

**GOVERNMENT ARTS COLLEGE (AUTONOMOUS)**  
**KUMBAKONAM 612 002**

Re - accredited With 'A' Grade by NAAC & Affiliated to Bharathidasan University

**DEPARTMENT OF COMPUTER SCIENCE**  
(Effective for those admitted from 2017-2018 onwards)



**SYLLABI**

**M.Sc., COMPUTER SCIENCE**

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**SEMESTER – I**

**CC 1 - ADVANCED JAVA PROGRAMMING – J2EE**

<b>Subject Code: 17P1CS1</b>	<b>Credits: 4</b>	<b>External Marks: 75</b>	<b>Hours: 6</b>
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**Objectives:** *To understand the development of enterprise applications using 'java 2 Platform, nterprise Edition (J2EE)'. EJB technology enables rapid and simplified development of distributed, transactional, secure and portable applications based on Java technology.*

**Unit I:** JDBC Overview - Connection Class - MetaData Function - SQLException - SQL warning - Statement - ResultSet - Other JDBC Classes.

**Unit II:** InetAddress - TCP/ IP client sockets - TCP/ IP server sockets - URL - URL Connection - Datagrams - Client/ Server application using RMI.

**Unit III:** Bean Development Kit - Jar Files - Introspection - Design Pattern for properties, events and methods - Constrained Properties - Persistence - Customizers

**Unit IV:** Life Cycle of Servlet - Generic Servlet - HTTP Servlet - Reading Initialization Parameters - Reading Servlet Parameters - Cookies - Session Tracking

**Unit V:** JApplet - Button - Combo - Trees - Tables - Panes - AWT Classes - working with Graphics, Color and Font

**Text book(s):**

1. Patrick Naughton & Herbert Schildt, "The Complete Reference: Java 2", Tata McGraw Hill, 1999. (Chapter - 18, 21, 24, 25, 26, 27)
2. Joseph Weber, "Using Java 2 Platform", Prentice Hall of India, 2000. (Chapter - 39, 40)

**Reference book(s):**

1. Deitel & Deitel, "Java How to Program", Prentice Hall, 5th Edition ,2002
2. Peter Hagggar, "Practical Java: Programming Language Guide", Addison-Wesley Pub Co, 1st Edition, 2000
3. Bruce Eckel, "Thinking in Java", Pearson Eduction Asia, 2nd Edition, 2000

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**M.Sc., COMPUTER SCIENCE**

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**SEMESTER – I**

**CC 2 - MATHEMATICAL FOUNDATION FOR COMPUTER SCIENCE**

<b>Subject Code: 17P1CS2</b>	<b>Credits: 4</b>	<b>External Marks: 75</b>	<b>Hours: 6</b>
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**Objectives:** *To Obtain Knowledge from the Basic elements and Derive the Discrete Digital Process from this Subject.*

**Unit I:** Mathematical Logic: Operands, Operators, Connectives, Conditional, Bi conditional, Well formed formula, Predicate Calculus, Algebra of Propositions, Truth Table Creations. Set Theory: Definition, Finite and Infinite Set, Equal Set, Equivalence Set, Empty Set, Power Set, Universal Set, Operation on Union, Intersection, and Difference Set, and Algebraic Laws of Set Theory.

**Unit II:** Relations and Functions: Types of Relations, Properties of Relations. Binary Relations, Matrix Representation of Relations. Partial Ordering Relations and Lattices: Principles of Duality. Functions: Definition, Types of Functions, Composition of Functions, Inverse of a Function, Recursive Functions, Hashing Function.

**Unit III:** Algebraic Structures: Semi groups and Monoids, Groups, subgroups and Homomorphism. Residue Arithmetic, Fermat's Theorem, Euler's Theorem, Group Codes: Communication model of Error Correction, Parity Checker, Error Recovery in Group Codes. Graphs: Basic Definition, Degree of a Vertex, Edge, Simple Graph, Matrix Representation of Graphs. Incidence Matrix, Adjacency Matrix, Huffman Adjacency Matrix. Paths, Cycles and connectivity. Graph Traversals: DFS and BFS, and Shortest Path Algorithms, Warshall's Algorithm.

**Unit IV:** Trees and Cut-Sets: Trees, Binary Tree, Rooted Trees, Path Lengths in Rooted Trees, Huffman Adjacency Code, Leaves, Weights, Missing Nodes. Prefix Codes, Binary Search Trees, Spanning Trees, Kruskal's Algorithm and Prim's Algorithm.

**Unit V:** Boolean Algebras: Lattices and Algebraic Systems, Boolean Lattices and Boolean Algebras, Boolean functions and Boolean Expressions. Simplification of Logic Expressions Using Karnaugh Map. Simplification of Logical Functions Using K-Map. Realization of product of sum Expression by K-Map. Simplification of Logic Expressions Using Quine-McCluskey Method. Design and Implementation by Gates – Digital – Switching Circuits, Constructing with the Data Flow Machines.

**Text book(s):**

1. "Discrete Mathematics with Graph Theory and combinatorics", T. Veerarajan, Pub: Tata McGraw Hill.
2. "Elements of Discrete Mathematics", C.L. Liu and Mohapatra, Pub: Tata McGraw Hill.

**Reference book(s):**

1. "Discrete Mathematical Structures With Applications to Computer Science", J.P. Tremblay and R. Manohar. Pub: Tata McGraw Hill.

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**SEMESTER – I**

**CC 3 - PRINCIPLES OF COMPILER DESIGN**

<b>Subject Code: 17P1CS3</b>	<b>Credits: 4</b>	<b>External Marks: 75</b>	<b>Hours: 5</b>
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**Objectives:** *An introduction to the design and implementation of programming language translators. Theoretical aspects of language design and translation are discussed and practically demonstrated by developing a working compiler.*

**Unit I:** Introduction on the phase of the compiler – Lexical Analysis, Regular Expression, Non deterministic Automata, Deterministic Automata equivalent to NFA's. Minimizing the states of DFA, Implementation of Lexical Analyzer.

**Unit II:** Syntax Analysis – Context free grammars - Top down Parsing Concepts, Recursive Descent Parsing, Predictive Parsers, Non recursive Predictive Parsing – Bottom Up Parsing, Handle pruning, Shift reduce parsing – Operator Precedence Parsing – Error recovery in Parsing, Parser Generators – YACC. [Omit LR Parsers : Sec 4.7]

**Unit III:** Intermediate Code Generation: Syntax directed Definitions, Construction of Syntax trees – Top down Translation, Bottom up Evaluation of inherited Attributes, Recursive Evaluators, Assigning Space at Compiler Construction time – Type checking.

**Unit IV:** Storage Organization : Storage Organization, Storage Allocation Strategies, Parameter Passing, Symbol tables, Dynamic Storage Allocation, Intermediate Languages – Representation of Declarations, Assignment Statement, Boolean Expression, Back patching, Procedure calls.

**Unit V:** Code Generation and Optimization: Design of the code generators, Runtime storage Management, Basic blocks and flow graphs, Register Allocation and Assignment, DAG representation of Basic blocks, Peephole optimization, Code optimization – The principle sources of optimization, Optimization of basic blocks, Global data flow Analysis, Loop optimizations.

**Text book(s):**

1. Alfred V.Aho, Ravi Sethi, Jeffrey D.Ullman, "Compilers – Principles, Techniques and Tools", 2007, Pearson Education.
2. Dhamdhere D.M., "Compiler Construction Principles and Practice", 1981, Macmillan India.

**Reference book(s):**

1. Reinhard Wilhelm, Director Mauser, "Compiler Design", 1995, Addison Wesley.

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**M.Sc., COMPUTER SCIENCE**

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**SEMESTER – I**

**CC 4 - DESIGN AND ANALYSIS OF ALGORITHMS**

<b>Subject Code: 17P1CS4</b>	<b>Credits: 4</b>	<b>External Marks: 75</b>	<b>Hours: 5</b>
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**Objectives:** *This study, inspired by the computer, has led to the discovery of many algorithms and design methods. The purpose of this syllabus to organize what is known about them in a coherent fashion so that students can learn to device and analyze new algorithms for themselves.*

**Unit I:** Introduction: What is an algorithm –algorithm specification- pseudo code - recursive – performance analysis – space & time complexity – notation – practical complexities – performance measurement. Elementary data structures – Stacks and queues – trees – terminology – binary trees – dictionaries –binary search trees - priority queues – heap – heap sort.

**Unit II:** Divide and conquer: General methods – binary search – finding maximum and minimum – merge sort – quick sort – selection – worst case optimal algorithms – Strassen’s matrix multiplication. The Greedy Methods: The general methods – knapsack problem – three vertex splitting – job sequence with deadlines – minimum cost spanning trees – kruskal’s algorithm.

**Unit III:** Dynamic programming: The general methods – multistage graphs – all pairs shortest paths – single source shortest paths general methods – optimal binary search trees – string editing. Basic traversal and search techniques: Techniques for binary trees – techniques for graph – breadth first search and traversal – depth first search and traversal.

**Unit IV:** Back tracking: The general method – the 8-queens problem – sum of subsets – graph coloring. Branch and found: The methods – least cost search – the 15 puzzle – FIFO branch and bound – 0/1 knapsack problem – LC branch and bound solutions & FIFO branch and bound solutions - traveling salesperson.

**Unit V:** Hypercube algorithms: Computational model – the hypercube – butterfly network – embedding other networks – PPR rouging – greedy algorithms – randomized algorithms - fundamental algorithms - broadcasting – prefix computation – data concentration sparse enumeration sort – selection – merging – odd even merge – sorting – odd ever merge sort.

**Text book(s):**  
Fundamentals of computer algorithms – Ellis horowitz , Sartaj Sahni, Senguthevar Rajasekaran – Galgotia Publications private limited.

**Reference book(s):**  
(1) Data structures and Algorithms, V.Aho, Hopcropft, Ullman , LPE (2)  
Introduction to design and Analysis of Algorithms – S.E. Goodman,ST.  
Hedetniem- TMH.

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**SEMESTER – I**

**CC 1 - ADVANCED JAVA PROGRAMMING LAB**

<b>Subject Code: 17P1CSP1</b>	<b>Credits: 4</b>	<b>External Marks: 60</b>	<b>Hours: 4+4</b>
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1. Write an Applet which will play two sound notes in a sequence continuously use the play() methods available in the applet class and the methods in the Audio clip interface.
2. Create a Japplet using swing control, which will create the layout shown below and handle necessary events.  
Format Enter your Name:  
Enter your Age:  
Select your s/w: \* Oracle \*Visual Basic  
\*Java  
Select your city : \*Delhi \*Mumbai  
\*Chennai  
OK Cancel
3. Use JDBC connectivity and create Table, insert and update data.
4. Write a program in Java to implement a Client/Server application using RMI.
5. Write a program in Java to create a Cookie and set the expiry time of the same.
6. Write a program in Java to create Servlet to count the number of visitors to a web page.
7. Write a program in Java to create a form and validate a password using Servlet.
8. Develop a Java Bean to demonstrate the use of the same.
9. Write a program in Java to convert an image in RGB to a Grayscale image.
10. Develop Chat Server using Java.

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**SEMESTER – II**

**CC 5 - ADVANCED MICROPROCESSORS AND MICROCONTROLLERS**

<b>Subject Code: 17P2CS5</b>	<b>Credits: 5</b>	<b>External Marks: 75</b>	<b>Hours: 6</b>
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**Objectives:** *To disseminate knowledge of high-end RISC/CISC Microprocessors, Microcontrollers and their Applications and to introduce Interfacing principles to these to postgraduate students of computer science and applications*

**Unit I: The Processor - 8086/8088-Architecture, Pin Diagrams and Timing Diagrams:** Register Organization-Architecture-Physical Memory-General Bus,I/O addressing-Minimum Mode-Maximum Mode of 8086  
**8086/8088 Instruction Set and Assembler:** Instruction Format-Addressing Mode-Instruction Set of 8086/8088-Simple programs

**Unit II: Basic Peripheral and their Interfacing with 8086/88:** Memory interfacing – RAM interfacing, Interfacing I/O ports-PIO 8255-Modes of 8255-Interfacing ADC-Interfacing DAC  
**Special purpose Programmable Peripheral Devices and their Interfacing:** Programmable Interval Timer 8253-Programmable Interrupt Controller 8259A-The Keyboard/Display controller 8279-Programmable communication Interface 8251 USART

**Unit III: 80386-80387 and 80486 the 32-Bit processors:** Salient features and of 80386-Register organization, addressing modes, Data types of 80386-Real Address mode, Protected Address mode of 80386-Segmentation-Paging-Virtual 8086 Mode-Enhanced Instruction set-The Coprocessor 80387

**Unit IV: Advanced Microprocessors:** Salient features of 80586(Pentium)-Intel MMX architecture-MMX Data types-MMX Instructions  
**Pentium 4:** Genesis-Salient features of Pentium 4-Hyperthreading in Pentium

**Unit V: Microcontrollers 8051 and 80196:** Intel family of Microcontrollers-Architecture, Features of 8051-Interrupts of 8051-Instruction Set of 8051-Design of a Microcontroller based Length measurement system for cloth of paper-Intel's 16-Bit Microcontroller family MCS-96

**Text book(s):**

**Advanced Microprocessors and Peripherals**-Architecture,Programming and Interfacing, Second Edition, A K Ray & K M Bhurchandi, Tata McGraw-Hill Publishing Company Limited, New Delhi

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**SEMESTER – II**

**CC 6 - OPEN SOURCE TECHNOLOGIES**

<b>Subject Code: 17P2CS6</b>	<b>Credits: 5</b>	<b>External Marks: 75</b>	<b>Hours: 6</b>
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**Objectives:** *The objective is to teach the students the principles of open source technology, benefits of open source, and the product that includes permission to use its source code, design documents, or contents. The students will also study and understand the different open source licenses and how to start an open source project.*

**Unit I:** **OPEN SOURCE** : Introduction : Open Source – Open Source vs. Commercial Software – What is Linux? - Free Software – Where I can use Linux? Linux Kernel – Linux Distributions

**Unit II:** **LINUX** : Introduction: Linux Essential Commands - Filesystem Concept - Standard Files - The Linux Security Model - Vi Editor - Partitions creation - Shell Introduction - String Processing - Investigating and Managing Processes - Network Clients - Installing Application

**Unit III:** **APACHE** : Introduction - Apache Explained - Starting, Stopping, and Restarting Apache - Modifying the Default Configuration - Securing Apache - Set User and Group - Consider Allowing Access to Local Documentation - Don't Allow public\_html Web sites - Apache control with .htaccess

**Unit IV:** **MySQL** : Introduction to MY SQL - The Show Databases and Table - The USE command - Create Database and Tables - Describe Table - Select, Insert, Update, and Delete statement - Some Administrative detail - Table Joins - Loading and Dumping a Database.

**Unit V:** **PHP** : PHP Introduction- General Syntactic Characteristics - PHP Scripting - Commenting your code - Primitives, Operations and Expressions - PHP Variables - Operations and Expressions Control Statement - Array - Functions - Basic Form Processing - File and Folder Access - Cookies - Sessions - Database Access with PHP - MySQL - MySQL Functions - Inserting Records - Selecting Records - Deleting Records - Update Records.

**Text book(s):**

1. "Open Source Web Development with LAMP using Linux, Apache, MySQL, Perl and PHP", James Lee and Brent Ware, Dorling Kindersley(India) Pvt. Ltd, 2008

**Reference book(s):**

1. "Setting Up LAMP: Getting Linux, Apache, MySQL, and PHP and working Together", Eric Rosebrock, Eric Filson, Published by John Wiley and Sons, 2004



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### SEMESTER – II

#### EC 1 - MOBILE COMMUNICATION

<b>Subject Code: 17P2CS7EC</b>	<b>Credits: 5</b>	<b>External Marks: 75</b>	<b>Hours: 5</b>
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**Objectives:** To understand the concepts of Mobile and wireless devices, Mobile IP and WAP.

**Unit I:** Introduction – Medium Access Control : Motivation for Specialized MAC– SDMA– FDMA – TDMA – CDMA– Comparison of Access mechanisms – Tele communications : GSM – Mobile Services – System Architecture – Radio Interface – Localization and Calling – Handover – Security – Satellite Systems: Basics– Routing– Localization – Handover – Broadcast Systems: Overview – Cyclic Repetition of Data– Digital Audio Broadcasting – Digital Video Broadcasting

**Unit II:** Wireless networks – Wireless LAN: Infrared Vs Radio Transmission – Infrastructure Networks – Ad hoc Networks– IEEE 802.11 – System Architecture – Protocol Architecture – Physical Layer– Frequency hopping spread spectrum – Direct sequences spread spectrum – Medium access control layer – HIPERLAN: Historical HIPERLAN – WATM – BRAN – HiperLAN2 – Bluetooth – Architectures.

**Unit III:** Mobile network layer – Mobile IP : Goals – Assumptions and Requirement – Entities and Terminology – IP packet Delivery – Agent Advertisement and Discovery – Registration – Tunneling and Encapsulation – Optimization – Reverse Tunneling – IPv6 – Dynamic Host Configuration Protocol – DHCP – Mobile Ad hoc Networks – Routing– Destination sequence distance vector – Dynamic Source Routing – Alternative Metrics.

**Unit IV:** Mobile transport layer – Traditional TCP – Congestion control – Slow start– Fast retransmit/fast recovery – Implications of mobility – Classical TCP improvements: Indirect TCP – Snooping TCP – Mobile TCP – Fast retransmit/ Fast Recovery – Transmission/ Timeout Freezing – Selective Retransmission – Transaction Oriented TCP

**Unit V:** WAP – Wireless Application Protocol– Architecture –Wireless Datagram Protocol – Wireless Transport Layer Security – Wireless Transaction Protocol – Wireless Session Protocol – Wireless Application Environment – Wireless Markup Language – WML Script – Wireless Telephony Application

**Text book(s):**

1. J.Schiller, Mobile Communication, Addison Wesley, 2000.

**Reference book(s):**

1. William C.Y.Lee, Mobile Communication Design Fundamentals, John Wiley, 1993.
2. William Stallings, Wireless Communication and Networks, Pearson Education, 2003.

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**SEMESTER – II**

**EC 2 - HUMAN COMPUTER INTERACTION**

<b>Subject Code: 17P2CS8EC</b>	<b>Credits: 5</b>	<b>External Marks: 75</b>	<b>Hours: 5</b>
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**Objectives:**

*Demonstrate an understanding of guidelines, principles, and theories influencing human computer interaction. Recognize how a computer system may be modified to include human diversity.. Design mock ups and carry out user and expert evaluation of interfaces. Carry out the steps of experimental design, usability and experimental testing, and evaluation of human computer interaction systems. Use the information sources available, and be aware of the methodologies and technologies supporting advances in HCI.*

**Unit I:      **The interaction:**** Introduction – Models of interaction – Frameworks and HCI – Ergonomics – Interaction Styles – Elements of WIMP interface – Interactivity – The Context of the interaction - **Paradigm:** Introduction – Paradigms for interaction.

**Unit II:      **Interaction Design basics:**** Introduction – what is design? – User focus – Scenarios – Navigation design – Screen design and layout – Interaction and prototyping - **HCI in the software process:** Introduction – The software lifecycle – Usability engineering – Interactive design and prototyping – Design rationale.

**Unit III:     **Design rules:**** Introduction – Principles to support usability – Standards – Guidelines – Golden rules and heuristics – HCI patterns - **ImplementationSupport:** Introduction – Elements of windowing systems – Programming the application – Using toolkits – User interface management systems.

**Unit IV:     **Evaluation techniques:**** What is evaluation – Goals of evaluation – Evaluation through expert analysis – Evaluation through user participation – Choosing an evaluation method - **Universal Design:** Introduction – Universal design principles – Multi-modal interaction – Designing for diversity.

**Unit V:      **User Support:**** Instruction – Requirements of user support – Approaches to user support – Adaptive help system – Designing user support systems.

**Text book(s):**

1. "Human-computer Interaction" - Alan Dix - Pearson Education - 2004.

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**SEMESTER – II**

**CC 2 - OPEN SOURCE PRODUCTS LAB**

<b>Subject Code: 17P2CSP2</b>	<b>Credits: 4</b>	<b>External Marks: 60</b>	<b>Hours: 4+4</b>
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**Objectives:** *To provide fundamental concept of internet, with a view to developing professional software development skills.*

1. Write a server side php program that display marks, total, grade of student in tabular format by accepting user inputs for name, number and marks from a HTML form.
2. Write a php program that adds products that a selected from a web page to a shopping cart.
3. Write a php program to access the data stored in my sql table.
4. Write a php program interface to create a database and insert a table  
  
Write a php program using classes to create a table
5. Write a php program to create a directory and read contents from the directory
6. Write a shell program to find the details of an user session
7. Write ashell program to change the extension fo a give file
8. Create a mysql table and execute queries to read, add, remove and modify a record from the table.
9. Create a php program for USER AUTHENTICATION
10. Create a php program for UPLOAD FILE TO SERVER

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**SEMESTER – III**

**CC 7 - DATA SCIENCE**

<b>Subject Code: 17P3CS9</b>	<b>Credits: 5</b>	<b>External Marks: 75</b>	<b>Hours: 6</b>
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**Objectives:**

*After the completion of the Data Science course, you should be able to:*

1. Gain insight into the 'Roles' played by a Data Scientist
2. Analyse Big Data using R, Hadoop and Machine Learning
3. Understand the Data Analysis Life Cycle
4. Work with different data formats like XML, CSV and SAS, SPSS, etc.
5. Learn tools and techniques for data transformation
6. Understand Data Mining techniques and their implementation
7. Analyse data using machine learning algorithms in R

**Unit I:** Data Evolution: Data Development Time Line – ICT Advancement - a Perspective – Data Growth - a Perspective – IT Components - Business Process – Landscape - Data to Data Science.

**Unit II:** Understanding data: Introduction – Type of Data: Numeric – Categorical – Graphical – High Dimensional Data — Data Classification – Hot Data – Cold Data – Warm Data – Thick Data – Thin Data - Classification of digital Data: Structured, Semi-Structured and Un-Structured. Sources of Data: Time Series – Transactional Data – Biological Data – Spatial Data – Social Network Data – Data Evolution – Data Sources

**Unit III:** Data Science: Data Science-A Discipline – Data Science vs Statistics, Data Science vs Mathematics, Data Science vs Programming Language, Data Science vs Database, Data Science vs Machine Learning, Data Analytics - – Relation: Data Science, Analytics, Big Data Analytics. Data Science Components: Data Engineering, Data Analytics-Methods and Algorithm, Data Visualization

**Unit IV:** Big Data: Digital Data-an Imprint: Evolution of Big Data – What is Big Data – of Big Data. Characteristics of Big Data 6Vs – Big Data Myths - Data Discovery-Traditional Approach, Big Data Technology: Big Data Technology Process – Big Data Exploration - Data Augmentation – Operational Analysis – 360 View of Customers – Security and Intelligence

**Unit V:** Big Data Use cases –Big Data Technology Potentials – Limitations of Big Data Challenges- Big Data Roles Data Scientist , Data Architect, Data Analyst – Skills – Case Study : Big Data – Customer Insights – Behavioral Analysis – Big Data Applications - Marketing – Retails – Insurance – Risk and Security – Health care

**Reference book(s):**

1. V. Bhuvaneshwari, T. Devi, “Big Data Analytics: A Practitioner’s Approach” 2016.
2. Han Hu, Yonggang Wen, Tat-Seng, Chua, Xuelong Li, “Toward Scalable Systems for Big Data Analytics: A Technology Tutorial”, IEEE, 2014

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**SEMESTER – III**

**CC 8 - ADVANCED SOFTWARE ENGINEERING**

<b>Subject Code: 17P3CS10</b>	<b>Credits: 5</b>	<b>External Marks: 75</b>	<b>Hours: 6</b>
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**Objectives:**

*Software affects us to an ever-increasing extent, both within industry and in our daily lives. Software Engineering deals with the design and development of high-quality software systems and is thus an increasingly important area of computer science.*

**Unit I:** Introduction –S/W Engineering Paradigm – life cycle models ( water fall, incremental, spiral, WINWIN spiral, evolutionary, prototyping, object oriented) – system engineering – computer based system – verification – validation – life cycle process – development process –system engineering hierarchy.

**Unit II:** Functional and non-functional – user – system –requirement engineering process – feasibility studies – requirements – elicitation – validation and management – software prototyping – prototyping in the software process – rapid prototyping techniques – user interface prototyping –S/W document. Analysis and modeling – data, functional and behavioral models – structured analysis and data dictionary.

**Unit III:** Design process and concepts – modular design – design heuristic – design model and document. Architectural design – software architecture – data design – architectural design – transform and transaction mapping – user interface design – user interface design principles. Real time systems – Real time software design – system design – real time executives – data acquisition system – monitoring and control system. SCM – Need for SCM–Version control – Introduction to SCM process – Software configuration items.

**Unit IV:** Taxonomy of software testing – levels – test activities – types of s/w test – black box testing – testing boundary conditions – structural testing – test coverage criteria based on data flow mechanisms – regression testing – testing in the large. S/W testing strategies – strategic approach and issues – unit testing – integration testing – validation testing – system testing and debugging.

**Unit V:** Measures and measurements – S/W complexity and science measure – size measure – data and logic structure measure – information flow measure. Software cost estimation – function point models – COCOMO model- Delphi method.- Defining a Task Network – Scheduling – Earned Value Analysis – Error Tracking – Software changes – program evolution dynamics – software maintenance – Architectural evolution. Taxonomy of CASE tools.

**Text book(s):**

1. “Software engineering- A practitioner’s Approach” , Roger S.Pressman, McGraw-Hill International Edition, 5 th edition, 2001.
2. “Software engineering”, Ian Sommerville, Pearson education Asia, 6 th edition, 2000.
3. “Software Engineering Concepts “, Richard E. Fairley, McGraw-Hill edition, 2002.

**Reference book(s):**

1. “Software Engineering – An Engineering Approach”, James F Peters and Witold Pedryez, John Wiley and Sons, New Delhi, 2000.

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**SEMESTER – III**

**EC 3 - WEB SERVICES AND SOAP**

<b>Subject Code: 17P3CS11EC</b>	<b>Credits: 5</b>	<b>External Marks: 75</b>	<b>Hours: 5</b>
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**Objectives:** *To introduce the students to the Fundamentals of CMOS circuits, to understand basic electrical properties of MOS circuits and the design process.*

**Unit I:** Introduction: What are web services? SOAP WSDL UDDI-why web services are ?-The evolution of web application- Not just another distribution computing platform-Web services and Enterprises.

**Unit II:** XML Fundamentals: The Lingua Franca of web services-XML Documents - XML Namespaces - Explicit and Default Namespace- Inheriting Namespaces - And Not Inheriting Namespace - Attributes and Namespace - XML Schema - XML Schema and Namespace- A First schema- Implementing XML Schema Types - The any Element-Inheritance-Substitution Groups - Global and Local Type Declarations - Managing Schemas-Schemas and Instance Documents - XML Schema Best Practices.

**Unit III:** Overview of SOAP - HTTP-XML-RPC-SOAP: Protocol - Message Structure - SOAP Messaging Example - Message Paths - SOAP Intermediaries - SOAP and Actors - SOAP Design Patterns - SOAP Faults - SOAP with Attachments - SOAP and Firewalls.

**Unit IV:** UDDI at a glance - Analogies with Telephone Directories - The UDDI Business Registry -UDDI Under the Covers - The UDDI Specification - UDDI Core Data Structures - Accessing UDDI -How UDDI is playing out - UDDI and Lifecycle Management - UDDI and Dynamic Access Point Management.

**Unit V:** Conversations: Overview-Conversational Requirements for B2B Interaction - Web services Conversation Language - Consuming interfaces - WSCL interface components - The Bar scenario conversations - Relationship between WSCL and WSDL.

**Text book(s):**

1. Sandeep Chatterjee, James Webber, "Developing Enterprise Web Services", Pearson Education, 2004.
2. Frank.P.Coyle,XML,Web Services And The Data Revolution, Pearson Education,2002.
3. Ramesh Nagappan,Robert Skoczylas and Rima Patel Sriganesh,"Developing Java Web Services", Wiley Publishing Inc.,2004.
4. McGovern, et al., "Java Web Services Architecture", Morgan Kaufmann Publishers,2005.

**GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KUMBAKONAM.**

Re-accredited with 'A' Grade by NAAC & Affiliated to Bharathidasan University

**M.Sc., COMPUTER SCIENCE**

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**SEMESTER – III**

**EC 4 - ARTIFICIAL INTELLIGENCE AND ROBOTICS**

<b>Subject Code: 17P3CS12EC</b>	<b>Credits: 5</b>	<b>External Marks: 75</b>	<b>Hours: 5</b>
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**Objectives:** *The Student or a Researcher should be thinking with creativity, without the muck up!*

**Unit I:** Introduction to AI. The Task Domain of AI. AI Techniques. Tic-Tac-Toe Game. State Space Search - Base Theorem - Performance Analysis [space, Time] Complexity. Path Specifications (or) Production Systems, Control Strategies: Breadth First Search & Depth First Search. Water Jug Problem. Heuristic Search Techniques: Generate and Test - Simple Hill Climbing - Steepest Ascent Hill Climbing. Towers of Honai. Generate a Tree structure for a soldier. Explain the Implicit Domain and Explicit Domain.

**Unit II:** Best First Search - OR Graphs Algorithm : Best First Search. The A\* Algorithm:  $f(s) = g(s) + h'(s)$ . Explain the Huffman code. Huffman Adjacency Matrix. Problem Reduction AND- OR Graphs. The AO\* Algorithm and Futility. Constraint Satisfaction and its Algorithm.- Means Ends Analysis and its Algorithm. Knowledge Representations: Mappings - Forward Vs Backward Reasoning. Backward -Chaining Rule Systems and Forward - Chaining Rule Systems.

**Unit III:** Combining: the Forward versus Backward Reasoning. Matching - Indexing - Matching with Variables - Conflict Resolutions [ or ] Bi-Directional Meet. Game Playing: Overview of The Minimax Search Procedure. Algorithm: Minimax( Position, Depth, Player) Adding Alpha-Beta Cutoffs. Algorithm: Minimax-A-B (Position, Depth, Player, Use Thresh, Pass Thresh ) Iterative Deepening, Algorithm: Depth First Iterative Deepening. Fuzzy Logic in chess. The AI Languages.

**Unit IV:** ROBOTICS: History, Robot Anatomy, Robot Manipulator and Wrist, Robot co-ordinate systems and Robot controllers.

**Unit V:** ROBOT Arm Kinematics and Dynamics: Matrices Rotations, Transformations, and Manipulators. Matrices of Angles - X,Y,Z in 3' Dimensional View Operations.

**Text Books:**

1. "ARTIFICIAL INTELLIGENCE" 2<sup>nd</sup> Edition. Elaine Rich & Kevin Knight, pub:Tata McGraw Hill.
2. "ROBOTICS TECHNOLOGY AND FLEXIBLE AUTOMATION". Satya Ranjan Deb. pub: Tata McGraw- Hill.

**Reference Book:**

1. "ROBOTICS" Control, Sensing, Vision and Intelligence. K.S. Fu, R.C. Gonzalez, C.S.G. Lee. Pub: McGraw-Hill Book Company.

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**M.Sc., COMPUTER SCIENCE**

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**SEMESTER – III**

**CC 3 - DATA SCIENCE LAB**

<b>Subject Code: 17P3CSP3</b>	<b>Credits: 4</b>	<b>External Marks: 60</b>	<b>Hours: 4+4</b>
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**Objectives:** After the completion of the Data Science course, you should be able to:

1. Gain insight into the 'Roles' played by a Data Scientist
2. Analyse Big Data using R, Hadoop and Machine Learning
3. Understand the Data Analysis Life Cycle
4. Work with different data formats like XML, CSV and SAS, SPSS, etc.
5. Learn tools and techniques for data transformation
6. Understand Data Mining techniques and their implementation
7. Analyse data using machine learning algorithms in R

**Unit I:** Data Evolution: Data Development Time Line – ICT Advancement - a Perspective – Data Growth - a Perspective – IT Components - Business Process – Landscape - Data to Data Science.

**Unit II:** Understanding data: Introduction – Type of Data: Numeric – Categorical – Graphical – High Dimensional Data — Data Classification – Hot Data – Cold Data – Warm Data – Thick Data – Thin Data - Classification of digital Data: Structured, Semi-Structured and Un-Structured. Sources of Data: Time Series – Transactional Data – Biological Data – Spatial Data – Social Network Data – Data Evolution – Data Sources

**Unit III:** Data Science: Data Science-A Discipline – Data Science vs Statistics, Data Science vs Mathematics, Data Science vs Programming Language, Data Science vs Database, Data Science vs Machine Learning. Data Analytics - – Relation: Data Science, Analytics, Big Data Analytics. Data Science Components: Data Engineering, Data Analytics-Methods and Algorithm, Data Visualization

**Unit IV:** Big Data: Digital Data-an Imprint: Evolution of Big Data – What is Big Data – Sources of Big Data. Characteristics of Big Data 6Vs – Big Data Myths - Data Discovery-Traditional Approach, Big Data Technology: Big Data Technology Process – Big Data Exploration - Data Augmentation – Operational Analysis – 360 View of Customers – Security and Intelligence

**Unit V:** Big Data Use cases –Big Data Technology Potentials – Limitations of Big Data and Challenges- Big Data Roles Data Scientist , Data Architect, Data Analyst – Skills – Case Study : Big Data – Customer Insights – Behavioral Analysis – Big Data Applications - Marketing – Retails – Insurance – Risk and Security – Health care

**Reference Books**

1. V. Bhuvaneshwari, T. Devi, “Big Data Analytics: A Practitioner’s Approach” 2016.
2. Han Hu, Yonggang Wen, Tat-Seng, Chua, Xuelong Li, “Toward Scalable Systems for Big Data Analytics: A Technology Tutorial”, IEEE, 2014



**GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KUMBAKONAM.**

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**M.Sc., COMPUTER SCIENCE**

**(Effective for those admitted from 2017-2018 onwards)**

**SEMESTER – IV**

**CC – 9 C# AND .NET FRAME WORK**

<b>Subject Code: 17P4CS13</b>	<b>Credits: 5</b>	<b>External Marks: 75</b>	<b>Hours: 5</b>
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**Objectives:**

- *Create and populate Windows Forms.*
- *Create and use user controls in a Windows Forms application*
- *Create menus in a Windows Forms application*
- *Add code to form and control event procedures in a Windows Forms application*
- *Validate user input in a Windows Forms application*

**Unit I:** Introduction to C# : C# Features – Understanding .Net – C# Basics : Simple C# Console Application – Namespaces and Comments – Getting and Displaying Interactive Input – Multiple Classes and Main Methods –Tokens – Data Types –Variables .

**Unit II:** Boxing and Unboxing – Expression – Type Conversion – Mathematical Function Decision Making : Branching – Looping Methods , Arrays and Strings : Methods – arrays – String – Structure – Enumeration .

**Unit III:** C# OOP Concepts : Introduction – Classes – Constructors – Destructor – Properties – Indexer – Inheritance – Polymorphism – Interface – Delegates – Events – Errors – Exception .

**Unit IV:** Application Development on .Net : Building windows Application & Events – Accessing data with ADO.Net , Web Based Application Development on .Net : Web forms – Creating web Application projects – Server Controls – Web Services.

**Unit V:** The CLR and the .Net Framework : Assemblies – Versioning – Attributes – Reflection – Marshalling – Remoting – Threads .

**Text book(s):**

C# and .Net Framework , R.Manjula Devi , Dr.R.C. Suganthe Charulatha  
Publication

**Reference(s):**

- 1.Jesse Liberty, "Programming C#", Second Edition, O'Reilly Press, 2002.
2. Robinson et al, "Professional C#", Fifth Edition, Wrox Press, 2002.

**GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KUMBAKONAM.**

Re-accredited with 'A' Grade by NAAC & Affiliated to Bharathidasan University

**M.Sc., COMPUTER SCIENCE**

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**SEMESTER – IV**

**CC 10 - OBJECT ORIENTED SYSTEM DEVELOPMENT**

<b>Subject Code: 17P4CS14</b>	<b>Credits: 5</b>	<b>External Marks: 75</b>	<b>Hours: 5</b>
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**Objectives:** *Object oriented systems development is a way to develop software by building self contained modules or objects that can be easily replaced, modified and reused.*

**Unit I:** Introduction: An Overview of Object Oriented Systems Development - Object Basics – Object Oriented Systems Development Life Cycle.

**Unit II:** Object Oriented Methodologies :Rumbaugh Methodology - Booch Methodology - Jacobson Methodology - Patterns – Frameworks – Unified Approach – Unified Modeling Language – Use case - class diagram - Interactive Diagram - Package Diagram - Collaboration Diagram - State Diagram - Activity Diagram.

**Unit III:** Object Oriented Analysis : Identifying use cases - Object Analysis - Classification – Identifying Object relationships - Attributes and Methods.

**Unit IV:** Object Oriented Design : Design axioms - Designing Classes – Access Layer – Object Storage - Object Interoperability.

**Unit V:** Software Quality And Usability : Designing Interface Objects – Software Quality Assurance – System Usability - Measuring User Satisfaction

**Text book(s):**

1. Ali Bahrami, “Object Oriented Systems Development”, Tata McGraw-Hill
2. Martin Fowler, “UML Distilled”, Second Edition, PHI/Pearson Education.

(UNIT II)

**References:**

1. Stephen R. Schach, “Introduction to Object Oriented Analysis and Design”, Tata McGraw-Hill, 2003.
2. James Rumbaugh, Ivar Jacobson, Grady Booch “The Unified Modeling Language Reference Manual”, Addison Wesley
3. Hans-Erik Eriksson, Magnus Penker, Brain Lyons, David Fado, “UML Toolkit”, OMG Press Wiley Publishing Inc., 2004.

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**M.Sc., COMPUTER SCIENCE**

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**SEMESTER – IV**

**EC 5 - REAL TIME PROGRAMMING AND EMBEDDED SYSTEMS**

<b>Subject Code: 17P4CS15EC</b>	<b>Credits: 4</b>	<b>External Marks: 75</b>	<b>Hours: 5</b>
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**Objectives:** *To disseminate knowledge of real time programming systems through principles programming embedded systems and their Applications to postgraduate students of computer science and applications*

**Unit I:** A First Look at Embedded Systems: Examples-Typical Hardware . Hardware Fundamentals for the Software Engineer: Terminology-Gates-Basic considerations-Timing diagrams-Memory

**Unit II:** Advanced Hardware Fundamentals: Microprocessors – Buses - Direct Memory Access-Interrupts – Built - Ins on the Microprocessor - Conventions used on Schematics - Sample Schematic Interrupts: Microprocessor Architecture-Interrupt Basics-The Shared Data Problem -Interrupt Latency

**Unit III:** Survey of Software Architectures: Round Robin - Round Robin with Interrupts - function, Queue, Scheduling architecture-Real time Operating System Architecture - Architecture Selection Introduction to Real time Operating Systems: Tasks, Task States - Task and Data - Semaphores and Shared data

**Unit IV:** More Operating System services: Message Queues, Mailboxes and Pipes-Timer -Events-Memory management-Interrupt routing in an RTOS environment Basic design using a Real time Operating systems: Overview-Principles-An Example-Encapsulation semaphores and Queues-Hard Real time scheduling considerations-Saving memory space-Saving power

**Unit V:** Embedded Software Development Tools: Post and Target machines-Linkers/Locators for embedded software-getting embedded software into the target system Debugging techniques: Testing on your host machine-Instruction set simulators-The Assert Macro-Using Laboratory tools

**Text book(s):**

1. An Embedded Software Primer, David E. Simon, Pearson Education

**Reference book(s):**

1. Embedded Systems-Architecture, Programming and Design, 2<sup>nd</sup> Edition, Raj Kamal, Tata McGraw-Hill Publishing Company Limited

**GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KUMBAKONAM.**

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**SEMESTER – IV**

**CC 4 - C# .NET LAB**

<b>Subject Code: 17P4CSP4</b>	<b>Credits: 4</b>	<b>External Marks: 60</b>	<b>Hours: 4+4</b>
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1. Write a Program in C# to check whether a number is Palindrome or not.
2. Developing the Account creation for Bank using interface
3. Write a Program in C# to find the roots of Quadratic Equation.
4. Write a Program in C# to demonstrate Boxing and unBoxing.
5. Write a Program in C# to implement Stack operations.
6. Write a Program to demonstrate Operator overloading.
7. Write a Program in C# to multiply to matrices using Rectangular arrays.
8. Develop a C# application to perform timer based quiz of 10 questions.
9. Develop a VB.Net application using the File, Direcory and Directory controls to implement a common dialog box.
10. Student mark list Using OLEDB
11. Develop a database application using ADO.NET to insert, modify, update and delete
12. operations. Develop a C#.Net application using Datagrid to display records.
13. Develop Payroll application using Datagridview to add, edit and modify records.