MCA (Master of Computer Applications)

Faculty of Sciences

Revised in June 2019
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   c. SYLLABUS
MCA CURRICULAM-2018 REVISION

1. PROGRAM OUTCOMES

PO-01: Computational Knowledge: Apply knowledge of computing fundamentals, computing specialization, mathematics, and domain knowledge appropriate for the computing specialization to the abstraction and conceptualization of computing models from defined problems and requirements.

PO-02: Problem Analysis: Identify, formulate, research literature, and solve complex computing problems reaching substantiated conclusions using fundamental principles of mathematics, computing sciences, and relevant domain disciplines.

PO-03: Design/Development of Solutions: Design and evaluate solutions for complex computing problems, and design and evaluate systems, components, or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.

PO-04: Conduct Investigations of Complex Computing Problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO-05: Modern Tool Usage: Create, select, adapt and apply appropriate techniques, resources, and modern computing tools to complex computing activities, with an understanding of the limitations.

PO-06: Professional Ethics: Understand and commit to professional ethics and cyber regulations, responsibilities, and norms of professional computing practice.

PO-07: Life-long Learning: Recognize the need, and have the ability, to engage in independent learning for continual development as a computing professional.

PO-08: Project management and finance: Demonstrate knowledge and understanding of the computing and management principles and apply these to one’s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO-09: Communication Efficacy: Communicate effectively with the computing community, and with society at large, about complex computing activities by being able to comprehend and write effective reports, design documentation, make effective presentations, and give and understand clear instructions.

PO-10: Societal and Environmental Concern: Understand and assess societal, environmental, health, safety, legal, and cultural issues within local and global contexts, and the consequential responsibilities relevant to professional computing practice.

PO-11: Individual and Team Work: Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary environments.

PO-12: Innovation and Entrepreneurship: Identify a timely opportunity and using innovation to pursue that opportunity to create value and wealth for the betterment of the individual and society at large.
2. PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

PEO1: To provide opportunities for acquiring in-depth knowledge of core concepts in computer science

PEO2: To develop the skill set to identify real world problems and to find effective solutions through research.

PEO3: To apply tools and techniques to address and solve the identified problems.

PEO4: To develop the abilities to face the changing trends and career opportunities in computer applications.

PEO5: To embed strong human values and professional ethics to impart social responsibilities.
### 3. CURRICULUM STRUCTURE

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### Semesters

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4. EVALUATION SCHEME AND GRADING SYSTEM

EVALUATION SCHEME

For theory courses, which are taught primarily in the lecture mode, 50% weightage will be given to continuous assessment (sessionals) and 50% for the end-semester (final) examination. For continuous assessment, there will be two tests, whose dates will be given by the Controller of Examination and published in the handbook, in addition to a number of assignments.

In the case of laboratory courses and practical’s, 70% weightage will be given to continuous assessment and 30% for end-semester examination. The weights for the components of
continuous assessment will be decided by the course committee at the beginning of the semester.

**GRADING SYSTEM**

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<td>Incomplete(Awarded only for Lab Courses/ project/Seminar)</td>
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</table>

5. **COURSE DETAILS**

**SEMESTER 1**

18MA201

**DISCRETE STRUCTURES**

3-1-0 4

**SYLLABUS**

and partial order Relations.
Similarity of Matrices (Definition and Examples only)-Diagonalization.
Introduction to Vector Space - Subspaces, Linear Independence, Basis and Dimension
Graph Theory: Definition, walk, path, trails, connected graphs, regular and bipartite graphs, cycle and circuits. Tree and rooted tree. Spanning trees – Eccentricity of a vertex radius and diameter of a graph. Central graphs – Centre (s) of a tree. Hamiltonian and Eulerian graph, planar graphs
Groups: Finite fields and Error correcting/detecting codes

TEXT BOOKS/ REFERENCES:

18EN281 ENGLISH FOR PROFESSIONAL PURPOSES * 0-0-1

SYLLABUS

TEXT BOOKS/ REFERENCES:

18CA201 COMPUTER ORGANIZATION AND ARCHITECTURE * 3-0-1-4

COURSE OUTCOMES
CO1: Ability to understand the basic electronic components used to design a basic computer
CO2: Ability to undebased functional units, operations, instruction formats and instruction types.
CO3: Ability to understand control operations inside the computer
CO4: Ability to understand basic arithmetic operations and the implementation of arithmetic circuits.
CO5: Ability to understand memory types and mapping techniques

SYLLABUS


TEXT BOOKS/ REFERENCES:


18CA202 COMPUTER PROGRAMMING * 3-0-1-4

SYLLABUS


TEXT BOOKS/ REFERENCES:


10
18CA203 DATABASE MANAGEMENT SYSTEMS 3-0-1-4

COURSE OUTCOMES

CO1: Understand the role of a database management system in an organization, basic database concepts, including the structure and operation of the relational data model and the role of the database administrator
CO2: Must be able to construct simple and advanced database queries using Structured Query Language (SQL)
CO3: Understand and successfully apply logical database design principles using E-R diagrams and database normalization.
CO4: Understand the concept of a database transaction and related database facilities, including concurrency control, backup and recovery, locking and related protocols
CO5: Able to design and implement a database application

SYLLABUS

Relational Database Design: Features of Good Relational Designs- Atomic Domains and 1NF-Decomposition using Functional Dependencies (2NF) – 3NF, 4NF, BCNF- Functional Dependency Theory- Decomposition using Multi-valued Dependencies– PJNF and DKNF.
Introduction to Transaction Management: Transactions-Concept- State-Atomicity and Durability-Concurrent Executions- Lock Based Protocols – Introduction to Deadlock Handling.
Query Evaluation and Optimization.

TEXT BOOKS/ REFERENCES:
COURSE OUTCOMES

CO1: Engage and analyse unfamiliar problems at a basic level and identify and apply relevant strategies for solving them.
CO2: Identify and apply basic concepts in algorithms and their analysis, design efficient algorithms for basic problems and verify their correctness.
CO3: Select and use relevant software (programming environment) to devise and interpret experiments, either for analysing a new problem or for testing your method and comparing possible solutions.

SYLLABUS

General Problem Solving Concepts: Problem Solving in Everyday Life- Types of Problems-Difficulties with Problem Solving- Defining Problem – Data representation in Computer: Constants and Variables, Data types, how the computer stores the data, operators– Introduction to testing and coding the solution – Software Development Life Cycle.


TEXT BOOKS/REFERENCES:


SEMMETER 2

18CA212 MICROPROCESSORS AND EMBEDDED SYSTEMS 3-0-1-4

COURSE OUTCOMES

CO1: To acquire knowledge about the basic working of a microprocessor/microcontroller
system and its programming.

CO2: Foster the ability to understand the internal architecture and interfacing of different peripheral devices with Microprocessor/Microcontroller.

CO3: Develop familiarity with various tools used for embedded application development.

CO4: To provide experience to integrate hardware and software for microcontroller systems.

CO5: To understand the design concept of embedded systems and its role in industrial applications.

SYLLABUS

8085 microprocessor architecture; Instruction set, instruction types and formats; Instruction execution, instruction cycles, different types of machine cycles and timing diagram. - 16-bit microprocessors, 8086 architecture, registers, memory segmentation and addressing, 32-bit/64-bit microprocessor families

Introduction to IoT – Architecture - Applications

Introduction to Arduino: The Arduino Platform, Architecture, Pin functions, overview of main features such as I/O Ports, Timers, interrupts serial port, PWM, ADC, etc.

Introduction to Arduino IDE, writing, saving, compiling and uploading sketches.

Interfacing discrete LEDs, Binary counter, Seven Segment LEDs. Interfacing LCD, switch Interface. Interfacing with different type of sensors and communication modules

Raspberry Pi Introduction: Board, ARM SoC (system-on-chip) architecture, Hardware interfaces

Basic Programming of the Pi: Hello World, Access the World Wide Web, Play audio, Control Peripherals with a Pi

TEXT BOOKS/ REFERENCES:
2. 8086/8088 Microprocessor: Architecture, Programming, and Interfacing by Barry B. Brey
3. Programming Arduino Next Steps: Going Further with Sketches- by Simon Monk

18CA213 OBJECT ORIENTED PROGRAMMING 3-0-1 4

COURSE OUTCOME
CO1: Understand Object Oriented Paradigm and represent the problem using objects and classes
CO2: Create applications in C++ using different oop concepts like polymorphism and \Inheritance
CO3: Use C++ features like exception handling while creating applicantions
CO4: Use Template classes and STL library for developing applications
CO5: Develop problem solving skills and use C++ language features in implementing a solution.

SYLLABUS

OO System Development Life Cycle- Object Oriented Methodologies - Comparison (OOP and

TEXT BOOKS/ REFERENCES:

18CA211 DATA STRUCTURES USING C++ 3-0-1 4

COURSE OUTCOME
CO1: Able to understand and explain the major data structures and their properties.
CO2: Illustrate the applications of different data structures
CO3: Implement the different data structures using arrays and linked lists
CO4: Analyse efficient use of data structures for computing resources.
CO5: Compare the cost and benefit of using one data structure against another

SYLLABUS

Note: Basic operations and applications of all data structures shall be covered, Different implementations with efficiency analysis shall be discussed.
Abstract Data Types, Linear Data Structures: Arrays (single and multi-dimensional), Stack ADT, Multi Stack ADT, Queue ADT, Circular Queue, Singly Linked List, Doubly Linked List, Circular Linked List.
Graphs: Matrix and List Representation of Graphs, Breath First Search, Applications of BFS, Depth First Search, Applications of DFS, Spanning Trees
Advanced Data Structures: Dictionaries, Hashing techniques, Disjoint Sets, List, Tree and Array based implementation–Union/Find.
TEXT BOOKS/ REFERENCES:

18CA214 OPERATING SYSTEMS 3-0-0 3

COURSE OUTCOME
CO1: To understand the services provided by the operating system and the design.
CO2: To understand what a process is and how processes are synchronized and scheduled.
CO3: To understand different approaches to memory management.
CO4: To understand different approaches to memory management.
CO5: Students should be able to use system calls for managing processes, memory and the file system.

SYLLABUS

TEXT BOOKS/ REFERENCES:

18CA215 SOFTWARE ENGINEERING TECHNIQUES 2-0-1 3

COURSE OUTCOME
CO1: Learn to apply the knowledge of software engineering methodologies to identify, formulate, and solve software engineering problems.
CO2: Understand the ability to analyse the complex system by applying analytical, engineering
and knowledge based techniques to clearly understand the requirements.

CO3: An ability to design a system, component, or process to meet desired needs within realistic constraints relevant to the system

CO4: An ability to implement, verify, validate, test and maintain software systems developed using modern techniques, skills and engineering tools.

CO5: An ability to function on multi-disciplinary teams with an understanding of professional and ethical responsibility to create solutions for significant application domains.

SYLLABUS

TEXT BOOKS/ REFERENCES:

18HU211 FINANCIAL ACCOUNTING* 2-0-0 2

SYLLABUS

TEXT BOOKS/ REFERENCES:

SEMESTER 3

18CA307 WEB APPLICATIONS DEVELOPMENT 2-0-1-3

COURSE OUTCOMES

CO1: Comprehend and propose Web Application infrastructure.
CO2: Evaluate several alternatives in the design of a web application
CO3: Acquire the knowledge and skills required to design and develop dynamic web applications.
CO4: Gain acquaintance with different tools and technologies used in s/w industry like Spring framework, Node.js etc.
CO4: Gain acquaintance with different tools and technologies used in s/w industry like Spring framework, Node.js etc.

SYLLABUS

Web Application development using Spring MVC
Server Side Technologies: Servlets - Java Server Pages –PHP - AJAX Controls for PHP- Basic Node.js
Web Security: Sessions and Cookies.

TEXTBOOKS / REFERENCES:
3. “Head First JavaScript Programming -A Brain-Friendly Guide” By Elisabeth Robson, Eric Freeman Publisher: O'Reilly Media, March 2014
COURSE OUTCOMES

CO1: Analyze the asymptotic performance of algorithms.
CO2: Demonstrate a familiarity with major algorithms and data structures.
CO3: Apply important algorithmic design paradigms and methods of analysis.
CO4: Synthesize efficient algorithms in common engineering design situations.
CO5: Learn about famous NP-complete problems

SYLLABUS

Dynamic Programming: Matrix Multiplication Problem- 0/1 Knap-sack Problem.
Branch and Bound - backtracking
Graph Algorithms: Graph Traversals (DFS, BFS with Analysis) - Shortest Path Algorithms (with Analysis) – Dijkstra - Bellman Ford- Floyd Warshall’s all Pair shortest path Algorithm- Minimum spanning Tree (with Analysis) – Kruskal- Prims - Applications of BFS and DFS.
Network Flow algorithms
NP Problems: Definition: P-NP-NP Complete-NP Hard. Examples:P-NP.

TEXT BOOKS/ REFERENCES:

CO1: To master the terminology and concepts of the network core and layered approach.

CO2: Understand and analyze (Using Wireshark tool) the concepts of TCP/IP layers and their working in local area networks and wide area networks.

CO3: To determine proper usage of the IP address, subnet mask and default gateway in a routed network and designing of Network Models using Simulation tool(Cisco Packet Tracer).

CO4: Mastering basic concepts of Multimedia protocols and services and their design/performance issues in local area networks and wide area networks.

SYLLABUS


Common network services and tools - ifconfig, nw.js - netcat - netstat - DNS - dhcp - apache - Nginx - Go language

TEXT BOOKS/ REFERENCES:


18MA301 PROBABILITY AND STATISTICS 3-1-0-4

COURSE OUTCOMES

CO1: Understand the basic concepts of probability and probability modelling.

CO2: Gain in depth knowledge about statistical distributions, properties and real time applications.

CO3: Understand some approximation theorems on probability and distributions.

CO4: Know the importance of estimating parameters of probability models.

CO5: Ability to make decisions under uncertainties using statistical testing of hypothesis
SYLLABUS


Testing of Hypothesis. Parameter and statistic – sampling distribution – Estimation and testing of hypothesis – critical region and level of significance – errors in testing of hypothesis – one-tailed and two-tailed tests – procedure for testing hypothesis – confidence interval – test of significance of large and small samples – Student’s t-distribution – Sndecor’s F distribution

Chi-Square Test for Goodness of fit and Independence.

TEXT BOOKS/ REFERENCES:


18CA302 ADVANCED DATABASES 3-0-0-3

COURSE OUTCOMES
C01: Design and implement advanced queries using Structured Query Language for object relational DBMS.
C02: To study the features, usage and applications of Object Oriented databases.
C03: Recommend and justify strategies for managing data security, privacy, audit/control, fraud detection, backup and recovery
C04: Understand the need for database query optimization.
C05: To learn techniques for controlling the consequences of concurrent data access.

SYLLABUS

Introduction to Object Oriented Database: Abstraction, encapsulation, and information hiding, Classes, Inheritance Overloading Polymorphism and dynamic binding - Object-Oriented Data
Model.
Complex Data Types – Structured Types and Inheritance in SQL – Table Inheritance – Array and Multiset Types in SQL – Object-Identity and Reference Types in SQL
Distributed Databases - Introduction to distributed architectures–Distributed and parallel databases concepts – Client/server, parallel and distributed architectures – Design strategies:Horizontal, vertical and hybrid fragmentation- Resource allocation.
Introduction to Transaction Management and Concurrency Control: Transaction model and properties–Transaction serialization and recovery–Lock based concurrency control–Multi-phase locking protocols–Timestamp ordering
Concurrency Control: Optimistic concurrency control–Deadlock management – Distributed deadlock – Distributed Query Processing
Spatial and Temporal Data and Mobility: Time in Databases – Spatial and Geographic Data – Multimedia Databases – Mobility and Personal Databases.
MySQL - MongoDB - Redis–Memcached

TEXT BOOKS/ REFERENCES:

18CA308 PROGRAMMING WITH JAVA 2-0-1-3

COURSE OUTCOMES

CO1: Identify classes, objects, members of a class and relationships among them needed for a specific problem
CO2: Understand fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries, etc.
CO3: Understand the principles of inheritance, packages and interfaces
CO4: The use of Java in a variety of technologies and on different platforms.
CO5: Write Java application programs using OOP principles and proper program structuring
CO6: Write Java programs to implement error handling techniques using exception handling

TEXT BOOKS/ REFERENCES:

5. H. M. Dietel& P. J. Deitel, Java: How to program, 10/e, (Early Objects) PHI, 2014.

SEMESTER 4

18CA314 CRYPTOGRAPHY AND NETWORK SECURITY 3-1-0 4

COURSE OUTCOME

CO1: To acquire knowledge on standard algorithms used to provide confidentiality, integrity and authenticity.

CO2: To understand how to deploy encryption techniques to secure data in transit across data networks.

CO3: To get insights into the various protocols for network security to protect against network threats.

CO4: To get familiarize with the usage of various standard security tools available.

CO5: To design security applications in the field of Information technology.

SYLLABUS

Introduction:- Goals of Security, types of attacks, services and mechanism, different techniques. Mathematics involved — integer arithmetic, modular arithmetic, matrices, linear congruence, algebraic structures,GF(2^n) fields. Symmetric key ciphers—Kerckhoff’s principle, substitution ciphers, transposition ciphers, stream and block ciphers,modern block ciphers, modern stream ciphers, DES structure and analysis, multiple DES, security, AES-transformations, key expansion, ciphers, analysis.
Asymmetric key cryptography – RSA cryptosystem, RABIN cryptosystem, ELGAMAL cryptosystem, elliptic curve cryptosystem. Message integrity, Random oracle model, message authentication, hash functions, digital signature, entity authentication, Key management.

Network security: At application layer – Email, PGP, S/MIME. At transport layer – SSL architecture, handshake protocol, changecipherspec protocol, Alert protocol, Record protocol, SSL message format, Transport layer security. At network layer – modes, security protocols, security associations, security policy, Internet key exchange, ISAKMP.

TEXT BOOKS/ REFERENCES:

18CA312 DATA MINING AND APPLICATIONS 3-0-1 4

COURSE OUTCOME
CO1: To acquire knowledge of Data mining principles and techniques for building a real time Application.
CO2: To generate frequent patterns using association rule mining.
CO3: To interpret the type of data and perform analysis using various classification and prediction algorithm and thereby evaluate its performance to provide valid and relevant conclusions
CO4: To understand and apply various clustering methods and evaluate its performance.
CO5: To mine complex data such as Time series data, biological data, graph mining, text mining etc. for intelligent application development which has societal impact.
CO6: To familiarize with the usage of data mining tools for application development.

SYLLABUS
Applications and Trends in Data Mining
Tools: Implementation of Data mining algorithms using Latest Open Source Data mining Tools. Tensorflow, python, R

TEXT BOOKS/ REFERENCES:
1. Jiawei Han, Micheline Kamber and Jian Pei, “Data mining concepts and Techniques”, Third Edition, Elsevier Publisher, 2006.
5. Itay Lieder, Yehezkel Resheff, Tom Hope, Learning TensorFlow, O'Reilly Media, 2017

18MA311 NUMERICAL ANALYSIS AND OPTIMIZATION Techniques

COURSE OUTCOME
CO1: Demonstrate understanding of common numerical methods and how they are used to obtain approximate solutions to otherwise intractable mathematical problems.
CO2: Apply numerical methods to obtain approximate solutions to mathematical problems.
CO3: Analyse and evaluate the accuracy of common numerical methods.
CO4: Feasibility study for solving an optimization problem.
CO5: Understand optimization techniques using algorithms.
CO6: Understand importance of optimization of industrial process management.

SYLLABUS

Errors In Numerical Calculations Types Of Errors-Significant Digits-Programming Errors-

TEXT BOOKS/ REFERENCES:
2. Kanthi Swarup, P.K. Gupta, Man Mohan, Operations research, Sultan Chand & Sons. (module
II), 5th edition.
3. R Panneerselvam – Operations research, 2nd edition, PHI
5. Gerald and Wheatley, Applied Numerical Analysis, Pearson Education Asia, Sixth Edition

18CA391 RESEARCH LEARNING AND PROBLEM FORMULATION 1-0-1 2

COURSE OUTCOME
CO1: To develop understanding of the basic framework of research process
CO2: identify various sources of information for literature review and data collection.
CO3: Gain a practical understanding of the various methodological tools used for conducting Research
CO4: Able to conduct a research study from its inception to its report
CO5: Able to familiarise with ethical issues in conducting research and practice ethical research Standards

SYLLABUS
Familiarization of Spreadsheet Tools, Presentation Tools and Writing Tools, Structuring the Report, Pagination, Identification, Presenting Footnotes, Abbreviations, Presentation of Tables and Figures- Referencing- Use and Format of Appendices, Indexing.
Ethical Issues, Copyright, Royalty, Intellectual Property Rights and Patent Law, Reproduction of Published Material, Citation and Acknowledgement.

TEXT BOOKS/ REFERENCES:

18CA382 COMPETITIVE PROGRAMMING Lab 0-0-1 1

COURSE OUTCOME
CO1: To describe how algorithmic problems are solved
CO2: To recognize the time and memory complexity of an algorithm or a structure
CO3: To analyze the given problem and recognize subproblems and devise a solution plan
CO4: To Learn how to implement an algorithm in an efficient way

SYLLABUS
Sorting - Greedy algorithms – Backtracking - Dynamic programming - Basic graph algorithms - Advanced graph algorithms – Trees - Basic geometry - Computational geometry – Strings - Basic heuristic search - Advanced search - Simulation problems – Number theory – Discrete structures. Any of the online platforms like CodeChef / Codeforces / Hackerrank can be used.

SEMESTER 5

18CA403 MOBILE APPLICATION DEVELOPMENT 3-1-0-4

COURSE OUTCOMES

CO1: To understand Android Architecture
CO2: To learn programming technologies, design and development of mobile applications
CO3: To develop database related android applications
CO4: To develop practical applications to continue professional development.

SYLLABUS

Introduction: About Android, Pre-requisites to learn Android, Dalvik Virtual Machine & .apk file extension, Android API levels (versions & version names)
Android Java Basics: Getting started with Android development, project folder structure, simple programming, running project, generating build/APK of the app from Android Studio
First application: Creating Android Project, Android Virtual Device Creation, Set up debugging environment, Workspace set up for development, Launching emulator, debugging on mobile devices.
Basic UI design: Basics about Views, Layouts, Drawable Resources, Input controls, Input Events, Toasts.
More UI Components: Layouts - GridView and ListView, Action bar, Adapters, Menus: Option menu, context menu, sub menu, Pickers - Date and Time, Spinners.
Activity and Fragment: Activity, Fragment, Activity Lifecycle and Fragment Lifecycle.
Intents: Implicit Intents, Explicit intents, communicating data among Activities.
Navigation Drawer: Panel that displays the app’s main navigation screens on the left edge of the screen
Android Notifications – Toast, Dialogs (TimePicker, DatePicker, Progress, Alert), Notification Manager and Push Notification
Introducing SQLite - SQLiteOpenHelper and creating a database - Opening and closing a database, Working with cursors Inserts, updates, and deletes.

TEXT BOOKS/ REFERENCES:

1. Erik Hellman, Android Programming: Pushing the Limits, Wiley
2. Pradeep Kothari, Android Application Development Black Book, Dreamtech Press, KLSI
3. Head first Android Development.

18CA404 COMPILER DESIGN 3-1-0-4

COURSE OUTCOMES
CO1: To understand the theory and practice of compiler implementation.
CO2: To learn finite state machines and lexical scanning.
CO3: To learn context free grammars, compiler parsing techniques, construction of abstract syntax trees, symbol tables, intermediate machine representations and actual code generation
CO4: Identify the similarities and differences among various parsing techniques and grammar transformation techniques.
CO5: To provide practical, hands on experience in compiler design

SYLLABUS

Automata and Language: Chomsky hierarchy of languages, Introduction to Finite Automata – Non-Deterministic Finite Automata- equivalence of NFAs and DFAs- minimization of DFA- Regular Expressions. Context-free Grammar - Parse tree derivations (Top-down, Bottom-up), Context-free languages – Chomsky normal form, GNF.

TEXT BOOKS/ REFERENCES:

**SYLLABUS**

The objective of Dissertation – Phase 1 is to gear up students for preparation of Dissertation-Phase 2 in Semester-VI. Dissertation provides an opportunity to the students to demonstrate independence and originality in thought and application. Students will select topics from the field of computer application and based on a thorough review of literature on that topic, they will identify the problems and decide on plans of research for dissertation. Under the supervision of faculty members, they will execute their plans involving theoretical and/or experimental work. Students will have to prepare proper documentation consisting of SRS, Modeling Techniques, Development Strategies and Implementation and Testing Strategies. Student may use any Design Methodologies such as SSAD, OOAD and UML etc. This is done during phase 1. Regular reviews will be conducted.

**SEMESTER 6**

**18CA497**  
**DISSERTATION PHASE II**  
**12**

The results obtained in phase 1 will be analyzed to arrive at a conclusion which will lead to some novelty in the field of computer application. Dissertation will be prepared as per the prescribed format/guidelines and will be presented in the form of regular reviews. The Dissertation work will be evaluated continuously over the span of the semester as per the approved procedure. For the final review, the department may appoint external expert from industry or academics. Also, a technical paper based on the work done has to be submitted and published at a reputed conference which indexes the publications in SCOPUS. The formalities insisted by the department in this regard has to be strictly adhered to.

**Elective Courses – MCA**

**18CA457**  
**MACHINE LEARNING**  
**3-0-0-3**

**COURSE OUTCOMES**
CO1: Ability to select and implement machine learning techniques and computing environment that are suitable for the applications under consideration
CO2: Ability to understand and apply scaling up machine learning techniques and associated computing techniques and technologies
CO3: Ability to recognize and implement various ways of selecting suitable model parameters for different machine learning techniques.
CO4: To develop skills of using recent machine learning software for solving practical problems.
CO5: To gain experience of doing independent study and research.

SYLLABUS

Introduction, linear classification, perceptron update rule, Perceptron convergence, generalization, Maximum margin classification, Classification errors, regularization, logistic regression, Linear regression, estimator bias and variance, active learning
Non-linear predictions, kernels, Kernel regression, kernels, Support vector machine (SVM) and kernels, kernel optimization.
Model selection, Model selection criteria, Description length, feature selection, Combining classifiers, boosting, Boosting, margin, and complexity, Margin and generalization (EM) algorithm, EM, regularization, clustering, Clustering, Spectral clustering, Markov models, Hidden Markov models (HMMs), Bayesian networks, Learning Bayesian networks, Probabilistic inference, Current problems in machine learning.

TEXTBOOKS / REFERENCES:

18CA334 COMPUTATIONAL INTELLIGENCE 3-0-0-3

COURSE OUTCOMES

CO1: Understand the fundamental theory, concepts and applications of computational intelligence methods so as to be able to compare with the concepts of AI
CO2: Gain knowledge about different neural networks, their architecture and training algorithm with Implementation in matlab.
CO3: To learn the concepts and applications of fuzzy logic which deals with reasoning under conditions of different levels of vagueness.
CO4: Theoretical understanding of the differences between major bio-inspired computing methods, including the advantages and disadvantages of each

SYLLABUS

Artificial Intelligence – a Brief Review – Pitfalls of Traditional AI – Need for Computational Intelligence – Importance of Tolerance of Imprecision and Uncertainty – Constituent Techniques – Overview of Artificial Neural Networks - Fuzzy Logic – Evolutionary Computation.
Neural Networks as Associative Memories - Hopfield Networks, Bidirectional Associative Memory. Topologically Organized Neural Networks – Competitive Learning, Kohonen Maps.
Swarm Intelligence Algorithms - Overview of other Bio-inspired Algorithms - Hybrid Approaches (Neural Networks, Fuzzy Logic, Genetic Algorithms etc.).

TEXT BOOKS/ REFERENCES:

18CA458 NATURAL LANGUAGE PROCESSING 3-0-0-3

COURSE OUTCOMES

CO1: Understand leading trends and systems in natural language processing
CO2: To gain knowledge about the basic Probability Theory
CO3: Understand the concepts of morphology, syntax, semantics and pragmatics of the language using tools
CO4: Evaluation of Language Models
CO5: Writing programs in Python to carry out natural language processing challenges

TEXT BOOKS/ REFERENCES:

18CA431 INFORMATION RETRIEVAL 3-0-0-3

COURSE OUTCOMES

CO1: To gain an understanding of the basic concepts and techniques in Information Retrieval
CO2: To understand how statistical models of text can be used to solve problems in IR, with a focus on how the vector-space model and the language model can be applied to the document retrieval problem;
CO3: To appreciate the importance of data structures such as an index to allow efficient access to the information in large bodies of text
CO4: To understand the algorithms required to build a document retrieval system
CO5: To perform document analysis using the knowledge of algorithms in document classification and clustering.
CO6: To learn to analyse the performance of retrieval systems using test collections

SYLLABUS


TEXT BOOKS/ REFERENCES:

18CA455 INTELLIGENT SYSTEMS
3-0-0-3

COURSE OUTCOMES
CO1: The principal achievements and shortcomings of AI
CO2: The main techniques that have been used in AI, and their range of applicability
CO3: Assess the validity of approaches to model intelligent processing
CO4: Assess the applicability of AI techniques in novel domains
CO5: Select appropriately from a range of techniques when implementing intelligent systems

SYLLABUS
Introduction to Agents: Structure of Intelligent Agents – Problem Solving Agents- Formulating Problems

TEXT BOOKS/ REFERENCES:
SYLLABUS

Historical Trends in Deep Learning, Linear Algebra, Probability and Information theory, Numerical Computation, Machine learning basics
Deep Networks: Deep feedforward networks, Regularization for deep learning, Optimization for training deep models, Convolutional Networks, Sequence modelling: Recurrent and recursive nets, Practical methodology, Applications
Deep Learning Research: Linear factor models, autoencoders, Representation learning, Structured probabilistic models, Monte-Carlo models,
Intro to NLP and Deep Learning, Simple Word Vector representations
Introduction to Tensorflow
Convolutional neural networks- Dynamic Memory Networks.

TEXT BOOKS/ REFERENCES:
2. Yoav Goldberg, A Primer on Neural Network Models for Natural Language Processing, 2015
3. Jurafsky, James H. Martin, Speech and Language Processing, 3rd edition, 2017

CO1: To provide a basic idea of Open source technology, their software development process.
CO2: To understand the role and future of open source software in the industry along with the impact of legal, economic and social issues for such software.
CO3: Be competent with distributed software engineering tools and processes such as test-driven development, issues tracking, unit testing, code review, distributed version control, and continuous integration
CO4: Can use the major development platforms and tools that are common for open source projects.
CO5: Gain hands own experience by participating in a public open source project.

SYLLABUS

World View: Classifying OSS Motivations - Technological Micro-level Motivation - Economic Micro-level and Macro-level Motivation - Socio-Political Micro-level and Macro-level Motivation.


TEXT BOOKS/ REFERENCES:

18CA331 BIG DATA ANALYTICS AND VISUALIZATION 3-0-0-3

COURSE OUTCOMES

CO1: Gain the ability to choose the right solution for a commercial task involving big data, including databases, architectures and cloud services.

CO2: Gain an understanding of the analysis of big data including methods to visualise and automatically learn from vast quantities of data.

CO3: Develop the programming skills to build solutions using big data technologies such as MapReduce, scripting for NoSQL, Apache Mahout, Hive and the ability to write parallel algorithms for multi-processor execution.

CO4: understanding of the issues of scalability of databases, data analysis, search and optimization.

CO5: Get insights into different data visualization techniques. Understanding of real life issues faced by different organizations and its effective solutions

SYLLABUS

Simple Linear regression, Multiple Linear regression, Logistic Linear Regression. History of Visualization, Goals of Visualization, Types of Data Visualization: Scientific Visualization, Information Visualization, Visual Analytics, Impact of visualization


TEXT BOOKS/REFERENCES:

18CA333 BUSINESS INTELLIGENCE 3-0-0-3

COURSE OUTCOMES

CO1: To be familiar with BI Infrastructure components and it's application.
CO2: Understand the concepts and role of data warehousing in BI
CO3: Gain the knowledge of common data integration approaches.
CO4: To be familiar with different datamodels and OLAP servers
CO5: Understand how to implement Enterprise reporting using SSRS

SYLLABUS

Introduction to Business Intelligence: Introduction to OLTP and OLAP, BI Definitions & Concepts, Business Applications of BI, BI Framework, Role of Data Warehousing in BI, BI Infrastructure Components – BI Process, BI Technology, BI Roles & Responsibilities, 3-tier data warehouse architecture, Data Marts Data integration: Basics of Data Integration (Extraction Transformation Loading)- Concepts of data integration need and advantages of using data integration. Introduction to common data integration approaches, Introduction to ETL using SSIS, Introduction to data quality, data profiling concepts and applications. Introduction to Multi-Dimensional Data Modeling-Introduction to data and dimension modeling, multidimensional data model, ER Modeling vs. multi-dimensional modeling, OLAP operations, concepts of dimensions, facts, cubes, attribute, hierarchies, star and snowflake schema, OLAP Servers – MOLAP, ROLAP, OLAP query model and query processing, indexing OLAP Data, Data Warehouse Implementation Introduction to business metrics and KPIs, creating cubes using SSAS. Basics of Enterprise Reporting- Introduction to enterprise reporting, concepts of
dashboards, balanced scorecards, introduction to SSRS Architecture, enterprise reporting using SSRS.

TEXT BOOKS/ REFERENCES:
2. Jiawei Han, Micheline Kamber and Jian Pei, “Data mining concepts and Techniques”, Third Edition, Elsevier Publisher, 2006.

18CA440 WIRELESS COMMUNICATIONS AND NETWORKS* 3-0-0-3

SYLLABUS

TEXTBOOK / REFERENCES:

18CA451 CLOUD COMPUTING* 3-0-0-3
SYLLABUS


TEXT BOOKS / REFERENCES:

18CA434 NETWORK MANAGEMENT AND SYSTEM ADMINISTRATION 3-0-0-3

COURSE OUTCOMES

CO1: To master the terminology and concepts of the Network core and layered approach
CO2: Understand and analyze (Using Wireshark tool) the concepts of Application protocols and their working in local area networks and wide area networks.
CO3: To determine proper usage of the IP address, subnet mask and default gateway in a routed network
and designing of Network Models using Simulation tool(Cisco Packet Tracer)

SYLLABUS


**TEXT BOOKS / REFERENCES:**

**18CA433 MODERN WEB APPLICATION DEVELOPMENT USING MEAN STACK**

**3-0-0-3**

**COURSE OUTCOMES**

CO1: Equip students with principles, knowledge and skills for the design and construction of web-enabled internet applications.

CO2: Design, Implement and deploy an inhouse project using MongoDB, Express.js, AnjularJS, Node.js

CO3: Get acquainted with the latest web application development trends in the IT industry.

CO4: Evaluate different web application development alternatives and choose the appropriate one for a specific scenario.

**SYLLABUS**

2. Introduction to Node JS Installation, Callbacks, Installing dependencies with npm, Concurrency and event loop fundamentals, Node JS callbacks, Building HTTP server, Importing and exporting modules, Building chat application using web socket.
3. Building REST services using Node JS REST services, Installing Express JS, Express Node project structure, Building REST services with Express framework, Routes, filters, template engines - Jade, ejs.
4. MongoDB Basics and Communication with Node JS Installation, CRUD operations, Sorting, Projection, Aggregation framework, MongoDB indexes, Connecting to MongoDB with Node JS,
Introduction to Mongoose, Connecting to MongoDB using mongoose, Defining mongoose schemas, CRUD operations using mongoose.


TEXT BOOKS/ REFERENCES:

18CA313 WEB SERVICES AND CLOUD* 3-0-0-3

SYLLABUS

Introduction to Web Services, Web service Architecture XML, XSD, DTD, XSLT, Parsers. WSDL- Purpose of WSDL, Types of WSDL, Message Exchange Patterns, Message Exchange Formats.
Introduction to Cloud Computing- Architecture, types of Cloud- Public cloud, private cloud, Community Cloud and hybrid clouds, Cloud service models- IAAS, SAAS, PAAS, and XAAS. Cloud an organization perspective- Cloud Migration and Virtualization, Cloud OS.
Cloud Computing Platforms, Cloud service Platforms- storage service, database service, analytical service and application service, Cloud Data center management, Distributed Storage Systems, Cloud usage scenarios, Cloud Security
Amazon Web Services (AWS), Amazon Elastic Cloud, AWS Architecture, Microsoft Azure, Google App Engine, DevOps Services, Open Stack and Open Nebula Private Cloud setup and usage.

TEXT BOOKS/ REFERENCES:

**18CA437 SEMANTIC WEB TECHNOLOGIES 3-0-0-3**

**COURSE OUTCOMES**

CO1: Understand the XML (Extensible Markup Language) language structure and XML document model.
CO2: To gain knowledge about the concepts of graph-based RDF model, XML syntax-based RDF model, and RDF Schema using Java/Jena.
CO3: Analyze the requirements and features of web ontology language (OWL).
CO4: Identify properties and property restrictions, and Boolean combinations of the OWL classes.
CO5: Apply Java API to manipulate XML/RDF data model and ontology.

**SYLLABUS**


**TEXT BOOKS / REFERENCES:**
SYLLabus


Text Books/ References:

18CA456

INTERNET OF THINGS

SYLLabus


TEXT BOOKS/ REFERENCES:
1. The Internet of Things: Applications and Protocols, Wiley publications. Author(s): Oliver Hersent, David Boswarthick, Omar Elloumi
2. Architecting the Internet of Things, Springer publications. Author(s): Dieter Uckelmann, Mark Harrison, Florian Michahelles
3. Internet of Things with Arduino Cookbook, Packt Publications. Author(s): Marco Schwatrz.

18CA459 SECURE APPLICATIONS FOR MOBILE DEVICES 3-0-0-3

COURSE OUTCOME
CO 1: To understand about the basic concepts of Operating System and TCP/IP model
CO 2: To understand the Design aspects of the mobile OS, Mobile characteristics and API development
CO 3: To understand and implement the concepts of Software Design for Android, Android Open Source Project (AOSP), CyanogenMod and Building a ROM
CO 4: To understand and implement the Concepts and polices to be maintained for Network Security which includes the browser security and cross site forgery; Linux Security and Android Security
CO 5: Mastering the Concepts of cloud storage and different types of computing.

SYLLABUS
OS refresher; TCP/IP Refresher; Mobile Systems Characteristics; Design of Mobile OS, Android Internals, API - Application Software Design for Android - Tour of: Android Open Source Project (AOSP), CyanogenMod; Building a ROM; Linaro - Network Security; Linux Security; Android Security; Location Based Services; Pocket Spy - Android Permissions System - Mobile Malware - Privacy Violations – cyber security - Mobile-, Cloud-, Ubiquitous-, Pervasive-Computing
Apache cordova - Cross site request forgery- cross site - browser security model and policies - same origin policy - CORS - Android security model.

TEXT BOOKS/ REFERENCES:
5. Adapted Materials from Android security sites.
INFORMATION SECURITY

COURSE OUTCOME
Co 1: To understand the information security basics and a clear idea about its significance.
Co 2: To analyse the different threats to computing system and how to dealt with it.
Co 3: To understand and analyse about network security, Database Security and Operating System threats and their countermeasures
Co 4: To be familiar with network security designs and to learn how to implement the design using available secure solutions
Co 5: To master information security governance, and related legal and regulatory issues.

SYLLABUS

TEXT BOOKS/REFERENCES:

BIO INFORMATICS

COURSE OUTCOME
CO1 : Able to explain fundamental concepts in Bioinformatics: the basic biology, data and tools
CO2: Able to perform text- and sequence-based searches on Bioinformatics data
CO3: Use existing softwares effectively to extract information from large databases
CO4 : Able to Integrate knowledge of the basic principles and concepts of biology, computer science and mathematics

SYLLABUS
Introduction to Bioinformatics: Definition - Importance and Uses of Bioinformatics - Information Technology - Systems Biology.
Applications of Data Mining to Bioinformatics Problems - Biological Data – Databases - Protein Sequencing - Nucleic Acid Sequencing - Sequence to Structure Relationship.

TEXT BOOKS/REFERENCES:

18CA336 DATABASE ADMINISTRATION 3-0-0-3

COURSE OUTCOME
Co1: Analyze and model requirements and constraints for the purposes of installing, configuring, and tuning a DBMS
Co2: To develop methods for implementing security, back-up and recovery measures
Co3: To develop methods for creating and Managing Database Storage Structures
Co4: Acquire the knowledge and skills required to Monitoring the Performance of the Database

SYLLABUS
TEXT BOOKS/REFERENCES:

18CA460 SOFTWARE TESTING * 3-0-0-3
SYLLABUS
Structural Testing: Path testing, DD-Paths, Cyclomatic Complexity, Graph Metrics, Data Flow Testing, Mutation testing, Static Analysis, Dynamic Analysis
Reducing the number of test cases: Prioritization guidelines, Priority category, Scheme, Risk Analysis, Regression Testing, Slice-based testing
Program slicing and its application, Reliability analysis, Formal methods; verification methods; oracles.

TEXT BOOKS/REFERENCES:

18CA438 SOFTWARE QUALITY ASSURANCE* 3-0-0-3
SYLLABUS

TEXT BOOKS/ REFERENCES:

18CA453 GRAPH THEORY 3-0-0-3
COURSE OUTCOME
CO1: To learn the basic concepts and theory associated with graphs.
CO2: To learn to model problems using graphs and to solve these problems algorithmically.
CO3: To Learn modern application on graph theory

SYLLABUS


Connectivity, Networks & Combinatorial Optimization: Cut vertices, Bi-connected graphs, algorithm for cut vertices and biconnected graphs, Vertex & Edge connectivity, Menger’s Theorem (Statement
only), Network flows, Ford and Fulkerson’s Theorem (Statement only), Edmonds-Karp Algorithm for the maximal network flow, Network Simplex algorithm for the minimum cost flow, Matching, Perfect matching, Hall’s marriage theorem, Edmond’s Algorithm for the maximum cardinality matching, Independent set, Covering, Clique, Dominating Set.

Planarity, Coloring & Intractable graph problems: Planar graphs, Kuratowski graphs, Different representations of planar graphs, DMP Algorithm for the Planarity detection, Geometric dual, Coloring, chromatic number, Four color theorem (Statement only), Grundy coloring, time table scheduling problem, chromatic polynomials, Algorithmic complexity, growth rates, P, NP, NPC classes, Cook’s theorem (Statement only), NPC reduction, NPC Graph problems.

TEXT BOOKS/ REFERENCES:
1. NarsinghDeo, Graph theory with Applications to Engineering & CS, PHI
2. Alan Gibbons, Algorithmic Graph theory, Cambridge University Press

18CA439  STRUCTURE AND INTERPRETATION OF COMPUTER PROGRAMS  3-0-0-3

COURSE OUTCOME

CO1: Identify the abstract syntax of any programming language
CO2: Be able to design and implement programs in Scheme/LISP that demonstrate the concepts covered in the course, specifically: Recursive and Iterative Processes and Procedures
Higher
   Order Procedures Object Oriented Methods Data Abstractions Procedures with State
Dispatch
    on Type"
CO3: Analyze the operation of a Scheme-like interpreter using the substitution and environment models
CO4: write simple programs using PROLOG

SYLLABUS
Introduction to the Elements of Programming Languages: Different Types of Programming Languages -Modeling Programming Languages, Computability versus Complexity, Computer Science for Computation.
Introduction to LISP and Scheme - Building Abstractions with Procedures - The Elements of Programming Procedures and the Process they Generate – Formulating Abstractions with Higher-Order Procedures.
Metalinguistic Abstraction: The Metacircular Evaluator – Lazy Evaluation - Variation on a Scheme-
Nondeterministic Computing – Logic Programming – Introduction to PROLOG.

TEXT BOOKS/REFERENCES:

18CA335 COMPUTER GRAPHICS AND VISUALIZATION 3-0-0-3

COURSE OUTCOME
CO1: Understand the structure of modern computer graphics systems and learning basic graphics components and its working principles
CO2: To be familiar with application development using OpenGL, OpenGL architecture, primitives and attributes, simple modeling and rendering of two- and three-dimensional geometric objects
CO3: Learning different output primitive drawing and filling algorithms and implementation in OpenGL
CO4: Understand Different Geometric transformations: 2D and 3D transformations and learning OpenGL Geometric Transformation Functions.
CO5: understand the Two-Dimensional and Three-Dimensional viewing, projections and clipping of 3D objects.
CO6: Demonstrate practical applications animations to continue professional development

SYLLABUS
TEXT BOOKS / REFERENCES:

18CA338 DIGITAL IMAGE PROCESSING * 3-0-0-3
SYLLABUS

TEXTBOOKS/ REFERENCES:

18HU433 PRINCIPLES OF ECONOMICS AND MANAGEMENT* 3-0-0-3
SYLLABUS

TEXTBOOKS/REFERENCES:

SYLLABUS

TEXTBOOK / REFERENCES:
18HU431 MANAGEMENT AND ORGANIZATIONAL BEHAVIOUR* 3-0-0-3
SYLLABUS
Managers and Management – Meaning – Role of managers – Processes of management – Historical roots of contemporary management practices.
Foundations of planning – Types of plans–Approaches to planning – Planning in dynamic environment. Organizational designs and structures – traditional and contemporary organizational designs. Organizational culture and ethical behavior – factors shaping organizational culture–creating an ethical culture.
TEXTBOOK / REFERENCES:
1. Jennifer George and Gareth Jones “Understanding and Managing Organizational Behavior”, Published by Pearson Education Inc.