Centre for Distance and Online Education (CDOE)

Devi Ahilya Vishwavidyalaya, Indore, MP (NAAC A^{+})

PROGRAMME GUIDE
wef 2022-23

Master of Computer Application
(Open and Distance Learning Mode)

www.dauniv.ac.in
www.cdoedavv.ac.in

MESSAGE FROM CDOE

Dear Learners,

It is a pleasure welcoming you to Central India's most promising and leading University – Devi Ahilya Vishwavidyalaya (DAVV) for Master of Computer Application (MCA) Programme being offered in Open and Distance Learning (ODL) Mode at the Centre for Distance and Online Education.

DAVV's Mission is to "Educate and empower the learners to realize their potential through righteous blending of knowledge, skills, and values for serving the society." To achieve this Mission, DAVV has laid out several objectives out of which following are specifically relevant to MCA program –

- To produce world-class professionals who have excellent analytical skills, communication skills, team building spirit and ability to work in cross cultural environment.

- To produce international quality IT professionals, who can independently design, develop and implement computer applications.

- Professionals who dedicate themselves to mankind, who are environment conscious, follow social norms and ethics

Facilitating learner centric multidisciplinary course curriculum, pedagogy and resources through technology enabled joyful and diverse learning environment, Providing demand driven educational programmes for enhancing skills and employability, Addressing issues and priorities for empowering local community with a global perspective.

This 2 Yrs MCA program offers a bouquet of courses that are meant to equip the graduates with professional competencies that make them "industry ready" thus generating higher employment in the region. It also encompassed the University's effort of making education available and affordable to all.

We wish you success in your educational endeavors.

Director

CONTENTS

PROGRAMME COORDINATOR

Dr ANAND MORE
Coordinator (MCA)
Centre For Distance and Online Education DAVV, Indore
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1. ABOUT THE PROGRAMME

1.1 Introduction of the Program

The CDOE has developed an innovative program **Master of Computer Application (MCA)** with emphasis on design, develop and implement computer applications.

1.2 Duration of the Programme

Minimum duration of the Programme: 4 (Four) Semesters / 02 (Two) Years
Maximum duration of the Programme: 8 (Eight) Semesters / 04 (Four) Years

1.3 Eligibility

A candidate seeking admission to MCA Course should be passed - BCA / Bachelor Degree in Computer Science Engineering or equivalent Degree

OR

Passed B.Sc./ B.Com/ B.A. with Mathematics at (10+2) level or at Graduation level. Obtained at least 50% marks and 45% marks in case of SC, ST, OBC (excluding Creamy Layer) category of Madhya Pradesh in aggregate form any UGC/ AICTE approved Indian University or from a foreign University recognized by Association of Indian Universities (AIU) or Institute recognized by the concerned University as equivalent thereto. Bachelor's degree of minimum 3 Yrs duration.

1.4 Medium of Instruction: English

(Study Material will be provided in English and Assignments and Question Papers will be only in English)

1.5 Programme Fee

Rs. 18,000/- (Rs. Eighteen Thousand) per semester to be paid in the beginning of each semester. Examination Fees shall be charged separately as decided by the University.

1.6 Brief Program Structure

SEMESTER – I

CourseCode	Course Title	Credit (T+P+MP/Case Study)	Marks Allotted			
			Max. End Semester Exam marks	Max. Internal marks for Assignments	Max. Practical/ Project mark	Total
CA-1001	Computer Organization and Architecture	5 (3+2)	70	10	20	100
CA-1002	Mathematical Foundation for Computer Application	4	70	30	--	100
CA-1003	Data Structures using C++	6 (3+2+1)	70	10	20	100
CA-1004	Operating Systems	5 (3+2)	70	10	20	100
CA-ID01	Communication Skills and Report Writing	3	70	30	--	100
CA-CV01	Comprehensive Viva	4	--	--	--	100
Total		**27**				**600**

NOTE: For the subjects of 6 credits, minor project/ case study is compulsory.

SEMESTER – II

CourseCode	Course Title	Credit (T+P+MP/ Case Study)	Marks Allotted			
			Max. End Semester Exam marks	Max. Internal marks for Assignments	Max. Practical/ Project mark	Total
CA-2001	Database Management System	6 (3+2+1)	70	10	20	100
CA-2002	Software Engineering	4	70	30	--	100
CA-2003	Design and Analysis of Algorithm	4	70	30	--	100
CA-2004	Computer Networks	5 (3+2)	70	10	20	100
CA-2005	Internet and Web Technology	6 (3+2+1)	70	10	20	100
CA-CV02	Comprehensive Viva	4	--	--	--	100
Total		**29**				**600**

NOTE: For the subjects of 6 credits, minor project/ case study is compulsory.

SEMESTER – III

CourseCode	Course Title	Credit (T+P+MP/Case Study)	Marks Allotted			
			Max. End Semester Exam marks	Max. Internal marks for Assignments	Max. Practical/ Project mark	Total
CA-3001	Automata Theory and Compiler Construction	5 (3+2)	70	10	20	100
CA-3002	Cloud Computing	5 (3+2)	70	10	20	100
CA-3003	Artificial Intelligence and Machine Learning	5 (3+2)	70	10	20	100
CA-3004	Information Security	5 (3+2)	70	10	20	100
CA-3005	Internet of Things	5 (3+2)	70	10	20	100
CA-CV03	Comprehensive Viva	4	-	-	-	100
Total		**29**				**600**

SEMESTER – IV

CourseCode	Course Title	Credit (T+P+MP/Case Study)	Marks Allotted			
			Max. End Semester Exam marks	Max. Internal marks for Assignments	Max. Practical/ Project mark	Total
CA-PR01	Project	12	-	-	-	100
Total		**12**				**100**

2. COUNSELLING SESSION

Counseling Sessions as per the norms shall be held at CDOE, DAVV Campus only in Indore. These sessions are normally on weekends and as per pre announced schedule. **It may be noted that the counseling sessions are not conventional classroom teaching. Lectures will be largely based on discussions which will help to overcome difficulties faced by the candidates while going through the study material.**

In these sessions candidates must try to resolve subject related difficulties if any.

Before you proceed to attend the counseling sessions, please go through your study material and identify of the points to be discussed. The detailed schedule of the counseling sessions will be availableon the CDOE Website.

Counseling session will be organized in all theory / practical courses. There will be Maximum 7 counseling session of 2 hours each. Attending the counseling session is not mandatory, nevertheless is always in the interest of learner to attend these session. For practical courses web based practical practice will be provided.

2.1 Mode of instruction

It is based on Self-Learning Study Material prepared and supplied by CDOE, besides counseling sessions and other exercises such as assignments etc. (The SLM will be provided in English and Assignments and Question Papers will be provided only in English.)

3. UPDATES REGARDING ACADEMIC ACTIVITIES

Students are advised to remain in touch with Programme Coordinator and visit website of CDOE, DAVV (www.dauniv.ac.in and www.cdoedavv.ac.in) regularly for the updates regarding academic activities pertaining to their Programme. Further, they should follow the Academic Calendar provided to them for the current academic year.

4. ACADEMIC CALENDAR

The academic calendar provides important dates and other relevant information corresponding to activities such as Counseling, Assignments, and Examinations etc. **Try to keep an eye on the important dates given in your academic calendar for different activities.**

5. EVALUATION SYSTEM

5.1 Assignments

- Assignments are a part of continuous evaluation system. The submission of assignments is compulsory. Assignments of a course carry 30% weightage in terms of marks.
- Assignments are designed in such a way as to help you concentrate mainly on the self-learning course material (SLM). However, access to other books and sources will be an added advantage in your academic pursuits.
- Assignments should be hand written. Typed or printed assignments shall not be entertained, else as advised.
- For your own record, it is advisable to retain a copy of all the assignment responses.

- You have to submit the Assignments to CDOE, DAVV on or before the last date of submission mentioned in the Academic Calendar or as notified.
- Write your Name and Roll Number correctly and legibly on the Assignment Sheets.
- Practical /Project Report Submission (Only for Subjects having Practical marks)
    - You have to submit the Practical /Projects repot to the CDOE, DAVV on or before the last date of submission mentioned in the Academic Calendar or as notified for the subjects as given in the scheme having Practical/Project marks.
    - Submission of report in the specific format shall be provided by CDOE, DAVV.
- For the subjects of 12 credits in IV Sem, major project / case study report of 12-16-week work done by student is compulsory to submit at the End of Semester.

5.2 Semester End Examinations

Semester End Examination is the major component of the evaluation system and it carries 70% weightage in final result. The written theory examination of **150-180 Minutes for each subjects and may be conducted for than one subject in a day.**

5.3 Semester End Examinations form

You must fill in the Semester End Examination Form online through Exam Portal as per the instruction given on the website. The examination forms should be submitted on or before the last date mentioned in the **Academic Calendar/Notice from the Director.**

5.4 Semester End Examination Date-sheet

After the successful submission of Examination Form, the Admit Card will be generated beforethe commencement of the Semester End Examination.

Examinations Date-sheet will be uploaded on the website much in advance before the commencement of the Examination.

While submitting your Examination Form for the Semester End Examinations, it is your responsibility to check whether you are registered for the programme and eligible to appear for that examination. If any of the above requirements are found missing, your examination is liable to be cancelled.

6. SEMESTER END EXAMINATION RESULT

The evaluation consists of two parts

(i) Assignments (Theory and Practical)

(ii) Semester End Examination.

In the final result all the Assignments of a course will carry 30% weightage while 70% weightage will be given to the Semester End Examination.

If a student fails to qualify any component of a paper or a course he/she can repeat the same during the subsequent Semester, up to the maximum duration provided for the Programme from the date of registration.

For further details please refer Ordinance 14 given on the website of the University.

7. OTHER

- **Late Fee**: A student who doesn't submit his/her Assignments and Examination Form on time may submit the same with the prescribed late fee; and

- Candidates are required to intimate the relevant authorities, sufficiently in advance, if there is any change of address/mobile number etc.

Centre for Distance and Online Education
Devi Ahilya Vishwavidyalaya, Indore

MCA (ODL)

Semester – I
Course Scheme & Syllabus

(Open and Distance Learning)

Centre for Distance and Online Education
Devi Ahilya Vishwavidyalaya, Indore

MCA (ODL), Semester – I

Course Scheme & Syllabus

Course Code	Course Name	Credit (T+P+MP/Case Study)	Marks Allotted			
			Max. End Semester Exam Marks	Max. Internal Marks for Assignments	Max. Practical/ Project Mark	Total
CA-1001	Computer Organization and Architecture	5 (3+2)	70	10	20	100
CA-1002	Mathematical Foundation for Computer Application	4	70	30	--	100
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CA-1004	Operating Systems	5 (3+2)	70	10	20	100
CA-ID01	Communication Skills and Report Writing	3	70	30	--	100
CA-CV01	Comprehensive Viva	4	--	--	--	100
Total		**27**				**600**

CENTRE FOR DISTANCE AND ONLINE EDUCATION

Course Name: **Computer Organization and Architecture**

Course Code : **CA-1001** Total Credits : **05 (3+2)**

Aim of the Subject

This course aims to give an understanding of the basic computer architecture, leading to strong foundation of assembly language, operating system, compilation process, performance aspects of software, IOT & Cloud Computing.

Objectives

- To develop understanding of core concepts of computer architecture from instruction execution viewpoint & memory interaction leading to basics of assembly language programming
- To develop understanding of different architectural styles, pipelining, various memory technologies
- To build foundation of IOT & Cloud basics from architecture point of view

Learning Outcomes

1. Students should understand the computer architecture, CPU-memory interaction, instruction execution process through assembly language of 8088 microprocessor.
2. Students should be able to understand different CPU Architectures like instruction pipelines, RISC/CISC, Cache memory, placement/replacement policies, cache coherence issues, memory technologies.
3. Students should be able to learn the basic concepts of IOT & Cloud so as to build strong foundation of these subjects from computer architecture point of view

Course Contents

Unit 1

Computer Organization: Digital and Analog computers, Major components of a digital computer, Memory addressing capability of a CPU, Word length of a computer, Processing speed of a CPU. Technological trends. Von Neumann model, Functional units and components in computer organization: The memory unit, the input and output subsystem, the bus structures, design of ALU in context of 8088 microprocessor.

Unit 2

Introduction to 8088/8086 Microprocessor: Architecture, Register Architecture: Accumulator, GPR, PC, IR, SP and Flag Register. Various instruction classification: Instruction Format, Opcode, Operand and Hex code. Addressing modes, Introduction to Assembly Language Programming: Instruction Operation Status, Various Instruction Sets: Data Transfer Group Instructions, Arithmetic Group Instructions, Logical Group Instruction, Branch Group Instructions: Conditional and Unconditional and Machine control Instructions, interrupts, Direct memory access.

Unit 3

Micro-Operations, Functional Requirements, Processor Control, Hardwired Implementation, Micro-programmed Control, Introduction to RISC and CISC Architecture, Instruction pipelining: Instruction pipelining hazards, data dependency hazards and control hazards, overcoming hazards. Internal Memory: RAM, SRAM and DRAM, Interleaved and Associative Memory, Cache Memory: Data caches, instruction caches and unified caches, cache implementations, fully associative and direct mapped caches, write back versus write through caches.

Unit 4

Understanding IoT fundamentals, IoT architectures and protocols, Working of sensors and actuators, Sensor Networks, Machine-to-Machine Communications, Interfacing with Arduino, Raspberry Pi, NVIDIA Jetson Nano (GPU) etc., Cloud platform for IoT, Io T Applications.

Unit 5

Grid Computing : data and computational grids, Grid architecture and its relations to various distributed technologies, Cloud computing : Evolution of cloud computing, Comparison with traditional computing architecture (client/server), Services provided at various levels, Parallel Computing : Flynn's Classification of Computer Architecture, Types of Parallelism, Parallel programming models.

Suggested Reading

1. Computer System Architecture, M. Morris Mano, Pearson Education.
2. Computer Organization & Architecture, William Stallings, 8e, Pearson Education.
3. Microprocessor Architecture, Programming and Applications with 8085/ 8080 by Ramesh S. Gaonkar.
4. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, " From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1st Edition, Academic Press, 2014.
5. Cloud Computing Bible, Barrie Sosinsky, Wiley-India, 2010
6. Andrew S. Tanenbaum, Maarten Van Steen, "Distributed System: Principles & Paradigms, Prentice Hall, 2007.

CENTRE FOR DISTANCE AND ONLINE EDUCATION

Course Name: **Mathematical Foundation for Computer Application**

Course Code : **CA-1002** Total Credits : **04**

Aim of the Subject

To develop logical and mathematical concepts commonly required in many areas of Computer Science.

Objectives

1. To be familiar with Propositions, Predicates and Set theory.
2. To provide the concept of Vector Spaces and Vector Subspaces those are mandatory in the area of Machine Learning.
3. To be able to form a strong base o f Mathematical Induction and Recurrence Relations, so as to implement them easily in algorithms.
4. To understand Functions and Relations and consequently, their importance in Computer Science.
5. To explore Probability and Statistical analysisthat will help in various applications of Computer Science.

Course Contents

Unit 1

Logics, Prepositions, Predicates and Quantifiers. Introduction to Set theory, Set Operations, Fuzzy Sets. Introduction to Vector Spaces, General properties of Vector Spaces, Vector Subspaces.
Introduction to methods of Proof, Mathematical Induction, use of Mathematical Induction to solve different problems.

Unit 2

Functions, One-to-One Functions, Onto Functions, Inverse Function, Composition of Functions. Recurrence Relations, solving Recurrence Relations, Applications of Recurrence Relation. Basic understanding of Complexities, Complexity and analysis of various basic algorithms.

Unit 3

Relation, importance of Relations in Computer Science, properties and applications of Relations, Closures of Relations, Equivalence Relations, representing Relations, Relation matrix, Relation graph, Composite relation, Operations on relations- union,
intersection and join.

Unit 4

Correlation, Coefficient of Correlation, Rank Correlation, Partial and Multiple Correlations. Regression, Regression Coefficient, Lines of Regression. Curve f itting, methods of Least Square for fitting different Curves.

Unit 5

Conditional Probability, Bayes' Rule, Discrete and Random variables. Discrete Probability Distributions- Binomial Distribution, Poisson Distribution, Uniform Distribution etc. Continuous Probability Distributions- Rectangular, Gaussian Distribution, Gamma Distribution, Beta Distribution etc.

Suggested Reading

1. Kenneth H. Rosen, " Discrete Mathematics and i ts Applications", 7 th Edition, McGraw-Hill Education, ISBN: 9780070681880, 0070681880
2. S.C. Gupta, V.K. Kapoor, "Fundamentals of Mathematical Statistics", 12th Edition, Sultan Chand & Sons, ISBN: 9789351611738, 9351611736
3. David C. Lay, "Linear Algebra and Its Applications", Pearson Education Limited, 4th Edition, ISBN: 9781292020556 , 1292020555

CENTRE FOR DISTANCE AND ONLINE EDUCATION

Course Name: **Data Structures Using C++**

Course Code : **CA-1003** Total Credits : **06 (3+2+1)**

Aim of the Subject

The aim of this course is to give you a feel for algorithms and data structures. student should end it appreciating that understanding the algorithm and data structures used for some problem is much more important than knowing the exact code for i t in some programming language. Student should be aware of the fact that there are often several algorithms for some problem, and one algorithm may be better than another or one algorithm better in some circumstances and another better in others.

Objectives

The objectives are that student should know something of all of these by the end of the course. Student should be aware of algorithms and data structures: sorting and searching algorithms, categorizing efficiency in t ime and memory use, linked list and tree data structures, hash tables, stacks and queues. As well as knowing about them, student should be familiar enough with the concepts that should you need to take any of them further and make use of them, student will be able to do so.

Learning Outcomes

Student writes generalized code expressing an algorithm or data structure in a way that may be used in a variety of real-world situations. Come to know how to work out the efficiency of an algorithm, though we won't cover detailed formal analysis.

Course Contents

Unit 1

Introduction to Data Structure: Concepts of Data and Information, Classification of Data structures, Abstract Data Types, Data structures operations. Algorithms, Algorithm complexity notations like big Oh, Theta, and Omega. Time Complexity, Big –Oh -notation, Running Times, Best Case, Worst Case, Average Case, Factors depends on running time. Implementation aspects: Memory representation. Static and Dynamic implementations. Examples and real life applications, Data Structures: Arrays, Address calculation in a single and multi dimensional array, Sparse Matrices, Pointer & Structure.

Unit 2

Stacks, Queues and Lists Definition, Array based implementation of stacks, Linked List based implementation of stacks, Examples : Infix, postfix, prefix representation, Applications : Mathematical expression Evaluation Definition: Queues & Lists: Array based implementation of Queues / Lists, Linked List implementation of Queues /Lists, Circular implementation of Queues and Singly linked Lists, Straight / circular implementation of doubly linked Queues / Lists, Priority queues , Applications.

Unit 3

Trees & Graphs Definition of trees and Binary trees, Properties of Binary trees and Implementation, Binary Traversal; pre-order, post-order, in-order traversal, Binary Search Trees, Implementations, Threaded trees, AVL Trees, Implementations , Balanced multi way search trees, Applications Definition of Undirected and Directed Graphs and Networks, The Array based implementation of graphs, Adjacency matrix, path matrix implementation, The Linked List representation of graphs, Shortest path Algorithm, Graph Traversal – Breadth f irst Traversal, Depth first Traversal, Connectivity of graphs; Connected components of graphs, Weighted Graphs, Applications.

Unit 4

Introduction to Recursion, Divide and Conquer Algorithm, Evaluating time Complexity. Straight Sequential Search, Binary Search, non – recursive Algorithms, recursive Algorithms, Indexed Sequential Search. Definition, Hash function, Collision Resolution Techniques, Hashing Applications.

Unit 5

Sorting Algorithms Introduction, Sorting by exchange, selection, insertions, Bubble sort, Selection sort, Insertion sort, Efficiency of algorithms, Shell sort, Performance of shell sort, Merge sort, Merging of sorted arrays, The merge sort Algorithms, Quick sort Algorithm, Analysis of Quick sort, Picking a Pivot, A partitioning strategy, Heap sort, Heap Construction, Heap sort, bottom – up, Top – down Heap sort approach, Radix sort.

Suggested Reading

1. Data Structures using C by A. M. Tenenbaum, Langsam, Moshe J . Augentem, PHI Pub, 6th Edition.
2. How to Program C++ by Paul Deitel , Harvey Deitel, Prentice Hall; 8 edition.

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CENTRE FOR DISTANCE AND ONLINE EDUCATION

Course Name: **Operating Systems**

Course Code : **CA-1004** Total Credits : **05 (3+2)**

Aim of the Subject

- General understanding of structure of modern computers purpose,
- Structure and functions of operating systems
- Illustration of key OS aspects by example

Objectives

1. To provide opportunity for the study of modern methods of information processing and its applications;
2. To acquaint students with knowledge of the computer systems with emphasis on their uses and limitation;
3. To develop among students the programming techniques and the problem solving skills through programming;
4. To foster among students an interest and confidence in using computers;
5. To encourage an understanding of the implications of computers in the modern world;
6. To preparestudents who wish to go on to further studies in computer science and related subjects.

Learning Outcomes

By the end of the course student should be able to describe the general architecture of computers describe, contrast and compare differing structures for operating systems understand and analyze theory and implementation of: processes, resource control (concurrency etc.), physical and virtual memory, scheduling, I/O and files.

Course Contents

Unit 1

Introduction: Evolution of operating systems, operating system concepts; activities, functions and services of operating system; Computer Systems: Mainframe, Desktop, Multiprocessors, Distributed, Clustered, Real time and Hand held systems. Compu ter Sys tem Opera tions, Storage hierarchy, Hardware pro tec tion, System calls, System structures. Process Management: Process concepts, Process scheduling, Operation on processes.

Unit 2

Cooperating processes, Inter-process communication. Threads: multithreading models, threading issues, thread examples. CPU Scheduling: concepts, scheduling criteria, scheduling algorithms, algorithm evaluation. Process synchronization:
Critical section problem, Mutual exclusion and synchronization Techniques of inter process: Synchronization hardware, semaphore, classical problems of synchroniza tion, cri tical regions and moni tors. Deadlock: deadlock characterization, deadlock handling methods.

Unit 3

Memory Management: Concepts, single user memory management. Partition memory allocation: paging, segmentation and segmentation with paging, Virtual memory management: concept, demand paging, process creation, page replacement, allocation of frames and thrashing.

Unit 4

File Management: File concepts, access methods, directory structure, file system mounting, sharing and protection of files. File system structure and implementation, allocation methods, free space management, reliability of f ile system. Unix file system.

Unit 5

Device Management: Goals of input/output software design, Structure of device hardware and software. Layers of I/ O software, structure of device drivers, Disk driver, disk arm scheduling algorithms, terminal driver, clock driver etc.

Suggested Reading

1. A. Silberschatz, P. Galvin and Gagne, Operating System Concepts, Addison Wesley, 6th Edition, 1994. his course aims to give an understanding of the basic computer architecture, leading to strong foundation of assembly language, operating system, compilation process, performance aspects of software, IOT & Cloud Computing.

CENTRE FOR DISTANCE AND ONLINE EDUCATION

Course Name: **Communication Skills and Report Writing**

Course Code : **CA-ID01** Total Credits : **03**

Aim of the Subject

To improve the confidence, communication skills and presentation capabilities of students that will help them in placements and corporate life.

Objectives

To develop effective communication skills in students which will help them in facing interviews and group discussions

Learning Outcomes

1. Improved skills in personal interviews and group discussions
2. Development of power of expression

Course Contents

Unit 1

Fundamentals of Communication :
Definitions, Importance, Forms of communication, Process of communication, Channels, Barriers and Strategies to overcome barriers of communication

Unit 2

Listening: Definitions, Importance, Benefits, Barriers, Approaches, Exercise and cases. Group Discussions : Definitions, Importance, Process, Points to be borne in mind while participating, Do's and Don'ts.

Unit 3

Presentation Skills : Do's and Don'ts. Interviews: Types of Interviews, Points to be borne in mind as an Interviewer or an Interviewee. Commonly asked questions. Do's and Don'ts.

Unit 4

Transactional Analysis, Johari Window. Written Communication: Report Writing, Business Correspondence, Preparation of Manuals and Project Report, Minutes of meeting, Notes and Circulars.

Unit 5

Intense practice of Presentations, Group Discussions and Interviews.

Suggested Reading

1. Communication – K. K. Sinha
2. Organizational Behavior - Fred Luthans
3. Organizational Behavior - Stephen Robbins

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Devi Ahilya Vishwavidyalaya, Indore

MCA (ODL)

Semester – II
Course Scheme & Syllabus

(Open and Distance Learning)

Centre for Distance and Online Education
Devi Ahilya Vishwavidyalaya, Indore

MCA (ODL), Semester – II

Course Scheme & Syllabus

SEMESTER – II

CourseCode	Course Title	Credit (T+P+MP/ Case Study)	Marks Allotted			
			Max. End Semester Exam marks	Max. Internal marks for Assignments	Max. Practical/ Project mark	Total
CA-2001	Database Management System	6 (3+2+1)	70	10	20	100
CA-2002	Software Engineering	4	70	30	--	100
CA-2003	Design and Analysis of Algorithm	4	70	30	--	100
CA-2004	Computer Networks	5 (3+2)	70	10	20	100
CA-2005	Internet and Web Technology	6 (3+2+1)	70	10	20	100
CA-CV02	Comprehensive Viva	4	--	--	--	100
Total		**29**				**600**

NOTE: For the subjects of 6 credits, minor project/ case study is compulsory.

CENTRE FOR DISTANCE AND ONLINE EDUCATION

Course Name: **Database Management System**

Course Code : **CA-2001** Total Credits : **06 (3+2+1)**

Aim of the Subject

The student should learn database design and information retrieval concepts and apply these concepts in complex projects involving large database.

Objectives

- To present necessary concepts for database designing.
- Design conceptual, logical database model and physical model.
- Evaluate set of query using SQL and algebra.
- Concepts of RDBMS, and learn Object oriented modelling.
- To introduce transaction management and concurrency.
- To introduce storage structure and file management.
- To introduce query optimization and query processing.
- To introduce data mining and data warehousing. Develop any multi-phased project as a part of a team

Learning Outcomes

1. Introduction provides the general overview of the nature and purpose of database systems. We explain how the concept of the database systems. We explain how the concept of database system has developed, what the common features of the database system are, what the database system does for the user, and how a database system interfaces with operating systems.
2. Database design provides the overview of the database-design process, with major emphasis on the database design using the entity relationship data model. Entity relationship data model provides a high level view of the issues in database design.
3. Relation database introduces the relational model of data, covering basic concepts as well as the relational algebra. A brief introduction to integrity constraints and focus on the most influential of the user- oriented relational languages: SQL.
4. SQL provide how to interface between a programming language and the database supporting SQL.
5. Introduction to the theory of relational database design. The theory of functional dependencies and normalization is covered, with emphasis on the motivation and intuitive understanding of each normal form. An overview of relational design and relies on an intuitive understanding of logical implication of functional dependencies. This allows the concept of normalization to be introduced prior to full coverage of functional dependency theory.
6. Transaction management focuses on the fundamentals of a transaction-processing system, including transaction atomicity, consistency, isolation, and durability as well as the notion of serializability. Focuses on concurrency control and presents several techniques for ensuring serializability, including locking, timestamping, and optimistic techniques.
7. Data storage and querying deals with disk, f ile, and f i le- system structure. A variety of data access techniques including hashing and B+ tree indices. Query-evaluation algorithms and query optimization provides an understanding of the internals of the storages and retrieval components of a database

Course Contents

Unit 1

Introduction and Relational Model: Advantages of DBMS approach, various views of data, data independence, schema & sub-schema, primary concept of data models, database languages, transaction management, database administrator &user, data dictionary, database structure & architectures. Relational Model: Domains, relation, kind of relation, Relational databases, Various types of keys: candidate, primary, alternate & foreign keys, relational algebra with fundamental and extended operations, modification of database.

Unit 2

ER Model and SQL: Basic concept, design issues, mapping constraint, keys, ER diagram, weak& strong entity-sets, specialization & generalization, aggregation, inheritance, design of ER schema, Reduction of ER Schema to tables. SQL: Basic structure of SQL, Set operation, Aggregate functions, Null values, Nested Sub queries, derived relations, views, Modification of database, join relation, Domain, relation & keys, DDL in SQL. Programming concepts of PL/ SQL, Stored procedure, Database connectivity with ODBC/ JDBC 9 . The concept of No SQL, Brief history of No SQL, SQL verses No SQL, CAP Theorem (Brewer' s Theorem), No SQL pros/cons, Categories of NoSQL database, Production deployment, Mongo Db, Key Features, practical with MongoDb.

Unit 3

Functional Dependencies: Basic definitions, Trivial & non trivial dependencies, closure set of dependencies & of attributes, Irreducible set of dependencies, FD diagram. Normalization: Introduction to normalization, non loss decomposition, First, second and third normal forms, dependency preservation, BCNF, multivalued dependencies and fourth normal form, join dependencies and fifth normal form.

Unit 4

Transaction Management: Basic concept, ACID properties, transaction state, Implementation of atomicity & durability, Concurrent execution, Basic idea of serializability. Concurrency & Recovery: Basic idea of concurrency control, the basic idea of deadlock, Failure Classification, storage structure-types, stable storage implementation, data access, recovery & Atomicity: log based recovery, deferred database modification, immediate database modification, checkpoints.

Unit 5

Database Integrity, Storage Structure & File Organization: general idea, integrity rules, Domain rules, Attributes rules, assertion, trigger, integrity & SQL. Storage Structure: overview of physical storage media, magnetic disk: performance & optimization, RAID. File Organization: File organization, Organization of records in files, the basic concept of Indexing, ordered indices: B+ tree & B tree index files.

Suggested Reading

1. Database System concepts –Henry F. Korth , Tata McGraw Hill 6th Edition.
2. " Fundamentals of Database Systems", Elmasri R, Navathe S, Addison Wesley 4 th Ed.
3. An introduction to database system-Bipin C. Desai
4. An introduction to Database System -C.J Date
5. SQL, PL/SQL The programming language of Oracle-Ivan Bayross

CENTRE FOR DISTANCE AND ONLINE EDUCATION

Course Name: **Software Engineering**

Course Code : **CA-2002** Total Credits : **04**

Aim of the Subject

Enable students to develop softwares using software develop life cycle.

Objectives

1. Explain the importance of software engineering.
2. Understand the project planning and management in software development.
3. Practice function oriented and object oriented analysis and design.
4. Get insight into the testing and quality assurance approaches.
5. Learn the importance of software maintenance.

Learning Outcomes

1. Understand the application of software engineering approaches in software development.
2. Ability to plan and estimate projects.
3. Analyze and design software.
4. Produce quality software using testing and quality assurance mechanisms.
5. Understand the importance of software maintenance.

Course Contents

Unit 1

Introduction to Software Engineering and Software Processes: Software, Software Classifications and Characteristics, Software Crisis, What is Software Engineering? System Engineering Vs. Software Engineering, Software Engineeri ng Challenges. Software Processes: Process model, Elements and Characteristics of Process model, Process Classification, Software Development Processes: SDLC, Waterfall model, Iterative Waterfall model, Prototyping model, Incremental model, Spiral model, RAD model, Agile Software Development: Principles, Practices & Methods; RUP process model, Component-Based Development model etc.

Unit 2

Project Management and Planning: Project management essentials, Project success and failures, Project Life Cycle, Project team structure and organization, Software Configuration Management, Risk Management. Project planning activities: Metrics and Measurements, Project Size Estimation, Effort Estimation Techniques, Staffing and Personnel Planning, Project Scheduling and Miscellaneous Plans.

Unit 3

Requirements Engineering: Software Requirements, Requirements Engineering Process, Requirements Elicitation. Requirements Analysis: Structured Analysis, Object-oriented Analysis. Requirements Specification, Requirements Validation, and Requirements Management

Unit 4

Software Design and Coding: Software Design Process, Characteristics of a Good Design, Design Principles, Modular Design (Coupling and Cohesion). Software Architecture. Design Methodologies: Function-oriented Design (Structured Design Methodology) and Object-oriented Design using UML, Logical Design. Coding principles, Coding process, Code verification and documentations.

Unit 5

Software Testing, Quality and Maintenance: Testing Fundamentals, Test Planning, Black- Box Testing, White-Box Testing, Levels of Testing, Usability Testing, Regression Testing, Program Slicing, Debugging Approaches. Quality Concept, Quality Factors, Verification and Validation, Quality Assurance Activities, Quality Standards: Capability Maturity Model (CMM), ISO 9000, Six Sigma. Best practices of Software Engineering. Software Reliability, Software Maintenance, Evolution, and Reengineering.

Suggested Reading

1. Software Engineering: Concepts & Practices- Ugrasen Suman, Cengage Learning, 2nd Edition.
2. Fundamentals of Software Engineering-Rajib Mall, PHI, New Delhi.
3. Object Oriented Analysis and Design Using UML, Ugrasen Suman et al, Cengage Learning.
4. An Integrated Approach to Software Engineering- Pankaj Jalote, Narosa Publishing House.
5. Software Engineering-A practitioner's approach- R. S. Pressman, Tata McGraw-Hill International Editions, New York.

CENTRE FOR DISTANCE AND ONLINE EDUCATION

Course Name: **Design and Analysis of Algorithm**

Course Code : **CA-2003** Total Credits : **04**

Aim of the Subject

The aim is to teach the basic concepts of algorithms.

Objectives

The objective of the course is to teach techniques for effective problem solving in computing. The use of different paradigms of problem solving will be used to illustrate clever and efficient ways to solve a given problem. In each case emphasis will be placed on rigorously proving correctness of the algorithm. In addition, the analysis of the algorithm will be used to show the efficiency of the algorithm over the naïve techniques.

Learning Outcomes

1. Argue the correctness of algorithms using inductive proofs and invariants.
2. Analyze worst-case running times of algorithms using asymptotic analysis.
3. Describe the divide-and-conquer paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize divide-and-conquer algorithms. Derive and solve recurrences describing the performance of divide-and- conquer algorithms.
4. Describe the dynamic-programming paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize dynamic-programming algorithms, and analyze them.
5. Describe the greedy paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize greedy algorithms, and analyze them.
6. Explain the major graph algorithms and their analyses. Employ graphs to model engineering problems, when appropriate. Synthesize new graph algorithms and algorithms that employ graph computations as key components, and analyze them.

Course Contents

Unit 1

Recall of asymptotic notation, big-oh, theta, big-omega, and introduce little-oh and little-omega. Worst case and average case complexity.

Unit 2

Divide and Conquer: Integer multiplication revisited with an efficient algorithm that motivates and leads into recurrences. Solving recurrences using recurrence trees, repeated substitution, statement of master theorem. Brief recall of merge sort and its recurrence. Median in worst case linear time.

Unit 3

Application of Graph Traversal Techniques: Recall representation of graphs, BFS (as a method for SSSP on unweighted graphs), DFS, connected components, topological sorting of DAGs, biconnected components, and strongly connected components in directed graphs Greedy Algorithms: Greedy choice, optimal substructure property, minimum spanning trees -- Prims and Kruskals, Dijkstra's shortest path using arrays and heaps, fractional knapsack, and Huffman coding (use of priority queue).

Unit 4

Dynamic Programming: Integral knapsack (contrasted with the fractional variant), longest increasing subsequence, Edit distance, matrix chain multiplication, and independent sets in trees. (The instructor may choose a subset that fits within the time frame.)

Unit 5

NP- completeness: reduction amongst problems, classes NP, P, NP- complete, and polynomial time reductions.

Suggested Reading

1. Introduction to Algorithms, by Cormen, Leiserson, Rivest, and Stein, MIT Press, Third Edition, 2009. [CLRS]
2. Algorithms, by Dasgupta, Papadimitrou and Vazirani, McGraw- Hill Education, 2006
3. Computer Algorithms, by Horowitz, Sahni, and Rajasekaran, Silicon Press, 2007

CENTRE FOR DISTANCE AND ONLINE EDUCATION

Course Name: **Computer Networks**

Course Code : **CA-2004** Total Credits : **05 (3+2)**

Aim of the Subject

Understand the fundamental concepts and basic principles of computer networks

Objectives

1. Develop a knowledge of the function of basic concepts of computer network systems.
2. Understanding basic design principles in network protocols and Internet protocols.
3. Gain an understanding of the principles of operation of a wide variety of network
4. technologies.
5. Develop an appreciation of how network services are developed and a knowledge of their uses.

Learning Outcomes

1. Familiarity with network terminologies, reference model, applications of network, design issues and computer network working.
2. Knowledge of Data link layer design issues, Framing, Error correction and Detection techniques.
3. Meaning of flow control and its methods.
4. Problems associated with broadcast network and multiple access control protocols.
5. Knowledge of LANs.
6. . Design issues related to Network layer l ike routing, addressing and their protocols.
7. Introductory knowledge of Transport layer protocols like TCP and UDP.
8. Idea about client server architecture and working of DNS, HTTP and E Mail.
9. Security issues in computer network and Introduction to Cryptographic algorithms and Digital Signature.

Course Contents

Unit 1

Introduction: Overview, Goal and Applications of Computer Networks; Network Classification - LAN, MAN, WAN, Internetworks and topologies; Network Software - Protocol hierarchies, Design issues for the layers, Connection Oriented and Connection less services, Service primitives, Relationship between Services and Protocols; Switching Techniques – Circuit Switching and Packet Switching; Reference models – OSI and TCP/ IP, comparison and critique of OSI and TCP/ IP
reference models.

Physical layer: Guided Transmission Media- Magnetic Media, Twisted Pairs, Coaxial Cable, Power Lines, Fiber Optics; Wireless Transmission- Electromagnetic Spectrum, Radio Transmission, Microwave Transmission; digital modulation and multiplexing; The public switched telephone network - Structure of telephone network; The mobile telephone system - Generations of mobile phones.

Unit 2

Data Link Layer: Design issues – Services, Framing, Error Control and Flow Control; Error Detection Techniques - Parity Check and Cyclic Redundancy Check (CRC); Error Correction Technique - Hamming code; Elementary Data Link Protocols - Unrestricted Simplex Protocol, Simplex Stop- and- Wait Protocol; Sliding Window Protocols - One-Bit Sliding Window Protocol, protocol using Go Back N and Selective Repeat; Data link layer in the Internet - PPP.

Unit 3

Medium Access Sublayer: Channel Allocation problem; Multiple access protocols- Pure Aloha, Slotted Aloha, CSMA Protocols, CSMA/ CD, Collision-Free Protocols, wireless LAN protocols; IEEE MAC Sublayer protocols - Ethernet, Fast Ethernet, Gigabit Ethernet, wireless LANs and broadband wireless, Bluetooth; High speed LANs – Fast Ethernet, FDDI; Wireless LANs; Data Link Layer Switching – Bridges and Switches, their difference with Repeaters, Hubs, Routers and Gateways.

Unit 4

Network Layer: Design issues - Store-and-forward packet switching, services, implementation of connectionless and connection- oriented service, VC and datagram networks; Routing algorithms - Optimality Principle, Shortest Path Routing, Flooding, Distance Vector Routing, Link State Routing, Hierarchical Routing, Broadcast Routing, Multicast Routing, routing in Mobile hosts, routing in Ad Hoc networks; Congestion Control algorithms - General principle of Congestion control, leaky bucket algorithm, Token Bucket Algorithm; Internetworking - network difference, network connection, tunneling; The Network Layer in the Internet - Internet Protocol, Internet addressing and Internet Control protocols, ARP, DHCP and Mobile IP, Internet routing protocols - RIP, OSPF, BGP.

Unit 5

Transport Layer: Transport Services; Elements of transport protocols - Addressing, Connection establishment, Connection release, Error control and Flow control, Multiplexing; The Internet Transport Protocols - UDP and TCP, The TCP Service Model, The TCP Protocol.

Application layer: DNS, E- mail Protocols (SMTP, POP 3, IMAP, MIME), WWW and HTTP, FTP, TELNET; Network Security - Cryptography, Symmetric Key Algorithms, Public key Algorithms and Digital Signatures

Suggested Reading

1. Andrew S. Tanenbaum and David J. Wetherall, Computer Networks, 5 th Edition.
2. Pearson- Prentice Hall, 2011 . 1 . Behrouz A. Frouzan, Data Communications and Networking, McGraw-Hill Education, 5 th Edition, 2013.
3. William Stallings, Data and Computer Communications, Pearson- Prentice Hall, 8 th Edition, 2007.

CENTRE FOR DISTANCE AND ONLINE EDUCATION

Course Name: **Internet and Web Technology**

Course Code : **CA-2005** Total Credits : **06 (3+2+1)**

Aim of the Subject

To give students a good understanding of basic concepts of object-oriented program design with the help of real world problem solving using JAVA. Enable students to develop web applications through web technology and database collaboration, especially through JSP and Servlet.

Objectives

To Briefly describe any course development objectives that are being implemented. (eg increased use of IT or web based reference material, changes in content as a result of new research in the field). As the technologies in Java are changing frequently so with the textbook, latest changes will also be incorporated in the course using web- based material. Students will also be given programming examples and exercises on every topic. The programming assignments will be checked every week in the computer-lab

Learning Outcomes

1. Understand basic principles of object-oriented program design using Java.
2. Understand the basic and some advanced issues related to writing classes and methods such as data, visibility, scope, method parameters, object references, and nested classes.
3. Understand the basic ideas behind class hierarchies, polymorphism, and programming to interfaces.
4. Get exposure to exceptions and basic I/O streams.
5. Understanding the concept and configuration of servers and web technology basics and their challenges.
6. Understanding various concepts related to collaboration, database handling inside web application.
7. Develop solid Java programming skills and the ability to put in practice the acquired knowledge and understanding of the Java language, object- oriented design and web applications in relatively simple case studies

Course Contents

Unit 1

Introduction to Java: Features of Java, Object- oriented Programming Overview, Introduction of Java Technologies, JVM architecture and i ts components, Java Program structure, Tokens, Control Constructs, Memory concepts, Introduction to Class, Objects, Methods and Instance Variables, Naming Conventions, Constructors, Method Overloading, Static Method, Static Field, Math Class, this reference, Garbage collection and finalize. String Handling: The String Constructors, String Operations, Character Exaction, String Comparison, String Buffer. Arrays: Creating an array, Enhanced for Statement, Passing Multidimensional Arrays, Variable-Length Argument l ists, Using Command- l ine Arguments. Wrapper Class: Introduction to wrapper classes. Inheritance: Relationship between Super classes and Subclasses, Using super, Constructor in Subclasses, The Object Class, Object Copying in Java. Polymorphism: Method Overriding, Upcasting, Dynamic Method Dispatch, final Field, Method and classes, Abstract classes and Methods.

Unit 2

Packages and Interfaces: Defining a Package, Understanding CLASSPATH, Access Protection, Importing packages, Creating own Packages. Defining an Interface, Properties of Interface, Advantages of Interface Achieving Multiple Inheritance through Interfaces, Variables in Interfaces, Exception Handling: Introduction, keywords, Types of Exceptions, Java Exception Hierarchy, f inally Block, Chained Exceptions, Declaring new Exception Types. Streams and Files: Introduction, Data Hierarchy, Files and Streams, Sequential- access Text

Files, Object Serialization, Random- Access f i les, Java Stream Class Hierarchy. Applets: Applet Basics, Applet Architecture, Applet Life Cycle Methods, Applet HTML Tag and Attributes, Executing Applet in Web Browser and in Applet viewer.

Unit 3

Multithreading: Introduction, Java Thread Model, Thread priorities, Thread life cycle, Creating Thread, Thread Execution, Thread Synchronization, Inter- Thread Communication. Introduction To GUI: Introduction, Overview of swing Components, Introduction to Event Handling, Common GUI Event Type and Listener Interfaces, Adapter Classes, Layout Managers, Database connectivity through different databases.

Unit 4

Introduction to HTTP, web Server and application Servers, Installation of Application servers, Deployment Descriptors, The Generic Servlet, Lifecycle of Servlet. Servlet Packages, Classes, Interfaces and Methods, Handling Forms with Servlet. Session handling API, Servlet Collaboration, Attributes and various scopes of an Attribute.

Unit 5

JSP Basics: JSP l i fecycle, Directives, scripting elements, standard actions, implicit objects, Session handling in JSP, Separating Business Logic and Presentation Logic, Building and using Java Bean. MVC Architecture, Database operations handling in Web applications.

Suggested Reading

1. M. Hall, L. Brown, " Core Servlets and Java Server Pages", 2 nd edition, Pearson Education
2. Java The Complete Reference by Herbert Schildt, Tata Mc Graw- Hill, 8th Edition, 2011.
3. C. Bauer, G. King, "Hibernate in Action", Manning Press
4. B. Basham, K. Sierra, B. Bates, " Head First Servlet and JSP", 2nd Edition, O'Reilly Media.
5. The Java Programming Language, Ken Arnold , James Gosling , David Holmes.

Centre for Distance and Online Education
Devi Ahilya Vishwavidyalaya, Indore

MCA (ODL)

Semester – III -IV
Course Scheme & Syllabus

(Open and Distance Learning)

Centre for Distance and Online Education
Devi Ahilya Vishwavidyalaya, Indore

MCA (ODL), Semester – III

Course Scheme & Syllabus

Course Code	Course Name	Credit (T+P+MP/Case Study)	Marks Allotted			
			Max. End Semester Exam Marks	Max. Internal Marks for Assignments	Max. Practical/ Project Mark	Total
CA-3001	Automata Theory and Compiler Construction	5 (3+2)	70	10	20	100
CA-3002	Cloud Computing	5 (3+2)	70	10	20	100
CA-3003	Artificial Intelligence and Machine Learning	5 (3+2)	70	10	20	100
CA-3004	Information Security	5 (3+2)	70	10	20	100
CA-3005	Internet of Things	5 (3+2)	70	10	20	100
CA-CV03	Comprehensive Viva	4	--	--	--	100
Total		**29**				**600**

MCA (ODL), Semester – IV

Course Code	Course Name	Credit (T+P+MP/Case Study)	Marks Allotted			
			Max. End Semester Exam Marks	Max. Internal Marks for Assignments	Max. Practical/ Project Mark	Total
CA-PR01	Project	12	-	-	-	100

CENTRE FOR DISTANCE AND ONLINE EDUCATION

Course Name: **Automata Theory and Compiler Construction**

Course Code : **CA-3001** Total Credits : **05 (3+2)**

Aim of the Subject

The aim of this course is to provide students the theoretical knowledge needed to understand and analyze the behavior of discrete computing systems as well as abilities to design and implement compilers.

Learning Outcomes

The students are expected to learn following after completion of the course:

- Adequate knowledge to understand abstract machine models and formal languages.
- Basic knowledge of compilation steps; ability to apply automata theory and knowledge on formal languages.
- Ability to design and implementation scanner modules in compilers.
- Ability to identify and select suitable parsing strategies for various cases.

Course Contents

Unit 1

Introduction: Alphabets, Strings and Languages; Automata and Grammars, Deterministic finite Automata (DFA)-Formal Definition, Simplified notation:
State transition graph, Transition table, Language of DFA, Nondeterministic finite Automata (NFA), Equivalence of NFA and DFA, Minimization of Finite
Automata, Regular Expressions, Arden's theorem.

Unit 2

Compiler Structure: Compilers and Translators, Various Phases of Compiler, Pass Structure of Compiler, Bootstrapping of Compiler. Lexical Analysis: The role of Lexical Analyzer, A simple approach to the design of Lexical Analyzer, Implementation of Lexical Analyzer. The Syntactic Specification of Programming Languages: CFG, Derivation and Parse tree, Ambiguity, Capabilities of CFG.
Basic Parsing Techniques: Top-Down parsers with backtracking, Recursive Descent Parsers, Predictive Parsers

Unit 3

Bottom–up Parsers, Shift-Reduce Parsing, Operator Precedence Parsers, LR parsers (SLR, Canonical LR, LALR) Syntax Analyzer Generator: YACC,
Intermediate Code Generation: Different Intermediate forms: three address code, Quadruples & Triples. Syntax Directed translation mechanism and attributed definition. Translation of Declaration, Assignment, Control flow, Boolean expression, Array References in arithmetic expressions, procedure calls, case statements, postfix translation.

Unit 4

Run Time Memory Management: Static and Dynamic storage allocation, stack based memory allocation schemes, Symbol Table management Error Detection and Recovery: Lexical phase errors, Syntactic phase errors, Semantic errors.

Unit 5

Optimization and Code Generation: Local optimization, Loop optimization, Peephole optimization, Basic blocks and flow graphs, DAG, Data flow analyzer, Machine Model, Order of evaluation, Register allocation and code selection.

Suggested Reading

1. Hopcroft, Ullman, "Introduction to Automata Theory, Languages and Computation", Pearson Education.
2. 2. Alfred V Aho, Jeffrey D. Ullman, "Principles of Compiler Design", Narosa.
3. Michal Sipser, "Theory of Computation", Cengage learning.
4. K.L.P. Mishra and N.Chandrasekaran, "Theory of Computer Science : Automata, Languages and Computation",PHI.
5. Louden, "Compiler construction", Cengage learning.
6. A.V. Aho, R. Sethi and J.D

CENTRE FOR DISTANCE AND ONLINE EDUCATION

Course Name: **Cloud Computing**

Course Code : **CA-3002** Total Credits : **5 (3+2)**

Aim of the Subject

To provide students with the fundamentals and essentials of Cloud Computing, thus creating a sound foundation while enabling students to start using and adopting Cloud Computing services and tools in their real-life scenarios.

Learning Outcomes

The students are expected to learn following after completion of the course:

- Learn the main concepts, key technologies, strengths, and limitations of cloud computing and the possible applications for state-of-the-art cloud computing
- Identify the architecture and infrastructure of cloud computing, including SaaS, PaaS, IaaS, public cloud, private cloud, hybrid cloud, etc.
- Learn Hands-on exercises on AWS, Salesforce and Google Cloud.
- Understanding of appropriate cloud computing solutions and recommendations according to the applications.
- Learn the core issues and latest trends and technologies of cloud computing.

Course Contents

Unit 1

Introduction to cloud computing, History, Importance of cloud computing in the current era, characteristics of cloud computing, what cloud computing really is and isn't, pros and cons of cloud computing, technologies in cloud computing, migrating into cloud.

Unit 2

Types of clouds, cloud infrastructure, cloud application architecture, working of cloud computing, trends in cloud computing, cloud service models, cloud deployment models, cloud computing and services pros and cons.

Unit 3

Cloud computing technology, cloud life cycle model, role of cloud modelling and architecture, cloud system architecture, virtualization, types of virtualization, importance and limitations of various types of virtualization, virtualization in cloud computing.

Unit 4

Data storage, introduction to enterprise data storage, data storage management, file system, cloud data stores, cloud storage characteristics, applications utilizing cloud storage.

Unit 5

Introduction to web services, cloud service deployment tools, management/ administrative services, risk management in cloud computing, introduction to apache Hadoop.

Suggested Reading

1. Cloud Computing: A practical approach for learning and implementation, 1st edition, Pearson, A. Srinivasan, J. Suresh.
2. Investigating various tools such as VMWare, Eucalyptus etc.
3. Examining cloud applications in context to social networking, email, document/ spreadsheet hosting services etc. and various Google cloud applications.

CENTRE FOR DISTANCE AND ONLINE EDUCATION

Course Name: **Artificial Intelligence and Machine Learning**

Course Code : **CA-3003** Total Credits : **5 (3+2)**

Aim of the Subject

The aim is to instruct students in the foundational ideas and game-changing applications of artificial intelligence and machine learning.

Learning Outcomes

The students are expected to learn following after completion of the course:

- The students are expected to learn the following after completion of the course: 1. Fundamental concepts of Artificial Intelligence & Machine Learning
- Innovative solutions to challenging problems in the field of Artificial Intelligence & Machine Learning.
- Real world applications and projects.

Course Contents

Unit 1

Overview of AI: AI: past, present, and future. Search: Depth- First Search, Breadth- First Search, Greedy Best-First Search, A* Search, Adversarial Search, Alpha-Beta Pruning, Depth- Limited Minimax. Knowledge: Knowledge- Based Agents, Propositional Logic, Inference, Knowledge Engineering, Inference Rules, Knowledge and Search Problems, Resolution, First Order Logic.

Unit 2

Uncertainty: Probability, Conditional Probability, Random Variables, Bayes' Rule, Bayesian Networks, Inference, Sampling, Likelihood Weighting, Markov Models, Hidden Markov Models. Optimization: Local Search, Hill Climbing, Simulated Annealing, Traveling Salesman Problem, Linear Programming, Constraint Satisfaction, Backtracking Search.

Unit 3

Machine Learning : Definition and overview, Regression, Simple Linear Regression, Multiple Regression, Assessing Performance, Ridge Regression, Feature Selection & Lasso, Nearest Neighbors & Kernel Regression.

Unit 4

Machine Learning : Classification, Linear Classifiers & Logistic Regression, Learning Linear Classifiers, Overfitting & Regularization in Logistic Regression, Decision Trees, Handling Missing Data, Boosting.

Unit 5

Neural Networks: Activation Functions, Neural Network Structure, Gradient Descent, Multilayer Neural Networks, Backpropagation, Overfitting, Computer Vision, Image Convolution, Convolutional Neural Networks, Recurrent Neural Networks.

Suggested Reading

1. Artificial Intelligence: A Modern Approach (3rdedition), Russell and Norvig. [2] Tom Mitchell, Machine Learning, First Edition, McGraw Hill, 1997.
2. CS50 's Introduction to Artificial Intelligence with Python MOOC of Harvard.

CENTRE FOR DISTANCE AND ONLINE EDUCATION

Course Name: **Information Security**

Course Code : **CA-3004** Total Credits : **05 (3+2)**

Aim of the Subject

The main aim of this course is to provide students with a background, foundation, and insight into the many dimensions of information security.

Learning Outcomes

The students are expected to learn following after completion of the course:

- Basic security concepts as confidentiality, integrity, and availability, which are used frequently in the field of information security.
- Symmetric and public-key based asymmetric algorithms for encryption-based security of information.
- The access control mechanism used for user authentication and authorization.

Course Contents

Unit 1

Computer Security Concepts: Introduction to Information Security, Confidentiality, Integrity; Attacks and Threats: Attacks Threatening Confidentiality, Attacks Threatening Integrity, Attacks Threatening Availability; Active versus Passive attacks; Security Services, Security Mechanisms etc.

Unit 2

Symmetric Cipher Model: Cryptography, Cryptanalysis and Brute-Force Attack; Substitution Techniques: Caesar Cipher, Monoalphabetic Ciphers, Playfair Cipher, Hill Cipher; Polyalphabetic Ciphers, One-Time Pad; Transposition ciphers: keyless transposition ciphers, keyed transposition ciphers, combining two approaches; Steganography etc.

Unit 3

Stream Ciphers and Block Ciphers, Synchronous and Non-synchronous Stream Ciphers, Attacks on Block Ciphers, Substitution and Transposition, P-Boxes and S-Boxes, Diffusion and Confusion, Feistel Cipher, DES Encryption and Decryption, Double and Triple DES, Strength and weakness of DES etc

Unit 4

AES General Structure, AES-128, AES-192 and AES-256, AES Transformation Functions: Substitute Bytes Transformation, Shift Rows Transformation, Mix Columns Transformation, Add Round Key Transformation, Strength and weakness of AES; Use of modern block ciphers:
Electronic Codebook (ECB) Mode, Cipher Block Chaining (CBC) Mode, Cipher Feedback (CFB) Mode, Output Feedback (OFB) Mode and Counter (CTR) Mode; Use of stream ciphers: RC4 238 and A5/1

Unit 5

Public-Key Encryption, Introduction to Public-Key Cryptography, Public-Key Encryption Algorithms, RSA Public-Key Algorithm, Diffie-Hellman Algorithm; Access Control Mechanisms, Authentication, Access Control and Authorization, Security Protocols and Solutions, Internet Protocol Security, Firewalls, Intrusion Detection, and Intrusion Prevention.

Suggested Reading

1. William Stallings,"Cryptography and Network Security: Principles and Practice", 6th Edition, Pearson/Prentice- Hall.
2. Behrouz A. Forouzan "Introduction to Cryptography and Network Security", McGraw-Hill Higher Education, 2008
3. Atul Kahate; "Cryptography and Network Security"; Tata McGraw-Hill
4. Mathew Bishop; Computer Security; Art and Science; Addison-Wisley Oct.

CENTRE FOR DISTANCE AND ONLINE EDUCATION

Course Name: **Internet of Things**

Course Code : **CA-3005** Total Credits : **05 (3+2)**

Aim of the Subject

To impart knowledge with a solid theoretical foundation, and strong practical skills in the fields of computer technology, communications networks and IT, that are required to develop a wide range of IoT applications.

Learning Outcomes

The students are expected to learn following after completion of the course:

- Understand IoT concepts, Its software, hardware components and communication technologies involved in IoT.
- Challenges of IoT application deployment in secured cloud environments.
- Exposure to real life projects and applications.
- Handling voluminous data through Data Analytics techniques.

Course Contents

Unit 1

Introduction to IoT: Definition, Characteristics, IoT design principles, Physical Design of IoT - Hardware and Software components; Logical Design of IoT- functional blocks, IoT communication models, Communication APIs; IoT network architecture, IoT enabling technologies, Introduction to cloud computing in IoT, advantages and disadvantages of IoT, IoT implementation challenges.

Unit 2

Domain specific IoTs: Introduction, home automation, cities, environment, energy, retail, logistics, agriculture, industry, health and lifestyle.

IoT and M2M: Introduction, machine-to-machine Communication, difference between IoT and M2M; SDN and NFV for IoT - Software Defined Networking, Network Function Virtualization.

Unit 3

Data Acquiring, Organizing and Processing: Introduction, data generation, data acquisition, data validation; Data categorization for storage, various types of data stores, organizing the data, transactions, business processes, integration; Online transactions and processing, stream processing, real-time processing, event stream processing, business process, business intelligence, distributed business process, enterprise systems, service oriented architecture(SOA).

Unit 4

Data Analytics and Machine Learning for IoT: Analytics phases - descriptive, predictive, and prescriptive analytics; Online analytical processing; Introduction to statistical and machine learning tools for data analytics; Introduction to Big data, Big data characteristics, Big data analytics.

Role of the cloud in IoT: Cloud Storage models and communication APIs for IoT, Security in IoT: Security challenges for IoT, IoT security practices.

Unit 5

Introduction to Arduino Programming: Familiarizing with Arduino Interfacing Board, configuration and architecture, Arduino IDE installation, program structure, data types, variables and constants, operators, control statements and loops, functions, strings, time, arrays, function libraries: I/O functions, Character functions, Math library, Interrupts, Communications. Integration of Sensors and Actuators with Arduino;

Suggested Reading

1. Arshdeep Bahga and Vijay Madisetti, “Internet of Things - A Hands-On Approach”, Universities Press (India) Private Limited, First edition, 2015.
2. Mayur Rangir, "Internet of Things - Architecture, Implementation and Security", Pearson India Education Services Pvt. Ltd. First edition, 2020.

3. Raj Kamal, “Internet of Things: Architecture and Design Principles”, McGraw Hill Education, India, First Edition, 2017.
4. Simon Monk, “Programming Arduino: Getting Started with Sketches”, McGraw Hill Publication; 1st edition, 2012.
5. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, “From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence”, 1st Edition, Academic Press Inc., 2014.

MCA (ODL), Semester – IV

Course Code	Course Name	Credit (T+P+MP/Case Study)	Marks Allotted			
			Max. End Semester Exam Marks	Max. Internal Marks for Assignments	Max. Practical/ Project Mark	Total
CA-PR01	Project	12	-	-	-	100