

**Year:II****Semester:II**

<b>Course Code</b>	<b>Course Title</b>	<b>Credits</b>	<b>Lecture (Hrs.)</b>	<b>Tutorial (Hrs.)</b>	<b>Laboratory (Hrs.)</b>	<b>Total (Hrs.)</b>
<b>BIT251HS</b>	<b>Probability and Statistics</b>	<b>3</b>	<b>3</b>	<b>1</b>		<b>4</b>
<b>BIT252CO</b>	<b>Computer Organization and Architecture</b>	<b>3</b>	<b>3</b>	<b>1</b>		<b>4</b>
<b>BIT253CO</b>	<b>Operating System</b>	<b>3</b>	<b>3</b>	<b>1</b>	<b>2</b>	<b>6</b>
<b>BIT254CO</b>	<b>Database Management System</b>	<b>3</b>	<b>3</b>	<b>1</b>	<b>2</b>	<b>6</b>
<b>BIT255CO</b>	<b>Programming in JAVA</b>	<b>3</b>	<b>3</b>	<b>1</b>	<b>2</b>	<b>6</b>
<b>BIT256CO</b>	<b>Project-IV</b>	<b>2</b>	<b>-</b>	<b>-</b>	<b>3</b>	<b>3</b>
	<b>Total</b>	<b>17</b>	<b>15</b>	<b>5</b>	<b>7</b>	<b>29</b>

# Probability and Statistics

## BIT251H

Year II

Semester: II

Teaching Schedule Hours/Week			Examination Scheme				
Theory	Tutorial	Practical	Internal Assessment		Final		Total
			Theory	Practical	Theory	Practical	
3	1	1	20	25	80	-	125

### Course Objective:

After the completion of the subject, students are expected to be able to: (i) assemble data, (ii) analyze data and (iii) determine central tendency, distribution and make viable conclusion for decision making.

### Course Contents:

1. **Nature and scope of statistics** **[2Hrs]**
  - 1.1 Definitions of statistics
  - 1.2 Descriptive and inferential statistics
  - 1.3 Scope of statistics
  - 1.4 Limitations and distrusts of statistics
  
2. **Data and its collection** **[2Hrs]**
  - 2.1 Primary and secondary data
  - 2.2 Sources of primary and secondary data
  - 2.3 Methods of data collection: census method, sample method
  - 2.4 Compilation of administrative records
  
3. **Classification and tabulation of data** **[2Hrs]**
  - 3.1 Classification procedure: qualitative and quantitative classification
  - 3.2 Tabulation of data
  
4. **Diagrammatic and graphic presentation of data** **[3Hrs]**
  - 4.1 Importance and limitations
  - 4.2 Types of diagrammatic representations: bar diagram, pie diagram; pictogram
  - 4.3 Types of graphic representations: histogram, frequency polygon, frequency curve, cumulative frequency curve (Ogive)
  
5. **Measures of central tendency** **[4 Hrs]**
  - 5.1 Arithmetic mean
  - 5.2 Geometric mean

- 5.3 Harmonic mean
- 5.4 The median: quartiles; deciles and percentiles
- 5.5 The mode
- 5.6 Relation between mean, median and mode

**6. Measures of dispersion** **[4 Hrs]**

- 6.1 Absolute and relative measures
- 6.2 The range
- 6.3 Inter-quartile range
- 6.4 Quartile deviation
- 6.5 Mean deviation
- 6.6 Standard deviation
- 6.7 Coefficient of variation
- 6.8 Skewness and Kurtosis

**7. Probability** **[6 Hrs]**

- 7.1 Preliminaries
- 7.2 Classical, empirical, axiomatic approaches of probability theory
- 7.3 Conditional probability
- 7.4 Inverse probability
- 7.5 Probability distribution
- 7.6 Mathematical expectation
- 7.7 Variance of random variable

**8. Theoretical distribution** **[7 Hrs]**

- 8.1 Introduction
- 8.2 Binomial distribution and its chief features (without proofs)
- 8.3 Fitting a binomial distribution
- 8.4 Poisson distribution and its chief features (without proofs)
- 8.5 Fitting Poisson distribution
- 8.6 Normal distribution and its chief features
- 8.7 Areas under normal distribution
- 8.8 Hyper-geometric distribution

**9. Estimation theory and testing of hypothesis** **[7 Hrs]**

- 9.1 Idea of sample and population
- 9.2 Point estimation and interval estimation
- 9.3 Characteristics of a good estimator
- 9.4 Interval estimation of population parameters
- 9.5 Sampling distribution and standard error

- 9.6 Sampling of attribute
- 9.7 Test of significance for single proportion
- 9.8 Test of significance for difference between two proportions
- 9.9 Sampling of variables
- 9.10 Large samples test
- 9.11 Test of significance for single mean
- 9.12 Test of significance for difference between two means
- 9.13 Small sample test
- 9.14 Student's T-distribution and its applications

## 10. Chi-Square distribution

[3 Hrs]

- 10.1 Introduction
- 10.2 Application
- 10.3 Test of goodness of fit
- 10.4 Test of independence of attributes

## 11. Correlation and regression analysis

[5Hrs]

- 11.1 Introduction
- 11.2 Correlation analysis
- 11.3 Various methods of calculating correlation coefficient
- 11.4 Regression analysis

### Laboratory Works:

There shall be 12 lab exercises covering all the features of statistical analysis based on SPSS or any other statistical software packages.

### References Books:

1. Sukhminder Singh Et. Al., "*Statistical Method for Research Workers*", Kalyani Publishers, New Delhi
2. B. M. Clarke & D. Cooke, "*A Basic Course in Statistics*", Elbs. (UK)
3. B. L. Agrawal, "*Basic Statistics*", Wiley Eastern
4. Minimum & Clarke, "*Elements of Statistical Reasoning*", Johnwiley & Sons
5. Levin, "*Statistics for Management*", Prentice Hall of India
6. S. C. Gupta, "*Fundamentals of Statistics*".



# Computer Organization and Architecture

## BIT251CO

Year: II

Semester:II

Teaching Schedule Hours/Week			Examination Scheme				
Theory	Tutorial	Practical	Internal Assessment		Final		Total
3	1	-	Theory	Practical	Theory	Practical	100
			20	-	80	-	

### Course Objective

The main objective of this course is to provide the concepts of computer architecture as well as computer organization and design.

### Course contents

1. **Introduction** [2Hrs]
  - 1.1 Introduction to computer architecture
  - 1.2 Design principles for modern computers
  
2. **Computer organization and design** [6Hrs]
  - 2.1 Instruction code
  - 2.2 Computer registers
  - 2.3 Computer instruction
  - 2.4 Timing and control
  - 2.5 Instruction cycle
  - 2.6 Memory reference instructions
  - 2.7 Input and output interrupt
  
3. **Control unit design** [4Hrs]
  - 3.1 Microprogrammed control (control memory, address sequencing)
  - 3.2 Hardwired control
  
4. **Central processing unit** [6Hrs]
  - 4.1 Instruction formats
  - 4.2 Addressing modes
  - 4.3 Data transfer and manipulation
  - 4.4 Program control
  - 4.5 RISC and CISC
  
5. **Pipeline and vector processing** [6Hrs]
  - 5.1 Parallel processing
  - 5.2 Pipelining
  - 5.3 Arithmetic and instruction pipeline

- 5.4 RISC pipeline
- 5.5 Vector processing
- 5.6 Array processing

**6. Computer arithmetic** **[6 Hrs]**

- 6.1 Data types
- 6.2 Fixed-point operations
- 6.3 Floating-point operations
- 6.4 Addition and subtraction algorithms
- 6.5 Multiplication and division algorithms

**7. Input and output organization** **[6 Hrs]**

- 7.1 Peripheral devices
- 7.2 Input-output interfaces
- 7.3 Modes of transfer
- 7.4 Interrupt
- 7.5 Direct memory access
- 7.6 Input-output processor

**8. Memory organization** **[6 Hrs]**

- 8.1 Memory hierarchy
- 8.2 Main memory
- 8.3 Auxiliary memory
- 8.4 Cache memory
- 8.5 Virtual memory
- 8.6 Memory management hardware

**9. Multiprocessor** **[3 Hrs]**

- 9.1 Characteristics of multiprocessors
- 9.2 Interconnection structures
- 9.3 Cache coherence

**Reference books:**

1. M. Morris Mano, "Computer System Architecture".
2. William Stalling, "Computer Organization & Architecture".
3. M. Morris Mano, "Digital Logic & Computer Design".
4. David A. Paterson & John L. Hennessy, "Computer Organization & Design".
5. Vicent P. Heuring & Harry F. Jordan, "Computer Systems Design & Architecture".
6. Andrew S. Tanenbaum, "Structured Computer Organization".
7. John P. Hayes, "Computer Architecture & Organization".



## Operating System BIT253CO

**Year: II**

**Semester: II**

Teaching schedule Hours/Week			Examination Scheme				
Theory	Tutorial	Practical	Internal Assessment		Final		Total
3	1	2	Theory	Practical	Theory	Practical	150
			20	50	80	-	

**Course Objective:** Objectives of this course are to provide fundamental concepts of operating systems, operating system design, and understanding of implementation of system utilities for inter-process communication in a multiprocessor environment.

### Course Contents:

- 1. Introduction** **[3 Hrs]**
  - a. Operating system as an extended machine & resource manager
  - b. History and types of operating system
  - c. Operating system concepts, functions, structures
  
- 2. Processes and Threads** **[9 Hrs]**
  - a. Introduction
  - b. Process model, process states, process control block
  - c. Introduction to threads, kernel and user implementation of threads
  - d. Inter- process communication (Multiprogramming, parallel processing, critical sections, race condition, mutual exclusion with busy waiting, semaphores, monitors)
  - e. Preemptive scheduling vs non-preemptive scheduling
  - f. Process scheduling (FCFS, SJF, RR, Priority, Real-time scheduling)
  
- 3. Memory Management** **[8 Hrs]**
  - a. Memory management without swapping
  - b. Swapping
  - c. Virtual memory
  - d. Paging, Page replacement algorithms (FIFO, Optimal, LRU, LFU, NRU, Random, Clock, Second-chance)
  - e. Predicting page faults
  - f. Segmentation with paging
  
- 4. File Systems** **[6 Hrs]**
  - a. Files
  - b. Directories
  - c. File system implementation
  - d. Protection mechanism and operating system securities
  
- 5. Input/Output** **[7 Hrs]**
  - a. Principles of input output hardware
  - b. Principles of input output software
  - c. Disks and disk scheduling algorithms (FSFS, SSTF, LOOK, SCAN, C-SCAN, C-LOOK)
  - d. Clocks
  - e. Terminals
  
- 6. Deadlocks** **[7 Hrs]**
  - a. Introduction
  - b. Conditions of deadlock
  - c. Resources and deadlock modeling using resources
  - d. Deadlock detection and recovery
  - e. Deadlock avoidance & prevention
  - f. Banker's Algorithm (Single and multiple resources)
  
- 7. Real Time System** **[2 Hrs]**
  - a. Introduction
  - b. Types of RTS (Soft real time, hard real time, firm real time)

**8. Distributed System**

**[3 Hrs]**

- a. Introduction and characteristics
- b. Processes and processors in distributed system

**9. Case Study**

UNIX / LINUX / Windows / Android / iOS

(No classes are allotted to the case study; the students themselves referring various books should study this unit.)

**Laboratory Works:** There shall be following lab exercises covering various features of different operating systems.

1. General commands and programming in LINUX
2. Process scheduling
3. Page replacement algorithms
4. Deadlock modeling
5. Memory fitting algorithms
6. IPC (Inter Process communication)
7. Shell programming

**Reference Books:**

1. Andrew S. Tanenbaum, "Modern Operating System", PHI
2. Silberschatz and Galvin, "Operating System Concepts", Addison Wesley
3. Andrew S. Tanenbaum, "Operating System, Design & Implementation", PHI

## Database Management System BIT254CO

**Year: II**

**Semester: II**

Teaching Schedule Hours/Week			Examination Scheme				
Theory	Tutorial	Practical	Internal Assessment		Final		Total
3	1	2	Theory	Practical	Theory	Practical	100
			20	20	60	-	

**Course Objective:** The main objective of the course is to provide fundamental concepts, theories and practices in design and implementation of database systems.

### Course Contents:

1. **Introduction** **[4 Hrs]**  
Definition of database, DBMS, RDBMS, ORDBMS, Definition of database system, Types and Characteristics of database, Advantages and disadvantages of using DBMS
2. **Database Systems Concepts and Architecture** **[8 Hrs]**  
Data models, Schemas and instances, DBMS architecture and data independence, Database language and interfaces, Degree of relationship, Cardinality, Data dictionary, E-R model, Strong and weak entity types, Attributes, Types of keys, Relationship types, E-R diagram
3. **Relational Model** **[4 Hrs]**  
Introduction to relational databases, Relational algebra, Modification of database
4. **SQL** **[7 Hrs]**  
Introduction, DDL, DML, Null values, String operations, Aggregate function, Joined relation, Views, Set operations, Triggers, SQL Queries, Nested Queries, Introduction to PL/SQL (Procedure, Function, Package)
5. **Integrity Constraints** **[2 Hrs]**  
Entity constraints, Domain constraints, Referential integrity
6. **Normalization** **[6 Hrs]**  
Pitfalls of relational model, Introduction to functional dependencies, Details of 1NF, 2NF and 3NF, Introduction to BCNF, 4NF and 5NF
7. **Database Security** **[4 Hrs]**  
Different levels of database security, Access control, Authentication, Authorization, Non-repudiation, Encryption and decryption.
8. **Transaction and Query Processing** **[7 Hrs]**  
Introduction to transaction, State, ACID properties, Introduction to concurrency control (Lock, Timestamp, Validation, Serializability, and Conflict serializability) Introduction to query processing, Steps used in query processing. – Introduction to Lock Management – Lock Conversions, Dealing with Dead Locks, Introduction to Crash recovery, the Write-Ahead Log Protocol.
9. **Backup and Recovery** **[3 Hrs]**  
Failure of database system, Backup devices, Backup of database and database system, Techniques used in recovery of database system

## Laboratory Works:

Laboratory works include the following exercises.

Use of CREATE, ALTER, RENAME and DROP statement in the database tables.

Use of INSERT INTO, DELETE and UPDATE statement in database tables.

Use of simple select statement.

Use of nesting of queries.

Use of aggregate functions.

Use of queries to create joins and views.

### Consider the following schema for Order Database:

SALESMAN (*Salesman\_id, Name, City, Commission*)

CUSTOMER (*Customer\_id, Cust\_Name, City, Grade, Salesman\_id*)

ORDERS (*Ord\_No, Purchase\_Amt, Ord\_Date, Customer\_id, Salesman\_id*)

### Write SQL queries to

1. Count the customers with grades above Amritsar's average.
2. Find the name and numbers of all salesmen who had more than one customer.
3. List all salesmen and indicate those who have and don't have customers in their cities (Use UNION operation.)
4. Create a view that finds the salesman who has the customer with the highest order of a day.
5. Demonstrate the DELETE operation by removing salesman with id 1000. All his orders must also be deleted.

### Consider the following schema for Order Database:

SALESMAN (*Salesman\_id, Name, City, Commission*)

CUSTOMER (*Customer\_id, Cust\_Name, City, Grade, Salesman\_id*)

ORDERS (*Ord\_No, Purchase\_Amt, Ord\_Date, Customer\_id, Salesman\_id*)

### Write SQL queries to

1. Count the customers with grades above Amritsar's average.
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4. Create a view that finds the salesman who has the customer with the highest order of a day.
5. Demonstrate the DELETE operation by removing salesman with id 1000. All his orders must also be deleted.

### Reference Books:

1. "Database System Concept", Silberschatz et. al., McGraw Hill, 3<sup>rd</sup> Edition
2. "An Introduction to Database System", C. J. Date, Addison Wesley
3. "Fundamentals of Database Systems", Ramez Elmasri, Shamkant B. Navathe



**Programming in JAVA**  
BIT255CO

**Year: II**

**Semester: II**

Teaching Schedule Hours/Week			Examination Scheme				
Theor y	Tutorial	Practical	Internal Assessment		Final		Total
3	1	2	Theory	Practical	Theory	Practical	150
			20	50	80	-	

**Objective:**

The main objective of this course is to make students understand fundamentals of object-oriented programming in Java using Java SDK environment so that they can write programs in JAVA to solve problems.

**1. Introduction to Java**

**[12 Hours]**

- 1.1 Overview of Object-oriented Programming in Java
- 1.2 JVM, Java environment, Java tools
- 1.3 Features of Java
- 1.4 Control Statements
- 1.5 Looping
- 1.6 Array
- 1.7 String and StringBuffer
- 1.8 Vector
- 1.9 Class and Objects
- 1.10 Inheritance
- 1.11 Polymorphism
- 1.12 Working with Collections
- 1.13 Interface and Packages
- 1.14 Exception Handling [try, catch, throw, user defined exception]
- 1.15 Multi-threaded Programming [life cycle, thread creation, thread synchronization]

**2. Applet Programming**

**[2 hours]**

- 2.1 Introduction to Applet
- 2.2 Standard Applet Methods
- 2.3 Putting an Applet on a Web Page
- 2.4 Passing parameter to Applets

2.5 Comparison between Applet and Application

**3. GUI Programming** **[7 hours]**

3.1 AWT Vs. Swing

3.2 Using Swing Components

3.3 Using Automatic Components [JLabel, JButton etc]

3.4 Using JFrame, JPanel, JTree and JTable

3.5 Event handling [Mouse driven, Keyboard driven and other]

**4. Java IO** **[5 hours]**

4.1 Working with Input/output APIs

4.2 Working with scanner class

4.3 Working with Files

4.4 Working with Object Serialization

**5. JDBC** **[4 hours]**

5.1 JDBC Basic

5.2 Different Types of Drivers

5.3 Setting up a database

5.4 Setting up a Connection

5.5 Retrieving Values from Result Sets

5.6 Deleting/Updating tables

5.7 Working with Statement and PreparedStatement

**6. Socket Programming** **[6 hours]**

6.1 Overview of Socket Programming

6.2 Introduction of APIs related to Socket Programming

6.3 Server Side Programming [TCP and UDP]

6.4 Client Side Programming [TCP and UDP]

6.5 A Sample Program

**7. Distributed Application** **[5 hours]**

7.1 Introduction to Distributed Objects

7.2 Overview of RMI

7.3 Rmi Architecture

7.4 Creating Distributed Application using RMI

## **8. Overview of Servlet and JSP**

**[4 Hours]**

- 8.1 Introduction to Servlet and JSP and its Architecture
- 8.2 Configuring Apache Tomcat to host Servlet/JSP files
- 8.3 Sample program of Servlet and JSP.

### **Laboratory Works:**

There shall be lab exercises covering all features of above chapters.

### **Reference Books:**

1. Cay S. Horstman, "Core Java Volume I & II", PHI
2. Bruce Eckel, "Thinking in Java", PHI
3. Herbert Schildt, "Java: The Complete Reference", McGraw Hill
4. Java 2.0 by "Ivan Bayross"
5. Programming with java by: "E. BALAGURUSAMY" latest edition.

**Computer Project-IV**  
**BIT256CO**

**Year: II**

**Semester: II**

Teaching schedule Hours/Week			Examination Scheme				
Theory	Tutorial	Practical	Internal Assessment		Final		Total
-	-	3	Theory	Practical	Theory	Practical	100
			-	60	-	40	

**Course Objective:**

After finishing this project, students will be able to develop application software using JAVA programming language.

**Course Contents:**

Each group of students (up to 3) will be assigned a project work. Students must develop the assigned software, submit written report, and give oral presentation.

**Project Evaluation Criteria for Internal assessment:**

The practical marks allotted for the project should be evaluated based on the following criteria:

- Title identification and Proposal Writing— 10 Marks
- Mid-term Presentation — 20 Marks
- Pre-final Submission and final Presentation — 30 Marks