

**Board of Studies in Computer Science**

Curriculum Structure and Syllabus for III and IV Semesters

**Computer Science**  
for  
**Bachelor of Science**

**Choice Based Credit System**

*m h* **2024 - 25 onwards**

*Prasad*  
ನೀವು ಈಗ ವಿದ್ಯಾರ್ಥಿಗಳಾಗಿರಬೇಕು  
ಇದನ್ನು ಸರಿಯಾಗಿ ಅರ್ಥೈಸಿಕೊಳ್ಳಿ  
ಮಾಡಿ.

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## Bachelor of Science – Computer Science

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**SEMESTER – III**

Sl. No	Paper	Title of the Paper	Instruction Hrs. per Week	No. of Credits	Duration of the Exam.	Marks		
						Internal Assessment	Semester End Exam.	Total
1	BSCT 301	Java Programming	4	4	3 Hrs.	20	80	100
2	BSCP 302	Java Programming Lab	4	2	3 Hrs.	10	40	50
<b>TOTAL</b>				<b>6</b>				<b>150</b>
<b>If student select Elective-1 Paper in Computer Science:</b>								
<b>Elective – 1 (Choose any one)</b>								
3	BSCT 303 A	System Software	3	3	3 Hrs.	20	80	100
	BSCT 303 B	Computer Architecture						
	BSCT 303 C	Mobile App Development						
	BSCT 303 D	Probability and Statistics						
<b>TOTAL</b>				<b>9</b>				<b>250</b>

**NOTE: Theory: 1 Hr. = 1 Credit.**

**Practical: 2 Hrs. = 1 Credit**

**BSCT:** BSc Core Paper Theory

**BSCP:** BSc Core Paper Practical

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**SEMESTER – IV**

Sl. No	Paper	Title of the Paper	Instruction Hrs. per Week	No. of Credits	Duration of the Exam.	Marks		
						Internal Assessment	Semester End Exam.	Total
1	BSCT 401	Database Management System	4	4	3 Hrs.	20	80	100
2	BSCP 402	Database Management System Lab	4	2	3 Hrs.	10	40	50
<b>Total</b>				6				<b>150</b>
<b>If student select Elective-1 Paper in Computer Science:</b>								
<b>Elective – 2 (Choose any one)</b>								
3	BSCT 403 A	Cloud Computing	3	3	3 Hrs.	20	80	100
	BSCT 403 B	Cyber Security						
	BSCT 403 C	Mobile Computing						
	BSCT 403 D	Internet of Things						
<b>TOTAL</b>				<b>9</b>				<b>250</b>

**NOTE: Theory: 1 Hr. = 1 Credit.**

**Practical: 2 Hrs. = 1 Credit**

**BSCT:** BSc Core Paper Theory

**BSCP:** BSc Core Paper Practical

<b>Third Semester BSc</b>			
<b>Subject Name: Java Programming</b>			
<b>Subject Code</b>	BSCT 301	CIE Marks	20
No of Hours/Week:	4	SEE Marks	80
Total Hours:	60	Credits	4

**COURSE OBJECTIVES:**

1. To introduce the object-oriented programming concepts.
2. To understand object-oriented programming concepts, and apply them in solving problems.
3. To introduce the principles of inheritance and polymorphism; and demonstrate how they relate to the design of abstract classes
4. To introduce the implementation of packages and interfaces
5. To introduce the concepts of exception handling and multithreading.
6. To introduce the design of Graphical User Interface using applets and swing controls.

**COURSE OUTCOMES:**

After completing this course satisfactorily, a student will be able to:

1. Understand the features of Java and the architecture of JVM
2. Write, compile, and execute Java programs that may include basic data types and control flow constructs and how type casting is done
3. Identify classes, objects, members of a class and relationships among them needed for a specific problem and demonstrate the concepts of polymorphism and inheritance
4. The students will be able to demonstrate programs based on interfaces and threads and explain the benefits of JAVA’s Exceptional handling mechanism compared to other Programming Language
5. Write, compile, execute Java programs that include GUIs and event driven programming and also programs based on files

<b>Unit 1</b>	<b>Introduction to Java</b>	<b>Hours 10</b>
	History of java, Features of java, JDK Environment & tools like (java, javac, appletviewer, javadoc, jdb) OOPs Concepts Class, Abstraction, Encapsulation, Inheritance, Polymorphism, Difference between C and JAVA, Structure of java program, Data types, Variables, Operators, Instance of operator, Keywords. Input and output statements-scanner class.	
<b>Unit 2</b>	<b>Objects and Classes</b>	<b>Hours 16</b>
	Control Statements: if conditions, switch-case; looping-while, for, do-while, jumping statements-break, continue and exit. Array-Single and Multi-dimensional array. Basics of objects and classes in java, Visibility modifiers, Methods and objects, Constructors, Finalizer, Inbuilt classes like String, Character, String Buffer, this reference, garbage collection, Function Overloading	

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<b>Unit 3</b>	<b>Inheritance and Polymorphism</b>	<b>Hours 10</b>
	Inheritance: Definition, types, final, super and static keyword, Interfaces in java. Overriding function. Polymorphism, Dynamic binding, Casting objects, Abstract class, Exception handling: Exception handling in Java.	
<b>Unit 4</b>	<b>Packages and Multithreading</b>	<b>Hours 09</b>
	Packages, Access Protection, Importing Packages. Multi-Threaded Programming: the classes threadable; Extending threads; Implementing runnable; Synchronization; Changing state of the thread;	
<b>Unit 5</b>	<b>Applet &amp; IO</b>	<b>Hours 15</b>
	Introduction, Applet Life cycle - Creating applet - Applet tag; Applet Classes - Color - Graphics - Font; AWT -Components and container used in AWT; Layout managers; Listeners and Adapter classes; Event Delegation model; I/O programming: Text and Binary I/O, Binary I/O classes, Object I/O, Random Access Files.	

### TEXT BOOKS:

1. Programming with Java, By E Balagurusamy – A Primer, Fourth Edition, Tata McGraw Hill Education Private Limited.
2. Core Java Volume I – Fundamentals, By Cay S. Horstmann, Prentice Hall
3. Object Oriented Programming with Java: Somashekara, M.T., Guru, D.S., Manjunatha, K.S

### REFERENCE BOOKS:

1. Java 2 - The Complete Reference – McGraw Hill publication.
2. Java - The Complete Reference, 7th Edition, By Herbert Schildt– McGraw Hill publication.

<b>Third Semester BSc</b>			
<b>Subject Name: Java Programming Lab</b>			
<b>Subject Code</b>	BSCP 302	CIE Marks	10
No of Hours/Week:	4	SEE Marks	40
Total Hours:	60	Credits	2

### **LIST OF PRACTICAL PROGRAMS**

#### **PART A:**

1. Write a java program that displays roots of a quadratic equation  $ax^2+bx+c=0$  , calculate the discriminate D and based on the value of D, Describe the nature of root (use nested if statement).
2. Write a program to find GCD of two integers.
3. Write a Java program for sorting a given list of names in ascending order.
4. Write a java program to demonstrate creation and accessing of objects and methods.
5. Write a java program to illustrate use of constructors overloading.
6. Write a java program to illustrate use of super keyword.
7. Write a java program to illustrate use of static member and static function,
8. Write a Java program to demonstrate all the concepts of inheritance
9. rite a java program to differentiate Abstract class and interface class.
10. Write a Java Program to demonstrate String Methods.

#### **PART B:**

1. Write a Java Program for creation of Java Built-in Exceptions.
2. Write a Java Program for creation of User Defined Exceptions.
3. Write a java program for creation of multi-threading concept.
4. Write a java program to create user defined package.
5. Program which creates and displays a message on the window
6. Program to draw several shapes in the created window
7. Create a simple applet which reveals the personal information of yours.
8. Create a frame which displays your personal details with respect to a button click
9. Develop an Applet that receives an integer in one text field & compute its factorial value & returns it in another text filed when the button “Compute” is clicked.
10. Write a java program to connect to database using JDBC to perform CRUD operations

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<b>Third Semester</b>			
<b>Elective - 1</b>			
<b>Subject Name: System Software</b>			
<b>Subject code</b>	BSCT 303 A	CIE Marks	20
No of Hours/Week:	3	SEE Marks	80
Total Hours:	45	Credits	3

### **COURSE OBJECTIVES:**

1. Understand the role and structure of system software and differentiate it from application software.
2. Explore language processors, their functions, and development tools used in language processing.
3. Gain knowledge of internal data structures like search and allocation data structures used in language processing.
4. Identify various software tools such as editors, debug monitors, and user interface tools that assist in software development.
5. Comprehend the concepts and design of assemblers, including single-pass and two-pass assembler mechanisms.

### **COURSE OUTCOMES:**

At the end of the course students will be able to:

1. Explain the fundamental concepts of system software including language processing activities and language processor tools.
2. Describe and apply various data structures used in language processing, such as search and allocation structures.
3. Demonstrate the use of software tools like editors, debuggers, and programming environments in software development.
4. Understand the elements and structure of assemblers, including design and implementation of single-pass and two-pass assemblers.
5. Analyze macro definitions and expansions, and design a macro processor with advanced features.

	<b>Introduction to System Software and software tools</b>	<b>8 Hours</b>
<b>Unit 1</b>	Language Processors: Introduction, Language Processing Activities, Fundamentals of Language Processing & Language, Specification, Language Processor Development Tools. Data Structures for Language Processing: Search Data structures, Allocation Data Structures, Software Tools: Software Tools for Program Development, Editors, Debug Monitors, Programming Environments, User Interfaces.	

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<b>Unit 2</b>	<b>Assemblers</b>	<b>8 Hours</b>
	Elements of Assembly Language Programming, A Simple Assembly Scheme, Pass Structure of Assemblers, Design of a Two Pass Assembler, A single pass Assembler for IBM PC.	
<b>Unit 3</b>	<b>Macros and Macro Processors</b>	<b>9 Hours</b>
	Macro Definition and Call, Macro Expansion, Nested Macro Calls, Advanced Macro Facilities, Design of a Macro Preprocessor.	
<b>Unit 4</b>	<b>Interpreters and Introduction of Compilers</b>	<b>8 Hours</b>
	Interpreters: Use and overview of interpreters, Pure and impure interpreters, Phases of the Compiler, Introduction of scanning and parsing, Aspects of compilation.	
<b>Unit 5</b>	<b>Linkers and Loaders</b>	<b>8 Hours</b>
	Introduction to linkers, Relocation and Linking Concepts, Design of a Linker, Self-Relocating Programs, A Linker for MS-DOS, Linking for Overlays and Loaders.	

### TEXT BOOK:

1. D. M. Dhamdhere, “Systems Programming and Operating Systems”, Second Revised Edition, Tata McGraw-Hill, 1999.

### REFERENCE BOOKS:

1. Leland L. Beck, “System Software – An Introduction to Systems Programming”, 3<sup>rd</sup> Edition, Pearson Education Asia, 2000.
2. Santanu Chattopadhyay, “System Software”, Prentice-Hall India, 2007

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Third Semester			
Elective – 1			
Subject Name: Computer Architecture			
Subject code	BSCT 303 B	CIE Marks	20
No of Hours/Week:	3	SEE Marks	80
Total Hours:	45	Credits	3

### COURSE OBJECTIVES:

1. This course introduces the students to the fundamental concepts of digital computer organization, design and architecture.
2. It aims to develop a basic understanding of the building blocks of the computer system and highlights how these blocks are organized together to architect a digital computer system.

### COURSE OUTCOMES:

On successful completion of the course, students will be able to:

1. Design and Simplify Combinational and sequential circuits using basic building blocks.
2. Represent data in binary form, convert numeric data between different number systems and perform arithmetic operations in binary.
3. Explain instruction cycle, pipelining and interrupts.
4. Explain data communication between CPU, memory and I/O devices.
5. Simulate the design of a basic computer using a software tool.

<b>Unit 1</b>	<b>Digital Logic Circuits</b>	<b>8 Hours</b>
	Logic Gates, Truth Tables, Boolean Algebra, Digital Circuits, Combinational Circuits, Introduction to Sequential Circuits, Circuit Simplification using Karnaugh Map, Don't Care Conditions, Flip-Flops, Characteristic Tables, Excitation Table.	
<b>Unit 2</b>	<b>Digital Components (Fundamental building blocks)</b>	<b>10 Hours</b>
	Designing of combinational circuits- Half Adder, Full Adder, Decoders, Encoders, Multiplexers, Registers and Memory (RAM, ROM and their types), Arithmetic Microoperations, Binary Adder, Binary Adder-Subtractor.	
<b>Unit 3</b>	<b>Data Representation and Basic Computer Arithmetic</b>	<b>8 Hours</b>

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	Number System, r and (r-1)'s Complements, data representation and arithmetic operations.	
<b>Unit 4</b>	<b>Basic Computer Organization and Design</b>	<b>8 Hours</b>
	Bus organization, Micro programmed vs Hardwired Control, Instruction Codes, Instruction Format, Instruction Cycle, Instruction pipelining, Memory Reference, Register Reference and Input Output Instructions, Program Interrupt and Interrupt Cycle.	
<b>Unit 5</b>	<b>Processors</b>	<b>11 Hours</b>
	General register organization, Stack Organization, Addressing Modes, Overview of Reduced Instruction Set Computer (RISC), Complex Instruction Set Computer (CISC), Multicore processor and Graphics Processing Unit (GPU) Memory hierarchy (main, cache and auxiliary memory), Input-Output Interface, Modes of Transfer: Programmed I/O, Interrupt initiated I/O, Direct memory access.	

### TEXT BOOKS:

1. David A. Patterson and John L. Hennessy. "Computer Organization and Design: The Hardware/Software interface", 5<sup>th</sup> edition, Elsevier, 2012.
2. Mano, M. Computer System Architecture, 3<sup>rd</sup> edition, Pearson Education, 1993.

### REFERENCE BOOKS:

1. Mano, M. Digital Design, Pearson Education Asia, 1995.
2. Null, L., & Lobur, J. The Essentials of Computer Organization and Architecture. 5<sup>th</sup> edition. (Reprint) Jones and Bartlett Learning, 2018.
3. Stallings, W. Computer Organization and Architecture Designing for Performance 8<sup>th</sup> edition, Prentice Hall of India, 2010.

<b>Third Semester</b>			
<b>Subject Name: Mobile Application Development</b>			
<b>Subject code</b>	BSCT 303 C	CIE Marks	20
No of Hours/Week:	3	SEE Marks	80
Total Hours:	45	Credits	3

**COURSE OBJECTIVES:**

1. To provide foundational understanding of the Android development environment, including the setup of Android Studio, AVDs, and essential tools for building applications.
2. To teach the structure and core components of Android applications, such as activities, services, intents, and permissions, with emphasis on Android app design principles.
3. To enable hands-on experience with Android APIs, UI/UX components, and data handling techniques using SQLite, Content Providers, and Web APIs for real-world deployment.

**COURSE OUTCOMES:**

On successful completion of the course, students will be able to:

1. Develop and deploy basic Android applications using Android Studio with proper setup of layouts, permissions, and manifest settings.
2. Design responsive and user-friendly Android user interfaces, implement animations, and manage multiple device configurations and resources.
3. Integrate core Android APIs, including database management, data sharing, and networking features, to create fully functional mobile applications for real-world use.

<b>Unit 1</b>	<b>Android OS Design and Features</b>	<b>8 Hours</b>
	Introduction to Android development framework: Key SDK features, Installing and running applications using Android Studio ,Creating Android Virtual Devices (AVDs),Types of Android applications, Best practices in Android programming, Common Android tools, Building your first Android application	
<b>Unit 2</b>	<b>Introduction to Android development framework</b>	<b>10 Hours</b>
	Important Android terms , Understanding Application Context ,Core components: Activities, Services, and Intents , Receiving and broadcasting intents, Android Manifest File and its main settings, Using Intents and Filters ,Working with Permissions.	
<b>Unit 3</b>	<b>Android User Interface (UI) Design Essentials</b>	<b>10 Hours</b>
	UI screen elements overview, Designing layouts for different screen sizes ,Working with various UI components, Using drawing tools and animations in UI, Managing Android application resources, Testing and publishing Android apps, Using preferences and handling multiple resource types	
<b>Unit 4</b>	<b>Using Common Android APIs</b>	<b>10 Hours</b>
	Data and storage APIs in Android, Using SQLite database, Sharing data between apps with Content Providers, Basics of Android Networking APIs, Using Web APIs in Android apps ,Deploying applications to the real world	
<b>Unit 5</b>	<b>Consuming Web Services</b>	<b>7 Hours</b>
	Consuming Web Services Using HTTP-Consuming JSON Services- Creating Your Own Services - Binding Activities to Services -Understanding Threading.	

**TEXT BOOKS:**

1. Lauren Darcey & Shane Conder, *Android Wireless Application Development*, Pearson Education, 2nd Ed. (2011).
2. Reto Meier, *Professional Android 2 Application Development*, Wiley India Pvt. Ltd.

**REFERENCE BOOKS:**

1. Barry Burd, *Android Application Development All-in-One for Dummies*, Edition I.
2. Wei-Meng Lee, *Beginning Android 4 Application Development*, Wiley India (Wrox), 2013.

<b>Third Semester</b>			
<b>Elective – 1</b>			
<b>Subject Name: Probability and Statistics</b>			
<b>Subject code</b>	BSCT 303 D	CIE Marks	20
No of Hours/Week:	3	SEE Marks	80
Total Hours:	45	Credits	3

**COURSE OBJECTIVES:**

1. This course is designed to introduce the historical development of statistics- presentation of data descriptive measures and fitting mathematical curves to the data.
2. This course also introduces measurement of the relationship of quantitative and qualitative data and the concept of probability.
3. This course will enable students to understand and summarize the data, understand and apply the descriptive measures and probability for data analysis, implement theoretical concepts of descriptive measures and probability, study the relationship between variables.

**COURSE OUTCOMES:**

After completing this course satisfactorily, a student will be able to:

1. Demonstrate the history of statistics Identify the type of data and present the data in various forms and summarize it using descriptive statistics.
2. Understand and apply the statistical concept of correlation, association, regression analysis and infer its results.
3. Understand and apply the concept of theory and its applications.

<b>Unit 1</b>	<b>Introduction and Analysis of Univariate data</b>	<b>Hours 10</b>
	Basic statistical concepts: Origin and development of Statistics- Scope-limitations and misuse of statistics. Types of data: primary and secondary data-quantitative and qualitative data. Scales of Measurement: nominal ordinal-ratio and interval. Discrete and continuous data variables. Construction of frequency distribution, stem and leaf display. Presentation of data by tables: construction of frequency distributions for discrete and continuous data. Graphical presentation of data -histograms and cumulative frequency curves. Measure of central tendency—Arithmetic mean, median and mode—their properties Partition values—quartiles, deciles and percentiles. Measures of dispersion—Range, quartile deviation and standard deviation and their relative measures. Skewness—concept and measures, Kurtosis—concept.	
<b>Unit 2</b>	<b>Correlation and Regression</b>	<b>Hours 13</b>
	Correlation: Scatter plot- Karl Pearson coefficient of correlation- Spearman's rank	

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	<p>correlation coefficient- multiple and partial correlations (for 3 variates only). Regression: Concept of errors Principles of Least Square- Simple linear regression and its properties.</p>	
<b>Unit 3</b>	<b>Basics of Probability</b>	<b>Hours 8</b>
	<p>Basic terminology-random experiment, sample space, event, mutually exclusive events, equally likely events. Definition of probability –Classical, empirical and axiomatic approaches. properties of probability. Theorems on probability- conditional probability and independent events- Laws of total probability- Baye’s theorem and its applications.</p>	
<b>Unit 4</b>	<b>Random variables and Probability distributions</b>	<b>Hours 15</b>
	<p>Definition of a random variable—discrete and continuous random variables— probability mass function and probability density function. Distribution function and its properties. Mean and variance of a random variable. Definition of a bivariate probability distribution and marginal probability functions. Discrete probability distributions—Binomial and Poisson distributions Continuous distributions—Normal distribution—computation of probabilities.</p>	
<b>Unit 5</b>	<b>Applied Statistics</b>	<b>Hours 14</b>
	<p>Formation of Hypothesis, Test of significance: Large sample test for single proportion, Difference of proportions, Single mean, Difference of means, and Difference of standard deviations. Test of significance for small samples: t- Test for single mean, difference of means, t-test for correlation coefficients, F- test for ratio of variances, Chi-square test for goodness of fit and independence of attributes.</p>	

### TEXT BOOKS:

1. S.C. Gupta and V.K. Kapoor - Fundamentals of Mathematical Statistics- 12th ed.- Sultan Chand & Sons- New Delhi- 2020.
2. P. Mukhopadhyay.- Mathematical Statistics-3rd ed.- Books and Allied (P) Ltd- Kolkata2018.

### REFERENCE BOOKS:

1. S. Ross, A First Course in Probability, 6th Ed., Pearson Education India.
2. W. Feller, An Introduction to Probability Theory and its Applications, Vol. 1, Wiley.
3. D. C. Montgomery and G. C. Runger, Applied Statistics and Probability for Engineers, Wiley.
4. J. L. Devore, Probability and Statistics for Engineering and the Sciences, Cengage Learning.

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Fourth Semester			
Subject Name: Database Management System			
Subject code	BSCT 401	CIE Marks	20
No of Hours/Week:	4	SEE Marks	80
Total Hours:	60	Credits	4

### COURSE OBJECTIVES:

1. To understand the basic concepts and the applications of database systems.
2. To understand the design of database.
3. To understand the relational database design principles
4. To Master the basics of SQL and construct queries using SQL
5. To become familiar with the basic issues of transaction processing and concurrency control

### COURSE OUTCOMES:

At the end of the course students will be able to:

1. Explain the various database concepts and the need for database systems.
2. Identify and define database objects, enforce integrity constraints on a database using DBMS.
3. Demonstrate a Data model and Schemas in RDBMS.
4. Identify entities and relationships and draw ER diagram for a given real-world problem.
5. Convert an ER diagram to a database schema and deduce it to the desired normal form.
6. Formulate queries in Relational Algebra, Structured Query Language (SQL) for database manipulation.
7. Explain the transaction processing and concurrency control techniques.

<b>Unit 1</b>	<b>Database Architecture</b>	<b>Hours 10</b>
	Introduction to Database system applications. Characteristics and Purpose of database approach. People associated with Database system. Data models. Database schema. Database architecture. Data independence. Database languages, interfaces, and classification of DBMS.	
<b>Unit 2</b>	<b>E-R Model</b>	<b>Hours 12</b>
	Entity-Relationship modeling: E – R Model Concepts: Entity, Entity types, Entity sets, Attributes, Types of attributes, key attribute, and domain of an attribute. Relationships between the entities. Relationship types, roles and structural constraints, degree and cardinality ratio of a relationship. Weak entity types, E -R diagram.	
<b>Unit 3</b>	<b>Relational Data Model</b>	<b>Hours 16</b>
	Relational model concepts. Characteristics of relations. Relational model constraints: Domain constraints, key constraints, primary & foreign key constraints, integrity constraints and null values. <i>Relational Algebra:</i> Selection, projection, set operations, renaming, Joins ,Division, Relational calculus: Tuple relational Calculus, Domain relational calculus.	

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	<i>Introduction to SQL</i> : Overview of SQL, Data types, DDL, DML, DCL, TCL, Structure of SQL queries, Nested Sub queries, Joins, Views, Index and Triggers.. Introduction to PL/SQL & programming of above operations in PL/SQL.	
<b>Unit 4</b>	<b>Data Normalization</b>	<b>Hours 12</b>
	Anomalies in relational database design. Decomposition. Functional dependencies. Normalization. First normal form, Second normal form, Third normal form. Boyce-Codd normal form. Higher Normal Forms - Introduction, Multi-valued dependencies and Fourth normal form, Join dependencies and Fifth normal form	
<b>Unit 5</b>	<b>Query Processing Transaction Management</b>	<b>Hours 10</b>
	Introduction Transaction Processing. Single user & multiuser systems. Transactions: read & write operations. Need of concurrency control: The lost update problem, Dirty read problem. Types of failures. Transaction states. Desirable properties (ACID properties) of Transactions. Concurrency Control Techniques: Locks and Time stamp Ordering.	

### TEXT BOOKS:

1. Fundamentals of Database Systems, Ramez Elamassri, Shankant B. Navathe, 7th Edition, Pearson, 2015.
2. Database Systems Concepts, Abraham Silberschatz, Henry Korth, S.Sudarshan, 6<sup>th</sup> Edition, McGraw Hill, 2010.

### REFERENCE BOOKS:

1. An Introduction to Database Systems, Bipin Desai, Galgotia Publications, 2010.
2. Introduction to Database System, C J Date, Pearson, 1999.
3. Database Management Systems, Raghu Rama Krishnan and Johannes Gehrke, 3rd Edition, McGraw Hill, 2002

<b>Fourth Semester</b>			
<b>Subject Name: Database Management System Lab</b>			
<b>Subject code</b>	BSCP 402	CIE Marks	10
No of Hours/Week:	4	SEE Marks	40
Total Hours:	60	Credits	2

### **LIST OF LAB PROGRAMS**

#### **PART A**

##### **1. Execute DDL Commands**

Consider the table:

STUDENT (regno number, name varchar2, dob date, marks number)

- Create the above table with suitable constraints.
- Remove the existing attribute marks from the table.
- Change the data type of regno from number to varchar2.
- Add a new attribute phno to the existing table.
- Insert 5 tuples into the table.
- Display the tuples in table

##### **2. Execute DML Commands**

Consider the table:

LIBRARY (bid number, title varchar2, author varchar2, publisher varchar2, yearof\_pub number, price number)

- create the above table.
- Enter 5 tuples into the table.
- Display all the tuples from the table.
- Display different publishers from table.
- Update price of all books with 5% GST amount.
- Delete the details of book published by a specific Author.
- Arrange the tuples in the alphabetical order of book title.
- List the details of all books whose price range between 100 rs and 300 rs.

##### **3. Execute DQL and group functions**

Consider the table EMPLOYEE (EmpNo, EmpName, Dept, Salary, DOJ, Branch)

Perform the following operations:

- Create the table
- Insert 5 tuples into the table
- Retrieve average salary of all employee

- d) Retrieve number of employees
- e) Retrieve distinct number of employee
- f) Retrieve total salary of employee group by employee name and count similar names
- g) Display details of employees whose salary is greater than 50000.

#### **4. Demonstrate the use of TCL and DCL Commands:**

##### **TCL:**

1. Create a table **accounts** ( **account\_id**, **account\_holder\_name**, **balance**)
2. Insert some sample data into the accounts table.
3. Start a transaction and perform the following operations:
  - Debit 1000 from account\_id 1.
  - Credit 1000 to account\_id 2.
4. Use the COMMIT command to save the changes.
5. Start a new transaction and perform the following operations:
  - Debit 500 from account\_id 1.
  - Credit 500 to account\_id 3.
6. Use the ROLLBACK command to undo the changes.
7. Create the save point and execute ROLLBACK TO previously created save point.

##### **DCL:**

1. Create a new user called user1 with a password.
2. Grant SELECT, INSERT, and UPDATE privileges on the accounts table to user1.
3. Login as user1 and perform the following operations:
  - Select data from the accounts table.
  - Insert a new row into the accounts table.
  - Update an existing row in the accounts table.
4. Revoke the INSERT privilege from user1.
5. Login as user1 and try to insert a new row into the accounts table.

#### **5. Implement the Nested Queries.**

An INVENTORY database has the following table.

ITEMS(itemcode number, name varchar2, price number)

PURCHASE(itemcode number, qty number)

- a) Create the tables with the above attributes.
- b) Enter 5 tuples into the tables.
- c) List the items purchased.
- d) List the items which are not purchased by anyone.

#### **6. Implement Join operations in SQL**

**The COMPANY database consists of the tables:**

**EMPLOYEE (SSN, Name, Address, Sex, Salary, SuperSSN, DNo)**

**DEPARTMENT (DNo, DName, MgrSSN, MgrStartDate)**

Create tables, Insert 5 tuples each and perform the following

- a) Give a 10 percent raise in salary for all employees working in the 'Research' Department.
- b) Retrieve the name of each employee Controlled by department number 5 (use EXISTS operator).
- c) Retrieve the name of each dept and number of employees working in each department which has at least 2 employees
- d) Retrieve the name of employees and their department name (using NATURAL JOIN)
- e) Perform EQUI join operation on the given tables.
- f) Perform NON-EQUI join operation on the given tables.
- g) Perform OUTER join operations on the given tables.

**7. Create the following tables:**

**Passenger(PassportID, Name, Age, Sex, Address) and  
Reservation(PNRno, JourneyDate, Noofseats, Address, ContactNo.)**

Query the tables using ANY, ALL, IN, Exists, NOT EXISTS, UNION, INTERSECT etc.,

1. Display unique PNR\_NO of all passengers
2. Display all the names of male passengers.
3. Display the ticket numbers and names of all the passengers.
4. Find the ticket numbers of the passengers whose name start with 'r' and ends with 'h'.
5. Find the names of Passengers whose age is between 30 and 45.
6. Display all the passengers names beginning with 'A'.
7. Display the sorted list of Passengers names

**8. Create views for a particular table**

**The RAILWAY RESERVATION SYSTEM database consists of the tables:**

**TRAIN(TrainNo, TrainName, StartPlace, Destination)**

**AVAILABILITY(TrainNo, Class,StartPlace,Destination,No\_of\_seats)**

- a) Create view sleeper to display train no, start place, destination which have sleeper class and perform the following
  - insert new record
  - update destination='Manglore' where train no='RJD16'
  - delete a record which have train no='KKE55'
- b) Create view details to display train no, train name, class
- c) Create view total\_seats to display train number, start place, use count function to no of seats , group by start place and perform the following
  - insert new record
  - update start place='Hubli' where train no='JNS8'
  - delete last row of the view
- d) Rename view sleeper to class
- e) Delete view details

**PART B**

1. Write PL/SQL program to enter any two numbers and find out their sum, difference, product, quotient and remainder.
2. Write PL/SQL procedure to compute factorial of a number using recursion
3. Given the table EMPLOYEE (EmpNo, Name, Salary, Designation, DeptID) write a cursor in PL/SQL to select the five highest paid employees from the table.
4. Write PL/SQL program to increase the salary for the employees of a particular department and enter the no of records updated, date, time, deptno and name of the person who increased the salary into another table called cursor\_ret.
5. Create a row level trigger for the customers table that would fire for INSERT or UPDATE or DELETE operations performed on the CUSTOMERS table. This trigger will display the salary difference between the old & new Salary on UPDATE operation and display the new or old salary for INSERT and DELETE operations, respectively.  
**CUSTOMERS(ID,NAME,AGE,ADDRESS,SALARY)**
6. Given the table MOVIE(MID,MTitle, Language,Director,Year) write a function in PL/SQL to find the total number of Movies in the table.
7. Given the Table CUSTOMERS(CID,CName, Address) write a PL/SQL program which asks for customer ID, if the user enters invalid ID then the exception **invalid\_id** is raised.
8. Write a PL/SQL program to demonstrate Packages.

<b>Fourth Semester</b>			
<b>Elective – 2</b>			
<b>Subject Name: Cloud Computing</b>			
<b>Subject code</b>	BSCT 403 A	CIE Marks	20
No of Hours/Week:	3	SEE Marks	80
Total Hours:	3	Credits	3

**COURSE OBJECTIVES:**

1. Understand the fundamentals of cloud computing including cloud models (public, private, hybrid) and key building blocks.
2. Gain insight into virtualization concepts, types, benefits, and how virtualization supports cloud infrastructure.
3. Learn how to set up a private cloud using open-source tools and plugins, including cloud provisioning and tool integrations.
4. Understand the relationship between IoT and Cloud Computing, and how they integrate in real-world applications.

**COURSE OUTCOMES:**

At the end of the course students will be able to:

1. Explain the fundamentals of cloud computing, virtualization concepts, and different types of cloud environments (public, private, hybrid).
2. Set up and configure a private cloud using open-source tools, and integrate tools like Docker and Nagios.
3. Differentiate between Cloud Computing, IoT, and Fog Computing, and describe their roles in modern IT infrastructures.
4. Demonstrate how to connect IoT devices to the cloud, manage cloud storage, and handle data communication protocols and APIs.
5. Analyze real-time IoT-cloud applications including device-to-cloud communication, data normalization, and infrastructure management.

<b>Unit 1</b>	<b>Introduction to Cloud</b>	<b>8 Hours</b>
	Virtualization concepts, Types of Virtualization & its benefits, Introduction to Various Virtualization OS, HA/DR using Virtualization, Moving VMs, Cloud Fundamentals, Cloud Building Blocks, Understanding Public & Private cloud environments, Private Cloud Environment, Public Cloud Environment, Managing Hybrid Cloud environment.	
<b>Unit 2</b>	<b>The Cloud Setup</b>	<b>8 Hours</b>

## Bachelor of Science – Computer Science

	Setting up your own Cloud: Build private cloud using open source tools, Understanding various cloud plugins, Setting up your own cloud environment, Auto-provisioning, Custom images, Integrating tools like Nagios, Integration of Public and Private cloud. Micro services using Docker	
<b>Unit 3</b>	<b>IoT and the Cloud</b>	<b>8 Hours</b>
	Introduction to cloud computing, Difference between Cloud Computing and IoT, Fog Computing: The Next Evolution of Cloud Computing, Role of Cloud Computing in IoT. Living on the Edge, An Abstract Edge Architecture Model, Connecting devices at the edge and to the cloud	
<b>Unit 4</b>	<b>Connecting Things to Cloud</b>	<b>8 Hours</b>
	Various Real time applications of IoT, Connecting IoT to cloud, Cloud Storage for Iot. Cloud-to-Device Connectivity, Device Ingress/Egress, Data Normalization and Protocol Translation, Infrastructure, APIs, The Topology of the Cloud.	
<b>Unit 5</b>	<b>Challenge in Integration of Things with Cloud</b>	<b>10 Hours</b>
	Security, Scalability, Reliability, Performance, Mobility, Resource Optimization & cost efficiency, Cloud data management, cloud data monitoring, Cloud data Exchange, Infrastructure Configuration & reconfiguration, IoT Overarching Challenges.	

### TEXT BOOKS:

1. Biron, J., & Follett, J. (2016). Foundational elements of an iot solution. O'Reilly Media, Incorporated
2. Buyya, R., Broberg, J., & Goscinski, A. M. (Eds.). (2010). Cloud computing: Principles and paradigms (Vol. 87). John Wiley & Sons.

### REFERENCE BOOK:

1. Hwang, K., Dongarra, J., & Fox, G. C. (2013). Distributed and cloud computing: from parallel processing to the internet of things. Morgan kaufmann.

<b>Fourth Semester</b>			
<b>Elective - 2</b>			
<b>Subject Name: Cyber Security</b>			
<b>Subject code</b>	BSCT 403 B	CIE Marks	20
No of Hours/Week:	3	SEE Marks	80
Total Hours:	45	Credits	3

**COURSE OBJECTIVES:**

1. This course introduces the students to the fundamental concept of Cyber security and issues and challenges associated with it.
2. It aims to develop a basic understanding of the basic security aspects related to Computer and Mobiles. They will be able to use basic tools and technologies to protect their devices.

**COURSE OUTCOMES:**

On successful completion of the course, students will be able to:

1. After completion of this course, students would be able to understand the concept of Cyber security and issues and challenges associated with it.
2. After completion of this course, students would be able to understand the concept of Cyber security and issues and challenges associated with it.
3. On completion of this course, students should be able to appreciate various privacy and security concerns on online Social media and understand the reporting procedure of inappropriate content, underlying legal aspects and best practices for the use of Social media platforms.
4. After the completion of this module, students would be able to understand the basic concepts related to E-Commerce and digital payments. They will become familiar with various digital payment modes and related cyber security aspects, RBI guidelines and preventive measures against digital payment frauds.

Students, after completion of this module will be able to understand the basic security aspects related to Computer and Mobiles. They will be able to use basic tools and technologies to protect their devices.

<b>Unit 1</b>	<b>Introduction to Cyber security</b>	<b>10 Hours</b>
	Defining Cyberspace and Overview of Computer and Web-technology, Architecture of cyberspace, Communication and web technology, Internet, World wide web, Advent of internet, Internet infrastructure for data transfer and governance, Internet society, Regulation of cyberspace, Concept of cyber security, Issues and challenges of cyber security.	
<b>Unit 2</b>	<b>Cyber-crime and Cyber law</b>	<b>10 Hours</b>

## Bachelor of Science – Computer Science

	Classification of cybercrimes, Common cybercrimes- cyber-crime targeting computers and mobiles, cyber crime against women and children, financial frauds, social engineering attacks, malware and ransomware attacks, zero day and zero click attacks, Cybercriminals modus-operandi, Reporting of cyber crimes, Remedial and mitigation measures, Legal perspective of cyber crime, IT Act 2000 and its amendments,	
<b>Unit 3</b>	<b>Social Media Overview and Security</b>	<b>10 Hours</b>
	Introduction to Social networks Types of Social media, Social media platforms, Social media monitoring, Hashtag, Viral content, Social media marketing, Social media privacy, Challenges, opportunities and pitfalls in online social network, Security issues related to social media, Flagging and reporting of inappropriate content, Laws regarding posting of inappropriate content.	
<b>Unit 4</b>	<b>E- Commerce and Digital Payments</b>	<b>8 Hours</b>
	Definition of E- Commerce, Main components of E-Commerce, Elements of E-Commerce security, E-Commerce threats, E-Commerce security best practices, Advantage of e-commerce, Survey of popular e-commerce sites. Introduction to digital payments, Components of digital payment and stake holders, Modes of digital payments- Banking Cards, Unified Payment Interface (UPI), e-Wallets, Unstructured Supplementary Service Data (USSD), Aadhar enabled payments, Digital payments related common frauds and preventive measures.	
<b>Unit 5</b>	<b>Security</b>	<b>7 Hours</b>
	End Point device and Mobile phone security, Password policy, Security patch management, Data backup, Downloading and management of third-party software, Device security policy, Cyber Security best practices, Significance of host firewall and Ant-virus, Management of host firewall and Anti-virus, Wi-Fi security, Configuration of basic security policy and permissions.	

### TEXT BOOKS:

1. Cyber Crime Impact in the New Millennium, by R. C Mishra, Auther Press. Edition 2010.
2. Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by SumitBelapure and Nina Godbole, Wiley India Pvt. Ltd. (First Edition, 2011).
3. Security in the Digital Age: Social Media Security Threats and Vulnerabilities by Henry A. Oliver, Create Space Independent Publishing Platform. (Pearson , 13th November, 2001)

### REFERENCE BOOKS:

1. Cyber Laws: Intellectual Property & E-Commerce Security by Kumar K, Dominant Publishers.
2. Fundamentals of Network Security by E. Maiwald, McGraw Hill.
3. Network Security Bible, Eric Cole, Ronald Krutz, James W. Conley, 2nd Edition, Wiley India Pvt. Ltd.

<b>Fourth Semester</b>			
<b>Elective - 2</b>			
<b>Subject Name: Mobile Computing</b>			
<b>Subject code</b>	BSCT 403 C	CIE Marks	20
No of Hours/Week:	<b>3</b>	SEE Marks	80
Total Hours:	45	Credits	3

**COURSE OBJECTIVES:**

1. To introduce the field of mobile communication and focuses on digital data transfer.
2. To address how mobile phone system works.
3. To understand the technology in wireless local area networks.
4. To focuses on mobility influencing applications, security, or IP networks

**COURSE OUTCOMES:**

1. An ability to understand the field of mobile communication.
2. An ability to understand how mobile phone system works
3. This course aims to understand the technology in wireless local area networks and its latest trends.

<b>Unit 1</b>	<b>Introduction</b>	<b>09 Hours</b>
	Introduction to Mobile Computing – Applications of Mobile Computing- Generations of Mobile Communication Technologies- Multiplexing – Spread spectrum -MAC Protocols – SDMA- TDMA- FDMA- CDMA- Different Generations of Wireless Networks- 1G, 2G, 3G, 4G,5G.	
<b>Unit 2</b>	<b>Mobile Telecommunication System</b>	<b>09 Hours</b>
	Introduction to Cellular Systems – GSM – Services & Architecture – Protocols – Connection Establishment – Frequency Allocation – Routing – Mobility Management – Security – GPRS- UMTS – Architecture – Handover – Security.	
<b>Unit 3</b>	<b>Mobile Network Layer</b>	<b>09 Hours</b>
	Mobile IP – DHCP – AdHoc– Proactive protocol-DSDV, Reactive Routing Protocols – DSR, AODV, Hybrid routing –ZRP, Multicast Routing- ODMRP, Vehicular Ad Hoc networks ( VANET) –MANET Vs VANET – Security	
<b>Unit 4</b>	<b>Mobile Transport and Application Layer</b>	<b>10 Hours</b>
	Traditional TCP, Classical TCP Improvements: Indirect TCP-Snooping TCP, Mobile TCP-Fast retransmit/fast recovery- Transmission /time-out freezing- Selective retransmission-Transaction oriented TCP-Wireless Application Protocol (WAP) –Architecture – XML – WML Script – Applications	
<b>Unit 5</b>	<b>Mobile Platforms And Applications</b>	<b>08 Hours</b>
	Mobile Device Operating Systems – Special Constraints & Requirements – Commercial Mobile Operating Systems – Software Development Kit: iOS, Android, BlackBerry, Windows Phone – MCommerce – Structure – Pros & Cons – Mobile Payment System – Security Issues	

**TEXT BOOKS:**

1. Jochen Schiller, —Mobile Communications, PHI, Second Edition, 2003.
2. Prasant Kumar Pattnaik, Rajib Mall, —Fundamentals of Mobile Computing, PHI Learning Pvt.Ltd, New Delhi – 2012

**REFERENCE BOOKS:**

1. Dharma Prakash Agarwal, Qing and An Zeng, —Introduction to Wireless and Mobile systems, Thomson Asia Pvt Ltd, 2005.
2. Android Developers: <http://developer.android.com/index.html>
3. Apple Developer: <https://developer.apple.com/>
4. Uwe Hansmann, Lothar Merk, Martin S. Nicklons and Thomas Stober, —Principles of Mobile Computing, Springer, 2003.
5. William. C.Y.Lee —Mobile Cellular Telecommunications-Analog and Digital Systems, Second Edition, Tata McGraw Hill Edition ,2006.

<b>Fourth Semester</b>			
<b>Elective - 2</b>			
<b>Subject Name: Internet of Things</b>			
<b>Subject code</b>	BSCT 407 D	CIE Marks	20
No of Hours/Week:	3	SEE Marks	80
Total Hours:	45	Credits	3

**COURSE OBJECTIVES:**

1. To understand the concepts of Internet of Things and the application of IoT.
2. To Determine the Market perspective of IoT.
3. To Understand the vision of IoT from a global context

**COURSE OUTCOME:**

On successful completion of the course, students will be able to:

1. Use of Devices, Gateways and Data Management in IoT.
2. Design IoT applications in different domain and be able to analyze their performance
3. Implement basic IoT applications on embedded platform.

<b>Unit 1</b>	<b>IoT &amp; Web Technology</b>	<b>10 Hours</b>
	The Internet of Things Today, Time for Convergence, Towards the IoT Universe, Internet of Things Vision, IoT Strategic Research and Innovation Directions, IoT Applications, Future Internet Technologies, Infrastructure, Networks and Communication, Processes, Data Management, Security, Privacy & Trust, Device Level Energy Issues, IoT Related Standardization, Recommendations on Research Topics.	
<b>Unit 2</b>	<b>M2M to IoT</b>	<b>10 Hours</b>
	A Basic Perspective– Introduction, Some Definitions, M2M Value Chains, IoT Value Chains, an emerging industrial structure for IoT, The international driven global value chain and global information monopolies.M2M to IoT-An Architectural Overview– Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations.	
<b>Unit 3</b>	<b>IoT Architecture</b>	<b>8 Hours</b>
	Introduction, State of the art, Architecture. Reference Model- Introduction, Reference Model and architecture, IoT reference Model, IoT Reference Architecture- Introduction, Functional View, Information	

	View, Deployment and Operational View, Other Relevant architectural views.	
<b>Unit 4</b>	<b>IoT Applications for Value Creations</b>	<b>10 Hours</b>
	Introduction, IoT applications for industry: Future Factory Concepts, Brownfield IoT, Smart Objects, Smart Applications, Four Aspects in your Business to Master IoT, Value Creation from Big Data and Serialization, IoT for Retailing Industry, IoT For Oil and Gas Industry, Opinions on IoT Application and Value for Industry, Home Management, eHealth.	
<b>Unit 5</b>	<b>IoT Privacy, Security and Governance</b>	<b>7 Hours</b>
	Introduction, Overview of Governance, Privacy and Security Issues, Contribution from FP7 Projects, Security, Privacy and Trust in IoT-Data-Platforms for Smart Cities, First Steps Towards a Secure Platform, Smartie Approach. Data Aggregation for the IoT in Smart Cities, Security.	

**TEXT BOOK:**

1. Vijay Madiseti and ArshdeepBahga, “Internet of Things: (A Hands-on Approach)”, Universities Press (INDIA) Private Limited 2014, 1st Edition.

**REFERENCE BOOKS:**

1. Michael Miller, “The Internet of Things: How Smart TVs, Smart Cars, Smart Homes, and Smart Cities Are Changing the World”, Pearson Education 2015.
2. Francis da Costa, “Rethinking the Internet of Things: A Scalable Approach to Connecting Everything”, Apress Publications 2013, 1st Edition.
3. Waltenequs Dargie, Christian Poellabauer, "Fundamentals of Wireless Sensor Networks: Theory and Practice”, Wiley 2014.
4. CunoPfister, “Getting Started with the Internet of Things”, O’Reilly Media 2011.

**Question Paper Pattern for Semester End Examination (SEE)  
(Common for III and IV Semester)  
SUBJECT NAME**

**Time: 3 Hrs.**

**Max. Marks: 80**

**Instruction to Candidate: Answer all the Sections**

**SECTION A**

**I. Answer any ten of the following questions (10X2 = 20)**

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.
- 11.
- 12.

**SECTION B**

**II. Answer any five of the following questions (5X5 = 25)**

- 13.
- 14.
- 15.
- 16.
- 17.
- 18.
- 19.

**SECTION C**

**III. Answer any five of the following questions (5X7 = 35)**

- 20.
- 21.
- 22.
- 23.
- 24.
- 25.
- 26.

