SANT GADGE BABA AMRAVATI UNIVERSITY GAZETTE

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PART- TWO

(Extra-Ordinary)

Tuesday, the 22th September, 2020

NOTIFICATION

No. - 61/2020 Date : 22.9.2020

Subject :- Implementation of new syllabi of Semester III to VI of Master in Computer Application (Three Year Degree Course.... Semester Pattern) as per Choice Based Credit System in the Faculty of Science & Technology from the session 2020-2021 and onwards in phase wise manner ...

It is notified for general information of all concerned that the authorities of the University have accepted to implement the new syllabi as per AICTE Guidelines of Master in Computer Application (Three Year Degree Course... Semester Pattern ..Choice Based Credit System) Course of Semester III & IV from the academic session 2020-2021 and Semester V & VI from the academic session 2021-2022 & onwards in phase wise manner as per '**Appendix – A' .**

Sd/-
(Dr.T.R.Deshmukh)
Registrar
Sant Gadge Baba Amravati University

Appendix – A

SYLLABUS OF MCA SEM III TO VI [C.B.C.S.]

SEMESTER III

Course Code **MCA19201**

Course Name **JAVA PROGRAMMING**

Credits **4**

Course Outcomes

1. Remember and know the use an integrated development environment to write, compile, run, and test simple Java programs and get knowledge of the structure and model of the Java programming language.
2. Understand Java as an Object oriented language and write programs that solve real-world problems.
3. Understand exception handling and multithreading in Java and apply the concepts to real problems
4. Understand Streams in Java and apply them to File handling, understand Generics
5. Understand Collection Frameworks and apply it for problem solving, design simple GUI based applications using Swing
6. Understand Event handling and analyze and apply the knowledge to develop small GUI based applications.

Units	Contents	Total Hrs
I	**Java Basics**: Program Components, Compilation cycle. Data types and Variables, Operators: Arithmetic, relational, Assignment, Shift operators. Control structures: if, nested if, switch, while,do-while, for loop, Enhanced for loops.	9
II	**Concepts of OOP**: Introduction to classes, class fundamentals, declaring objects, methods, constructor, **this** keyword, access control, Inheritance, Polymorphism, Abstract classes and Interfaces, Packages String and String Buffer classes, Math class. Arrays: Basics, One - & Multi-dimensional, Array of Objects, Passing array to methods.	10
III	**Exception handling:** Exception types, Built-in Exceptions, checked and unchecked Exceptions, using try and catch, throw, throws, finally clauses, multiple catch clauses, **Multithreaded programming:** Java thread model, creating a thread, creating multiple threads, thread priorities & synchronization.	9

IV	**Java I/O:** Stream classes, Byte Stream & Character Streams: Input stream, Output stream, File Input stream, File Output stream, Data Input stream, Data Output stream, Print Writer. **Generic Programming:** Motivation for generic programming, generic classes, generic methods, inheritance and generics, Restrictions on Generics	9
V	**Java Collections Framework:** Introduction, Collections Framework hierarchy, List, Set, Map Interface and their implementing classes and methods, Iterator/ ListIterator, Utility classes. **Introduction To Swing:** Swing Features, Hierarchy Of Java Swing Classes, Swing GUI Components, Packages Used In Swing, Swing Control Classes & Methods, Swing API.	10
VI	**Event handling:** Event handling mechanisms, Delegation Event model, Event sources &Event Listeners, Event Classes, Event Listener Interfaces. Using delegation Event model, Handling mouse events, handling Keyboard events, Adapter classes, Inner classes, anonymous inner classes.	9

Text Book: Herbert Schildt: Java The Complete Reference, Ninth Edition McGraw Hill.

Reference Books:
1. Core Java, Volume I — Fundamentals (9th Edition), Cay S.Horstmann, Gary Cornell, Prentice Hall.
2. Effective Java, Second Edition, Joshua Bloch, Addison-Wesley Educational Publishers Inc.

Course Code	**MCA19202**
Course Name	**DATA COMMUNICATION NETWORK**
Total Credits	**4**

Course Outcomes

1. Understand the concepts of Data Communication System and its components.
2. Learn various types of network topologies and their appropriateness for designing a network.
3. Understand the various standard models of networking. Acquire deeper understanding about service implementation of various protocols used during network communication.
4. Understand roles and importance of different network devices within a network.
5. Recognize the technological trends of Computer Networking.
6. Acquire introductory knowledge about digital wireless communication systems.

Units	Contents	Total Hrs
I	**UNIT-I: Data Communication:** Advantages, Basic Model of Communication System; **Data Transmission: Modes:** Simplex, Half Duplex, Full Duplex; **Methods/Types:** Parallel, Serial: Asynchronous, Synchronous, Isochronous; **Transmission Media:** Guided and Unguided; **Modulation:** Amplitude, Phase Shift, Frequency, PAM, PCM; **Multiplexing:** FDM, WDM, TDM; **Switching:** Circuit, Message, Packet; Delays in Packet Switched Network, Packet Loss; Telephone Networks, Network topologies, Types of Networks: LAN,MAN,WAN; **Network Reference Models:** ISO-OSI model, TCP/IP model	10
II	**UNIT-II: Application Layer:** Services; **Processes:** Client-Server Model, Socket Interface; Services required by Application Layer; **HTTP:** Introduction, RTT, HTTP Handshake, types of HTTP Connections, HTTP Messages, Authentication and Cookies; **FTP:** Service Model, FTP Commands; Electronic Mail; SMTP; **DNS:** Services and working	09
III	**UNIT-III: Transport Layer:** Services; Multiplexing and De-multiplexing Applications; Connectionless Transport – UDP; Principles of Reliable of Data Transfer (RDT); Stop-and-wait and Pipelined protocols; GBN protocol; Connection-Oriented Transport: TCP; Flow Control; Principles of Congestion Control; Approaches towards Congestion Control; TCP Congestion Control	10
IV	**UNIT-IV: Network Layer:** Services; Network Service Model: Datagram, Virtual Circuit; Routing Principles; Routing Algorithms: Classifications; Hierarchical Routing; Internet Protocol: IP Addressing, IPv4: Classes and Packet format, DHCP; ICMP; Routing in the Internet: RIP, OSPF, BGP; Router; IPv6; Multicast Routing.	9

V	**UNIT-V: Data Link Layer:** Services; Error Detection and Correction; Multiple Access Protocols in LANs: ALOHA, CSMA/CD; LAN Addresses and ARP; Ethernet; Hubs, Bridges and Switches; Point-to-Point Protocol.	9
VI	**UNIT-VI: Wireless Communication:** Advantages, Applications; **Signals:** Characteristics, Propagation, Fading, Multipath Propagation; Spread Spectrum; Frequency Reuse Principle, Cellular System; Medium Access Control: SDMA, FDMA, TDMA, CDMA; Wireless LAN: IEEE 802.11; Bluetooth.	9

Reference Books:

1) Computer Networking –James F. Kurose and Keith W. Ross (Pearson)
2) Data Communication and Networking – Behrouz A. Forouzan (McGraw Hill)
3) Computer Network & Internet - Douglas E. Comer(Pearson)
4) Data and Computer Communication – William Stallings(Pearson)
5) Computer Networks - Andrew S. Tanenbaum (PHI)
6) Mobile Communications - Jochen Schiller(Addison-Wesley)

Course Code **MCA19203**

Course Name **DESIGN AND ANALYSIS OF ALGORITHMS**

Credits **4**

Course Outcomes

1. Understand the factors that affect the efficiency of algorithms and analyze the performance of algorithms.
2. Learn and Understand variety of divide and conquer algorithms, analyze them and apply ideas to new situations.
3. Learn and Understand variety of greedy algorithms, find out the basic ingredients of a greedy algorithm, and how to approach arguing the correctness of such algorithms.
4. Understand and Apply variety of dynamic programming algorithms.
5. Understand and solve variety of backtracking algorithms.
6. Analyze time and space complexity.

Units	Contents	Total Hrs
I	**Iterative Algorithm Design Issue**: Introduction, Use of Loops, Efficiency of Algorithms, Estimating & Specifying Execution Times, Order Notations, Algorithm Strategies, Design using Recursion	10
II	**Divide And Conquer**: Introduction, The gteeneral method, Binay Search, Finding minimum and maximum, merge sort, quick sort, selection sort, Strassen's matrix multiplication.	9
III	**Greedy Methods**: Introduction, Knapsack Problem, Job sequencing with deadlines, Minimum Spanning Trees, Prim's Agorithms, Kruskal's Algorithm, Dijkstra's Shortest Path Algorithm.	9
IV	**Dynamic Programming** :Introduction, Multistag eGraphs, Travelling Salesman, Matrix multiplication, Longest Common Sub-Sequences, Optimal Polygon Triangulation, Single Source Shortest Paths.	10
V	**Backtracking:** Combinational Search, Search& Traversal, Backtracking Strategy, Backtracking Framework, Some typical lState Spaces.	9
VI	**Efficiency of Algorithm**: Polynomial Time & Non Polynomial Time Algorithms, Worst and Average case Behaviour, Time Analysis of Algorithm, Efficiency of Recursion, Complexity, Examples of Complexity Calculation for Various Sorting algorithms. Time-Space Trade off	9

Text Book: "Design and Analysis of Algorithms" , Dave and Dave:, Pearson Education

Reference Books:

1) Fundamentals of computer Algorithms, E.Horowitz &S.S.Sahani. (Galgotia).
2) .Aho,Hopcroft& Ullman "The Design & Analysis of Computer Algorithms ", Addison-Wesley
3) G.Brassard, P.Bratley: Fundamentals of Algorithmics" , PHI

Course Name **Elective III : (i) MIS FRAMEWORK AND IMPLEMENTATION**
Credits **4**
Course Outcomes

1. Ability recognize role of Management Information System in industry.
2. Evaluate the role of information systems in today's competitive business environment.
3. Assess the relationship between organizations, information systems and business processes, including the processes for customer relationship management and supply chain management.
4. Analyze the relationship between information systems and organizations. Evaluate the role of information systems in supporting various levels of business strategy
5. Understand and apply technology in Management Information System
6. Learn relevance of IT, MIS & BPR.

Units	Contents	Total Hrs
I	**The meaning & role of MIS:** What is MIS? MIS & Computers, Decision Support System, MIS support to management, Role & importance of management. The system view of business MIS organization within the company, manager's view of information system.	10
II	**Basics of MIS** : MIS & decision making concept, information concept & classification, method of data & information collection, value of information management & organizational behaviours, management , information & the system approach. Development of MIS choice of IT.	9
III	**Strategic & project planning for MIS**: general business planning, appropriate MIS response, MIS planning MIS planning details. Implementation, evaluation & maintenance of the MIS.	9
IV	Application of information system to business MIS application in service industries & role of MIS in source industries. **DSS:**- concepts & philosophy, deterministic systems & knowledge based expert system MIS & role of DSS.	10
V	**Technology in MIS:** - Data processing, transaction processing, application processing, information system processing, DBMS, Client-server architecture & MIS. **MIS & data warehouse**: - Architecture management & implementation of data warehousing, E-business Model, E-payment, security in E-business, MIS & E-business.	9
VI	**MIS &Network**:- Network technology, LAN, Data communication, ATM Technology, Introduction of business processing, process model of organization, value system model, relevance of IT, MIS & BPR.	9

Text Books :

1) W.S. Jawadekar: Management Information System (II Edition), TMH
2) R.G. Murdick, J.E. Ross & J.R. Clagget: Information systems for modern management, 3rd edition, PHI.

Reference Books:-

1) Kenneth C. Landan & J.P. Landan: Management Information System, 8th edition, Pearson education
2) Robert Schuithesis, Mary Sumner: Management Information System, 4th edition, PHI
3) Laudon & Laudon, V.M. Prasad: Management Information System, 9th edition, Pearson education

Course Code **MCA19204**

Course Name **Elective III : (ii) MANAGERIAL ECONOMICS**

Credits **4**

Course Outcomes

1. Acquaint with concepts and techniques used in Micro-Economics and to enable their application
2. Acquire knowledge in business decision making .
3. Develop an understanding of the applications of managerial economics.
4. Interpret regression analysis and discuss why it's employed in decision-making.
5. Understand optimization and utility including consumer behavior.
6. Evaluate the relationships between short-run and long-run costs.
7. Understand uniform pricing and how it relates to price discrimination and total revenue.

Units	Contents	Total Hrs
I	Concept, Need, Scope, Techniques and Applications of Managerial Economics.	9
II	Utility Analysis, Marshal Approach, Demand Analysis, Demand Function, Law of Demand, Elasticity of Demand and demand forecasting. Law of Supply and Supply Analysis	10
III	Production & Cost function, Production Iso-quant, Iso-cost, Expansion path, Economies and Diseconomies of scale, short run and long run cost behavior	9
IV	Theories of firm, Profit Maximization, Sales Maximization, Managerial Utility Model, Simon Satisfying Behaviour Model	10
V	Market Structure-Perfect Competition, Monopoly, Oligopoly, Monopolistic Competition, short term pricing in these market structure.	9
VI	Cost Sheet, Costing for decision making, Relevant Costing. Marginal Costing & Absorption costing.	9

Text Books :

1) Adhikary, M. Business Economics. New Delhi, Excel Books, 2000
2) Baumol, W.J. Economics Theory and Operations Analysis 3rd ed., New Delhi, Prentice Hall Inc. 1996.

Reference Books:

1) Chopra, O.P. Managerial Economics. New Delhi, Tata McGraw Hill 1985
2) Keat, Paul G & Philips K.Y.Young, Managerial Economics, Prentice Hall New Jersey 1996.
3) Koutsoyiannis, A Modern Micro Economics. New York, Macmillan, 1991
4) Milgrom, P and Roberts J. Economics Organization and Management Englewood Clitts, New Jersey Prentice Hall Inc. 1992.
5) Maheshwari, Yogesh. Managerial Economics., P.H.I.
6) Mehta, P.L. Managerial Economics., Sultanchand& Sons. 9. Varshney, R.L. Managerial Economics., Sultanchand& Sons
7) Bhattacharya S.K. and Dearden J. Accounting for Management. Text and cases. New Delhi, Vikas, 1996.

Course Code **MCA19204**

Course Name **Elective III : (iii) OBJECT ORIENTED ANALYSIS AND DESIGN**

Credits **4**

Course Outcomes :

After completing this course students will be able to:

1. Understand the issues involved in implementing an object-oriented design
2. Analyze requirements and produce an initial design.
3. Develop the design to the point where it is ready for implementation.
4. Design components to maximize their reuse.
5. Learn to use the essential modeling elements in the most recent release of the Unified Modeling Language

Units	Contents	Total Hrs
I	**Introduction:** Two views of software Developments: SSAD and OOAD. Why Object–Orientation? **The Object Paradigm** Object and classes, Abstraction and encapsulation, Methods and Message, Interfaces, Inheritance and Polymorphism , Access Control	9
II	**Introduction to UML & Modeling** Review of the object Oriented Methodologies by Booch Rumbaugh, Cood Yourdon, Ivar Jacobson Unified Approach Diagramming and Notational Techniques using the UML. UML Diagrams and software Development Phases	10

III	**Object-Oriented Systems Development Process** Rational Unified Process : Four Major phases, Inception Elaboration, Construction, Transition. Requirements Engineering Problem analysis - Understanding Stockholders need	9
IV	**Structural Modeling** Common Structural Modeling Techniques – Approaches to find classes. Modeling Structural Elements : Classes, Relationships, Interfaces , Packages, Class Diagrams, Difference between ERD & Class Diagram, Object Diagram. **Behavioral Modeling** Common Behavioral Modeling Techniques, Interactions. Use Cases and Use Case Diagrams Interaction Diagrams : Sequence Diagrams, Collaboration Diagrams , Activity Diagrams, State chart Diagram, Forward & Reverse Engineering	10
V	**Persistent Object and Database Issues:** The Codd Data Management Domain. Object Persistence, Object-oriented Database Management System, Object- Oriented verses Relational Database. Mapping object to Relational Data structure.	9
VI	**Testing of Object Oriented applications:** Introduction to Testing Strategies Impact of Object Orientation on Testing. Testing Business Process. Patterns, Benefits of patterns. Using patterns During Analysis. Using Pattern During Design	9

Text Books:

1. Object Oriented Analysis and Design with Applications by Grady Booch., Benjamin / Cummings, 1994., Pearson Pub.
2. Object–Oriented Modeling and Design by J Rumbaugh, M B laha,W.Premerlani, PHI Pub.

Reference Books :

1) Magnifying Object Oriented Analysis and Design by Arpita Gopal and Netra Patil : PHI Publication
2) Principles of Object- Oriented Software Development - Anton Eliens , Addison Wesley.
3) Object Oriented System Development - Ali Bahrami McGRAW-HILL International Edition.
4) Object-Oriented Software Engineering - Ivar Jacobson Pearson Education INC
5) Applying UML And Pattern by Craig Larman Pearson Education INC
6) UML Distilled Martin Flowler - Pearson Education INC
7) The Unified Modeling Language User Guide -Grady Booch, James Rumbaugh, Ivar Jacobson- Pearson EducationINC
8) The Unified Modeling Language Reference Guide -Grady Booch, James Rumbaugh, Ivar Jacobson- Pearson EducationINC
9) DesignObject-OrientedSoftware-RebeceaWrifs-Brock.BrianWilkerson,LaurenWiener
10) Object Oriented Analysis and Design- Bennett , Simon McGrawHill.
11) Designing Flexible Object Oriented System with UML - Charless Richter,Techmedia
12) Instant UML – Muller – A pressLP
13) UML Instant – Thomas A Pendar – Wiley Publication
14) UML in Nutshell ,O'reilly Pub.
15) **Note**: The Subject should be taught through **case study approach**. The **focus should be on various UML diagrams**

Course Code **MCA19206**

Course Name **Lab 7 - BASED ON JAVA**

Credits **01**

Course Outcomes Ability to Apply core concepts of Java for problem solving .

The sample list of programs is given below. This list can be used as a guideline but the scope of the laboratory should not be limited to the same. Aim of the list is to inform about minimum expected outcomes.

1. rite, debug and execute simple JAVA programs that demonstrate programming logic by making use of various control statements.
2. Programs to Demonstrate the understanding and application of classes and objects to real world problems
3. Programs that Demonstrate the understanding and application of interfaces.
4. Programs to Demonstrate the understanding of built in and user defined packages

5. Programs that Demonstrate the understanding and application of Exception handling using real world problems
6. Programs that Demonstrate the understanding and application of Multi-threading using Thread Class/Run able Interface
7. Programs that Demonstrate the understanding and application of synchronization using multi-threading.
8. Programs that Demonstrate use of streams for File handling,
9. Programs to Demonstrate the use and benefits of generic classes, generic methods, , inheritance
10. Programs that Demonstrate the use of few Collection classes with real world problems
11. Programs that Demonstrate the use of Swing Control Classes & Methods in GUI application development
12. Programs that demonstrate the use of Delegation Event model and benefits of Inner classes, and anonymous inner classes.

Course Code **MCA19207**

Course Name **Lab 8 - BASED ON DAA**

Credits **01**

Total Hrs: **15**

Course Outcomes **I**dentify and apply the appropriate algorithm to a given real world problem.

The sample list of programs is given below. This list can be used as a guideline but the scope of the laboratory should not be limited to the same. Aim of the list is to inform about minimum expected outcomes.

1) Write a program to perform binary search using the divide and conquer method.
2) Write a program to find out maximum and minimum using divide and conquer rule.
3) Write a program to implement merge sort using divide and conquer approach.
4) Write a program to implement quick sort using divide and conquer approach.
5) Write a program to implement selection sort using divide and conquer approach.
6) Write a program to solve knapsack problem using Greedy method.
7) Write a program to implement Greedy Algorithm for Job Sequencing With Deadlines
8) Write a program to implement prim's algorithm using greedy method.
9) Write a program to implement Kruskal algorithm using greedy method.
10) Write a program to implement Dijkstra's algorithm for the Single source shortest path problem.
11) Write a program to implement Traveling Salesman problem using dynamic programming algorithm.
12) Write a program to Program to implement All Pairs Shortest Path using dynamic programming.
13) Write a Program to implement graph traversal using Breadth First Search.
14) Write a Program to implement graph traversal using Depth First Search.
15) Write a Program to implement 8 queen's problem.

Text Books:

1) "Design and Analysis of Algorithms" , Dave and Dave:, Pearson Education
2) Fundamentals of computer Algorithms, E.Horowitz &S.S.Sahani. (Galgotia).

Course Code **MCA19208**

Course Name **Lab 9 - BASED ON SOFTWARE TESTING**

Credits **02**

Total Hrs: 30

Course Outcomes

1. Analyze requirements to determine appropriate testing strategies
2. Apply a wide variety of testing techniques and tools in an effective and efficient manner
3. Compute test coverage and yield according to a variety of criteria
4. Evaluate the limitation of given testing process and provide a succinct summary of those limitations

UNIT-I :

Introduction: Software-Testing, Terminology and Methodology, Verification and Validation. **Dynamic Testing**: Black Box Testing Techniques, White Box Testing Techniques, Static
Testing, Validation Activities, Regression Testing.

UNIT-II :
Test Management, Software Metrics, Testing Metrics for Monitoring and Controlling the Testing Process, Efficient Test Suite Management. Testing Object Oriented Software, Testing Web Based Systems, Debugging**.**

UNIT-III :
Overview of Testing Tools, Testing an Application using Win Runner, Test Script Language, Architecture and use of Silk Test, Use of Load Runner and J Meter, Source Code Testing
Utilities in Unix / Unix Environment.

Suggested Reading:

1) Naresh Chauhan, **Software Testing Principles and Practices**, Oxford University Press, 2010.
2) Dr. K.V.K.K.Prasad, **Software Testing Tools**, Dreamtech press, 2008.
3) William E. Perry, **Effective Methods for Software Testing**, 3rd Edition, Wiley & Sons, 2006.
4) Srinivasan Desikan, Gopalaswamy Ramesh, **Software Testing: Principles and Practices,** Pearson Education, 2006.

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SEMESTER IV

Course Code MCA19210
Course Name: CLIENT SERVER COMPUTING
Credits 4

Course Outcomes:
After completion of this course, student will be able to :

1. Acquire knowledge of Server Side programing by implementing Servlet and JSP.
2. Acquire the knowledge of J2EE architecture, MVC Architecture.
3. Distinguish Web Server, Web Container and Application Server, Serialization, Internationalization
4. Understand and write the deployment descriptor and enterprise application deployment.
5. Design and implement components like: Session, Java Beans, JSTL, Tag Extension and Filter.
6. Gain knowledge of frameworks such as Struts Architecture and Hibernate Architecture
7. Distinguish JDBC and Hibernate. Design and Develop various application by Integrating any of Servlets, JSPs, Database, Struts, Hibernate after analyzing requirements and evaluating existing system.

Pre-requisite of course: Core Java

Units	Contents	Total Hrs
I	**Java Database Connectivity:** JDBC Concepts, JDBC API, Driver Manager, Connection, Statement,Prepared Statement, Callable Statement and Result Set classes with relevant methods, Types of Result Sets. Handling queries, inserts, deletes and updates to database. Displaying the query results. Stored Procedures.	10
II	**Servlets in Java:** Servlet structure & lifecycle. Servlet A P I basics, various classes & interfaces. Servlet requirements, writing. Running of Servlets, Concepts of Cookies, Servlets & cookies. Session management with Servlet API. Server side includes and request forwarding. Servlet chaining. Jdbc Servlets	9
III	**Introduction to JSP:** Simple JSP concepts, Environment set up for JSP, Life cycle of a JSP, Elements involved with development of JSP: Scripting Elements, Directives, Implicit Objects. Java beans: Concept of Beans, Properties, Bean instances & serialization, Bean Scopes, Writing Beans, Deploying a bean, JDBC bean. Jsp Actions, Using a bean in a JSP. Java Standard Tag Library (JSTL/Advanced JSP): Types of tags, core and SQL tags in detail.	9
IV	**Introduction to Java script:** What is Java script?, Values, Types and Operators, Expressions and statements, control flow statements, Functions, Arrow Functions, HTTP and Forms, Event handling, data structures, objects	10
V	**Introduction to Hibernate:** Why Hibernate?, Architecture of Hibernate, Hibernate Query language, Hibernate O/R Mapping, Setting up the Development Environment ,Creating Database Table, Writing-> Hibernate Configuration File, Java Bean, and Hibernate Mapping File, Developing Controller Component, Developing view Component.	9
VI	**Introduction to Struts:** Explaining MVC 2 Design Pattern for Struts 2 ,The Need for Struts 2,Processing Request in Struts 2, Struts 2 Architecture,, Actions in Struts 2, Interceptors, OGNL Support, Performing Validation in Struts 2, Internationalizing Struts 2 Applications, Implementing Plug-in in Struts 2,Integrating Struts 2 with Hibernate	9

Text Books :

1) 1 Java Server Programming Java EE 7 (J2EE 1.7) Black Book(2014),. Kogent Learning Solutions Inc.
2) Core Servlets and Java Server Pages: Core Technologies by Marty Hall and Larry Brown,Java 2 Platform Enterprise Edition series, Prentice Hall

Reference Book : 1 Java EE cookbook, Elder Moraes,Packt Publishing Limited (9 April 2018)

Course Code **MCA19211**
Course Name: **ARTIFICIAL INTELLIGENCE AND APPLICATIONS**
Credits **4**

Course Outcomes:

1. Adopt an approach in view of Problem solving with AI.
2. Identify and apply suitable 'Intelligent Agents for various AI applications.
3. Identify knowledge statement and represent it.
4. Empower students for path planning of a robotic system.
5. To develop and survey embedded systems applications using machine learning.

Units	Contents	Total Hrs
I	**Introduction to Artificial Intelligence:** What is an AI, Introduction of Intelligent systems, The Foundations of Artificial Intelligence, Applications of A.I. Problem solving with AI, AI models, **Intelligent Agents:** Agents and Environments, Good Behavior: The Concept of Rationality, The Nature of Environments, The Structure of Agents, How the components of agent programs work.	10
II	**Knowledge, Reasoning, and Planning**: Knowledge based agents, The Wumpus World, Logic, propositional logic, Representation of knowledge using rules, Predicate logic, Unction and lifting, inference in FOL, Forward Chaining, Backward Chaining, Resolution, Logic Programming. Planning problem, Planning, Algorithms for Planning as State-Space Search, Planning Graphs, simple planning agent, planning languages, blocks world problem, goal stack planning.	9
III	**Logical Agents:** Knowledge representation structures: Frames, semantic net, Scripts, Logic: Prepositional Logic, Prepositional Theorem Proving, Inference and proofs, Proof by resolution, Conjunctive normal form, Horn clauses and definite clauses, Syntax and Semantics of First-Order Logic, Symbols and interpretations, Knowledge Engineering in First-Order Logic, Unification, Resolution, and Introduction to logic programming (PROLOG).	9
IV	**Problem Decomposition and Planning:** Problem Decomposition: Goal Trees, Rule Based Systems, Rule Based Expert Systems. Planning: STRIPS, Forward and Backward State Space Planning, Goal Stack Planning, Plan Space Planning, A Unified Framework for Planning. Constraint Satisfaction : N-Queens, Constraint Propagation, Scene Labeling, Higher order and Directional Consistencies, Backtracking and Look ahead Strategies.	10
V	**Natural Language Processing and Robotics:** **Natural Language Processing:** Language Models, Steps in NLP, Syntactic Analysis (Parsing), Semantic interpretation, Discourse and pragmatic Processing, Text Classification. Discourse and pragmatic Processing, Implementation aspects of Syntactic Analysis (Parsing). **Robotics:** Fundamentals, path Planning for Point Robot, Sensing and mapping for Point Robot, Mobile Robot Hardware, Non Visual Sensors like: Contact Sensors, Inertial Sensors, Infrared Sensors, Sonar, Radar, laser Rangefinders, Biological Sensing.	9
VI	**Machine Learning:** Machine Learning Concepts, methods and models, Supervised Learning, unsupervised and semi-supervised, Learning Decision Trees, Evaluating and Choosing the Best Hypothesis, Artificial Neural Networks, Non-parametric Models, Support Vector Machines.	9

Text Books:

1) Artificial Intelligence: A Modern Approach by Peter and Norvig.
2) Stuart Russell and Peter Norvig (1995), Artificial Intelligence: A Modern Approach," Third edition, Pearson.

Reference Books:

1. .Shai Shalev-Shwartz, Shai Ben-David: Understanding Machine Learning from Theory to algorithms, Cambridge University Press
2. Michael Jenkin, Gregory, “Computational Principals of Mobile Robotics”, Cambridge University Press.
3. Artificial Intelligence by Elaine Rich, Kevin Knight and Nair, TMH
4. Deepak Khemani, “A First Course in Artificial Intelligence”, McGraw Hill Education (India).
5. Artificial Intelligence and Intelligent Systems by Padhy, Oxford University Press.

Course Code MCA19212

Course Name: DATA WAREHOUSING AND DATA MINING

Credits 4

Course Outcomes

1. Understand the functionality of the various data mining and data warehousing components
2. Identify strengths and limitations of various data mining and data warehousing models
3. Understand the analyzing techniques of various data
4. Understand different methodologies used in data mining and data ware housing.
5. Analyze different approaches of data ware housing and data mining with various technologies.
6. Understand the use and importance of different end user applications.

Units	Contents	Total Hrs
I	Introduction, Data mining, Data mining functions, classification and major issues. Data Pre-processing: Data cleaning, data integration and transformation, data reduction, discretisation & concept hierarchy generation.	10
II	**Data mining primitives**: Data mining primitives, data mining query language. Concept description: concept description, data generalization, Analytical characterization, mining class comparison.	9
III	**Application and trends in data mining** : data mining applications, data mining systems and research prototypes, additional themes on data mining, trends in data mining .	9
IV	Data ware house and OLAP Technology for data mining: What is data ware house, multidimensional data model, data warehouse architecture, data ware house implementation.	10
V	**Data Staging:** overview, plan effectively, dimension table staging, fact table loads and ware house operations, data quality and cleansing, miscellaneous issues.	9
VI	**Building end user applications** : role of end user application, application specification, end user application development, maintaining and growing data ware house : manage the existing data ware house environment, prepare for growth and evaluation.	9

Text Books :

1) J. Han and M.Kamber: Data Mining Concepts and Techniques, Elsevier Pub. Indian Reprint, 2004.
2) R. Kimball: The Data Ware House Life Cycle Tool Kit, Wiley Press, John Wiley and Sons ASIA) Pvt. Ltd.

Reference Books :

1) Berson : Data Ware Housing, Data Mining and OLAP, Tata McGraw Hill.
2) Arun K. Pujari : Data Mining Techniques, University Press (Orient Longman)

Course Code MCA19213 (01)

Course Name: Elective IV : (i) COMPUTER GRAPHICS AND MULTIMEDIA

Credits 4

Course Outcomes:

1. Understand the core concepts of computer graphics, including viewing, projection, perspective, modelling and transformation in two dimensions.
2. Apply the concepts of colour models, lighting and shading models, textures, ray tracing, hidden surface elimination, anti-aliasing, and rendering.
3. Interpret the mathematical foundation of the concepts of computer graphics.
4. Know the fundamentals of animation, parametric curves and surfaces, and spotlighting.
5. Understand technicalaspect ofMultimediaSystems.
6. Understand the standards available for different audio, video and textapplications and Data Compression Techniques.

Units	Contents	Total Hrs
I	**An overview of Computer Graphics and Graphics System:** Video display devices, Raster-Scan systems, Random-Scan systems, Graphics monitors and workstations, input devices, hard copy devices, Graphics software.	10
II	**Output Primitives :** Point and Lines, Line drawing algorithms, loading the frame buffer, line function, circle and ellipse generating algorithms, curves, parallel curves algorithms, Pixel addressing, filled-area primitives, functions, Cell array, character generation.	9
III	**2-D Geometric Transformations:** Basic transformations, matrix representations, composite transformations, other transformations, transformations between coordinate systems, affine transformations, and transformation functions, Raster methods for transformations. Two-Dimensional viewing: viewing coordinates, Window-to-viewport coordinate transformation, viewing functions, clipping: point, line, polygon, curve, and text, exterior. Projections.	9
IV	**Multimedia Authoring and Data Representations:** Introduction. Components of Multimedia. Hypermedia and Multimedia. Overview of Multimedia Software Tools, Multimedia Authoring, VRM. Graphics and Image Data Representations: 1- Bit Images, 8-Bit Gray-Level Images, 24-Bit Color Images, 8-Bit Color Images, Color Lookup Tables, Popular Image File Formats. Color in Image and Video Color Science, Color Models in Images, Color Models in Video	10
V	**Fundamental Concepts in Video:** Types of Video Signals, Component Video, Composite Video, S-Video, Analog Video, NTSC Video, PAL Video, SECAM Video, Digital Video.**Basics of Digital Audio:** Digitization of Sound, Digitization, Nyquist Theorem, Signal-to-Noise Ratio (SNR), Signal-to-Quantization-Noise Ratio (SQNR), MIDI: Musical Instrument Digital Interface. Hardware Aspects of MIDI, Structure of MIDI Messages, General MIDI, MIDI-to-WAV Conversion.	9
VI	**Multimedia Data Compression:** Lossless Compression Algorithms: Basics of Information Theory, Run-Length Coding, Variable-Length Coding, Dictionary-Based Coding, Arithmetic Coding, Lossy Compression Algorithms: Introduction, Distortion Measures, Quantization, Uniform Scalar Quantization, No uniform Scalar Quantization, Image Compression Standard: The JPEG Standard.	9

Text Books :

1) D. Hearn, M.P .Baker : Computer Graphics, II edition (Pearson Education)
2) Ze-Nian, Li, Mark S. Drew “Fundamentals of Multimedia” (Pearson Education)

Reference Books :

1) Rajan Parekh “Principles of Multimedia “ (Tata McGraw-Hill)
2) F.S. Hill : Computer Graphics Using Open GL, II edition (Pearson Education)
3) W .M. Newman & R.F. Sproul : Principles of Interactive Computer Graphics, 2/e, (McGraw Hill)
4) F .S. Hill: Computer Graphics (Macmillan)
5) Harington : Computer Graphics (McGraw Hill)

Course Code **MCA19213 (02)**

Course Name **Elective IV :(ii) CYBER SECURITY AND DIGITAL FORENSIC**

Total Credits **4**

Course Outcomes

1. Understand the concepts and foundations of Cyber Security
2. Identify security risks
3. Ability to take preventive steps
4. Investigate Cyber Crime and analysis of evidences
5. Acquire knowledge of Digital Forensics.

Units	Contents	Total Hrs
I	Cyber security concepts, Cyber security Strategy, Current Laws Involving Cyber security, International Comprehensive Cyber security Strategy, Cyber security Policy and Strategy Emerging Challenges, Cyber security, Need of Cyber security Malwares: Viruses, Trojans, and Attacks, Development of Computer Viruses, Malicious Attacks	10
II	Threat Landscape, Attack Classification, Threat Attacks, Botnets and Cyber Crime Applications , Different types of crimes, Deep Web , Vulnerabilities, Risk Assessment, and Risk Management, Random Stochastic Models ,issues of Time and Sequence, Attack Graphs, Cyber security vulnerabilities, Constraint and Simulations , Optimization and Risk.	9
III	Cyber Threat Spectrum—Cyberspace Attacks and Weapons, Cyber Threat Capability and Cyber Tools, Cyber Digital Arsenal , Rationale of Cyberspace Infrastructure Attacks Framework forImproving Critical Infrastructure Cyber security.	9
IV	Basics of Critical Infrastructure Protection ,Design and Utility of Infrastructures, Evolution of Infrastructures, Impact of Infrastructures on Society ,Random Nature of Faults, Failures, and Engineering Resilience, Fault Intolerance and Fault Tolerance, Fail-Safe.	10
V	Management Methods and Standards, Economic Impact on Regulation and Duties to Protect ,Legal Requirements and Regulations Critical Infrastructure Protection Strategies and Operations ,Physical Security ,Personnel Security, Operational Security Information Warfare Theory and Application Cost of Cyber security Contemporary Cost of Cyber Crime, Cyber security Insurance New Cyber security Models, Future Generations for Cyber security, Transformational Challenges	9
VI	Digital Forensics: Introduction of digital forensics, Need for digital forensics, Forensic process, Investigation, Digital evidence collection, Application , limitations, Legal considerations, Digital evidence, investigation tools.	9

Reference Books :

1) Cyber Security - Edited By Thomas A Johnson CRC Press.
2) CYBER SECURITY By Dr. Krishan Kumar Goyal, Prof Amit Garg.
3) The NICE Cyber Security Framework: Cyber Security Intelligence and Analytics by Izzat Alsmadi
4) Computer Forensics and Digital Investigation with EnCase Forensic v7 By SuzanneWidup
5) Digital Forensics for Network, Internet and Cloud computing By Cunt P Garrison

Course Code **MCA19213 (03)**

Course Name Elective IV:(iii) VISUAL PROGRAMMING

Credits **4**

Course Outcomes :

1. Understand the development and deployment cycles of enterprise applications.
2. Utilize the .NET framework to build distributed enterprise applications.
3. Develop ASP.NET Web Services, secure web services, and .NET remoting applications.
4. Understand the 3-tier software architecture (presentation/client tier, application tier, data tier) and develop multi-tier applications.
5. Understand and experiment with the deployment of enterprise applications.
6. Develop web applications using a combination of client-side and server-side JavaScript, HTML, HTML5, J Query, AJAX ASP.NET, ADO.NET.
7. Develop network applications using state-of-the-art RPC technologies including: .NET remoting, and Web Services (SOAP).

Units	Contents	Total Hrs
I	**Introduction**, course mechanics, .NET Overview, CLR, Assemblies (monolithic vs. component-based applications), Execution Model, Client-Side vs. Server-Side Programming, Web Technologies, A Tour of the IDE	9
II	**Basics of Front end Technologies** :HTML, HTML5, JavaScript, j Query, Need and Introduction of CSS, Creating new styles in External style sheets, Creating Embedded and Inline style sheets**. Introduction to Server Controls:** A Closer Look at ASP.NET Server Controls, Types of Controls, Standard controls, HTML controls, Data controls, Validation controls, Navigation controls, Login controls, Ajax Extensions, ASP.net State Engine..	10
III	**Introduction to Programming :** Data Types and Variables, Converting and Casting Data Types, Using Arrays and Collections, Statements: Operators, Making Decisions, Loops, Organizing Code : Methods- Functions, The App Code Folder, Organizing Code with Namespaces, Writing Comments, Object Orientation Basics, Important OO Terminology, Events	9
IV	**Consistent Page Layout with Master Pages:** Creating Master Pages, Creating Content Pages, An Introduction to the ASP.NET Page Life Cycle, **Navigation:** Different Ways to Move around Your Site: Understanding Absolute and Relative URLs, Understanding Default Documents, Using the Navigation controls: Architecture of the Navigation Controls, Examining the Website map File, Using the Menu Control, Using the Tree View Control, Using the Site Map Path Control, Programmatic Redirection: Programmatically Redirecting the Client to a Different Page, Server-Side Redirects **Validating User Input:** Gathering Data from the User: Validating User Input in Web Forms, Understanding Request Validation	10
V	**Introduction to ASP.NET AJAX:** The Timer Control, Using Web Services and Page Methods in Ajax Web Sites: What Are Web Services?, Creating Web Services, **An Introduction to j Query:** Choosing the Location for Your j Query Reference, Different Ways to Include the jQuery Library, Selecting Items Using j Query, **Modifying the DOM with j Query**: CSS Methods, Handling Events, Effects with j Query.	9
VI	**Introduction to Database**: What Is a Database? Different Kinds of Relational Databases, Using SQL to Work with Database Data, Retrieving and Manipulating Data with SQL, Creating Your Own Tables, Data Types in SQL Server, Understanding Primary Keys and Identities, Creating Relationships Between Tables, Data Controls, Data Source and Data-bound Controls Working Together, Introducing Security in ASP.NET 4, **exception Handling, Debugging and Tracing, Deploying Your Web Site.**	9

Text Book: Beginning ASP.NET4 in C# and VB,Imar Spaanjaars,Wrox Publication, 2010, ISBN 978-0-470-50221-1

Reference Books:

1) Beginning ASP.NET 4.5 in C#, Apress, 2012, ISBN-10: 1430242515
2) Pro C# with .NET 3.0, Andrew Troelsen, Apress, 2007, ISBN 978-1-59059-823-8
3) Microsoft Windows SharePoint Services 3.0 Step by Step, Olga Londer, Todd Bleeker, Penelope Coventry, James Edelen, Microsoft Press, 2005, ISBN-10: 0735623635
4) Microsoft .NET XML Web Services: Step by Step,Adam Freeman, Allen Jones, Microsoft Press, 2003, ISBN 0-7356-1720-1
5) Microsoft .NET Distributed Applications: Integrating XML Web Services and .NET Remoting, Matthew MacDonald, ISBN 0-7356-1933-6.

Course Code **MCA19213 (04)**

Course Name Elective IV:(iv) CLOUD COMPUTING

Credits **4**

Course Outcomes:

1. Understand the core concepts of the cloud computing and its benefits along with its various models and services in cloud computing.
2. Use various types of Virtualization techniques using its open source tools.
3. Handle various types of cloud file systems.
4. Install cloud computing environments.
5. Manage various stages of SLA life cycle.
6. Identify various security threats and issues in cloud environments.

Units	Contents	Total Hrs
I	**Introduction to Cloud Computing** Introduction, Defining Cloud Computing, Understanding Cloud Architecture, Benefits of Cloud Computing SOA, Web services, Web 2.0, Mash ups, Grid computing, Utility computing, Hardware virtualization, Essentials of Cloud characteristics, Challenges, Cloud economics, Role of Networks in Cloud Computing: Cloud types and service models, Primary Cloud Service models, Cloud Services brokerage, Primary cloud deployment models, cloud computing reference model, The green field and brown field deployment options.	10
II	**Virtualization** Introduction, Understanding Abstraction & Virtualization Technologies, Virtualization, Types of Virtualization, Characteristics of Virtualized environments, Taxonomy of Virtualization techniques, Pros and Cons of Virtualization, Technology examples: Xen, KVM, Vmware, Microsoft Hyper-V, Load Balancing & Virtualization, Understanding Hypervisors, Defining Baseline and metrics, Baseline measurements, System metrics, Load testing, Resource ceilings, Servers and instance types, Network Capacity, Scaling.	9
III	**Storage in Cloud** Storage system architecture, Big data, Virtualize data cente r(VDC) architecture, VDC Environment, server, storage, networking, Virtual Machine Components and Process of converting physical to VMs, Block and file level storage virtualization, Virtual Provisioning, VLAN, VSAN and befits, Network traffic management techniques in VDC, Cloud file systems: GFS and HDFS, Big Table, H Base and Dynamo. Features and comparisons among GFS, HDFS	9
IV	**Cloud computing platforms & Standards** Infrastructure as Service, best-of breed cloud infrastructure components, cloud ready converged infrastructure, Anatomy of Cloud infrastructure, Distributed management of virtual infrastructure, scheduling techniques, SLA Commitment, Google Web Services, Amazon Web Services, Microsoft Cloud services. Cloud Computing Standards Objectives, Best Practices and Standards, Practical Issues-Interoperability, Portability, Integration, Security, Standards Organizations and Groups	10
V	**Cloud monitoring and management** Introduction and architecture for federated cloud computing, Performance prediction for HPC on Cloud. SLA management: Types of SLA, Life cycle of SLA, service catalog, cloud portal and its functions, cloud interface standards, system integration and work-flow modeling, cloud service life-cycle phases: service planning, service creation, service operation, and service termination Control layer, its functions and benefits,element and unified manager, software defined approach and techniques for managing IT resources	9
VI	**Security in Cloud Computing** Introduction, Global Risk and Compliance aspects in cloud environments and key security terminologies, Data security risk, Cloud computing and identity, Digital identity and access management, Content level security, Securing the Cloud, Securing Data, Establishing Identity and Presence. Cloud Applications, Research trend in Cloud Computing, Fog Computing, Open Source and Commercial Clouds, Cloud Simulator	9

Text Books:

1) Barrie Sosinsky,"Cloud Computing", Wiley India.
2) Dr. Kumar Saurabh,"Cloud Computing", Wiley Publication.
3) RajkumarBuyya, "Mastering Cloud Computing", Tata McGraw Hill.

Reference Books:

1) Greg Schulr,"Cloud and virtual data storage networking", CRC Press.
2) Anthony T. Velte, "Cloud Computing, A Practical Approach", TATA Mc Graw Hill
3) Pachghare V. K.,"Cloud Computing", PHI Learning
4) Kailash Jayaswal, "Cloud computing", Black Book, Dreamtech Press.

Course Code **MCA19215**

Course Name **Lab-10 Based on Client Server Computing**

Credits 01 [**Total Hrs** 15]

Course Outcomes:

1. Gain knowledge of Server Side programming by implementing Servlets and JSP.
2. Gain knowledge of J2EE architecture, MVC Architecture.
3. Distinguish Web Server, Web Container and Application Server, Serialization, Internationalization
4. Design and implement components like: Session, Java Beans, JSTL, Tag Extension and Filter.
5. Acquire knowledge of frameworks such as Struts and Hibernate
6. Distinguish between JDBC and Hibernate.
7. Design and Develop various application by Integrating any of Servlets, JSPs, Database, Spring, Hibernate by analyzing requirements and evaluating existing system.

The sample list of programs is given below. This list can be used as a guideline but the scope of the laboratory should not be limited to the same. Aim of the list is to inform about minimum expected outcomes.

1. (Use of JDBC) WAP TO:
    a. Create a database using JAVA
    b. Create a table, IN THE DATABASE
    c. Insert records in the table
2. Update records in database table based on conditions
3. Display the records in database table based on conditions
4. Write a servlet program in Java that calls a stored procedure and displays the values returned by the stored procedure.
5. Create login form and perform state management using Cookies,
6. Perform state management using HttpSession
7. Create a registration form with validations using java script
8. Create database of student subject-wise data and retrieve all data using JSP
9. Study and implement Hibernate
10. Study and Implement MVC using Struts
11. A mini project using all concepts

Course code MCA19216

Course Name **Lab- 11 - BASED ON ARTIFICIAL INTELLIGENCE AND APPLICATIONS**

Credits **01**

Total Hrs 15

Course Outcomes : Skill to develop Artificial Intelligence, Robotics and Machine Learning Applications.

The following list can be used as guidelines for creating problem statements but the scope of the laboratory should not be limited to this list. Aim of the list to inform about minimum expected outcomes.

1. At least 6 Practical based on LISP language.
2. At least 6 Practical based on PROLOG Language.
3. Develop chat-bot application for enquiry purpose.
4. At least 1 practical based on implementation of Natural Language Processing using any of its open source tools.
5. Use any one open source robot simulation software and perform at least 1program to demonstrate simulate robots (like line follower robot).
6. Practical to demonstrate the use of Machine Learning concept to classify any type of information based on facts as "real" or "fake".

Course Code **MCA19217**

Course Name **Lab-12 Based on Elective-4 (COMPUTER GRAPHICS AND MULTIMEDIA)**

Credits **2**

Total Hrs **30**

Course Outcomes: Apply the core concepts of computer graphics and multimedia to real world problems
Minimum Twelve practicals /experiments based on the respective syllabus, covering each of the units.
The following list of can be used as guidelines for basic understanding but the scope of the laboratory should not be limited to this list. Aim of the list to inform about minimum expected outcomes.

1. To Study various in build graphics functions in C library.
2. Write a program to draw a line using DDA algorithm.
3. Write a program to draw a line using Bresenham‘s algorithm.
4. Write a program to draw a circle using midpoint algorithm.
5. Write a program to draw a circle using Bresenham‘s algorithm.
6. Write a program to draw a rectangle using line drawing algorithm.
7. Write a program to perform 2D Transformation on a line.
8. Write a program to perform shear transformation on a rectangle.
9. Write a program to rotate a circle (alternatively inside and outside) around the circumference of another circle.
10. Write a program to draw a car using in build graphics function and translate it from bottom left corner to right bottom corner of screen.
11. Write a program to draw balloons using in build graphics function and translate it from bottom left corner to right top corner of screen.
12. Write a program to draw a cube using in build library function and perform 3D transformations

i) Translations in x, y, z directions

ii) Rotation by angle 450 about z axis, rotation by 600 about y-axis in succession.

iii) Scaling in x-direction by a factor of 2, scaling in y- direction by a factor of 3.

12. Write a program to implement line clipping (Cohen Sutherland algorithm).
13. Write a program for making Bezier curve.
14. Write a program to study various in build functions for 2D drawing in MAYA software.
15. Write a program to show animation of a ball moving in a helical path.
16. Write a program to show animation of solar system.

Course Code **MCA19217**

Course Name **Lab-12 Based on Elective-4 (CYBER SECURITY AND DIGITAL FORENSIC)**

Credits **2**

Total Hrs **30**

Course Outcomes: Apply the concepts of Cyber Security to real world problems

Minimum Twelve practical experiments based on the respective syllabus, covering each of the units.
The sample list of program is given below. This list can be used as guide line but the scope of the laboratory should not be limited to the same.

1 TCP scanning using NMAP
2 Port scanning using NMAP
3 TCP / UDP connectivity using Netcat
4 Network vulnerability using OpenVAS
5 Web application testing using DVWA
6 Manual SQL injection using DVWA
7 XSS using DVWA
8 Automated SQL injection with SqlMap

Course Code **MCA19217**

Course Name **Lab-12 Based on Elective-4 (VISUAL PROGRAMMING)**

Credits **2**

Total Hrs **30**

Course Outcomes :

1. Understand and the use of the development framework to build applications.
2. Develop web applications using a combination of client-side and server-side JavaScript, HTML, HTML5, J Query, AJAX ASP.NET, ADO.NET.

3. Understand and experiment with the deployment of enterprise applications.

The sample list of program is given below. This list can be used as guide line for problem statements but the scope of the laboratory should not be limited to the same. Aim of the list is to inform about minimum expected outcomes (recommended : C# language with ASP.NET)

1. Create and use the IDE for creating webform application
2. Create an informative website using HTML and HTML5
3. Create an informative website using HTML, HTML5, Java script and j Query.
4. To Study and the use of different types of CSS.
5. Create an application using ASP.NET to use standard controls.
6. Create an application to study and use login controls and navigation controls.
7. Create an application to use ASP.NET to use arrays and different control structures.
8. Create an application to use Master pages ang navigate to other webpages.
9. Create an application using ASP.NET with AJAX.
10. Create an application using ASP.NET to study and use validation controls.
11. Create an application using ASP.NET to study and use of Function.
12. Create an application using ASP.NET to study and use of ADO.NET .

Course code **MCA19217**

Course Name **Lab-12 Based on Elective- 4 (CLOUD COMPUTING - LAB)**

Credits **02**

Total Hrs **30**

Course Outcomes :

1. Develop Skill to use Cloud sim Tool to develop its Applications
2. Acquire Skill to develop applications using Hadoop Map/Reduce
3. Understand PAAS type applications
4. Ability to use Amazon, Microsoft Azure Web Services.

The following list of can be used as guidelines for basic understanding but the scope of the laboratory should not be limited to this list. Aim of the list to inform about minimum expected outcomes.

1. Case Study: To study cloud architecture and cloud computing model
2. Installation and Configuration of virtualization using KVM.
3. A simple example showing how to create a data center with one host and run one cloudlet on it. (use Cloud sim Tool)
4. A simple example showing how to create two data centers with one host and a network topology each and run two cloudlets on them. (use Cloud sim Tool)
5. An example showing how to create scalable simulations. (use Cloud sim Tool)
6. An example showing how to pause and resume the simulation, and create simulation entities (a Data center Broker in this example) dynamically. (use Cloud sim Tool)
7. Installation and Configuration of Hadoop.
8. Create an application (Ex: Word Count) using Hadoop Map/Reduce.
9. Case Study: PAAS(Facebook, Google App Engine)
10. Case Study: Amazon Web Services, Microsoft Azure.

SEMESTER V

Course Code **MCA19301**

Course Name : **MOBILE APPLICATION DEVELOPMENT**

Credits **4**

Course Outcomes :

1. Identify various concepts of mobile programming that make it unique from programming for other platforms,
2. Critique mobile applications on their design pros and cons.
3. Utilize rapid prototyping techniques to design and develop sophisticated mobile interfaces.
4. Program mobile applications for the Android operating system that use basic and advanced phone features.
5. Deploy applications to the Android marketplace for distribution.

Units	Contents	Total Hrs
I	Introduction to Mobile A brief history of Mobile, The Mobile Ecosystem, Why Mobile?, Types of Mobile Applications, Mobile Information Architecture, Mobile Design, Mobile 2.0, Mobile Web development, Small Computing Device Requirements. J2ME: Overview The World of Java, Inside J2ME, J2ME Architecture, MIDlet Programming, J2ME Wireless Toolkit, Hello World J2ME Style, Multiple MIDlets in a MIDlet Suite.	10
II	Introduction to Android: History of Android, Introduction to Android, Operating Systems, Android Development Tools, Android Architecture.	9
III	Development Tools: Installing and using Eclipse with ADT plug-in, Installing Virtual machine for Android sandwich/Jelly bean (Emulator), configuring the installed tools, creating a android project – Hello Word, run on emulator, Deploy it on USB-connected Android device.	9
IV	User Interface Architecture: Application context, intents, Activity life cycle, multiple screen sizes User Interface Design: Form widgets, Text Fields, Layouts, Button control, toggle buttons, Spinners(Combo boxes),Images, Menu, Dialog.	10
V	Testing Android applications, Publishing Android application, Using Android preferences, Managing Application resources in a hierarchy, working with different types of resources. Understanding of SQLite database, connecting with the database.	9
VI	Publishing and Distributing Android Applications : The Android Software Development Process, Assessing Project Risks, Writing Essential Project Documentation, Deploying Mobile Applications, Designing and Developing Bulletproof Android Applications.	9

Text Books:

1. J2ME: The Complete Reference, James Keogh, Tata McGraw Hill
2. Android application development for java programmers. By James C. Sheusi. Publisher: Cengage Learning, 2013.
3. Lauren Darcey and Shane Conder, - Android Wireless Application Development||, Pearson Edn, 2nd edn. (2011)

Reference Books:

1) Reto Meier, “Professional Android 2 Application Development”, Wiley India Pvt Ltd
2) Mark L Murphy, “Beginning Android”, Wiley India Pvt Ltd
3) Android Application Development All in one for Dummies by Barry Burd, Edition: I

Course Code **MCA19302**

Course Name **SOFTWARE ENGINEERING**

Credits **4**

Course Outcomes :

1. Recognize evolving role of software project management.
2. Understand and estimate cost for software project.
3. Identify & analyze aspect in s/w to manage time, process & resources effectively with quality concept.
4. Estimate software productivity using metrics and indicator & identify important issues for planning a project
5. Judge different testing techniques used to test software.
6. Evaluate the role of user and software teams.

Units	Contents	Total Hrs
I	**Evolving role of Software**. Software crises & myths. Software engineering. Software process & process models: Linear sequential, prototyping, RAD, Evolutionary Product & Process. Project management concepts: People, Product, Process, Project. W5HH principle, critical practice.	10
II	**Measures, Metrics & Indicators**. Metrics in process & project domains-software measurement, Metrics for software quality, small organization. Software projects Planning: Scope, resources, estimation, decomposition technique, Tools. Software risks: identification, risk projection, refinement & RMMM plan.	9
III	**Project Scheduling:** Concepts. Peoples Efforts. Task set, Task network. Scheduling. EV analysis, Project Plan. Software quality concepts. SQ Assurance, Software reviews, technical reviews, software reliability, ISO 900 L, SQA Plan. SCM process. Version control. SCM standard.	9
IV	**System Engineering:** Hierarchy, Business Process & Product engineering: Overviews. Requirement engineering, System modeling. Requirement analysis. Analysis principles. Software prototyping. Specification. Design Process. Design Principles & Concepts. Effective modular design. Design model & documentation.	10
V	**Software architecture:** Data Design, Architectural styles, Requirement mapping. Transform & Transaction mappings. User-interface design : Golden Rule. UTD, Task analysis &modlling, ID activities, Tools, design evaluation. Component level design : Structure programming, Comparison of design notation	9
VI	**Software Testing Fundamentals**; test case design, Whit ebox testing. Basis path, control structure-, Blackbox-Testing, & for specialized environments. Strategic approach to S/W testing. Unit testing, integration testing, validation testing, system testing. Debugging. Technical metrics for software.	9

Text Book : Pressman Roger. S. : Software Engineering, A Practitioner's Approach TMH.

Reference Books :

1) Somerville : Software Engineering (Addison-Wesley) (5/e)
2) Fairly R. : Software Engineering (McGraw Hill)
3) Davis A. : Principles of Software Development (McGraw Hill)
4) Shooman, M.L. : Software Engineering (McGraw-Hill).

Course Code	**MCA19303**
Course Name	**DISTRIBUTED SYSTEMS**
Total Credits	**4**

Course Outcomes :

1. Understand the concept and foundations of Distributed Systems.
2. Learn the principles and architectures in distributed systems.
3. Learn Distributed models, algorithms and programming used
4. Understand in detail the system level and support required for distributed system.
5. Learn issues related to clock Synchronization and the need for global state in distributed systems.
6. Understand the significance of agreement, fault tolerance and recovery protocols in Distributed Systems.
7. Learn how several machines orchestrate to correctly solve problems in an efficient, reliable and scalable way.
8. Understand the issues involved in process management and resource management.

Units	Contents	Total Hrs
I	Introduction of Distributed System, Middleware, Design Goals, Types of Distributed Systems, Architectures, layered architectures, system architectures, Centralized, Decentralized, Hybrid architectures, Network File System.	10
II	Processes: Threads, threads in distributed systems, Virtualization, clients, Networked user interfaces, Servers, code migration, RPC, parameter passing, Message oriented communication, Multicast communication.	9
III	Naming: Names, Identifiers, addresses, Structured Naming, Attribute based naming,, clock synchronisation, physical clocks, logical clocks, Mutual exclusion, Election algorithms, bully algorithm, ring algorithm, location systems.	9
IV	Consistency and replication: Reasons for replication, Data centric consistency models, monotonic reads and writes, Replica management, Content distribution, Consistency protocols, primary based protocol, Cache coherence protocols, Client centric consistency.	10
V	Fault Tolerance: Introduction to fault tolerance, concepts, models, Failure masking by redundancy, process resilience, Failure masking and replication, consensus in faulty systems with crash failures, ex Paxos, Client server communication, point to point communication, atomic multicast, Recovery, Recovery oriented computing.	9
VI	Introduction to Security, Security Threats, policies and mechanisms, Design issues, Cryptography, Secure Channels, Authentication, integrity, confidentiality, secure group communication, Kerberos, Access control, Firewalls, Secure Naming, Security management, Key management, Authorization management.	9

Text Book: Distributed Systems, Andrew S.Tanenbaum, Maarten Van Steen, 3rd Edn, Pearson Education

Reference Books:

1. Distributed Systems, Concepts and Design, George Coulouris, J Dollimore and Tim Kindberg, Pearson Education.
2. Distributed Systems, An Algorithm Approach, Sikumar Ghosh, Chapman & Hall/CRC, Taylor & Fransis Group.
3. Distributed Computing: Principles, Algorithms, and Systems, Ajay D. Kshemkalyani, Mukesh Singhal, Cambridge University Press.
4. Principles of Distributed Systems, VK Garg, Kluwer Academic Publishers.
5. Distributed Systems and Algorithmic Approach, Su Kumar Boss, Chamal & Hall.

Course Code **MCA 19304(01)**

Course Name **DATA ANALYTICS**

Total Credits **4**

Course Outcomes :

At the end of the course, the students will be able to:
1. Develop and maintain reliable, scalable systems using Apache, HADOOP
2. Write Map Reduce based application
3. Differentiate between conventional SQL and NoSQL
4. Analyze and develop Big Data solutions using HIVE and PIG

Units	Contents	Total Hrs
I	**Introduction** Distributed file system and its issues, Introduction to big data, big data characteristics, types of big data, traditional vs. big data approach, big data applications	10
II	**Hadoop** Why Hadoop? Hadoop architecture, Hadoop components HDFS and YARN, comparison between YARN 1 and YARN 2architecture, HDFS federation : Name Node, Data Node, Resource Manager, Job Tracker, Task Tracker Hadoop Ecosystem : Scoop, HIVE, PIG, Flume, Zookeeper,HBASE Hadoop installation in pseudo distribution mode, running HDFSCommands	9
III	**Map Reduce** Understanding Map Reduce, Map Task, Reduce Task, speculative execution, partioner and combiner in Map Reduce Running sample Map Reduce Program: Word Count. Algorithm using Map Reduce :-matrix vector multiplication, -grouping and aggregation-relational algebra operations	9
IV	**NoSQL** What is NoSQL? NoSQL - Case study, data architecture pattern: key value, column family, document store.HBASE overview, HBASE data model, row oriented vs. column oriented storage, HBASE architecture, HBASE shell commands	10
V	**HIVE** : background, architecture, warehouse directory and meta-store, HIVE query language, loading data into table, HIVE built-in functions, joins in HIVE, HIVE installation, Hive QL: querying data, sorting and Aggregation	9
VI	**PIG** : background, architecture, PIG Latin Basics, PIG execution modes, PIG processing – loading and transforming data, PIG built-in functions, filtering, grouping, sorting data Installation of PIG and PIG Latin commands	9

Reference Books :

1) Tom White, “HADOOP: The definitive Guide”, O Reilly 2012
2) Chris Eaton, Dirk deroos et al., “Understanding Big Data”, McGraw Hill, 2012.
3) Big Data Analytics – RadhaShankarmani and M. Vijayalakshmi Wiley Text book Series
4) Hadoop in Action - Chuck Lam Dreamtech Press
5) Hadoop in Practice - Alex Holmes Dreamtech Press.

Course Code **MCA19304(02)**

Course Name **BIO - INFORMATICS**

Credit **4**

Course Outcomes : -

1. Understand Biologists need of information in digital form for correct and meaningful interpretation.
2. Apply knowledge of Data mining and detail study of Genome analysis using different tools and databases.
3. Detail study of Gene Identification and prediction methods for micro analysis.
4. Apply knowledge of Protein and proteomics tools techniques as visualization methods in biological environment.
5. Understand knowledge of computational methods, biological system and pathways.
6. Illustrate the concept of drug discovery and implementation of bioinformatics applications.

Units	Contents	Total Hrs.
I	**Introduction:** Historical overview and definition, bioinformatics applications, major databases in bioinformatics, data management and analysis, central dogma of molecular biology	10
II	**Data mining and Genome analysis :**Tools for web search, data retrieval tools, data mining of biological databases, genome analysis, genome mapping, genetic mapping and linkage analysis, the human genome project	9
III	**Gene Identification and Prediction** Basis of gene prediction, pattern recognition, gene prediction methods, gene prediction tools, DNA microarrays, data sources and tools for microarray analysis	9

IV	**Protein and Proteomics** Overview of the protein structure, protein structure visualization, structure-based protein classification, protein structure visualization databases and tools, tools and techniques in proteomics, protein-protein interaction, methods of gene family identification.	**10**
V	**Computational methods for Pathways and systems Biology** Analysis of pathways, metabolic network properties, metabolic control analysis, biological mark up languages, application of computer in biology , molecular biology and bioinformatics	**9**
VI	**Drug Discovery and Bioinformatic applications** Areas influencing drug discovery, pharmacogenetics and pharmacogenomics applications, analysis of single nucleotide polymorphisms, important parameters of drug discovery, Application of bioinformatics in various different fields like biotechnology, drug development, gene therapy etc.	**9**

Text Book: Bioinformatics, Methods and Applications by S.C. Rastogi, N. Mendiratta, P. Rastogi Tata McGraw-Hill India ISBN 81-203-3062-5.

Reference Books:

1. Introduction to Bioinformatics by Arthur M. Lesk OXFORD university press ISBN 10-0-19-568525-3
2. Bioinformatics Computing by Bergeron Bryan **Prentice-Hall of India Private Limited** ISBN :81-203-2258-4
3. Fundamental Concepts of Bioinformatics by Dan E. Krane and Michael L. Raymer Pearson Education ISBN 81-7758-757-9

Course Code **MCA 19304(03)**

Course Name **GAME PROGRAMMING**

Credit **4**

Course Outcomes :

1. write survey on the gamification paradigms.
2. Solve problems using gamification and open source tools.
3. solve problems for multi-core or distributed, concurrent/Parallel environments

Units	**Contents**	**Total Hrs**
I	**Introduction:** Game Programming, Development Process of Game Programming, Programming languages used to develop, APIs and Libraries for Graphic APIs and other, Game structure.	10
II	**3d Graphics For Game Programming:** Coordinate Systems, Ray Tracing, Modeling in Game Production, Vertex Processing, Rasterization, Fragment Processing and Output Merging, Illumination and Shaders, Parametric Curves and Surfaces, Shader Models, Image Texturing, Bump Mapping, Advanced Texturing, Character Animation, Physics-based Simulation	9
III	**Game Design Principles:** Character development, Story Telling, Narration, Game Balancing, Core mechanics, Principles of level design, Genres of Games, Collision Detection, Game Logic, Game AI, Path Finding	9
IV	**Gaming Engine Design:** Renderers, Software Rendering, Hardware Rendering, and Controller based animation, Spatial Sorting. Game engines - Adventure Game Studio, DX Studio.	10
V	**Gaming Platforms And Frameworks:** Flash, DirectX, OpenGL, JAVA, Python, XNA with Visual Studio, Mobile Gaming for the Android, iOS,	9

VI	**Game Development**: Developing 2D and 3D interactive games using OpenGL, DirectX – Isometric and Tile Based Games, Puzzle games, Single Player games, Multi-Player games.	9

Text Books :

1) David H. Eberly, "3D Game Engine Design, Second Edition: A Practical Approach to Real-Time Computer Graphics" Morgan Kaufmann, 2 Edition, 2006.
2) JungHyun Han, "3D Graphics for Game Programming", Chapman and Hall/CRC, 1st edition, 2011.
3) Jonathan S. Harbour, "Beginning Game Programming", Course Technology PTR, 3 edition, 2009.
4) Dino Dini, "Essential 3D Game Programming", Morgan Kaufmann, 1st edition 2012.
5) Kenneth C. Finney,"3D Game Programming All in One", Premier Press

Reference Books:

1) Mike McShaffrfy, "Game Coding Complete", Third Edition, Charles River Media, 2009.
2) Ernest Adams and Andrew Rollings, "Fundamentals of Game Design", Prentice Hall 1st edition, 2006.
3) Roger E. Pedersen, "Game Design Foundations", Edition 2, Jones & Bartlett Learning, 2009.
4) Scott Rogers, "Level Up! The Guide to Great Video Game Design", Wiley, 1st edition, 2010.
5) Jason Gregory, "Game Engine Architecture", A K Peters, 2009.
6) Jeannie Novak, "Game Development Essentials", 3rd Edition, Delmar Cengage Learning, 2011.

Course Code **MCA 19304(04)**

Course Name **INTERNET OF THINGS**

Credit **4**

Course Outcomes :

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

1. Identify the use of IoT from a global context.
2. Design application using IoT.
3. Analyze the IoT enabling Technologies
4. Determine the real world problems and challenges in IoT .

Units	Contents	Total Hrs
I	**IoT Architecture** – State of the Art 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	10
II	**IoT Enabling Technologies** - Wireless Sensor Networks ,Cloud Computing, Big Data Analytics, Communication Protocols, Embedded Systems	9
III	**Real-World Design Constraints**- Introduction, Technical design Constraints–hardware, Data representation and visualization, Interaction and remote control	9
IV	**Open – Source Prototyping Platforms for IoT-** Basic Arduino Programming Extended Arduino Libraries, Arduino – Based Internet Communication, Raspberry PI, Sensors and Interfacing	10
V	**Data Management,** Business Process in IoT, IoT Analytics, Creative Thinking Techniques, Modification, Combination Scenarios, Decentralized and Interoperable ,Approaches, Object – Information Distribution, Architecture, Object Naming Service(ONS), Service Oriented Architecture, Network of Information,	9
VI	**Domain specific** Home Automation - Smart Lighting, Smart Appliances , Intrusion Detection , Smoke/Gas Detectors Energy-Smart Grids ,Renewable Energy Systems ,Prognostics Health & Lifestyle -Health & Fitness Monitoring ,Wearable Electronics ,Agriculture - Smart Irrigation ,Green House Control ,Retail- Inventory Management , Smart Payments ,Smart Vending Machines , Cities -Smart Parking ,Smart Lighting ,Smart Roads ,Structural Health Monitoring ,Surveillance ,Emergency Response	9

Reference Books:

1) From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence, Jan Holler VlasiosTsiatsis Catherine Mulligan Stefan Aves & Stamatis Karnouskos David Boyle
2) VijayMadisetti and Arshdeep Bahga, "Internet of Things (A Hands-on-Approach)", 1 st Ed., VPT, 2014
3) Getting Started with the Internet of Things by Cuno P fister
4) The Internet of Things: Connecting Objects by Hakima Chaouchi
5) FrancisdaCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1st Edition , Apress Publications, 2013

Course Code **MCA19306**

Course Name Lab 13 **BASED ON MOBILE APPLICATION DEVELOPMENT**

Credits **1**

Total Hrs **15**

Course Outcomes **Skill of Mobile Application Development using Android Studio Development tool.**

The following list of can be used as guidelines for basic understanding but the scope of the laboratory should not be limited to this list. Aim of the list is to inform about minimum expected outcomes

1. Add two Edit Text. When a number is entered in Edit Text 1, the square of that number should be displayed in Edit Text 2.
2. Add an Edit Text and a button. When the button is clicked, the text inputted in Edit Text should be retrieved and displayed back to the user
3. Add two EditText and a button. When the button is clicked, the text inputted in Edit Text 1 should be retrieved and displayed in EditText2.
4. Program a calculator
5. Create a Unit convertor for height
6. Create a Unit convertor for height and weight in the same application. Selection of height/weight can be done using a spinner.
7. Add a spinner. When the spinner is selected, there should be three options (e.g., android, java, testing). When you click on each option, it should go to another page containing some other components. Each of these pages should have a "back" button, which on pressing will take you back to the page with the spinner.
8. Create applications to include Action Bar, Menus, Dialogs and Notifications.
9. Create a user login form and registration form. First time users have to register through the registration form and the details should be stored in the database. Then they can login using the login page.
10. Create a camera application, where you can click a picture and then save it as the wallpaper.
11. Create a media player which plays an mp3 song.
12. Create a media recorder which will record the sound.

References:

1. Professional Android 4 Development by Reto Meier, John Wiley and Sons, 2012.
2. Android in Action, Third Edition, by W. Frank Ableson, RobiSen, Chris King, C. Enrique Ortiz, 2012
3. Android Application Development Cookbook, by Wei-Meng Lee, John Wiley and Sons, 2013
4. Beginning Android 4, by Grant Allen, Apress, 2011.

Course Code **MCA19307**

Course Name **Lab 14 - Distributed Systems**

Credits **1**

Total Hrs **15**

Course Comes: Apply the principles and architectures in distributed systems

Minimum 12 practicals /experiments must be completed based on the respective syllabus covering each of the units.

Sr. no	List of the practicals not limited to the following:
1.	Write a program to determine class, Network and Host ID of the node address using software tool
2.	Program to implement process synchronization
3	Write a program to implement Inter process Communication
4.	Practicals to demonstrate the Remote Procedure call RPC
5.	Practicals to demonstrate the Parameter Passing
6.	Practicals based on demonstration of advanced transient messaging
7.	Practicals based on implementation of mutual exclusion algorithms
8.	Practicals based on implementation of Election algorithms
9.	Write the programs for Recovery Oriented Programming
10.	Write a program to create one or more grid users
12	Write a program to creates Gridlets and sends them to a grid resource entity
11.	Write a program to show how to keep message logging
13.	Programs demonstrating flooding based multicasting
14.	Write a program to demonstrate of how to connect two Grid entities using a link.
15.	Write a program to net user entity sends messages to test entity and test entity sends back these messages
16.	Implement the program for data security through cryptographic methods
17.	Implement the program to check the authenticity
18.	Write the program to check the Data Integrity

Course Code **MCA19308**

Course Name **Lab 15 - Based on Data Analytics**

Credits **2**

Total Hrs **30**

Course Outcomes 1. Write Map Reduce based applications
2. Analyze and develop Big Data solutions using HIVE and PIG

Minimum 12 practicals / experiments must be completed based on the respective syllabus covering each of the units. The following list of can be used as guidelines for basic understanding but the scope of the laboratory should not be limited to this list.
Aim of the list to inform about minimum expected outcomes.

1 To understand the overall programming architecture using Map Reduce API
2 Store the basic information about students such as roll no, name, date of birth , and address of student using various collection types such as List, Set and Map.
3 Basic CRUD operations in Mongo DB
4 Retrieve various types of documents from students collection
5 To find documents from Students collection
6 Develop Map Reduce Work Application
7 Creating the HDFS tables and loading them in Hive and learn joining of tables in Hive

Course Code **MCA19308**
Course Name **Lab15 - Based on Bio-Informatics**
Credit **02**

Total Hrs **30**

Course Outcomes : Skill of effective use of Database search tools and computational methods.

The following list can be used as guideline for creating problem statements but the scope of the laboratory should not be limited to this list. Aim of the list is to inform about minimum expected outcomes.

1. Literature databases (searching & downloading).
2. Perform any two techniques of Protein and proteomics as visualization methods.
3. Protein sequence databases PIR-PSD
4. Database searches: Sequence comparisons & alignment
5. Exploring EMBOSS series .
6. Sequence comparisons & alignment
7. Case study on Visualisation &Bio-Informatics Applications.

Course code **MCA19308**

Course Name **Lab-15 Based on Elective- 5 (GAME PROGRAMMING LAB)**

Credits **02**

Total Hrs **30**

Course Outcomes **Skill to develop Game Programming.**

The following list of can be used as guidelines for basic understanding but the scope of the laboratory should not be limited to this list. Aim of the list to inform about minimum expected outcomes.

1. Case study to define Game Structure
2. To develop any one 3D graphics for game programming using any one of its open source development tool.
3. To develop program on any one type of Game Logic (Like Collision Detection, etc.)
4. Use Adventure Game Studio/DX Studio and develop any application of its type.
5. Case study on OpenGL.
6. To develop any one 2D or 3D interactive small game using any one of its open source framework.

Course Code **MCA19308**

Course Name **Lab 15 - Based on Internet of Things**

Credits **2**

Total Hrs **30**

Course Outcomes : Design IoT based application

Minimum Twelve practicals / experiments must be completed based on the respective syllabus covering each of the units.

The following list of can be used as guidelines for basic understanding but the scope of the laboratory should not be limited to this list. Aim of the list to inform about minimum expected outcomes.

1. Study of Raspberry-Pi, Beagle board, Arduino and other micro controller .

2. Study of different operating systems for Raspberry-Pi /Beagle board. Understanding the process of OS installation on Raspberry-Pi /Beagle board.

3. Study of Connectivity and configuration of Raspberry-Pi /Beagle board circuit with basic peripherals, LEDS. Understanding GPIO and its use in program.

4. Understanding the connectivity of Raspberry-Pi /Beagle board circuit with temperature sensor. Write an application to read the environment temperature. If temperature crosses a threshold value, the application indicated user using LEDSs.

5. Understanding the connectivity of Raspberry-Pi /Beagle board circuit with IR sensor.

6. Write an application to detect obstacle and notify user using LEDs.

7. Understanding and connectivity of Raspberry-Pi /Beagle board with camera. Write an application to capture and store the image.

8. Understanding and connectivity of Raspberry-Pi /Beagle board with a Zigbee module. Write a network application for communication between two devices using Zigbee .

9. Write an application using Raspberry-Pi /Beagle board to control the operation of stepper motor.

10. Write an application using Raspberry-Pi /Beagle board to control the operation of a hardware simulated traffic signal.

11. Write a server application to be deployed on Raspberry-Pi /Beagle board. Write client applications to get services from the server application .

12. Create a small dashboard application to be deployed on cloud. Different publisher devices can publish their information and interested application can subscribe.

SEMESTER VI

Course code **MCA19310**

Course Name **INDUSTRY PROJECT AND INTERNSHIP/START-UP**

Credits 18

Guidelines :

1. Students may opt either Industrial Project or Internship or Start-up.
2. Industrial Project: It is a software development project assigned by any registered industry/organization to the student. Student may complete the project at industry/organization or from home. Student shall submit the completion/implementation certificate issued by the Industry/organization. Students should take prior approval from the institute in this regard.
3. Internship: In the internship, students shall apply direct/through institute to the Industry/Organization for internship or take use of 'Intershala', an initiative of AICTE. The internship is placement of students in the industry/organization for which they are entitled to receive stipend. Students shall submit the appointment letter at the start of the internship and completion certificate at the end of the session well before the final examination.
4. Start-up: Students may undertake startup activity which is recognized by the Institute. Institute shall incubate the start-up using the system available at institute level and assign a mentor/guide to the student. The necessary support may be extended to the students for this activity. Students shall submit their proposal well in advance to the institute and Institute should grant its approval through available mechanism at Institute level. The registration of start-up and business proposal shall be the essential documents for this activity. Activity shall be evaluated on the basis of its profit ratio.
5. In all the three above activities, students need to submit complete Project Report to the Institute well before the final examination.

Course code **MCA19309**

Course Name Seminar / Presentation

Credits 06

Guidelines :

1. Institute shall assign mentor/guide to each student.
2. Student shall submit synopsis approved by the mentor/guide.
3. Institute shall approve the seminar topic.
4. Students shall prepare seminar report and presentation with the help of guide and submit seminar report and presentation approved by the guide well in advance to conduct final presentation/examination.
5. Students may take seminar topic based on new technology, case study, success story of start=up he/she has undertaken in the 'Industrial Project/Internship/Start-up activity.

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