

## BCA-II SEMESTER III

Course Number	Course Title	Credit Value	#Lec.	#Tut.	#Lab.	Weightage for EoTE/IA	EoTM
301	Operating System	5	3	2	-	60%/40%	Univ.
302	Software Engineering	5	3	2	-	60%/40%	Univ.
303	Data Structures	5	3	2	-	60%/40%	Univ.
304	Mathematics	4	2	2	-	60%/40%	Univ.
305	Lab on Data Structures	2	-		4	60%/40%	Univ.
306	Minor Project -II	2	-	-	4	60%/40%	Univ.
307	General Course III Environmental Studies	2	2	-	-	Continuous Assessment	
<b>Total</b>		<b>25</b>	<b>13</b>	<b>08</b>	<b>08</b>		

## SEMESTER IV

Course Number	Course Title	Credit Value	#Lec.	#Tut.	#Lab.	Weightage for EoTE/IA	EoTM
401	Computer Networks – I	5	3	2	-	60%/40%	Univ.
402	Software Testing	5	3	2	-	60%/40%	Univ.
403	Java Programming	5	3	2	-	60%/40%	Univ.
404	Statistics	4	2	2	-	60%/40%	Univ.
405	Lab on Java	2	-		4	60%/40%	Univ.
406	Minor Project -III	2	-	-	4	60%/40%	Univ.
407	General Course IV Aptitude – I	2	2	-		Continuous Assessment	Institute
<b>Total</b>		<b>25</b>	<b>13</b>	<b>08</b>	<b>08</b>		

**Course Number : 301**  
**Course Title: OPERATING SYSTEMS**  
**No. of Credits: 5(3L+2T+0L)**

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**Objectives**

- To provide an understanding of the major operating system components
- To provide coverage of basic computer system organization

**Learning Outcome**

- Explain the objectives and functions of modern operating systems
- Describe how operating systems have evolved over time from primitive batch systems to sophisticated multi-user systems
- Analyze the tradeoffs inherent in operating system design Describe the functions of a contemporary operating system with respect to convenience, efficiency, and the ability to evolve
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**Prerequisite**

- There are no prerequisites. However, students should have basic knowledge of working on an operating system

**References books**

1. Silberschultz, Abraham and Galvin, Peter Raer. Operating system Concepts, 5<sup>th</sup> Edition
  2. Milan Milenkovic Operating system Concepts and Design, TMH 2<sup>nd</sup> Edition
  3. Tanenbaum A.S. Modern Operating System Prentice Hall 2<sup>nd</sup> Edition.
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**UNIT I**

What is an operating system(OS)?, History of OS, Simple Batch Systems, Multiprogrammed Batched Systems, Time-Sharing Systems, Personal Computer Systems, Distributed Systems and Real –Time Systems, Operating System Structures- Command Interpreter System, Operating System Services, System Calls, System Programs.

## **UNIT II**

### **Process Management**

Process Concept, Process control Block, Process Scheduling, CPU Scheduling – Basic Concepts, scheduling Algorithms – FIFO, RR, SJF, Multi-level, Multi-level feedback.

## **UNIT III**

### **Storage Management**

Basic Concepts, Logical and Physical Address Space , Swapping, Contiguous Allocation, Paging, Segmentation, Virtual Memory – Demand Paging, Page Replacement, Page Replacement Algorithms, Allocation of Frames, Thrashing and Demand Segmentation.

## **UNIT IV**

### **Interprocess communication and Synchronization**

Need, Mutual Exclusion, Semaphore definition, Busy- wait implementation, characteristics of Semaphore. Queuing implementation of semaphore, Producer consumer problem. Critical region and conditional critical region.

## **UNIT V**

### **Deadlock**

Conditions to occurs the deadlock, Reusable and consumable resources, deadlock prevention, Deadlock Avoidance, resource request, resource release, detection and recovery,

## **UNIT VI**

### **File System**

File Concept, Access Methods, Directory Structure, Protection, File system Structure, Allocation Methods, Free-Space Management.

## **UNIT VII**

### **I/O Systems**

Overview of I/O systems, I/O interface, Secondary storage structure – Disk Structure, Disk Scheduling.

Case Study:- UNIX, LINUX,WINDOWS Operating system and overview of ANDROID Operating System.

**Course Number : 302**  
**Course Title : Software Engineering**  
**No. of Credits : 5 (3L+2T+0L)**

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**Objectives:** To introduce the current methodologies involved in the development and maintenance of Software over its entire life cycle.

**Learning Outcomes:** At the end of this course, student should be able to

- a) Develop SRS as per any of the existing standards;
- b) Know various Function and Object oriented modelling & design techniques;
- c) Know various testing techniques;
- d) Know different Software Development Life Cycle models;
- e) Know the concepts of Software Project Management; and
- f) Know the concept of software maintenance

**Pre-requisites:** Preliminary knowledge of computer, their operations and applications.

**Reference Books:**

1. SOFTWARE ENGINEERING A PRACTITIONERS APPROACH  
7th ed. by Roger S. Pressman McGraw Hill International Edition.
  2. Software Engineering by Sommerville, Pearson Education, 7th edition
  3. Software Engineering by K.K. Aggarwal & Yogesh Singh, New Age International Publishers.
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**UNIT-I : Software Engineering Concepts:**

**Software Development Models:** Program vs Software, Definition of Software Engineering, importance, principles of software engineering, Difference between software engineering and software programming.

**Software Project Management Concepts:** Planning, Execution, Monitoring, Control of Software Projects, Software Metrics, Application of PERT and GANTT charts.

**Software Engineering Fundamentals:** Software Configuration Management, Software Maintenance, Software Quality Assurance.

**UNIT-II : Software process and Feasibility study:**

**Software Development Life Cycle :**General software development life cycle, Comparison between waterfall , prototyping and spiral model, Comparative study of incremental model and RAD model, Component based development, Fourth generation techniques.

**Feasibility study:** Need of Feasibility study, types of Feasibility.

**Cost Benefit Analysis:** Why Cost Benefit analysis? Cost Benefit analysis process.

### **UNIT-III : Requirement Engineering:**

What is Requirement Engineering? Types of requirements, Requirement elicitation techniques- Traditional Methods and Modern Methods, Verification and Validation Process.

### **UNIT-IV : Development of SRS**

**Characteristics of SRS:** Completeness, Unambiguity, Inconsistency, IEEE SRS.

**Function Oriented Modeling:** DFD, ERD, Structure Chart, SRS, Data Dictionaries.

**Object Oriented Modeling:** UML Introduction, Use Case Diagrams, Class Diagrams.

### **UNIT-V: Design and Testing:**

**Function Oriented Design:** Constructing solution to problem, Identifying components and their interaction, Visualizing the solution, Characteristics of a good function oriented design (Coupling, Cohesion etc.).

**Object Oriented Design:** Identification & Specification problem domain static objects, Working out the application logic objects, Identification of necessary utility objects, Methodology of identification of objects, Case Study.

**Testing Techniques:** Different testing techniques with examples.

Development and Execution of test cases: Debugging, Testing tools & Environments, Types of test cases and test plans.

### **UNIT-VI: Software Quality Concepts:**

**Quality Concepts-** What is Quality, Quality Control, Quality Assurance, Cost of Quality Software Quality Assurance, Software Reviews,

**Formal Technical Reviews-** The Review Meeting, Review Reporting and Record Keeping, Review Guidelines, Formal Approaches to SQA, Statistical Quality Assurance, Software Reliability, SQA Plan.

### **UNIT-VII: Software Maintenance**

What is software maintenance? Problems during software maintenance.

**Categories of Software Maintenance:** Corrective maintenance, Adaptive maintenance, Perfective maintenance, and preventive maintenance.

**Potential Solutions to Maintenance:** Budget and efforts reallocation, Complete Replacement, maintenance of existing system.

**Maintenance Process and Models:** maintenance processes, Fix Model, Iterative Enhancement Model, Reuse Oriented Model, Boehm Model, and Taute's Models.

**Course Number : 303**  
**Course Title : Data Structures**  
**No. of Credits: 5 (3L+2T+0L)**

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**Objective:** The syllabus covers study of Data structures concepts with implementation in a C language. The Arrays, Stacks, Queues, Linked list & tree, with their applications are taught.

**Learning Outcome:** At the end of this course, student should be able Understand the most basic aspects of data structures including Stacks, Queue, Linked list & tree.

**Pre-requisites :** C Programming

**Reference Books :**

1. Data Structures Using C -Rajni Jindal (Umesh Publications)
  2. Data structure through C- Yashwant Kanitkar (BPB Publications)
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**Unit I: Concepts of Data structure**

Concept of Data and variable, Type of Data, Atomic Data, Non-atomic Data, structures, memory allocation for structure, Abstract data type (ADT)

**Unit II: Arrays**

Array Definition, Array Operations, Applications of Array, Multi-dimensional arrays.

**Unit III: Linked List**

Linked List Definition, Memory representation of Linked List, linked list operations (inserting a node, deleting a node), Applications of Linked List, Types of Linked List: Simple, Double Linked List & Circular Linked List.

**Unit IV: Stack**

Concept of Stack, Stack Operations, Array implementation of Stack, Linked List implementation of Stack, Applications of Stack.

**Unit V: Queues**

Concept of queue, Queue Operation, Array implementation of queue, Linked List Implementation of Queue, Applications of Queue.

**Unit VI: Searching and Sorting**

Searching algorithms: Simple search, binary search.

Sorting algorithms: Bubble Sort, insertion sort, selection sort, quick sort.

**Unit VII: Introduction to Trees**

Concept of Tree, Binary Tree, Tree Traversal, Breadth First Traversal, Depth First Traversal.

**Course Number: 304**  
**Course Title: Mathematics**  
**No. of Credit-4 (2L+2T+0L)**

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**Objectives:**

To gain a fundamental knowledge of the basic mathematics concepts which can be described or applied in real life phenomena? The digital computer is basically finite structure and many of its properties can be understood and interpreted within framework of finite mathematical systems.

**Prerequisite:** Students are XII th passed with mathematics, they will understanding application of mathematics in computer science.

**Learning Outcomes:**

On successful completion of the course students will be:

- 1 .Students can able to write algorithm.
- 2.They understood how algorithm works in computer.

**Textbooks/References:**

1. Discrete Mathematics Schaum's outlines II Edition (TMH)
  - 3.Discrete Mathematics and its Applications 6th ed. Kenneth Rosen (TMH)
  - 4.Discrete Mathematics Structures RM.Somasundaram Prentice-Hall of India
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**UNIT I : SET THEORY**

Introduction, Sets elements, Universal set and empty set, Veen diagrams, set operations, algebra of sets and duality, Finite sets, Counting Principle, classes of sets, power sets ,Partitions (6L)

**UNIT II : RELATIONS**

Introduction, product Sets ,Relations, Pictorial Representation of Relations, Composition of Relations, Types of Relations ,closure Properties ,Equivalence Relations, Partial Ordering Relations ,n-ary Relations(6L)

**UNIT III :FUNCTIONS**

Introduction, Functions, types of relations, Invertible functions, Mathematical Induction.(6L)

**UNIT IV : LOGIC**

Introduction, Propositions and Compound Propositions ,basic Logical operations, Properties and Truth tables, Tautology and Contradictions(6L)

**UNIT V : BOOLEAN ALGEBRA**

Introduction, Basic Definitions, Duality, Boolean Algebra, Sum of Products Form for Sets, Sum of Products From for Boolean Algebra, Minimal Boolean Expressions, Logic Gates and Circuit (10L)

## **UNIT VI : PROPERTIES OF THE INTEGERS**

Introduction ,order and Inequalities ,Absolute Value ,Division Algorithm, Divisibility, Primes, Greatest Common Divisor, Euclidean Algorithm, Fundamental Theorem of Arithmetic's(10L)

## **UNIT VII :MATRIX ALGEBRA**

Definition of Matrix, Types of Matrices ,Matrices Associated with a Given Matrix, Sub Matrix, Equality of Matrices ,Addition and Subtraction of matrices, Multiplication of Matrices.(5L)



**Course Number : 305**  
**Course Title : Lab on Data Structures**  
**No. of Credits : 2 (0L+0T+4L)**

1. Write a program to implement stack using array.
2. Write a program to implement stack using linked list.
3. Write a program to implement queue using array.
4. Write a program to implement queue using linked list.
5. Write a program that convert infix expression into postfix form.
6. Write a program to sort following data using Bubble Sort  
6, 5, 4, 7, 12, 11, 9, 10, 8, 2
7. Write a program to search whether 17 is present or not from the given list using binary search technique 9, 11, 17, 20, 25, 30, 33
8. Write a program to convert decimal to binary using stack.
9. Write a program to implement insertion, deletion, and searching and count number of items present in a singly linked list.
10. Write a program to check whether a string is a Palindrome or not using stack.
11. Write a program to convert an infix expression into prefix format.
12. Write a program to count number of leaf nodes and total number of nodes in a tree.
13. Write a program to arrange following data in ascending order using Quick Sort technique 89, 22, 55, 8, 7, 12, 57, 29, 65, 34
14. Write a program to traverse a tree in pre-order format.
15. Write a program to delete any node from Binary Search Tree.
16. Write a program that illustrates the working of Selection Sort.
17. Write a program that illustrates the working of insertion Sort.
18. Write a program to implement insertion, deletion and count number of items present in a Queue.
19. Write a program to implement any-2 operation of Doubly Linked List.
20. Write a program to implement multiplication of two 3X3 matrices.

**Course Name: Minor Project-II**  
**No. of Credits: 2(L: 0, T:2, P:4)**

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**Objective:** The objective of this course is to develop skills to solve a problem which requires more efforts than laboratory experiment; this also demands that students has to work in a group and distribute work to solve problem. Finally student document work as dissertation and evaluated it by panel of examiner. Examiner expected to evaluate on their work by testing the functionality of project and content of dissertation along with judging contribution of individual.

**BCA-II (Sem.-IV)**  
**Course Number : 401**  
**Course Title : Computer Networks-I**  
**No. of Credits : 5 (3L + 2T + 0L)**

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**Objectives:**

The main objective is to introduce Computer Networks in a simple language to all undergraduate students, regardless of their specialization. It will help students in understanding of various types of computer networks, technologies behind networks and application protocols, e-mail and communication protocols will be introduced to students through this subject.

It will help them to pursue specialized programs leading to technical and professional careers and certifications in the Networking and Communication Industry.

**Learning Outcomes:**

After completing this course, students will be able to:

- Administer and maintain a computer network.
- Demonstrate basic understanding of network principles.

Demonstrate understanding of how computers communicate with each other and the methods employed to assure that the communication is reliable.

**Pre-requisites:**

This course assumes students have basic knowledge of Computer.

**Reference Books:**

- 1) Data Communications & Networking, Behrouz A. Ferouzan (4th Edition)
  - 2) Computer Network, Andrew S. Tenenbaum(4<sup>th</sup> Edition)
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**Unit I: Basics of Computer Network**

Fundamental of Transmission and Communication:- Signals and their properties, Mode of Communication, Computer Network : Definition, Goals, Advantages, Applications and structure. Network topology, Types of Network, Various Switching Techniques with their advantages and disadvantages.

**Unit II: Computer Network Model:**

Introduction of layered architecture of Computer Network, OSI reference model: Layer wise functionality, various terminology associated with OSI Model. Internet Model: TCP/IP, comparison between OSI and ICP/IP Model.

### **Unit III: Transmission Media and Connecting Devices:**

Classes of Transmission Media, Guided or wired Media: Coaxial Cable, Twisted Pair, Optical Fiber. Unguided or wireless media: - Radio Waves, Infra-Red, Micro-Wave, Satellite, Light wave, unguided media (Wireless), Electromagnetic Spectrum for Wireless Communication

### **Unit –IV : Wireless Networks**

Wireless Transmission : Radio Waves, Infra-Red, Micro-Wave,  
Wireless LANs(IEEE802.11) Architecture : MAC Sub layer, Frame Format, Frame Types  
Bluetooth : Architecture, (Piconet, Scatternet, Bluetooth layers), Applications

### **Unit –V : Network Connecting Devices**

Hubs (Passive and Active) , Repeaters, Bridges(Transparent Bridges, Spanning Tree Bridges, Source Routing Bridges), Switches (2-Layer Switch, 3-Layer Switch) , Gateways, Network Security Devices(firewalls, Proxy Serever)

### **Unit VI: Local Area Network**

**Wired LANs:** Components, Network Adapter, Network Interface Card, Ethernet: Basic Features, Ethernet Types, Ethernet Cable, Ethernet Topologies, IEEE Standards: IEEE 802.3 (CSMA/CD), IEEE 802.4 (Token Bus), IEEE 802.5 (Token Ring).

**Wireless LANs:** Architecture of IEEE802.11- MAC Sub layer, Frame Format, Frame Types, Services

**Bluetooth:** Architecture- Pico net, Scatter net, Bluetooth Layers, Applications of Bluetooth Network.

### **Unit VII: Internet Basics:**

Concept of Intranet & Extranet, Internet Information Server (IIS), World Wide Web (WWW), Web Documents, Search Engines, Internet Service Providers(ISP), E-Mail.

**Course Number : 402**  
**Course Title : Software Testing**  
**No. of Credits : 5 (3L+2T+0L)**

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**Objectives:**

The primary goal of software testing is to reduce risk and acquire knowledge of software testing process using various techniques to improve the quality of software.

**Learning Outcomes:**

After completing this course, students will be able to:

- a) Describe the software development V-Model, its critical activities, and where software testing and quality assurance fits in that process.
- b) Describe the purposes of software testing and quality assurance.
- c) Describe the generic test process and identify the inputs and outputs of each activity in the process.
- d) Identify and describe several testing techniques.
- e) Understand Use Case requirements and apply suitable techniques to derive a set of test cases from them.

**Pre-requisites:**

This course assumes students have these skills:

- Basic knowledge of software concepts.
- Basic understanding of the roles within a software development team, such as the role of the Project Manager, System Analyst and Programmer.

**Reference Books:**

- 1) Software Testing by Renu Rajani and Pradeep Oak
  - 2) Software Engineering by Roger S. Pressman
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**Unit I: Introduction to Software Concepts:**

Introduction, Definition and Characteristics of Software, Importance of Software, Software types, Software components, Members involved in software development, Overview of SDLC.

**Unit II: Introduction to Testing:**

What is testing, Importance of Testing. Testing goals and characteristics, Testing during planning stage, Testing during design stage, Testing during coding stage.

**Unit III: Software Testing Lifecycle:**

Overview of STLC, Principles of Verification and Validation, Techniques of verification (review, inspections, walkthroughs),  
V testing model

- a) Software development V & V

- b) Software acquisition V & V
- c) Software supply V & V

#### **Unit IV: Software Testing Process:**

Testing process: a) Plan b) Develop c) Execute d) Manage  
Conventional Software Architectures.

#### **Unit V: Software Testing Strategies:**

Test strategies for conventional software

- a) Unit Testing
- b) Integration Testing
  - i) Top-Down Integration
  - ii) Bottom-Up Integration
  - iii) Regression Testing
  - iv) Smoke Testing
  - v) Integration test documents
- c) Validation Testing
  - a. Test Criteria
  - b. Configuration Review
  - c. Alpha and Beta Testing
- d) System Testing
  - i) Recovery Testing
  - ii) Security Testing
  - iii) Stress Testing
  - iv) Performance Testing

Difference between Testing and Debugging, The Art of Debugging a)  
Debugging Process b) Debugging strategies c) Correcting the Error.

#### **Unit VI: Software Testing Techniques:**

Overview of Black-Box and White-Box Testing, Methods of White-box Testing:

- a) Basis Path Testing
  - i) Flow Graph Notation
  - ii) Independent Program Paths
  - iii) Deriving Test Cases
  - iv) Graph Matrices
- b) Control Structure Testing
  - i) Conditional Testing
  - ii) Data Flow Testing
  - iii) Loop Testing
    - Simple Loops
    - Nested Loops
    - Concatenated Loop

Methods of Black-Box Testing:

- a) Graph Based Testing
- b) Equivalence Partitioning

- c) Boundary Value Analysis
- d) Orthogonal Array Testing

Testing of client/server Architectures, Testing Documentation and Help Facilities, Testing for Real-Time Systems:

- a) Task Testing
- b) Behavioral Testing
- c) Intertask Testing
- d) System Testing

Testing Patterns:

- a) Pair Testing
- b) Separate Test Interface
- c) Scenario Testing

### **Unit VII: Risk Management:**

Introduction and Characteristics of Risks, Role of Testing in Risk Management, Types of Risks:

- a) Project Risks
- b) Technical Risks
- c) Business Risks
- d) Predictable Risks
- e) Unpredictable Risks

**Course Number : 403**  
**Course Name: Java Programming**  
**No. of credits: 05 (3L+2T+0L)**

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**Objectives:** The objective of this paper is to make the students familiar with Object Oriented Programming Principles using JAVA. At the end of this course, students will be able to understand the most basic concepts of Java programming.

**Learning Outcomes:**

At the end of the course a student should be able to -

- (a) understand the most basic aspects of Java features.
- (b) Basic programs through Java.

**Pre-requisites:** Object Oriented Language

**Reference Books:**

1. E. Balgurusamy Programming with Java , Tata McGra-Hill, 3rd Ed., 2008.
  2. The Complete Reference Java2 Tata McGraw-Hall.
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**UNIT I: Fundamentals of Java**

Basics of Java, History of Java, Features of Java, Comparison between java and C++, Java program structure ,JVM (Java Virtual Machine), Java byte code, compilation and Execution, Data types in Java, Variables: Declaring, dynamic initialization & Scope, Type conversion  
Operators: Arithmetic operators, Relational Operators, Logical Operators, Conditional Operators Assignment Operators, Bitwise Operators, Special operators.Command line arguments.

**UNIT II: Control Structures**

If, if-else, Nesting of if-else , Else-if ladder, switch statement  
Loops: while, do, for statement

**Unit-III**

Defining a Class, Fields declaration, Methods Declaration , Creating Objects, Accessing Class Members , constructors- default constructors, parameterized , constructor, Method overloading, this keyword, garbage collection, finalize() method.

**UNIT-IV: Inheritance**

Concept of inheritance and implementation, single versus multiple inheritance. method overriding, keywords: super and final, Extending a class

Interfaces- definition, user defined interfaces and their applications, implementing an interface, extending interfaces, Abstract classes, abstract methods.

### **UNIT –V: Exception Handling**

Types of errors, Overview of exception handling, using try and catch blocks, multiple catch blocks, nested try blocks, throwing exception (throw statement), throws keyword, finally keyword.

### **UNIT-VI: Packages**

Concept of package, Java API Packages , System packages , Naming Conventions, Creating, Accessing and Using a Package.

### **UNIT VII: Applet Programming**

Introduction to applet, Applet Vs Application, applet life cycle, building applet code, creating applet, Applet tag, adding applet to HTML file, Running applet.



**Course Number : 404**  
**Course Name: STATISTICS**  
**No. of credits: 04 (2L+2T+0L)**

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**Objectives:** The main objective is to introduce basic concepts of statistics to the students.

**Learning Outcomes:** After completing this course, students will be able to understand the basic concepts of statistics like types of data, tabulation, classification, measures of central tendency, measures of dispersion, correlation and regression analysis.

**Pre-requisites:** This course assumes students have basic knowledge of statistics.

**Reference Books:**

- 1) Fundamentals of Statistics , S.C. Gupta , Himalaya Pub. House (5th Ed.
  - 2) Business Statistics , S.P. Gupta, M.P.Gupta –Sultan Chand & Sons, 16<sup>th</sup> Ed.
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**Unit 1: Introduction to Statistical Methods :**

- 1.1 Definition of Statistics, Importance of Statistics,
- 1.2 Scope of statistics : Economics, Computer Science, Business and Management, etc., limitations of Statistics .

**Unit 2: Collection and Organization of Data:**

- 2.1 Sources of Data : Primary and Secondary, Discrete and Continuous variables
- 2.2 Construction of frequency distribution, cumulative frequency distribution.
- 2.3 Graphical representation of frequency distribution : Histogram, frequency polygon
- 2.4 Diagrammatic representation : Simple bar, subdivided bar, pie diagram.

**Unit 3: Measures of Central Tendency :**

- 3.1 Concept of central tendency, good measures of central tendency
- 3.2 Arithmetic mean : Definition, formula and computing for grouped and ungrouped data, merits and demerits.
- 3.3 Median : Definition, formula and computing for grouped and ungrouped data, merits and demerits.
- 3.4 Mode : Definition, formula and computing for grouped and ungrouped data, merits and demerits.

**Unit 4: Measures of Dispersion :**

- 4.1 Concept of dispersion, Absolute and relative measure of dispersion,
- 4.2 Range, Average deviation, Standard deviation , variance, coefficient of variation.

**Unit 5: Correlation :**

5.1 Concept of correlation, types of correlation,

5.2 Methods of studying correlation : Karl Pearson's coefficient, Rank coefficient

5.3 Properties of correlation coefficient

**Unit 6: Regression Analysis**

6.1 Linear regression model, regression lines, Y on X and X on Y.

6.2 Regression coefficients, properties of Regression coefficients

6.3 Estimation of unknown values to find regression coefficient and correlation coefficient from lines of regression

6.4 correlation vs. regression analysis.

**Unit 7: Analysis of Time series:**

7.1 Component of time series, measure of trends, moving average and least square.

**PRACTICAL QUESTIONS:**

1. Write a java application program to display hello message.
2. Write a java program to accept a number from command line and check whether it is even or odd.
3. Write a java program to accept a number from command line and Calculate its factorial.
4. Develop a java application for displaying prime numbers between 1 to 50.
5. Develop an interface shape containing method 'area()' and implement it to other classes like Rectangle, Circle.
6. Develop a class student to store roll number, name and total marks. Use constructor to initialize values. Also provide parameterised constructor for the class.
7. Develop a class that handles ArithmeticException.
8. Write a java program to show effective use of finally block.
9. Develop a class that Throws IOException.
10. Create an abstract class 'Oval' by using interface. Inherit this 'Oval' class to 'NewOval' for implementation. [Hint: 'Oval' class implements shape interface but doesn't give code for 'area()', Extend 'oval' class and create 'NewOval' that provides code for 'area()']
11. Develop an applet to display hello message.

**Course Number : 406**  
**Course Name: Minor Project-III**  
**No. of Credits: 2(L: 0, T:2, P:4)**

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**Objective:** The objective of this course is to develop skills to solve a problem which requires more efforts than laboratory experiment; this also demands that students has to work in a group and distribute work to solve problem. Finally student document work as dissertation and evaluated it by panel of examiner. Examiner expected to evaluate on their work by testing the functionality of project and content of dissertation along with judging contribution of individual.

**Course Number : 407**  
**Course Title : General Course IV Aptitude-I**  
**No. of Credits : 2 (2L+0T+0L)**

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**Objectives:**

The main objective is to introduce Quantitative Aptitude to all undergraduate students. It will help students in understanding of basic aptitude concepts .

**Learning Outcomes:**

After completing this course, students will be able to appear for competitive examination.

**Pre-requisites:**

This course assumes students have basic knowledge of mathematics.

**Reference Books:**

1. Quantitative Aptitude and reasoning- R.V. Pravin-PHI
  2. Quantitative Aptitude for Competitive Examination-Abhijit Guha-McGraw Hill Education Series.
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**Unit I : HCF and LCM**

**Unit II : Decimal Fractions**

**Unit III : Permutation and Combination**

**Unit IV : Ratio and Proportion**

**Unit V : Percentage**

**Unit VI : Profit and Loss**

**Unit VII : Simple and Compound interest**