

# **B-Tech Computer Science & Engineering**

## **Semester-VI**

<b>Course Code</b>	<b>Course Title</b>	<b>L – P</b>	<b>Credit</b>
<b>CSE 611T</b>	Java Programming	4 – 0	4
<b>CSE 612T</b>	Formal Language and Automata Theory	4 – 0	4
<b>CSE 613T</b>	Computer Graphics	4 – 0	4
<b>CSE 614T</b>	Embedded Systems	4 – 0	4
<b>MTH- 611T/P</b>	Numerical Methods	3 – 1	4
<b>XXX-ExxX</b>	Elective IV		X
<b>CSE 615P</b>	Java Programming Lab	0 – 2	1
<b>CSE 616P</b>	Computer Graphics Lab	0 – 2	1
	<b>Total Credits</b>	<b>19 – 5</b>	<b>22+X</b>

**Java Programming**  
**CSE-611T**

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**Unit-I**

Introduction to java, importance of java to internet, Java Virtual Machine Architecture, Class loading process by Class loaders, Role of Just in Time Compiler (JIT) , Data Types, Variables and Arrays ,precedence and associability rules, Operators, Control statements, Object oriented Paradigms

Class Fundamentals, Command Line Arguments, static initializer, Inheritance, abstract classes, Variable Hiding ,Overloading and Overriding of Methods , Access Controls modifiers, Nested and Inner Classes ,Dynamic method dispatch introduction to Packages, Understanding CLASSPATH, Access Protection, Importing Packages, Distributing packages as ZIP and Jar files, Defining and implementing an Interface, Abstract classes Vs Interfaces.

**Unit-II**

Fundamentals of Exception handling, Types of exceptions, exception handlers, Try and catch , Multiple catch clauses, Nested try statements, throw, throws and finally ,Creating custom exceptions  
String class, String buffer class, String builder class, Wrapper class. File Handling, Binary Streams, Character Streams, Serialization.

Lambda Expressions: Introduction to Lambda Expressions, Using Lambda Expression, Method References

**Unit-III**

Windows Programming: introduction to AWT, containers and components, AWT classes, AWT controls, Layout managers and Menus

Event Delegation Model: Event Classes Event Listeners

Swing: Introduction to JFC Controls.

Applet: Applet Basics, Architecture and Skelton, Simple Applet Display Methods.

**Unit-IV**

The Java Thread Model, Creating a Thread: Extending Thread, Implementing Runnable, Creating Multiple Threads and Context Switching, Synchronization, Inter-thread Communication , Java collection framework, maps and Generics, Introduction to Stream API, Steam API Examples.

**Unit-V**

RMI: Distributed Applications, RMI Architecture, Implementation of RMI Server and Client ,Call-back Mechanism

JDBC: JDBC Drivers, JDBC API,Executing statements, prepared statements and callable statements, Metadata ,Scrollable & Updatable ResultSet, Data Source & Connection Pooling, Batch Updates ,Rowsets

**Text Books/References**

1. The Java Handbook by Patrick Naughton, Michael Morrison Osborne/McGraw-Hill publication
2. Java 2 The Complete Reference by Herbert Schildt Tata McGraw-Hill publication.
3. Professional Java Server Programming J2EE edition Volume I,II Wrox publications
4. SCJP Sun certified programmer for java 6 exam study guide by Kathy Sierra and Bert Bates dreamtech press
5. Head First Java by Kathy Sierra and Bert Bates oreilly publications
6. Horstmann, "Computing Concepts with Java 2 Essentials", John Wiley
7. "Programming with Java" by E Balaguruswamy.
8. Decker & Hirshfield, "Programming.Java", Vikas Publication.
9. Java: An Introduction to Computer Science and Programming by W.Savitch (Prentice-Hall).

Advanced Java: Internet Applications by A.Gittleman (Scott Jones). Covers a broad range of advanced topics from JDBC, servlets and JSP to Java2D and beans.

# Formal Languages and Automata Theory

CSE-612T

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## Unit -I

**Introduction to finite Automata:** Introduction to finite automata, The central concepts of Automata theory, Deterministic finite automata, Nondeterministic finite Automata

## Unit-II

**Finite Automata & Regular Expressions:** An application of finite Automata, Finite Automata with epsilon-transitions, Regular Expressions, Finite Automata, Pumping Lemma for Regular Expressions, Equivalence and Minimization Of Automata

## Unit-III

**Context Free Grammars and Languages:** Context free grammars, Parse trees, Ambiguity in Grammars, Left Recursion, Eliminating Epsilon Productions, Eliminating Unit productions, Chomsky Normal Form, Greibach Normal Form

## Unit-IV

**Pushdown Automata:** Definition of the pushdown automata, the languages of a PDA, Equivalence of PDA's and CFG's, Deterministic Pushdown Automata

## Unit-V

**Introduction to Turing Machine:** The Turing Machine, Programming techniques for Turing machines, Extensions to the basic Turing machines

### TEXT BOOKS:

1. Jhon E. Hopcroft,,Rajeev Motwani, Jeffery D.Ullman: Introduction to Automata Theory, Languages and Computation, 3<sup>rd</sup> edition, pearson education, 2007

### REFERENCE BOOKS:

1. K.L.P. Mishra: Theory of Computer Science, Automata , Languages and Computation, 3<sup>rd</sup> edition, PHI, 2007
2. Jhon C martin: Introduction to languages and Automata Theory, 3<sup>rd</sup> edition ,Tata McGraw-hill,2007
3. A.M. Padma reddy : Formal Languages and Automata theory, 3<sup>rd</sup> edition, United Publishers,2009
4. Shirish S. Sane: Theory of computer science, 2<sup>nd</sup> edition, Technical publications Pune

**Unit: I:**

Introduction to Graphics, Manual drafting vs. Computer Graphics, Advantages of Computer Graphics, Characteristics & Applications of Computer Graphics, Graphic Display Devices (CRT, Random Scan Display monitors, Raster Scan Display monitors). Graphic Input Devices (Keyboard, Mouse, Trackballs & Space balls, Joy-sticks, Touch-screens).

**Unit: II:**

Points & Lines, Line Drawing Algorithms (DDA, Bresenham's Line Algorithm). Circle – Generating Algorithms (Basic concepts & properties of circle drawing, Mid-pt. circle algorithm). Ellipse Generating Algorithms (Basic concepts & properties of ellipse drawing, Mid-pt. Ellipse-algorithm). Boundary Filling Algorithm, Flood Filling Algorithm, Aliasing / Anti-aliasing.

**Unit: III:**

Introduction to 2D- transformation: Basic transformation (Translation, Rotation & Scaling). Composite Transformations (Translation, Rotation & Scaling). Other Transformations (Reflection & Shearing).

2-D Viewing: The viewing pipeline, Clipping operations, Point Clipping, Line clipping (Cohen –Sutherland Line Clipping). Polygon clipping (Sutherland-Hodgeman Polygon Clipping), Text clipping.

**Unit: IV:**

Projections (Parallel Projections & Perspective Projections), Visible-Surface Detection Methods (Classification of Visible –Surface Detection Algorithms,

**Unit: V:**

Back-Face Detection, Depth-Buffer Method, Scan-line Method).

Interactive Picture –Construction Techniques (Basic Positioning Methods, Constraints, Grids, Gravity field, Rubber Band Techniques , Dragging , Painting & Drawing , Inking ).

**Text Books:**

1. Computer Graphics by Donald Hearn & M. Pauline Baker.

**Reference Books:**

1. Principles Of Interactive Computer Graphics by William. M. Newman & Robert. F. Sproull.
2. Steven Harrington."Computer Graphics A Programming Approach" McGraw Hill.
3. James .D. Foley, VanDam Fundamentals of interactive Computer Graphics.
4. David F. Frogers & J Alan Adams- Procedure and elements of Computer graphics.

## **UNIT – I**

Introduction to an embedded systems design & RTOS: Introduction to Embedded system, Processor in the System, Microcontroller, Memory Devices, common examples of Embedded Systems. Inter-process Communication and Synchronization of Processes, Tasks and Threads, Problem of Sharing Data by Multiple Tasks, Real Time Operating Systems: OS Services (overview).

## **UNIT – II**

Overview of Microcontroller: Microcontroller and Embedded Processors, Overview of 8051Microcontroller family: Architecture, basic assembly language programming concepts, The program Counter and ROM Spaces in the 8051, Data types, 8051 Flag Bits and PSW Register, 8051 Register Banks and Stack Instruction set, Loop and Jump Instructions, Call Instructions, Time delay generations and calculations, I/O port programming Addressing Modes, accessing memory using various addressing modes, Arithmetic instructions and programs, Logical instructions, BCD and ASCII application programs, Single-bit instruction programming, Reading input pins vs. port Latch, Programming of 8051 Timers, Counter Programming.

## **UNIT – III**

Communication with 8051: Basics of Communication, Overview of RS-232, UART, USB, 8051 connections to RS-232, 8051 serial communication programming, 8051 interrupts, Programming of timer interrupts, Programming of External hardware interrupts, Programming of the serial communication interrupts, Interrupt priority in the 8051.

## **UNIT -IV**

Interfacing with 8051: Interfacing an LCD to the 8051, 8051 interfacing to ADC, Sensors, 8051 interfacing to the keyboard, Interfacing a DAC to the 8051.

## **UNIT-V**

Motor Control: Electromechanical relays, optoisolator, interfacing a stepper motor, and interfacing DC motor. Arduino: Hardware overview, Arduino IDE and Arduino syntax (basic examples), interfacing LED.

### **Text books:**

1. Raj Kamal, “Embedded Systems”, TMH, 2004.
2. M.A. Mazidi and J. G. Mazidi, “The 8051 Microcontroller and Embedded Systems”, PHI, 2004.

### **References books:**

1. David E. Simon, “An Embedded Software Primer”, Pearson Education, 1999.
2. K.J. Ayala, “The 8051 Microcontroller”, Penram International, 1991.
3. Dr. Rajiv Kapadia, “8051 Microcontroller & Embedded Systems”, Jaico Press
4. Dr. Prasad, “Embedded Real Time System”, Wiley Dreamtech, 2004.

## Numerical Methods MTH 611T/P

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### Unit-I:

**Finite Difference:** Difference Table and its usage. The difference operators  $\Delta$ ,  $\nabla$  and the operator E.

**Interpolation:** Interpolation with equal intervals, Newton's advancing difference formula. Newton's backward difference formula. Interpolation with unequal intervals. Newton's divided difference formula. Lagrange's interpolation formula.

**Central Differences:** The central difference operator  $\delta$  and the overranging operator  $\mu$ . Relations between the operators. Gauss forward and backward interpolation formula, Sterlings, Bessel's, Laplace and Everetts formulae.

### Unit-II

**Inverse interpolation:** Inverse interpolation by (i) Lagrange's (ii) Methods of successive approximation & (iii) Methods of elimination of third differences

**Numerical solution of algebraic and Transcendental Equations:** Graphic Method, Regula-Fast method, Balzano's Process of bisection of intervals, Newton-Raphson Method and its geometrical significance.

### Unit-III:

**Numerical Integration:** Numerical Integration, General Quadrature Formula, Simpson's one-third and three-eighth rules, Weddles' rule, Hardy's rule, Trapezoidal rule.

**Numerical differentiation :** Numerical differentiation of a function. Differential coefficient of a function in terms of its differences. Applications

### Unit-IV

**Difference Equations:** Linear-homogeneous and non-homogeneous difference equations of order n with constant coefficient, and their solution, methods of undetermined coefficient.

**Numerical Solution of ordinary differential equations:** Numerical solution of ordinary differential equations, Picard's method. Taylor's series method, Euler's method, Runge-Kutta Method.

### Unit-V

**Laboratory:** Writing computer programmes for numerical methods like Simpson's rule, Newton-Raphson method & Runge-Kutta method etc. Running of programme exercises.

### Books Recommended:

1. Numerical Methods for Scientists and Engineering by M.K.Jain, S.R.Iyengar & R.K. Jain, Wiley Eastern Ltd.
2. Mathematical Numerical Analysis by S.C. Scarborough, Oxford and IBH .
3. Introductory methods in Numerical Analysis by S.S.Sastry, Prentice Hall of India.
4. Numerical Solution of Differential equations by M.K.Jain.
5. Numerical Methods for Science & Engineering by R.G.Stanton.

**Lab Details:**

1. Write a Java program that prints all real solutions to the quadratic equation  $ax^2 + bx + c = 0$ . Read in a, b, c and use the quadratic formula. If the discriminant  $b^2 - 4ac$  is negative, display a message stating that there are no real solutions.
2. The Fibonacci sequence is defined by the following rule. The first two values in the sequence are 1 and 1. Every subsequent value is the sum of the two values preceding it. Write a Java program that uses both recursive and non recursive functions to print the nth value in the Fibonacci sequence.
3. Write a Java program that prompts the user for an integer and then prints out all prime numbers up to that integer.
4. Write a Java program that checks whether a given string is a palindrome or not. Ex: MADAM is a palindrome.
5. Write a Java program for sorting a given list of names in ascending order.
6. Write a Java program to multiply two given matrices.
7. Write a Java Program that reads a line of integers, and then displays each integer, and the sum of all the integers (use StringTokenizer class)
8. Write a Java program that reads a file name from the user then displays information about whether the file exists, whether the file is readable, whether the file is writable, the type of file and the length of the file in bytes.
9. Write a Java program that reads a file and displays the file on the screen, with a line number before each line.
10. Write a Java program that displays the number of characters, lines and words in a text file.
11. Write a Java program that:
  - a) Implements stack ADT.
  - b) Converts infix expression into Postfix form.
12. Write an applet that displays a simple message.
13. Write an applet that computes the payment of a loan based on the amount of the loan, the interest rate and the number of months. It takes one parameter from the browser: Monthly rate; if true, the interest rate is per month; Otherwise the interest rate is annual.
14. Write a Java program that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the + - X % operations. Add a text field to display the result
15. Write a Java program for handling mouse events.
16. Write a Java program for creating multiple threads
17. Write a Java program that correctly implements producer consumer problem using the concept of inter thread communication.
18. Write a Java program that lets users create Pie charts. Design your own user interface (with Swing & AWT)
19. Write a Java program that allows the user to draw lines, rectangles and Ovals.
20. Write a Java program that implements a simple client/server application. The client sends data to a server. The server receives the data, uses it to produce a result, and then sends the result back to the client. The client displays the result on the console. For ex: The data sent from the client is the radius of a circle, and the result produced by the server is the area of the circle.
21. Write a Java program that illustrates how run time polymorphism is achieved.
22. Simple exercises to learn the concept of RMI, Servlets, JSP
23. Finding Simple and Compound interest using RMI
24. RMI-based implementation of Airline Reservation system.

## **Computer Graphics Lab**

**CSE-616P**

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### **Lab Details:**

1. Line drawing algorithms
  - a) DDA Algorithm.
  - b) Bresanham's Line Algorithm.
2. Circle Generating Algorithms.
3. Eclipse Generating Algorithms.
4. Creation of segments Algorithms.
5. Translation Algorithm.
6. Rotation Algorithms.
7. Scaling Algorithms.
8. Clipping Operation Algorithms.