controller <ul style="list-style-type: none"> ○ Device Interface signals ○ I/O Drivers 	1 hrs
	<ul style="list-style-type: none"> • CPU operation <ul style="list-style-type: none"> ○ CPU states ○ CPU Registers ○ Clock ○ CPU memory communication ○ Instruction format and Instruction cycle ○ Macro operation & micro operation ○ RTL (Register Transfer Language) ○ Instruction set design ○ Bus Concept ○ Instruction execution 	7 hrs
	<ul style="list-style-type: none"> • Interrupts 	1 hrs
	Data Representation and Digital logic	10 hours
	<ul style="list-style-type: none"> • Fixed point Numbers <ul style="list-style-type: none"> ○ Representation types <ul style="list-style-type: none"> ▪ Sign Extension ▪ 1's complement ▪ 2's complement 	2 hrs

2	<ul style="list-style-type: none"> • Floating point Numbers <ul style="list-style-type: none"> ○ IEEE Representation (Only Single precision) ○ Normalization ○ Excess code 	3 hrs
	<ul style="list-style-type: none"> • Gates <ul style="list-style-type: none"> ○ AND ○ OR ○ NOT ○ X-OR ○ X-NOR ○ NAND ○ NOR • Flip-flops <ul style="list-style-type: none"> ○ R-S ○ JK ○ D ○ T • Half adder and Full adder • Encoder and Decoder • Multiplexer and Demultiplexer <p>Note: Only Block diagram and truth table.</p>	5 hrs
3	Memory Organization & Management	10 Hours
	<ul style="list-style-type: none"> • Classification of memory <ul style="list-style-type: none"> ○ By functionality(main, auxiliary, cache, associative, virtual) ○ By access(random access, sequential access, semi random) ○ By capability(RAM, ROM) 	2 hrs
	<ul style="list-style-type: none"> • Memory hierarchy • Memory parameters • Main memory Limitation • Instruction prefetch • Write Buffer 	3 hrs
	<ul style="list-style-type: none"> • Cache memory <ul style="list-style-type: none"> ○ Cache principle ○ Cache hit and cache miss ○ Mapping(direct, associative, se associative) ○ Cache replacement ○ Cache write ○ Cache coherence 	5 hrs

4	Microprocessors	10 hours
	<ul style="list-style-type: none"> • Introduction to microprocessors <ul style="list-style-type: none"> ○ Microcontroller ○ RISC & CISC Microprocessors ○ Scalar & super scalar processors ○ Vector & array processors 	2 hrs
	<ul style="list-style-type: none"> • Intel 8086 <ul style="list-style-type: none"> ○ Pin description ○ Operating modes <ul style="list-style-type: none"> ▪ Maximum mode pin description ▪ Minimum mode pin description ○ 8086 Register organization ○ BIU & EU ○ Addressing modes of 8086 ○ Interrupts 	6 hrs
<ul style="list-style-type: none"> • Introduction to Advanced Microprocessors <ul style="list-style-type: none"> ○ Chronology of Intel processors <ul style="list-style-type: none"> ▪ Pentium ▪ Pentium Pro ▪ Pentium II ▪ Pentium III ▪ Pentium IV ▪ Itanium ○ Latest Intel processors <ul style="list-style-type: none"> ▪ Atom ▪ I3 ▪ I5 ▪ I7 ○ AMD processors ○ MIPS processors ○ SUN's Sparc processor ○ Mobile/Tablet processors 	2 hrs	

Note: Demo/Assignments of Assembly language programs based on addition, subtraction, multiplication and division should be shown/ given to the students. Programs/Instructions based on these programs should NOT be asked in examination.

Textbook:

Computer Organization and Advanced Microprocessors

By: Tripti Dodiya & Zakiya Malek

Publisher: Cengage

Reference Books:

1. Computer architecture and organization
By: B Govindrajalu
Publisher: Tata Mcgraw Hill
2. Advanced Microprocessors and Interfacing
By: - Badri Ram
Publisher: Tata Mcgraw Hill

Core Course CC-202 Data Structures

Course Introduction:

This course introduces students to get the detailed knowledge of basic data structures, representations, building and use of these data structures in different applications in real world.

Objectives:

Students would be able to:

- 1.) Understand the concept, role and importance of data structure.
- 2.) Recognize the use of data structure for real applications.
- 3.) Identify the key differences between various data structures.
- 4.) Comprehend the type of data structure to apply according to the scenery of applications.
- 5.) Be aware about the real building of the data structure using various programming languages.
- 6.) Implement the various operations of data structures by using algorithms.

No. of Credits: 3

Theory Sessions per week: 4

Teaching Hours: 40 hours

UNIT	TOPICS / SUBTOPICS	TEACHING HOURS
1	Introduction to Data Structures, Arrays & Linked List	10 hours
	<ul style="list-style-type: none"> • Introduction <ul style="list-style-type: none"> ○ Data ○ Data Types <ul style="list-style-type: none"> ▪ Abstract Data Types (Primitive) ▪ User-Defined Data Types (Non-Primitive) ○ Data Structures: ○ Definition ○ Classification of Data Structures and details of each classifications 	2 hrs
	<ul style="list-style-type: none"> • Array <ul style="list-style-type: none"> ○ Definition ○ Mapping ○ Sparse Matrix 	1 hrs
	<ul style="list-style-type: none"> • Linked list <ul style="list-style-type: none"> ○ Comparison of Array and Linked List ○ Types of Linked Lists ○ Representation of Linked Lists ○ Operations on Doubly Linked Lists (Algorithm and Explanation) <ul style="list-style-type: none"> ▪ Creation ▪ Traversal 	2 hrs

	<ul style="list-style-type: none"> ▪ Insertion <ul style="list-style-type: none"> i. At Front ii. In Between (After and Before) iii. At End ▪ Deletion <ul style="list-style-type: none"> i. From Beginning ii. From Between iii. From End 	
	<ul style="list-style-type: none"> • Searching: <ul style="list-style-type: none"> ○ Introduction to Searching ○ Searching Techniques: <ul style="list-style-type: none"> ▪ Sequential Search ▪ Binary Search 	2 hrs
	<ul style="list-style-type: none"> • Sorting: <ul style="list-style-type: none"> ○ Introduction to Sorting ○ Sorting Techniques: <ul style="list-style-type: none"> ▪ Bubble sort ▪ Selection sort ▪ Insertion sort ▪ Quick sort ▪ Merge sort 	3 hrs
	Stack & Queues	10 hours
2	<ul style="list-style-type: none"> • Stack: <ul style="list-style-type: none"> ○ Introduction (Idea of the Stack) ○ Operations of the Stack (Algorithm and Explanation) ○ Implementation of the Stack (Using linked list) ○ Applications of the Stack: <ul style="list-style-type: none"> ▪ Definition: Reverse and Polish ▪ Conversion: Infix to Postfix using manually and stack for parenthesis and Non-parenthesis (with Algorithm) ▪ Recursion(Definition) 	5 hrs
	<ul style="list-style-type: none"> • Queue: <ul style="list-style-type: none"> ○ Introduction (Idea of the Queue) ○ Types of Queue ○ Operations of Simple and Circular Queue (Algorithm and Explanation) ○ Implementation of the Queue (Using Linked list) 	5 hrs
	Tree	10 hours
	<ul style="list-style-type: none"> • Introduction • Terminology • Binary Tree: <ul style="list-style-type: none"> ○ Definition ○ Representation of Binary Tree ○ Operation on Binary Tree <ul style="list-style-type: none"> ▪ Creation 	5 hrs

3	<ul style="list-style-type: none"> ▪ Insertion ▪ Deletion ▪ Traversal (Pre-Order, In-Order and Post-Order) ▪ Conversion from (Pre, In or Post) into Binary Tree 	
	<ul style="list-style-type: none"> • Types of Binary Tree <ul style="list-style-type: none"> ○ Full Binary Tree ○ Complete Binary Tree ○ Binary Search Tree ○ Expression Tree ○ Threaded Binary Tree ○ Heap Tree ○ Height Balanced Tree (AVL Tree) ○ B-Tree 	5 hrs
4	Graph	10 hours
	<ul style="list-style-type: none"> • Introduction • Basic Terminology • Representation of Graph <ul style="list-style-type: none"> ○ Adjacency Matrix (Array) ○ Adjacency Linked • Traversal of Graph <ul style="list-style-type: none"> ○ Breadth First Traversal (Algorithm and Tracing) ○ Depth First Traversal (Algorithm and Tracing) 	6 hrs
	<ul style="list-style-type: none"> • Application of Graph <ul style="list-style-type: none"> ○ Spanning Tree <ul style="list-style-type: none"> ▪ Minimum Spanning Tree (BFS and DFS) ▪ Prim's Algorithm ▪ Kruskal's Algorithm ○ Shortest Path Algorithm ○ Dijkstra's Algorithm 	4 hrs

Textbook:

Data and File Structures using C
 Publisher: Oxford
 By Reema Thareja

Reference Book:

1. Data Structures and Algorithms in C++
 Publisher: Dreamtech
 By B. M. Harvani
2. Magnifying Data Structures
 Publisher: PHI

By: Arpita Gopal

3. Data Structures using C & C ++

Publisher: Wiley-India

By : Rajesh K. Shukla

4. Introduction to Data Structures in C

Publisher: Pearson Education

By: Ashok N. Kamthane

5. Data Structures Using C

Publisher: Pearson Education

By : A. K Sharma

Core Course
CC- 203 Object Oriented Concepts and Programming

Course Introduction:

Students will be provided with the overview of objects and basic knowledge of C++ programming language – Class, Objects, Constructors, Destructors, Virtual Functions, Templates, etc.

Objectives:

Students would be able to:

- 1.) Get in-depth practical knowledge of C++ language.
- 2.) Understand how to use C++ programming real-life applications.

No. of Credits: 3

Theory Sessions per week: 4

Teaching Hours: 40 hours

UNIT	TOPICS / SUBTOPICS	TEACHING HOURS
1	OOPS Introduction	10 hours
	<ul style="list-style-type: none"> • Overview of Object Oriented Programming <ul style="list-style-type: none"> ○ Introduction to Object Oriented Programming ○ Procedure Oriented and Object Oriented ○ Difference Between C and C++ ○ C++ Output/ Input ○ Keywords in C++ ○ New style of header file specification ○ Comments in C++ ○ Variables in C++ ○ Reference Variables in C++ ○ The bool Data type ○ Importance of function prototyping in C++ ○ Function Overloading ○ Default Arguments ○ Inline Function ○ Scope Resolution Operator 	6 hrs
	<ul style="list-style-type: none"> • Classes And Object <ul style="list-style-type: none"> ○ Structures in C ○ Structure in C++ ○ Access Specifier ○ Classes ○ Objects in C++ ○ Characteristics of Access Specifier 	4 hrs

	<ul style="list-style-type: none"> ○ Function outside a class ○ Initialization of variable in C++ ○ Arrow Operator ○ 'this' pointer 	
2	More on++Classes and Object, Dynamic Memory Management, Constructor & Destructor	10 hours
	<ul style="list-style-type: none"> • More on Classes and Objects <ul style="list-style-type: none"> ○ Member Functions and Data Members ○ Friend Functions ○ Friend Class ○ Array of Class Object ○ Passing Class Objects to Function ○ Returning Objects from Functions ○ Nested Classes ○ Namespaces 	5 hrs
	<ul style="list-style-type: none"> • Dynamic Memory Management <ul style="list-style-type: none"> ○ Introduction ○ Dynamic Memory Allocation Using “new” ○ Dynamic Memory Deallocation ○ “Set_New_Handler” Function 	2 hrs
	<ul style="list-style-type: none"> • Constructor and Destructor <ul style="list-style-type: none"> ○ Constructor ○ Characteristics of Constructor ○ Types of Constructor ○ Destructor ○ Characteristics of Destructor 	3 hrs
3	Inheritance and Polymorphism	10 hours
	<ul style="list-style-type: none"> • Inheritance <ul style="list-style-type: none"> ○ Introduction ○ Advantages of Inheritance ○ ‘Protected’ Access specifier ○ Inheritance using different access specifier ○ Initialization of Base class members through derived class object ○ Different forms of Inheritance ○ Function Overriding 	5 hrs
	<ul style="list-style-type: none"> • Virtual Functions and Inheritance <ul style="list-style-type: none"> ○ Introduction ○ Pointers to derived class ○ Rules for virtual function ○ Internals of Virtual Functions ○ Pure virtual function 	5 hrs

	<ul style="list-style-type: none"> ○ Virtual Base class ○ Virtual destructor ○ Abstract class ○ Limitations of virtual Function ○ Early binding v /s Late binding 	
4	Operator Overloading, Constructor-Destructor Invocation and Templates	10 hours
	<ul style="list-style-type: none"> • Operator Overloading <ul style="list-style-type: none"> ○ Introduction ○ Operators that can be overloaded ○ Overloading Unary Operator using member Functions ○ Overloading Unary Operator using friend Functions ○ Overloading Binary Operator using member Functions ○ Overloading Binary Operator using friend Functions ○ Why to Overload Operators using friend Function? ○ Rules for Operator Overloading 	5 hrs
	<ul style="list-style-type: none"> • Constructor- Destructor Invocation <ul style="list-style-type: none"> ○ Introduction ○ Order of Invocation of Constructors and destructors ○ Destructors in Action ○ Type Conversions 	2 hrs
	<ul style="list-style-type: none"> • Templates <ul style="list-style-type: none"> ○ Introduction ○ Function Templates ○ Function Templates with multiple parameters ○ Overloading Function Template ○ Class Template ○ Class Template with multiple parameters ○ Nested Class Templates ○ Advantages of using Templates 	3 hrs

Textbook:

Object Oriented Programming with C++
Publication: Pearson
By Subhash KU

Reference Book:

1. Object-Oriented Programming with C++ (Second Edition)
Publication: PHI
By Poornachandra Sarang

2. Object Oriented Programming using C++
Publication: Cengage Learning
By Joyce Farrell

3. Object Oriented Programming In C++
Publication: Wiley India Edition
By Rajesh K. Shukla

Core Course CC-204 Fundamentals of Operating System

Course Introduction:

This course covers fundamentals of processes, scheduling concepts, memory management, I/O and file systems in a typical operating system.

Objectives:

Students would be able to

- 1.) Know the components of an operating system
- 2.) Understand the basics of process management and memory management.
- 3.) Know the concepts of I/O and file systems
- 4.) Provide information about the functions and roles of each of the components of the operating system.

No. of credits: 3

Lectures per week: 4

Teaching Hours: 40 hours

UNIT	TOPICS/SUB TOPICS	TEACHING HOURS
1.	Introduction to Operating System & Processor Management	10 hours
	<ul style="list-style-type: none"> • Introduction to Operating System <ul style="list-style-type: none"> ○ What is Operating System? ○ Operating system software ○ Types of Operating System 	2 hrs
	<ul style="list-style-type: none"> • Processor Management <ul style="list-style-type: none"> ○ Job Scheduler, Process Scheduler, ○ Job and Process Status ○ Process Control Block ○ Process Scheduling Policies ○ Process Scheduling Algorithms: <ul style="list-style-type: none"> ▪ First Come First Serve, Shortest Job Next, Priority Scheduling, Shortest Remaining Time, Round Robin 	8 hrs
	<ul style="list-style-type: none"> • Process Synchronization <ul style="list-style-type: none"> ○ What is parallel Processing? ○ Typical Multiprocessing configurations ○ Process Synchronization Software-test and set, Wait and Signal ○ Semaphores ○ Process Cooperation-Producers and consumers 	
	Deadlock & Device Management	10 hours
	<ul style="list-style-type: none"> • Deadlock <ul style="list-style-type: none"> ○ Seven cases for dead lock ○ Conditions for Deadlock ○ Strategies for handling Deadlocks ○ Starvation(Dining Philosophers Problem) 	5 hrs

2.	<ul style="list-style-type: none"> • Device Management <ul style="list-style-type: none"> ○ Types of System Devices ○ Component of I/O subsystem ○ Communication among devices ○ Management of I/O requests ○ Device Handler Seek Strategies <ul style="list-style-type: none"> ▪ FCFS ▪ SSTF ▪ Elevator(Look) ○ RAID 	5 hrs
3.	Memory Management	10 hours
	<ul style="list-style-type: none"> • Memory Management: Early System <ul style="list-style-type: none"> ○ Single User Contiguous Scheme ○ Fixed Partitions ○ Dynamic Partitions ○ Allocation and deallocation methods ○ Relocatable Dynamic Partitions 	4 hrs
	<ul style="list-style-type: none"> • Memory Management: Virtual Memory <ul style="list-style-type: none"> ○ Paged Memory Allocation ○ Demand Paging ○ Page Replacement Algorithms <ul style="list-style-type: none"> ▪ First In First Out ▪ Least Recently Used ○ Segmented Memory allocation ○ Segmented/Demand Paged Memory allocation ○ Virtual Memory 	6 hrs
4.	File Management & Security	10 hours
	<ul style="list-style-type: none"> • The File Manager • Interacting with the file manager <ul style="list-style-type: none"> ○ Typical Volume Configuration ○ About Subdirectories • File Organization • Physical storage allocation • Data Compression • Access Control Verification module 	8 hrs
	<ul style="list-style-type: none"> • Security <ul style="list-style-type: none"> ○ Role of Operating system in security ○ Security Breaches ○ System Protection 	2 hrs

Text Book:

Operating Systems
Publication: Cengage learning
By Flynn/Mc Hoes,

Reference Books:

1. Operating Systems Concepts
Publication: Pearson Higher Education
By Silberschatz, Galvin &Gagne
2. Operating Systems: Internals and Design Principles, 5/E
Publication: Pearson Higher Education
By William Stallings

Core Course
CC- 205 Statistical Computing

Course Introduction:

This course introduces the subject of statistics and statistical problem solving. It also develops the ability to find approximate solutions and/or answer by choosing correct statistical technique for a given problem.

Objectives:

Students will be able to:

- 1.) Get a working knowledge of statistical methods.
- 2.) Understand the use of statistical methods with computer related computational approach.
- 3.) With statistical techniques so that they are prepared to apply the knowledge in the field of computer science.

No. of Credits: 3

Theory Sessions per week: 4

Teaching Hours: 40 hours

UNIT	TOPICS / SUBTOPICS	TEACHING HOURS
1	Introduction and Measures of Central Tendency	10 hours
	<ul style="list-style-type: none"> • Definitions, Functions, Scope and Limitations of Statistics <ul style="list-style-type: none"> ○ Introduction ○ Meaning of Statistics ○ Functions of Statistics ○ Scope or Importance of Statistics ○ Limitations of Statistics 	2 hrs
	<ul style="list-style-type: none"> • Measures of Central Tendency <ul style="list-style-type: none"> ○ Introduction ○ Characteristics of a Good Average. • Different Types of Measures of Central Tendency <ul style="list-style-type: none"> ○ Mean <ul style="list-style-type: none"> ▪ Arithmetic Mean ▪ Arithmetic Mean of Grouped Frequency Distribution ▪ Short-cut Method and Step-Deviation Method of Obtaining Arithmetic Mean (Excluding Mathematical Properties of A.M) ▪ Combined Arithmetic Mean ▪ Cumulative Arithmetic Mean ▪ Advantages, disadvantages of Arithmetic Mean ▪ Geometric Mean 	8 hrs

	<ul style="list-style-type: none"> ▪ Advantages, disadvantages and uses of G. M ▪ Harmonic Mean ▪ Advantages, disadvantages and Uses of H.M ▪ Relation Among A.M.,G.M.,H.M. ▪ Weighted Arithmetic Mean ○ Median <ul style="list-style-type: none"> ▪ Individual Frequency Distribution ▪ Ungrouped Frequency Distribution ▪ Grouped Frequency Distribution ▪ Advantages, disadvantages and uses of Median ○ Mode <ul style="list-style-type: none"> ▪ Individual Frequency Distribution ▪ Ungrouped Frequency Distribution ▪ Grouped Frequency Distribution ▪ Advantages, disadvantages and uses of Mode <p>Practical Demo should be given for Mean, Median and Mode in Excel</p>	
	Measures of Dispersion Or Variation	10 hours
2	<ul style="list-style-type: none"> • Quartiles, Deciles and Percentiles • Introduction, Objectives and essentials of a good measure • Absolute and Relative Measures of Dispersion <ul style="list-style-type: none"> ○ Range ○ Quartile Deviation <ul style="list-style-type: none"> ▪ Advantages and disadvantages of Q.D. ▪ Coefficient of Quartile Deviation 	4 hrs
	<ul style="list-style-type: none"> ○ Mean Deviation <ul style="list-style-type: none"> ▪ Coefficient of Mean Deviation ▪ Advantages and disadvantages of M.D. ○ Standard Deviation <ul style="list-style-type: none"> ▪ Alternative Method of Standard Deviation ▪ Relationship among Q.D., M.D., S.D. ▪ Advantages and disadvantages of S.D. 	4 hrs
	<ul style="list-style-type: none"> ○ Variance (Excluding Properties of S.D) <ul style="list-style-type: none"> ▪ Coefficient of Variation ▪ Direct Method ▪ Step-Derivation Method <p>Practical Demo should be given for Range, Q.D, M.D, S.D in Excel</p>	2 hrs
	Probability and Mathematical Expectation	10 hours
	<ul style="list-style-type: none"> • Probability <ul style="list-style-type: none"> ○ Introduction ○ Definitions of Some Important Terms <ul style="list-style-type: none"> ▪ Random Experiment ▪ Trial Event ▪ Favorable Cases 	3 hrs

3	<ul style="list-style-type: none"> ▪ Equally Likely Events ▪ Mutually Exclusive Events ▪ Exhaustive Events ▪ Dependent Events ▪ Independent Events 		
	<ul style="list-style-type: none"> ○ Classical approach to probability ○ Statistical approach to probability ○ Modern approach to probability ○ Symbols associated with probability ○ Algebra of sets ○ Conditional Probability ○ Theorems (Laws) of Probability(Without Proof only Examples) <ul style="list-style-type: none"> ▪ Addition (Only for two events) ▪ Multiplication (Only for two events) ○ Baye's Rule(only for two events) 	7 hrs	
4	Correlation Analysis And Regression Analysis		10 hours
	<ul style="list-style-type: none"> • Correlation Analysis <ul style="list-style-type: none"> ○ Introduction ○ Types of Correlation <ul style="list-style-type: none"> ▪ Positive, Negative and Zero Correlation ▪ Linear and non-linear Correlation ▪ Simple, Multiple and Partial Correlation ▪ Positive, Negative and Zero Correlation ▪ Methods of Measuring Correlation ▪ Karl Pearson's Product Moment Method ▪ Spearman's Rank Method ▪ Concurrent Deviation Method 	6 hrs	
	<ul style="list-style-type: none"> • Regression Analysis <ul style="list-style-type: none"> ○ Definition <ul style="list-style-type: none"> ▪ Regression Equation. ▪ Method of Least Squares. ▪ The regression equation of Y on X ▪ The regression equation of X on Y ▪ Regression Coefficient & Its Properties (without proof) ○ Correlation Versus Regression ○ Coefficient of Determination <p>Practical Demo should be given for Correlation and Regression in Excel</p>	4 hrs	

Note: - Excel function/s and its syntax should not be asked in theory examination.

Textbook:

Business Statistics (Third Revised Edition)

Publication: S.Chand

By Padmalochan Hazarika

- **Chapter-1**(1.1,1.2,1.3,1.4,1.5)
- **Chapter-5**(5.1,5.2,5.4,5.5)
- **Chapter-6**(6.1,6.2,6.3,6.4,6.5(Excluding Lorenz Curve))
- **Chapter-8**(8.1,8.2,8.3)
- **Chapter-13**(13.1, 13.2)

Reference Book:

1. Business Mathematics and Statistics
Publication: Tata McGraw Hill Education Private Limited
By N G Das and J K Das

Core Course
CC-206 *CC-202 Practical

Course Introduction:

Student will be provided with practical knowledge of basic data structures, representation, building and use of various data structures in different applications in real world.

Objectives:

- 1.) To gain the knowledge of various advanced data structure topics practically.
- 2.) To develop skills for effective use of the pointers and structures in programming.

No. of Credits: 3

Practical Sessions per week: 3

Teaching Hours: 40 hours

The students are expected to write program in “C or C++ Programming “languages unit wise as given below. The list in each unit is indicative only and may or may not be asked in the examination. The programs given below are only sample example for practice in lab.

UNIT	TOPICS / SUBTOPICS	TEACHING HOURS
1	Link List	10 hrs
	1. Write program to implement following operations using Singly link list <ul style="list-style-type: none"> • Insert at first • Insert at Last • Insert at specified location (Before or After the Node) • Delete from first • Delete from last • Delete any specified node • Traversal • Sorting • Splitting • Merging • Counting Operations(Total no. of nodes, even and odd no. of nodes) 	4 hrs
	2. Write program to implement following operations using Doubly link list <ul style="list-style-type: none"> • Insert at first • Insert at Last • Insert at specified location (Before or After the Node) • Delete from first • Delete from last • Delete any specified node • Traversal • Sorting • Splitting 	6 hrs

	<ul style="list-style-type: none"> • Merging • Counting Operations(Total no. of nodes, even and odd no. of nodes) 	
2	Searching and Sorting	10 hrs
	1. Write a program to implement sequential search.	2 hrs
	2. Write a program to implement binary search.	
	3. Write a program to implement bubble sort.	8 hrs
	4. Write a program to implement selection sort	
	5. Write a program to implement merge sort	
	6. Write a program to implement quick sort	
7. Write a program to implement insertion sort.		
3	Stack	10 hrs
	1. Write a program to implement following operations in stack Using Linked List. <ul style="list-style-type: none"> • PUSH • POP • PEEP • CHANGE 	5 hrs
	2. Write a program to implement Evaluation of given postfix expression.	
	3. Write a program to implement conversion of infix expression into postfix expression (parentheses and non parentheses).	5 hrs
	4. Write a program to implement recursion.	
5. Write a program to reverse the string using the stack.		
4.	Queue, Tree and Graph.	10 hrs
	1. Write a program to implement Simple Queue operations using Linked List. <ul style="list-style-type: none"> • ENQUEUE • DEQUEUE • Traversal (display) 	5 hrs
	2. Write a program to implement Circular Queue operations Using Linked List. <ul style="list-style-type: none"> • ENQUEUE • DQUEUE • Traversal (display) 	
	3. Write a program to implement following operations on Binary Search Tree using Linked List. <ul style="list-style-type: none"> • Creation • Insertion • Traversal(In-order, Pre-order, Post-order) 	5 hrs
4. Write a program to implement following DFS and BFS traversal Of a graph.		

Note: The students should maintain the record of typical (not simple ones) programs in their file, which duly certified, should be presented at the time of final examination.

Textbook:

Data and File Structures using C
Publisher: Oxford
By Reema Thareja

Reference Book:

1. Data Structures and Algorithms in C++
Publisher: Dreamtech
By B. M. Harvani
2. Magnifying Data Structures
Publisher: PHI
By: Arpita Gopal
3. Data Structures using C & C ++
Publisher: Wiley-India
By : Rajesh K. Shukla
4. Introduction to Data Structures in C
Publisher: Pearson Education
By: Ashok N. Kamthane
5. Data Structures Using C
Publisher: Pearson Education
By : A. K Sharma

Core Course
CC-207 *CC-203 Practical

Course Introduction:

Students will be provided with practical knowledge of C++ programming language – Class, Objects, Constructors, Destructors, Virtual Functions, Templates, etc.

Objectives:

- 1.) The objective of this subject is to get in-depth practical knowledge of C++ language.
- 2.) To obtain practical knowledge of programming for real life applications.

No. of Credits: 3

Practical Sessions per week: 3

Teaching Hours: 40 hours

The students are expected to write program in ‘C++’ language unit wise as given below. The list in each unit is **indicative only and may or may not be asked in the examination.**

UNIT	TOPICS / SUBTOPICS	TEACHING HOURS
	Introduction to OOP, Classes & Objects	10 hrs
1	1 Write a program to calculate the area of circle, rectangle and square using function overloading.	
	2 Write a program to demonstrate the use of default arguments in function overloading.	
	3 Write a program to demonstrate the use of returning a reference variable.	
	4 Create a class student which stores the detail about roll no, name, marks of 5 subjects, i.e. science, Mathematics, English, C, C++. The class must have the following: <ul style="list-style-type: none"> • Get function to accept value of the data members. • Display function to display values of data members. • Total function to add marks of all 5 subjects and store it in the data members named total. 	
	5 Create a function power() to raise a number m to power n. the function takes a double value for m and int value for n, and returns the result correctly. Use the default value of 2 for n to make the function calculate squares when this argument is omitted. Write a main that gets the values of m and n from the user to test the function.	
	6 Write a basic program which shows the use of scope resolution operator.	
	7 Write a C++ program to swap the value of private data members from 2 different classes.	
	8 Write a program to illustrate the use of this pointer.	
	9 An election is contested by five candidates. The candidates are numbered 1 to 5 and the voting is done by marking the candidate number on the ballot paper. Write a program to read the ballots and count the votes cast for each candidate using an array variable count. In case a number is read	

		outside the range of 1 to 5, the ballot should be considered as a 'spoilt ballot' and the program should also count the number of spoilt ballots.	
	10	Write a program to call member functions of class in the main function using pointer to object and pointer to member function.	
		Dynamic Memory Management, Constructor & Destructor, Inheritance	10 hrs
2	1	Using friend function find the maximum number from given two numbers from two different classes. Write all necessary functions and constructors for the program.	
	2	Using a friend function, find the average of three numbers from three different classes. Write all necessary member functions and constructor for the classes.	
	3	Define currency class which contains rupees and paisa as data members. Write a friend function named AddCurrency () which add 2 different Currency objects and returns a Currency object. Write parameterized constructor to initialize the values and use appropriate functions to get the details from the user and display it.	
	4	Create Calendar class with day, month and year as data members. Include default and parameterized constructors to initialize a Calendar object with a valid date value. Define a function AddDays to add days to the Calendar object. Define a display function to show data in "dd/mm/yyyy" format.	
	5	Create a class named 'String' with one data member of type char *, which stores a string. Include default, parameterized and copy constructor to initialize the data member. Write a program to test this class.	
	6	Write a base class named Employee and derive classes Male employee and Female Employee from it. Every employee has an id, name and a scale of salary. Make a function ComputePay (in hours) to compute the weekly payment of every employee. A male employee is paid on the number of days and hours he works. The female employee gets paid the wages for 40 hours a week, no matter what the actual hours are. Test this program to calculate the pay of employee.	
	7	Create a class called scheme with scheme_id, scheme_name, outgoing_rate, and message_charge. Derive customer class from scheme and include cust_id, name and mobile_no data. Define necessary functions to read and display data. Create a menu driven program to read call and message information for a customer and display the detail bill.	
	8	Write a program with use of inheritance: Define a class publisher that stores the name of the title. Derive two classes book and tape, which inherit publisher. Book class contains member data called page no and tape class contain time for playing. Define functions in the appropriate classes to get and print the details.	
	9	Create a class account that stores customer name, account no, types of account. From this derive classes cur_acc and sav_acc to include necessary member function to do the	

		<p>following:</p> <ul style="list-style-type: none"> • Accepts deposit from customer and update balance • Compute and Deposit interest • Permit withdrawal and Update balance. 	
	10	Write a base class named Employee and derive classes Male employee and Female Employee from it. Every employee has an id, name and a scale of salary. Make a function ComputePay (in hours) to compute the weekly payment of every employee. A male employee is paid on the number of days and hours he works. The female employee gets paid the wages for 40 hours a week, no matter what the actual hours are. Test this program to calculate the pay of employee.	
		Virtual Functions, Operator Overloading	10 hrs
3	1	Create a class vehicle which stores the vehiclno and chassisno as a member. Define another class for scooter, which inherits the data members of the class vehicle and has a data member for a storing wheels and company. Define another class for which inherits the data member of the class vehicle and has a data member for storing price and company. Display the data from derived class. Use virtual function.	
	2	Create a base class shape. Use this class to store two double type values that could be used to compute the area of figures. Derive two specific classes called triangle and rectangle from the base shape. Add to the base class, a member function get_data() to initialize the base class data members and another member function display_area() to compute and display the area of figures. Make display_area() as a virtual function and redefine this function in the derived class to suit their requirements.	
	3	Write a program to demonstrate the use of pure virtual function.	
	4	For multiple inheritance, write a program to show the invocation of constructor and destructor.	
	5	Create a class string with character array as a data member and write a program to add two strings with use of operator overloading concept.	
	6	Create a class distance which contains feet and inch as a data member. Overhead = =, <and> operator for the same class. Create necessary functions and constructors too.	
	7	Create a class MARIX of size mxn. Overload + and – operators for addition and subtraction of the MATRIX.	
	8	Define a class Coord, which has x and y coordinates as its data members. Overload ++ and – operators for the Coord class. Create both its prefix and postfix forms	
	9	Create one class called Rupees, which has one member data to store amount in rupee and create another class called Paise which has member data to store amount in paise. Write a program to convert one amount to another amount with use of type conversion.	
	10	Create two classes Celsius and Fahrenheit to store temperature in terms of Celsius and Fahrenheit respectively. Include necessary functions to read and display the values. Define	

		conversion mechanism to convert Celsius object to Fahrenheit object and vice versa. Show both types of conversions in main function.	
		Templates, Files	10 hrs
4	1	Write a program to create a function template for finding maximum value contained in an array.	
	2	Write a program to create a class template for the 'Array' class.	
	3	Create a template for the bubble sort function.	
	4	Write a program to illustrate the use of insertion and extraction operators for Text mode Input/Output.	
	5	Write a program to illustrate the use of put(), get() and getline() functions for Text mode Input/Output.	
	6	Write a program to illustrate the use of read() and write() functions for Binary mode Input/Output.	
	7	Write a program to illustrate the use of manipulators in file handling.	
	8	Write a program to illustrate the use of file pointer manipulation functions.	
	9	Write down a program to Copy source file 'source.txt' to destination file.	
	10	<p>A file contains a list of telephone numbers in the following format :</p> <p style="margin-left: 40px;">(a) Ram 47890</p> <p style="margin-left: 40px;">(b) Krishna 878787</p> <p style="margin-left: 40px;">(c) ----- -----</p> <p style="margin-left: 40px;">(d) ----- -----</p> <p>The names contain only one word and the names and telephone numbers are separated by white space. Write a Program to read the tel.dat file and display the content. The names should be left justified and the number right-justified.</p>	

Note : The students should maintain the record of typical (not simple ones) programs in their file which duly certified, should be presented at the time of final examination.

Textbook:

Object Oriented Programming with C++
Publication: Pearson
By Subhash KU

Reference Book:

1. Object-Oriented Programming with C++ (Second Edition)
Publication: PHI
By Poornachandra Sarang
2. Object Oriented Programming using C++
Publication: Cengage Learning
By Joyce Farrell

3. Object Oriented Programming In C++
Publication: Wiley India Edition
By Rajesh K. Shukla

Foundation Course FC-201(1) Principles of Management

Course Introduction:

The field of management has undergone a sea change and has today assumed a form of a profession with a well-defined body of knowledge. This knowledge is continuously evolving and new issues and findings are constantly emerging. This field is attracting many people who want to undergo a formal training in this area.

Objectives:

The student would be able

- 1.) To get a basic understanding with reference to working of business organizations through the process of management.
- 2.) To understand the managerial functions of planning and organizing.
- 3.) To discuss on the managerial functions of staffing, directing and controlling.

No. of Credits: 2

Theory Sessions per week: 3

Teaching Hours: 40 hours

UNIT	TOPICS / SUBTOPICS	TEACHING HOURS
1	Introduction to Management, Planning and Organizing	10 hours
	<ul style="list-style-type: none"> • Management <ul style="list-style-type: none"> ○ Meaning and process of management 	
	<ul style="list-style-type: none"> • Planning <ul style="list-style-type: none"> ○ Meaning ○ Planning process ○ Planning premises ○ Types of plans – based on breadth and use. 	
	<ul style="list-style-type: none"> • Organizing <ul style="list-style-type: none"> ○ Introduction ○ Meaning of organizing ○ Principles of organizing. 	
2.	More on Organizing and Staffing	10 hours
	<ul style="list-style-type: none"> • Departmentation <ul style="list-style-type: none"> ○ Meaning 	
	<ul style="list-style-type: none"> • Bases of departmentation <ul style="list-style-type: none"> ○ Function wise ○ Product wise ○ Territory wise ○ Process wise ○ Customer wise. 	

	<ul style="list-style-type: none"> • Delegation <ul style="list-style-type: none"> ○ Meaning ○ Elements of delegation ○ Principles of effective delegation. 	
	<ul style="list-style-type: none"> • Centralization and decentralization <ul style="list-style-type: none"> ○ Meaning ○ Factors affecting degree of centralization and decentralization. 	
	<ul style="list-style-type: none"> • Staffing <ul style="list-style-type: none"> ○ Meaning ○ Human Resource Planning <ul style="list-style-type: none"> ▪ Meaning ▪ Importance ○ Job Analysis <ul style="list-style-type: none"> ▪ Meaning ▪ Importance ○ Recruitment <ul style="list-style-type: none"> ▪ Meaning ▪ Only sources of recruitment ○ Selection <ul style="list-style-type: none"> ▪ Meaning ▪ Only the selection process ○ Training <ul style="list-style-type: none"> ▪ Meaning ▪ Methods of training-job rotation ○ Lectures/conference vestibule(a short note on these) 	
3	<p>Directing</p> <ul style="list-style-type: none"> • Meaning of directing • Principles of directing • Motivation <ul style="list-style-type: none"> ○ Meaning ○ Theories of motivation <ul style="list-style-type: none"> ▪ Herzberg’s Two-Factor theory ▪ McGregor’s Theory X and Theory Y , Theory Z • Leadership <ul style="list-style-type: none"> ○ Meaning of leadership ○ Types of leadership <ul style="list-style-type: none"> ▪ Autocratic ▪ Democratic ▪ Theories of leadership-Blake and Mouton’s ▪ Managerial grid ▪ Leadership continuum ○ Communication <ul style="list-style-type: none"> ▪ Meaning and Importance 	10 hours

	Control	10 hours
4	<ul style="list-style-type: none"> • Meaning and Nature of control • Importance of control • Control process • Essentials/principles of effective control system • Techniques of control-Break-Even Analysis 	

Textbook:

Principles of Management (Fifth Edition)

Publication: Tata McGraw Hill

By P C Tripathi, PN Reddy,

Reference Book:

1. Fundamental of Management, Concept, application, skill development

Publication: Cengage Learning

By Robert N. Lussier

2. Entrepreneurship and Managemen

Publication: Pearson

By: S. Nagendra, VS Manjunath

3. Management-Concept, Practice and Cases

Publication: Tata McGraw Hill(first Edition-2010)

By: Karminder Ghuman and K. Aswathapa

Foundation Course FC-201(2) Mass Communication

Course Introduction:

With the advances in ICT, the new methods of mass communication have been developed. More and more, radio, TV channels as well as news papers are been made available to the society. Since, the student having good knowledge of ICT will have openings in mass media field. It is essential that the student should know different aspects of mass media and communication. This subject makes an attempt to expose the students to the role of electronic and print media, in corporate as well as societal communication.

Objectives:

- 1.) To gain understanding of mass communication and its processes.
- 2.) To become aware of the effects of mass media upon society.
- 3.) To understand the theoretical underpinnings and ethical standards within mass media fields.
- 4.) To enhance media literacy.
- 5.) To learn about the norms and practices within mass media fields.

No. of Credits: 2

Theory Sessions per week: 3

Teaching Hours: 40

UNIT	TOPICS / SUBTOPICS	TEACHING HOURS
1	Mass Communication: An Overview	10 hours
	<ul style="list-style-type: none"> • Mass Communication & Society • Uses & Effects • Content of Media • Impact o f Mass Media on children, women & others • Target Audience & Objectives • Cultural Context & Psychology • Technology in Communication • Various Media • Convergence & New Media: E-Commerce, E-learning • Effective Presentation Skills 	
2	Print Media & Corporate Communication	10 hours
	<ul style="list-style-type: none"> • Newspapers • Magazines • What is news? • News Values, Types & Sources • Role of Editors & Reporters • Technology used in print media • Content analysis of newspaper • What is Corporate Communication? • In-house Communication • Corporate Identity: Definition & Types 	

3	Radio	10 hours
	<ul style="list-style-type: none"> • Importance of Spoken words • Strength & Weaknesses of Radio as a Medium • Functioning of Radio Stations • Public & Private Radio Stations • Different Production Formats & Genres • Technology in Radio • Ethics in Broadcasting 	
4	Television	10 hours
	<ul style="list-style-type: none"> • Basics of Photography • Early Experiments of Television (SITE, KCP, Jhabua project,etc) • Developing Ideas & Script Writing • TV Production Formats • Planning & Budgeting • Camera Compositions, Framing, Movements • Editing • Television Crew & Functioning of Studio • E-Content 	

Reference Book:

1. Mass Communication in India
Publication: JAICO Publications
By Keval J. Kumar

Elective Course EC-201(1) Soft Skills Development

Course Introduction:

In the age of liberalization, privatization and globalization, the need has arisen to inculcate such habits and attitudes which help students to adapt to the occupational set-ups. Such behavioral competencies are known as Soft Skills.

Objectives:

- 1.) To help students do well in academics.
- 2.) To motivate students to personal and professional growth.
- 3.) To provide students with tools for success and character building.

No. of Credits: 2

Theory Sessions per week: 2

Teaching Hours: 20

UNIT	TOPICS / SUBTOPICS
1	<p>Changing Ourselves to Change the World</p> <ul style="list-style-type: none"> • Understanding what are soft skills, • Realizing the need for personality growth and development for a better life and a better world, • Need for Soft Skills in today's world, • Learning to recognize our wants and our choices, Anticipating and understanding changes, • Preparing and dealing with change: Reacting to change in our lives; attitudinal barriers to change
2	<p>Time Management and Stress Management</p> <ul style="list-style-type: none"> • Importance of Time Management, How to regulate the way you spend time, Identifying and eliminating time wasters, Strategies for Managing Time, • Understanding stress: Causes of Stress and its consequences, Techniques to manage stress
3	<p>Reading Skills</p> <ul style="list-style-type: none"> • Importance of Reading • Pleasure of Reading • Types of Reading • Calculating Reading speed and Accuracy • Techniques to read faster and better • Technique of SQ3R, Practising Comprehension • How to identify the core ideas of reading material
4	<p>Writing and Speaking Skills</p> <ul style="list-style-type: none"> • Importance of writing effectively • Methods of writing better • Selecting a topic, Knowing your audience • Writing an outline, Researching, Organizing, Writing and revising drafts,

	<ul style="list-style-type: none">• Making quick notes• Writing your resume and covering letter
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Text Book:

The ACE of Soft skills
Publication: Pearson
By Gopalaswamy Ramesh, Mahadevan Ramesh

Corporate Skills
Publication: Rupa & Co 2010, New Delhi .
By Gulati, Sarvesh

Reference Books:

1. Soft Skill for Everyone
Publication: Cengage
By Jeff Butterfield
2. Contemporary Business Communication
By Scott Ober
3. Business Communication Today
By Bovee, Thill, Schazman
4. Enrich your English
By CIEFL (Academic Skills book)
5. Contemporary English Grammar
By Raymond Murphy
6. Essential English Grammar
By Raymond Murphy
7. English and Soft skills
Publication: Orient Blackswan
By S.P.Dhanavel:

Elective Course
EC-201(2) Carbon Credit

No. of Credits: 2

Theory Sessions per week: 2

Teaching Hours: 20

Syllabus and text book as per B.S.C Syllabus Semester III Elective Course.

Elective Course
EC-201(3) Learning from Great Indian Thinkers

Course Introduction:

This course aims at revisiting the Indian culture with the objective of inspiring students to become better citizens. The course is designed to adopt any pedagogy suited to teach the values, ethics and works of some of the world renowned thinkers who have changed history and brought about a renaissance in the cultural and spiritual heritage of mankind.

No. of Credits: 2

Theory Sessions per week: 2

Teaching Hours: 20 hours

UNIT	TOPICS / SUBTOPICS
	Extracts from
1	<ul style="list-style-type: none"> • Ancient India:(Any three) <ul style="list-style-type: none"> ○ The Vedas ○ Stories from the Mahabharata ○ Ramayana and Bhagvad Gita ○ Tales from the Buddha's Life/Jataka ○ Tales from the life of Mahaveer/Jain stories and folklore ○ Upanishadic and Pauranic Stories ○ Extracts from the Sangam Literature, the Milinda Panho, the Arthashastra, and the Charak Samhita ○ Foreign travelers account ○ Life stories of Panini, Gargi, Maitreyi, Aryabhata ○ Varahmihira ○ Ashtavakra ○ Shankracharya ○ Charvak
	Extracts from life stories
2	<ul style="list-style-type: none"> • Modern India(Any three) <ul style="list-style-type: none"> ○ Raja Ram Mohan Roy ○ Iswar Chand Vidyasagar ○ Swami Dayanand, Saraswati ○ Swami Vivekananda ○ Rabindranath Tagore ○ P.C. Ray ○ Swami Sahajanand Saraswati ○ Sarvapalli Radhakrishnan ○ Sri Aurobindo ○ Veer Savarkar

	<ul style="list-style-type: none"> ○ Sardar Patel ○ Bal Gangadhar Tilak ○ Gopal Krishna Gokhale ○ Mohandas Karamchand Gandhi ○ Subhashchandra Bose ○ Jawaharlal Nehru ○ Dr. Baba Saheb Ambedkar ○ Vinoba Bhave ○ Jayprakash Narayan ○ Sarojini Naidu ○ Madam Bhikaji Kama ○ Ram Manohar Lohia ○ FieldMarshall Manekshaw ○ Pandit Madan Mohan Malaviya
3	<p>Extracts from the life stories of</p> <ul style="list-style-type: none"> • Contemporary Indian Leaders: (any three) <ul style="list-style-type: none"> ○ K.R. Narayanmurthi ○ Azim Premji ○ A.P.J. Abdul Kalam ○ Jagdish chandra Bose ○ Ramanujan, Meghnad Saha ○ Vikram Sarabhai ○ Mother Teresa ○ Dhirubhai Ambani ○ J.R.D Tata ○ Ghanshyam Das Birla ○ L. N. Mittal ○ Subhash Chandra ○ Baba Amte, Varghese Kurien ○ Ela Bhatt ○ Medha Patkar ○ Nandan Nilekani, Gita Piramal, C.K. Prahlad ○ Case Study-Setting Goals at State Bank of Vermont
4	<p>Extracts from the life stories of</p> <ul style="list-style-type: none"> • Philosophers(all eras) (any three): <ul style="list-style-type: none"> ○ J. Krishnamurty ○ Rajneesh (Osho) ○ Ram krishna Paramhansa ○ Raman Maharshi ○ Amartya Sen ○ Maharshi Arvind

Elective Course
EC-201(4) Introduction to Indian Constitution

Course Introduction:

To create awareness of Fundamental Law of the land and generate common civic sense.

Objectives:

The Student will be able to:

- 1.) Understand the basic features of the Constitution of India, as set out in the Preamble.
- 2.) Identify your fundamental rights and learn how they can be enforced.
- 3.) See how the Directive Principles of State Policy influence the law makers of the country.
- 4.) Get an understanding of your fundamental duties.

No. of Credits: 2

Theory Sessions per week: 2

Teaching Hours: 20

UNIT	TOPICS / SUBTOPICS
1	<p>Introduction to Constitution of India</p> <ul style="list-style-type: none"> • The Background • Making of the Constitution • Basic Principles • The Philosophy of the Constitution
2	<p>More on Constitution of India</p> <ul style="list-style-type: none"> • Salient Features of the Constitution • Special Features of the Constitution • The Preamble • The Union and Its Territory • Citizenship
3	<p>Fundamental Rights & Duties</p> <ul style="list-style-type: none"> • Introduction of Fundamental Rights • Right to Equality • The Right to Freedom • The Right against Exploitation • The Right to Freedom of Religion • Cultural and Educational Rights • A Right to Constitutional Remedies • An Assessment • The Directive Principles of State Policy • Fundamental Duties
4	<p>Members In Parliament, Judiciary and Federalism</p> <ul style="list-style-type: none"> • The Union Executive • The Vice President and the Attorney-General • The Union Legislature – The Parliament of India • Legislative Procedure • The Union Judiciary – the Supreme Court • The Machinery of Government in the States

	<ul style="list-style-type: none">• Judiciary in the States• The Federal System• Administrative Relations between the Union and the States• Financial Relations between the Union and the States• Inter-State Trade and Commerce
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Textbook:

An Introduction to the Constitution of India

Publication: Vikas Publications

By Dr. M V Pylee

Reference Book:

1. Introduction to the Constitution of India

Publication: PHI Publications

By Brij Kishore Sharma

2. Introduction to the Constitution of India

Publication: LexisNexis Publications

By Durga Das Basu