# J.K.K. MUNIRAJAH COLLEGE OF TECHNOLOGY

**Approved by AICTE, New Delhi and Affiliated to Anna University, Chennai.**

**T.N.Palayam (Po), Gobi (Tk), Erode (Dt) – 638 506**

| ACADEMIC YEAR (2021-2022) | | | | | | |
|---|---|---|---|---|---|---|
| **S.No** | **Name of the course** | **Course Code** | **Programme Offering** | **Project work** | **Internship training** | **Number of students** |
| 1 | Project Work | MC5414 | MASTER OF COMPUTER APPLICATIONS | ✓ | | 3 |
| 2 | Python Programming | MC5107 | MASTER OF COMPUTER APPLICATIONS | ✓ | | 1 |
| 3 | Advanced Database Technology | MC5105 | MASTER OF COMPUTER APPLICATIONS | | ✓ | 3 |
| 4 | Artificial Intelligence and Machine Learning | MC5208 | MASTER OF COMPUTER APPLICATIONS | ✓ | | 1 |
| 5 | Data Science | MC5306 | MASTER OF COMPUTER APPLICATIONS | | ✓ | 1 |
| 6 | Internet programming | MC5206 | MASTER OF COMPUTER APPLICATIONS | ✓ | | 3 |
| 7 | Cloud Computing Technologies | MC5207 | MASTER OF COMPUTER APPLICATIONS | ✓ | | 2 |

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| MC5107 | PYTHON PROGRAMMING | L T P C |
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**OBJECTIVES:**

- To develop Python programs with conditionals and loops.
- To define Python functions and use function calls.
- To use Python data structures – lists, tuples, dictionaries.
- To do input/output with files in Python.

**UNIT I PYTHON BASICS** **10**

Introduction to Python Programming – Python Interpreter and Interactive Mode– Variables and Identifiers – Arithmetic Operators – Values and Types – Statements. Operators – Boolean Values – Operator Precedence – Expression – Conditionals: If-Else Constructs – Loop Structures/Iterative Statements – While Loop – For Loop – Break Statement-Continue statement – Function Call and Returning Values – Parameter Passing – Local and GlobalScope – Recursive Functions.

**UNIT II DATA TYPES IN PYTHON** **10**

Lists, Tuples, Sets, Strings, Dictionary, Modules: Module Loading and Execution – Packages – Making Your OwnModule – The Python Standard Libraries

**UNIT III FILE HANDLING AND EXCEPTION HANDLING** **8**

Files: Introduction – File Path – Opening and Closing Files – Reading and Writing Files –File Position – Exception: Errors and Exceptions, Exception Handling, Multiple Exceptions

**UNIT IV MODULES, PACKAGES** **9**

Modules: Introduction – Module Loading and Execution – Packages – Making Your OwnModule – The Python Libraries for data processing, data mining and visualization-NUMPY, Pandas, Matplotlib, Plotly

**UNIT V OBJECT ORIENTED PROGRAMMING IN PYTHON** **8**

Creating a Class, Class methods, Class Inheritance, Encapsulation, Polymorphism, class method vs. static methods, Python object persistence

**TOTAL: 45 PERIODS**

**OUTCOMES:**

Upon completion of the course, students will be able to

- Develop algorithmic solutions to simple computational problems
- Structure simple Python programs for solving problems.

- Read and write data from/to files in Python Programs.
- Represent compound data using Python lists, tuples, dictionaries.
- Decompose a Python program into functions.

**REFERENCES:**


1. ReemaThareja, "Python Programming using Problem Solving Approach", Oxford University Press, First edition, 2017
2. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", Second Edition, Shroff,O'Reilly Publishers, 2016 (http://greenteapress.com/wp/thinkpython/)
3. Guido van Rossum, Fred L. Drake Jr., "An Introduction to Python – Revised andUpdated forPython 3.2, Network Theory Ltd., First edition, 2011
4. John V Guttag, "Introduction to Computation and Programming Using Python",Revised and Expanded Edition, MIT Press, 2013
5. Charles Dierbach, "Introduction to Computer Science using Python", Wiley IndiaEdition, First Edition, 2016
6. Timothy A. Budd, "Exploring Python", Mc-Graw Hill Education (India) Private Ltd.,First edition,2011
7. Kenneth A. Lambert, "Fundamentals of Python: First Programs", Cengage Learning, second edition,2012

**MC5105** **ADVANCED DATABASE TECHNOLOGY** **L T P C**
**3 0 0 3**

**OBJECTIVES:**

- To learn the fundamentals of data modeling and design in advanced databases.
- To study the working principles of distributed databases.
- To have an introductory knowledge about the query processing in object-based databases and its usage.
- To understand the basics of spatial, temporal and mobile databases and their applications.
- To learn emerging databases such as XML, Data warehouse and NoSQL.

**UNIT I DISTRIBUTED DATABASES** **9**

Distributed Systems – Introduction – Architecture – Distributed Database Concepts – DistributedData Storage – Distributed Transactions – Commit Protocols – Concurrency Control – DistributedQuery Processing

**UNIT II NOSQL DATABASES** **9**

NoSQL – CAP Theorem – Sharding - Document based – MongoDB Operation: Insert, Update, Delete, Query, Indexing, Application, Replication, Sharding, Deployment – Using MongoDB with PHP / JAVA – Advanced MongoDB Features – Cassandra: Data Model, Key Space, Table Operations, CRUD Operations, CQL Types – HIVE: Data types, Database Operations, Partitioning – HiveQL – OrientDB Graph database – OrientDB Features

**UNIT III ADVANCED DATABASE SYSTEMS** **9**

Object Oriented Databases-Need for Complex Data Types - The Object-Oriented Data Model-Object-Oriented Languages-Spatial Databases: Spatial Data Types, Spatial Relationships, Spatial Data Structures, Spatial Access Methods – Temporal Databases: Overview – Active Databases – Deductive Databases – RecursiveQueries in SQL – Mobile Databases: Location and Handoff Management, Mobile TransactionModels, Concurrency – Transaction Commit Protocols – Multimedia Databases.

**UNIT IV XML AND DATAWAREHOUSE** **9**

XML Database: XML – XML Schema – XML DOM and SAX Parsers – XSL – XSLT – XPath and XQuery – Data Warehouse: Introduction – Multidimensional Data Modeling – Star and SnowflakeSchema – Architecture – OLAP Operations and Queries.

**UNIT V INFORMATION RETRIEVAL AND WEB SEARCH** **9**

IR concepts – Retrieval Models – Queries in IR system – Text Preprocessing – Inverted Indexing – Evaluation Measures – Web Search and Analytics – Ontology based Search - Current trends.

**TOTAL: 45 PERIODS**

**OUTCOMES:**

On completion of the course, the student will be able to:

1. Design a distributed database system and execute distributed queries.
2. Use NoSQL database systems and manipulate the data associated with it.
3. Design a data warehouse system and apply OLAP operations.
4. Design XML database systems and validating with XML schema.
5. Apply knowledge of information retrieval concepts on web databases.

**REFERENCES:**


1. Henry F Korth, Abraham Silberschatz, S. Sudharshan, "Database System Concepts", 6th Edition, McGraw Hill, 2011.
2. R. Elmasri, S.B. Navathe, "Fundamentals of Database Systems", Seventh Edition, Pearson Education/Addison Wesley, 2017.
3. C. J. Date, A. Kannan, S. Swamynathan, "An Introduction to Database Systems", Eighth Edition, Pearson Education, 2006.
4. Jiawei Han, MichelineKamber ,Jian Pei, "Data Mining: Concepts and Techniques", Third Edition, Morgan Kaufmann, 2012.
5. Brad Dayley, "Teach Yourself NoSQL with MongoDB in 24 Hours", Sams Publishing, First Edition, 2014.
6. ShashankTiwari, "Professional NoSQL", O'Reilly Media, First Edition, 2011.
7. Vijay Kumar, "Mobile Database Systems", John Wiley & Sons, First Edition, 2006


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**MC5208 ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING** **L T P C**
**3 0 0 3**

**OBJECTIVES:**

- To familiarize with the principles of Artificial intelligence like problem solving,inference, perception, knowledge representation, and learning.
- To understand the various characteristics of Intelligent agents
- To design and implement the machine learning techniques for real world problems
- To gain experience in doing research using Artificial intelligence and Machinelearning techniques.

**UNIT I ARTIFICIAL INTELLIGENCE** **9**

Foundation of AI-History of AI-State of Art.-Intelligent Agents: Agents and Environments- Concepts of Rationality-Nature of Environments-Structure of Agents. Problem Solving: Problem Solving by Search: Problem Solving Agents-Searching for Solutions-Uniform Search Strategies-Heuristic Search Strategies- local Search Algorithms and Optimization Problems.

**UNIT II KNOWLEDGE AND REASONING** **9**

Logical Agents: Knowledge Based Agents-Logic-Propositional Logic-Propositional Theorem Proving-Model Checking-Agent based on Propositional Logic. First-Order Logic: Syntax and Semantics- Using First-Order Logic-Knowledge Engineering. Inference in First-Order Logic:

Prepositional Vs. First-Order Inference-Unification and Lifting-Forward Chaining-Backward Chaining – Resolution.

**UNIT III BAYESIAN LEARNING** **9**

Basic Probability Notation- Inference – Independence - Bayes' Rule. Bayesian Learning: Maximum Likelihood and Least Squared error hypothesis-Maximum Likelihood hypotheses for predicting probabilities- Minimum description Length principle -Bayes optimal classifier - Naïve Bayes classifier - Bayesian Belief networks -EM algorithm.

**UNIT IV PARAMETRIC MACHINE LEARNING** **9**

Logistic Regression: Classification and representation – Cost function – Gradient descent – Advanced optimization – Regularization - Solving the problems on overfitting. Perceptron – Neural Networks – Multi – class Classification - Backpropagation – Non-linearity with activation functions (Tanh, Sigmoid, Relu, PRelu) - Dropout as regularization.

**UNIT V NON PARAMETRIC MACHINE LEARNING** **9**

k-Nearest Neighbors- Decision Trees – Branching – Greedy Algorithm - Multiple Branches – Continuous attributes – Pruning. Random Forests:ensemble learning. Boosting – Adaboost algorithm. Support Vector Machines – Large Margin Intuition – Loss Function - Hinge Loss – SVM Kernels.

**TOTAL: 45 PERIODS**

**REFERENCES:**

1. Stuart Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach" , ThirdEdition Pearson Education Limited, 2015
2. CalumChace , "Surviving AI: The Promise and Peril of Artificial Intelligence", Three CS publication, Second Edition, 2015.
3. Christopher M Bishop, "Pattern Recognition and Machine Learning", Spring 2011 Edition.
4. Trevor Hastie, Robert Tibshirani, Jerome Friedman, "The Elements of StatisticalLearning: Data Mining, Inference and Prediction", Springer 2nd Edition

5. EthemAlpaydin, "Introduction to Machine Learning", Second Edition, MIT Press, 2010.
6. Tom M. Mitchell, "Machine Learning", India Edition, 1st Edition, McGraw-Hill EducationPrivate Limited, 2013
7. Elaine Rich, Kevin Knight, Shivashankar B. Nair, "Artificial Intelligence", Third Edition, Tata McGraw-Hill Education, 2012
8. Elaine Rich, Kevin Knight, Shivashankar B. Nair, "Artificial Intelligence", Third Edition,Tata McGraw-Hill Education, 2012

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| MC5306 | DATA SCIENCE | L T P C<br>3 0 0 3 |
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**OBJECTIVES:**

- To know the fundamental concepts of data science and analytics.
- To learn fundamental data analysis using R.
- To understand various data modeling techniques.
- To learn the basic and advanced features of open source big data tools and frameworks.
- To study various analytics on stream data.

**UNIT I INTRODUCTION TO DATA SCIENCE AND BIG DATA 9**

Introduction to Data Science – Data Science Process – Exploratory Data analysis – Big data: Definition, Risks of Big Data, Structure of Big Data – Web Data: The Original Big Data – Evolution Of Analytic Scalability – Analytic Processes and Tools – Analysis versus Reporting – Core Analytics versus Advanced Analytics– Modern Data Analytic Tools – Statistical Concepts: Sampling Distributions – Re-Sampling – Statistical Inference – Introduction to Data Visualization.

**UNIT II DATA ANALYSIS USING R 9**

Univariate Analysis: Frequency, Mean, Median, Mode, Variance, Standard Deviation, Skewness and Kurtosis – Bivariate Analysis: Correlation – Regression Modeling: Linear and Logistic Regression – Multivariate Analysis – Graphical representation of Univariate, Bivariate and Multivariate Analysis in R: Bar Plot, Histogram, Box Plot, Line Plot, Scatter Plot, Lattice Plot, Regression Line, Two-Way cross Tabulation.

**UNIT III DATA MODELING 9**

Bayesian Modeling – Support Vector and Kernel Methods – Neuro – Fuzzy Modeling – Principal Component Analysis – Introduction to NoSQL: CAP Theorem, MongoDB: RDBMS VsMongoDB, Mongo DB Database Model, Data Types and Sharding – Data Modeling in HBase: Defining Schema – CRUD Operations

**UNIT IV DATA ANALYTICAL FRAMEWORKS 10**

Introduction to Hadoop: Hadoop Overview – RDBMS versus Hadoop – HDFS (Hadoop Distributed File System): Components and Block Replication – Introduction to MapReduce – Running Algorithms Using MapReduce – Introduction to HBase: HBase Architecture, HLog and HFile, Data Replication – Introduction to Hive, Spark and Apache Sqoop.

**UNIT V STREAM ANALYTICS** 8

Introduction To Streams Concepts – Stream Data Model and Architecture – Stream Computing – Sampling Data in a Stream – Filtering Streams – Counting Distinct Elements in a Stream – Estimating Moments – Counting Oneness in a Window – Decaying Window.

**TOTAL: 45 PERIODS**

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**OUTCOMES:**

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

1. Convert real world problems to hypothesis and perform statistical testing.
2. Perform data analysis using R.
3. Design efficient modeling of very large data and work with big data platforms..
4. Implement suitable data analysis for stream data.
5. Write efficient MapReduce programs for small problem solving methods.

**REFERENCES:**


1. Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics", John Wiley & sons, First Edition,2013.
2. Umesh R Hodeghatta, UmeshaNayak, "Business Analytics Using R – A Practical Approach", Apress, First Edition,2017.
3. J. Leskowec, AnandRajaraman, Jeffrey David Ullman, "Mining of Massive Datasets", Cambridge University Press, Second Edition,2014.
4. NishantGarg, "HBase Essentials", Packt, First Edition, 2014.
5. Rachel Schutt, Cathy O'Neil, "Doing Data Science", O'Reilly, First Edition,2013
6. Foster Provost, Tom Fawcet, "Data Science for Business", O'Reilly, First Edition,2013.
7. Bart Baesens, "Analytics in a Big Data World: The Essential Guide to Data Science and its Applications", Wiley, First Edition,2014.
8. https://www3.cs.stonybrook.edu/~skiena/519/


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| MC5206 | INTERNET PROGRAMMING | L T P C<br>3 0 0 3 |
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**COURSE OBJECTIVES:**

- To understand the fundamentals of web programming and client side scripting.
- To learn the server side development using servlets, websocket.
- To learn the Spring framework and build applications using Spring.
- To learn and implement the concept of Java Persistence API.
- To learn the advanced client side scripting and framework.

**UNIT I INTRODUCTION TO WEB & CLIENT SIDE PROGRAMMING 9**

Introduction to Web: Server - Client - Communication Protocol (HTTP), JavaScript: Data Types and Variables - Expressions - Operators and Statements - Objects and Arrays - Functions - Classes - Modules - DOM - Events - Storage: LocalStorage, Cookies, IndexedDB, JSON, AJAX

**UNIT II SERVER SIDE PROGRAMMING 9**

Web Server: Web Containers - Web Components, Servlet: Lifecycle - Request - Servlet Context - Response - Filter - Session - Dispatching Requests, WebSocket, Logging - Log4j2, Build tool - Gradle. Introduction to Spring: IoC Container and Dependency Injection (DI)

**UNIT III SPRING 9**

Spring Configuration and Spring Boot, Spring MVC: DispatcherServlet and Configuration - Interceptors - Controllers - Views - Input Validation - File Upload, Building RESTful Web Services, Spring Security Architecture, Spring Cache.

**UNIT IV JAVA PERSISTENCE API AND HIBERNATE 9**

Entity: Basic, Embeddable and Collection Types - Identifiers - Entity Relationship - Inheritance, Persistence Context and Entity Manager, JPQL, Criteria API, Spring Data JPA - Specification and Projection.

**UNIT V ADVANCED CLIENT SIDE PROGRAMMING 9**

Asynchronous JavaScript: Callbacks - Promises - async and await, React JS: ReactDOM - JSX - Components - Properties - State and Lifecycle - Events - Lifting State Up - Composition and Inheritance - Higher Order Components.

**TOTAL: 45 PERIODS**

**Course Outcomes:**

Upon completion of the course the students should be able to:

- To write client side scripting.
- To implement the server side of the web application.
- To implement Web Application using Spring.
- To implement a Java application using Java Persistence API.
- To implement a full-stack Single Page Application using React, Spring and JPA.

**REFERENCE BOOKS**


1. David Flanagan, "Java Script: The Definitive Guide", O'Reilly Media, Inc, 7th Edition, 2020
2. Matt Frisbie, "Professional JavaScript for Web Developers", Wiley Publishing, Inc, 4th Edition, ISBN: 978-1-119-36656-0, 2019

3. Alex Banks, Eve Porcello, "Learning React", O'Reilly Media, Inc, 2nd Edition, 2020 https://reactjs.org/docs
4. David R. Heffelfinger, "Java EE 8 Application Development", Packt Publishing, First edition2017
5. Benjamin Muschko, "Gradle in Action", Manning Publications, First edition2014
6. IulianaCosmina, Rob Harrop, Chris Schaefer, Clarence Ho, "Pro Spring 5: An In-Depth Guide to the Spring Framework and Its Tools", Apress, Fifth edition2017
7. Christian Bauer, Gavin King, and Gary Gregory, "Java Persistence with Hibernate", Manning Publications, \r, 2nd Edition, 2015

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| MC5207 | CLOUD COMPUTING TECHNOLOGIES | L T P C<br>3 0 0 3 |
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**OBJECTIVES:**

- To understand the basic concepts of Distributed systems
- To learn about the current trend and basics of Cloud computing
- To be familiar with various Cloud concepts
- To expose with the Server, Network and storage virtualization
- To be aware of Microservices and DevOps

**UNIT I DISTRIBUTED SYSTEMS** 9

Introduction to Distributed Systems – Characterization of Distributed Systems – Distributed Architectural Models –Remote Invocation – Request-Reply Protocols – Remote Procedure Call – Remote Method Invocation – Group Communication – Coordination in Group Communication – Ordered Multicast – Time Ordering – Physical Clock Synchronization – Logical Time and Logical Clocks

**UNIT II INTRODUCTION TO CLOUD COMPUTING** 9

Cloud Computing Basics – Desired features of Cloud Computing – Elasticity in Cloud – On demand provisioning - Applications – Benefits – Cloud Components: Clients, Datacenters & Distributed Servers – Characterization of Distributed Systems – Distributed Architectural Models - Principles of Parallel and Distributed computing - Applications of Cloud computing – Benefits – Cloud services – Open source Cloud Software: Eucalyptus, Open Nebula, Open stack, Aneka, Cloudsim.

**UNIT III CLOUD INFRASTRUCTURE** 9

Cloud Architecture and Design – Architectural design challenges – Technologies for Network based system - NIST Cloud computing Reference Architecture – Public, Private and Hybrid clouds – Cloud Models : IaaS, PaaS and SaaS – Cloud storage providers - Enabling Technologies for the Internet of Things – Innovative Applications of the Internet of Things.

**UNIT IV CLOUD ENABLING TECHNOLOGIES** 9

Service Oriented Architecture – Web Services – Basics of Virtualization – Emulation – Types of Virtualization – Implementation levels of Virtualization – Virtualization structures – Tools & Mechanisms – Virtualization of CPU, Memory & I/O Devices – Desktop Virtualization – Server Virtualization – Google App Engine – Amazon AWS - Federation in the Cloud.

**UNIT V MICROSERVICES AND DEVOPS** 9

Defining Microservices - Emergence of Microservice Architecture – Design patterns of Microservices – The Mini web service architecture – Microservice dependency tree – Challenges with Microservices - SOA vsMicroservice – Microservice and API – Deploying and maintaining Microservices – Reason for having DevOps – Overview of DevOps – History of DevOps – Concepts and terminology in DevOps – Core elements of DevOps – Life cycle of DevOps – Adoption of DevOps - DevOps Tools – Build, Promotion and Deployment in DevOps - DevOps in Business Enterprises.

**TOTAL: 45 PERIODS**

**OUTCOMES:**

Upon completion of the course, the students will be able to

- Use Distributed systems in Cloud Environment
- Articulate the main concepts, key technologies, strengths and limitations of Cloud computing
- Identify the Architecture, Infrastructure and delivery models of Cloud computing
- Install, choose and use the appropriate current technology for the implementation of Cloud
- Adopt Microservices and DevOps in Cloud environment

**REFERENCES:**


1. Kai Hwang, Geoffrey C. Fox & Jack G. Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, First Edition, 2012
2. Andrew S. Tanenbaum& Maarten Van Steen, "Distributed Systems - Principles and Paradigms", Second Edition, Pearson Prentice Hall, 2006
3. Thomas Erl, ZaighamMahood& Ricardo Puttini, "Cloud Computing, Concept, Technology & Architecture", Prentice Hall, SecondEdition,2013
4. Richard Rodger, "The Tao of Microservices", ISBN 9781617293146, Manning Publications, First Edition,December 2017.
5. Magnus Larsson, "Hands-On Microservices with Spring Boot and Spring Cloud: Build and deploy microservices using spring cloud, Istio and kubernetes", Packt Publishing Ltd, First Edition,September 2019.
6. Jim Lewis, "DEVOPS: A complete beginner's guide to DevOps best practices", ISBN-13:978-1673259148, ISBN-10: 1673259146, First Edition, 2019.


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