

AHMEDABAD UNIVERSITY
Master of Computer Applications (M.C.A.)
With Effect From July 2009

First Year MCA :

Trimester III

Subject Code: MCA 131

Subject Name: Operating Systems

Lectures per week (hours) : 3 Lectures + 1 Tutorial

Practicals per week (hours) : 3

Internal Assessment : 50 Marks

External Assessment : 50 Theory + 50 Practical Marks

Total Credits : 7

Prerequisite: Basic knowledge of Computer System peripherals and its functionality.

Aim:

The course is aimed to provide knowledge about the Operating of various components of Computer System.

Objectives:

- (1) To understand the concept, structure and mechanism of Operating Systems.
- (2) To understand the complex interaction among various parts of systems.
- (3) To present nature and characteristics of Modern Operating Systems.
- (4) To make students familiar with multi-user and multitasking Operating System.

| Unit No. | Topics to be Covered | No. of Lectures | Marks per Unit |
|-----------------|--|------------------------|-----------------------|
| Unit I | <p>Computer System Overview Basic Elements, Processor Register, Instruction Execution, Interrupt and Interrupt Processing, Memory Hierarchy</p> <p>Operating System Overview Operating System Objective, OS as User/Computer Interface and Resource Manager, Evolution of OS – Serial, Simple Batch and Multiprogrammed Batch Systems, Time Sharing, Levels of OS</p> <p>Process Process and Process States, Two State Process Model, Creation and Termination of Process, Five State Process Model, Overview of Suspended Process and OS Control Structure, Process Control Structure, Modes of Execution and Process Switching</p> | 9 | 10 |
| Unit II | <p>Threads & SMP</p> | 9 | 15 |

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Process & Thread, Multithreading and Thread Functionality , SMP Architecture and Organization and Overview of Microkernel

Concurrency: Mutual Exclusion & Synchronization
Principles of Concurrency, Race Condition, Process interaction, Competition among Process for Resources, Requirement of Mutual Exclusion, Semaphore, Producer / Consumer problem using Semaphore

Concurrency: Deadlock and Starvation
Principle of Deadlock, Types of Resources, Resource Allocation Graph, Conditions for Deadlock, Deadlock Prevention, Overview of Deadlock Avoidance and Detection

| | | | |
|----------|---|-----------|-----------|
| Unit III | Memory Management Requirement, Memory Partitioning, Fixed and Dynamic ,Paging and Segmentation Virtual Memory Locality and Virtual Memory, Virtual Paging, TLB, Virtual Segmentation, OS System Software Uniprocessor Scheduling Types of Processor Scheduling, Scheduling Algorithm – Scheduling Criteria, Alternative Scheduling Policies (FCFS, RR, Overview of SPN & SRT) | 9 | 15 |
| Unit IV | I/O Management and Disk Scheduling I/O Devices, DMA, I/O Buffering, Disk Scheduling, Overview of RAID File Management File and File System, File Architecture, File Organization and Access, Secondary Storage Management ,Free Space Management Security Security Threats, Overview of Protection, Intruders | 9 | 10 |
| | Total | 36 | 50 |

Outcomes:

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

1. Students will be able to know the operating platform.
2. Students will be familiar with functional units of Operating System.
3. To generate and execute the shell scripts.

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Prescribed Reference Books:

- (1) Operating Systems: Internals and Design Principles, William Stallings, PHI, Fifth Edition.
- (2) Unix Concepts and Applications, Sumitabha Das, Tata McGraw-Hill, Fourth Edition

Additional Reference Books:

- (1) Operating Systems Design and Implementation, Andrew Tananbaum, Pearson Education, Fourth Edition
- (2) Operating Systems Concepts and Design, Milan Milenkovic, Tata McGraw-Hill, Second Edition.
- (3) Unix Shell Programming, Yashavant Kanetkar, BPB Publications.

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Subject Code: MCA 131 **Subject Name:** Operating Systems
Practicals per week (hours) : 4
Total Marks (Practical Exam) : 50

Topics to be covered in Practical Sessions

| Sr. No. | Topics to be Covered | No. of Practicals |
|----------------|--|------------------------------|
| 1 | Understanding Unix Commands Locating Commands, Internal and External Commands, Arguments option and file names General Purpose Utilities Banner, cal , date ,who, tty, uname, passwd, echo, tput, bc, script, spell, ispell File Systems Parent child relationship, concept of path, various directories, ls, mkdir, cd, rmdir, pwd, and path. | 7 |
| 2 | Handling ordinary Files cat, ap, rm, mv, more, file, wc, od, split, cmp, comm, and diff. The Shell sh command, pattern matching, wild card characters , escaping, quoting, redirection, special files, pipes and tees The vi editor Practical Implementation of Mutual Exclusion - Producer Consumer Problem | 6 |
| 3 | Basic File Attributes Listing file attributes, directory attributes ,file permission, chmod, chgrp, chown, ln Simple Filters Head, tail , cut , paste, sort, uniq, nl , tr | 6 |
| 4 | Regular Expression and grep family Shell Programming Shell scripts, read, command line argument, exit status, logical operators, if, case, expr, while, for. | 8 |
| | Total | 27 |

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First Year MCA :

Trimester III

Subject Code: MCA 132 **Subject Name:** Object Oriented Concepts and Programming with C++

Lectures per week (hours) : 3 Lectures + 1 Tutorial
Practicals per week (hours) : 4
Internal Assessment : 50 Marks
External Assessment : 50 Marks Theory + 50 Marks Practical
Total Credits : 8

Prerequisite: Programming using C and C++ (Trimester II subject)

Aim

To learning object-oriented concepts and their applications using C++ programming language

Objectives

- Differentiate between procedural programming approach and object-oriented programming (OOP) approach and the advantages of OOP approach to real-life software application development.
- Learn object-oriented concepts and their application using C++ language to develop efficient and maintainable solutions to various programming problems.
- Learn ANSI C++ language and its various features.
- To provide a strong foundation for the students for learning modern day object-oriented technologies like JAVA, .NET and PHP.

Course Contents:

| Unit No. | Topics to be Covered | No. of Lectures | Marks per Unit |
|-----------------|--|------------------------|-----------------------|
| Unit I | Introduction to Classes, objects, static members, Constructors and Destructors Classes and objects, Memory allocation for objects, Static-members of class, static data-members and static methods, array of objects, const member functions, Constructors and their use, Multiple constructors in a class, parameterized constructors, constructors with default arguments, constructing two-dimensional arrays, constant objects, dynamic initialization, dynamic memory allocation, copy constructors, member initialization list, destructors. | 9 | 12 |

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|----------|---|---|----|
| Unit II | Operator overloading Friend functions, function with object as arguments, defining operator overloading, process of overloading, overloading unary operators, overloading binary operators and their usage, overloading binary operators using friend functions, manipulation of strings using operators (brief idea of inbuilt ANSI C++ string class and its overloaded operators), rules for overloading operators, user defined conversions: basic to class type, class to basic type, one class to another class type, using friends functions for operator overloading Templates Introduction to generic programming and software reusability, its advantages, types of templates: function template and class template, single argument function templates, instantiation, function templates with multiple arguments, function templates with two generic arguments and non-generic arguments, template argument deduction, explicitly specializing a template function, overloading a generic function with another generic function, class templates, defining functions of class template outside class, class instantiation, using non-type arguments in template class, using default arguments in template class. | 9 | 13 |
| Unit III | Inheritance Advantages of inheritance, implementation of inheritance in C++ object model, Types of inheritance, use of protected access specifier in inheritance, public, private and protected modes of inheritance, defining a derived class from a single base class using public modifier, deriving multiple classes from single base class and its example, multiple inheritance with example, drawbacks of multiple inheritance, virtual base class and why it is required, abstract class, rules of constructors and destructors in inheritances, composite (container) objects Runtime polymorphism using Virtual Functions Polymorphism, different types and its importance, difference between compile-time and run-time polymorphism, pointer to objects, array of pointers to objects, this pointer, virtual functions and achieving runtime polymorphism, virtual destructors, pure virtual functions. | 9 | 13 |
| Unit IV | IO streams and formatted IO Predefined Streams, advantages of using C++ IO over C I/O, new features in ANSI C++ IO, hierarchy of C++ | 9 | 13 |

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stream classes, formatted and unformatted I/O, put and get member functions, using getline, read and write functions with their programs, using formatting flags in ios class, setting and clearing format flags, using setf function with two arguments, manipulators, differences between manipulators and ios functions, using manipulators for toggle effect, short hand manipulators, creating your own manipulator, usage of custom manipulator with a report printing program

Using files for IO

Hierarchy of file IO classes, opening and closing files using constructors and open function, creating file input stream and file output streams, using overloaded input and output operators for file IO, checking the end of file, using get, put and getline functions, different file modes, file pointers and their manipulations (seekg and seekp), random access using seek functions, differences between text and binary streams, dealing with binary files, binary read and write functions, reading and writing class objects (object persistence and serialization)

Namespaces

Introduction to namespaces, name conflict problem, scope operator and fully qualified names, using declaration and using directive, defining namespaces with variables only, defining functions inside namespace, defining classes inside namespace, nested namespaces, std namespace.

Total

36

50

Prescribed Reference Books:

- The Complete Reference C++ by Herbert Schildt (Fourth edition)
- Programming with ANSI C++ by Bhushan Trivedi, Oxford University Press (First Edition)

Additional Reference Books:

- Object oriented programming with C++ by E Balagurusamy (Third Edition)
- Object oriented Programming in Turbo C++ by Robert Lafore (First Edition, 2002)
- Let Us C ++ by Yashwant Kanitkar

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Subject Code: MCA 132 **Subject Name: Object Oriented Programming with C++**
Practical per week (hours) : 4
Total Marks (Practical Exam) : 50

Topics to be covered in Practical Sessions

| Sr. No. | Topics to be Covered | No. of Practical (Hours) |
|----------------|--|---|
| 1.0 | Classes, objects, static members, Constructors and Destructors Classes and objects, Static-members of class, static data-members and static methods, array of objects, const member functions, Constructors and their use, Multiple constructors in a class, parameterized constructors, constructors with default arguments, constructing two-dimensional arrays, constant objects, dynamic initialization, dynamic memory allocation, copy constructors, member initialization list, destructors. | 09 |
| 2.0 | Operator overloading Friend functions, function with object as arguments, overloading unary operators, overloading binary operators and their usage, overloading binary operators using friend functions, manipulation of strings using operators user defined conversions: basic to class type, class to basic type, one class to another class type, using friends functions for operator overloading Templates function template and class template, single argument function templates, instantiation, example of generic | 09 |

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sorting and need for operator overloading, example of sorting employee objects using generic bubble sort, function templates with multiple arguments, function templates with two generic arguments and non-generic arguments, template argument deduction, explicitly specializing a template function, overloading a generic function with another generic function, class templates, defining functions of class template outside class, class instantiation, using non-type arguments in template class, using default arguments in template class.

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|-----|--|-----------|
| 3.0 | Inheritance Types of inheritance, use of protected access specifier in inheritance, public, private and protected modes of inheritance, defining a derived class from a single base class using public modifier, deriving multiple classes from single base class and its example, multiple inheritance with example, virtual base class, abstract class, rules of constructors and destructors in inheritances, composite (container) objects Runtime polymorphism using Virtual Functions Polymorphism, different types and its importance, difference between compile-time and run-time polymorphism, pointer to objects, array of pointers to objects, this pointer, virtual functions and achieving runtime polymorphism, virtual destructors, pure virtual functions. | 09 |
| 4.0 | IO Streams, Using files for IO and namespaces Using Streams for formatting I/O, manipulators, creating your own manipulator, text and binary streams, dealing with text and binary files, random access using seek. Defining namespaces, nested namespaces, using std namespace. | 09 |
| | Total | 36 |

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First Year MCA :

Trimester III

Subject Code: MCA 133

Subject: Design and Analysis of Algorithms

Lectures per week (hours) : 3 Lectures + 1 Tutorial

Practicals per week (hours) : 4

Internal Assessment : 50 Marks

External Assessment : 50 Marks

Total Credits : 6

Prerequisite: Introduction to Programming using C, Data Structures

Aim:

The course is aimed to introduce the various techniques to solve complex problems.

Objectives:

- (1) Understanding of the concept of algorithm and analysis of its computational complexity.
- (2) Design principles of algorithms and their application to computing problems.
- (3) To make students familiar with analysis of algorithms.

| Unit No. | Topics to be Covered | No. of Lectures | Marks per Unit |
|-----------------|--|------------------------|-----------------------|
| Unit I | Introduction Notion of Algorithm Fundamentals of Algorithmic Solving Important Problem types Fundamentals of the Analysis Framework (T) Asymptotic Notations and Basic Efficiency Classes | 6 | 10 |
| Unit II | Brute Force Technique Selection Sort Bubble Sort (T) Sequential Search Brute-force string matching Divide-and-Conquer Merge sort Quick Sort Binary Search Binary tree- Traversal and Related Properties (T) | 12 | 14 |

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| Unit III | Decrease-and-Conquer Insertion Sort Depth first Search Breadth First Search (T) Transform-and-Conquer Presorting Balanced Search trees AVL Trees Heaps and Heap sort (T) | 9 | 12 |
| Unit IV | Dynamic Programming Warshall's and Floyd's Algorithm Optimal Binary Search trees Greedy techniques Prim's Algorithm Kruskal's Algorithm Dijkstra's Algorithm(T) Huffman trees Introduction to P, NP and NP-Complete problems | 9 | 14 |
| | Total | 36 | 50 |

Outcomes:

Upon the completion of this course, the student will be able to:

1. Design, develop and implement algorithms for complex problems.
2. Analyze and understand the complexity of code.
3. Being able to implement the algorithms in practice
4. Choose the appropriate data structures

Reference Books:

- (1) Introduction to the Design and Analysis of Algorithm, Anany Levitin, Pearson Education Asia, 2003.
- (2) Introduction to Algorithms, T.H. Cormen, C.E. Leiserson, R.L. Rivest and C. Stein, PHI Pvt. Ltd., 2001

Additional Reference Books:

- (1) Computer Algorithms - Introduction to Design and Analysis, Sara Baase and Allen Van Gelder, Pearson Education Asia, 2003.
- (2) The Design and Analysis of Computer Algorithms, A.V.Aho, J.E. Hopcroft and J.D.Ullman, Pearson Education Asia, 2003.

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Subject Code: MCA 133 **Subject Name: Design and Analysis of Algorithms**
Practicals per week (hours) : 4
Total Marks (Practical Exam) : 50

Topics to be covered in Practical Sessions

| Unit No. | Topics to be Covered | No. of practical sessions |
|-----------------|--|----------------------------------|
| 1.0 | Introduction Fundamentals of Algorithmic Solving-paper work Important Problem types Asymptotic Notations and Basic Efficiency Classes | 4 |
| 2.0 | Implementation of Brute Force Technique Selection Sort Bubble Sort (T) Sequential Search Brute-force string matching Implementation of Divide-and-Conquer Merge sort Quick Sort Binary Search Binary tree- Traversal and Related Properties (T) | 10 |
| 3.0 | Implementation of Decrease-and-Conquer Insertion Sort Depth first Search Breadth First Search (T) Implementation of Transform-and-Conquer Presorting Balanced Search trees AVL Trees Heaps and Heap sort (T) | 12 |
| 4.0 | Dynamic Programming Warshall's and Floyd's Algorithm Optimal Binary Search trees Implementation of Greedy techniques Prim's Algorithm Kruskal's Algorithm Dijkstra's Algorithm(T) Huffman trees | 10 |
| | Total | 36 |

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| First Year MCA : | Trimester III |
|-------------------------|----------------------|

Subject Code: MCA 134 **Subject:** Computer Oriented Numerical and Statistical Methods

Lectures per week (hours) : 3 Lectures + 1 Tutorial
Practicals per week (hours) : 2
Internal Assessment : 50 Marks
External Assessment : 50 Marks
Total Credits : 6

Prerequisite:

The basic concepts of trigonometric, logarithmic, exponential and arithmetic functions, polynomial and roots of a polynomial. The basic knowledge of statistics, measures of central tendency, measures of dispersion, correlation and regression.

Aim:

In the modern times, a comprehensive grasp of mathematics and statistics is absolutely necessary for the meaningful study of business problems as well as profit making decisions.. The aim of this course is to teach various quantitative and qualitative methods and tests which help students to select, interpret, analyze and present data.

Objectives:

- (1) To develop the concept of error in various methods
- (2) To explain, calculate and interpret inferential statistics including probability and hypothesis tests.
- (3) To identify and apply the correct statistical technique to the problem.
- (4) To predict the future values using different time series methods.
- (5) To analyze the variance amongst different sample data.
- (6) To identify connections between statistics and the real world.

| Unit No. | Topics to be Covered | No. of Lectures | Marks per Unit |
|-----------------|--|------------------------|-----------------------|
| Unit I | Computer Arithmetic and Iterative Methods Concept of significant digits and precision – Arithmetic operations on floating point numbers – Normalized floating point representation - Definition of error – Types of errors – Overflow and underflow errors | 9 | 12 |

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Categories of iterative methods – Bisection method –
 False Position method – Newton Raphson method –
 Discarte’s rule of sign

Probability and Expectation

Basic Definitions – Approaches of probability –
 Addition and Multiplication rules - Conditional
 probability – Baye’s rule applications

| | | | |
|----------|---|-----------|-----------|
| Unit II | Random variable and Probability distribution Expectation .- Joint probability – Probability mass function – Binomial distribution – Poisson distribution- Geometric distribution – Normal distribution. | 9 | 12 |
| Unit III | Statistical Inference Theory and Non – parametric tests Statistical Inference Theory: (overview of sampling) Type I and Type II error – One tail and Two tail tests – Large Sample tests – Small sample tests Non – parametric tests: Chi square test – Applications of chi square test – Sign test – U test – H test – One sample run test. | 9 | 14 |
| Unit IV | Time Series and Analysis of Variance (ANOVA) Time Series: Definition – Components of Time series – Semi average method – Moving average method – Method of simple average – Ratio to trend method Analysis of Variance (ANOVA): Definition, Assumptions and uses of ANOVA – One way ANOVA – Two way ANOVA | 9 | 12 |
| | Total | 36 | 50 |

Outcomes:

Upon the completion of this course, the student will be able to:

1. Efficiently list the sources of errors in computation
2. Identify correct statistical technique to the problem.
3. Effectively choose proper hypothesis and solve the problem
4. Apply the knowledge of various parametric and non – parametric tests to solve the real life applications.
5. Forecast values using proper time series method.

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Prescribed Reference Books:

- (1) Numerical Methods: Principles, Analyses and algorithms by Srimanta Pal, Oxford Higher Education, First Edition
- (2) Statistical Methods by S.P. Gupta, S. Chand Company Ltd., 1st Edition
- (3) Statistics for Management by R. Levin and D.S. Rubin, PHI Private Ltd., 7th Edition

Additional Reference Books:

- (1) Comprehensive Statistical Methods by P.N. Arora, Sumeet Arora, S. Arora, S. Chand Company Ltd., 2nd Edition.
- (2) Statistics for Managers Using Microsoft Excel by Levine, Stephan, Krehbiel, Berenson, PHI Private Ltd., 4th Edition.
- (3) Statistics: Theory, Methods and Application by D.C. Sancheti and V.K. Kapoor, S. Chand Company Ltd., 7th Edition.
- (4) Business Statistics by A.P. Verma, Asian Books Private Ltd., Third Edition.

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Subject Code: MCA 134 **Subject Name:** Computer Oriented Numerical and
Statistical Methods

Practicals per week (hours) : 2
Total Marks (Practical Exam) : 50

Topics to be covered in Practical Sessions

| Sr. No. | Topics to be covered | No. of Practicals |
|--------------------|---|------------------------------|
| 1.0 | Iterative Methods* | 6 |
| | 1.1 Bisection Method | |
| | 1.2 False Position Method | |
| | 1.3 Newton Raphson Method | |
| | Probability and Expectation | |
| | 1.4 Conditional probability | |
| | 1.5 Baye's Rule | |
| | 1.6 Expectation | |
| 2.0 | Random variable and Probability distribution | 4 |
| | 2.1 Binomial Distribution | |
| | 2.2 Poisson Distribution | |
| | 2.3 Geometric Distribution | |
| | 2.4 Normal Distribution | |
| 3.0 | Statistical Inference Theory and Non – parametric tests | 4 |
| | 3.1 Large Sample Tests | |
| | 3.2 Small Sample Tests | |
| | 3.3 Tests of Number of Successes and Difference between Proportion | |
| | 3.4 Chi – Square Test, Sign Test, H – Test, U – Test One – Sample Run Test | |

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| 4.0 | Time Series and Analysis of Variance (ANOVA) | 4 |
| 4.1 | Moving average | |
| 4.2 | Ratio to trend method | |
| 4.3 | One way ANOVA | |
| 4.4 | Two way ANOVA | |
| | Total | 18 |

* Students will have to explore the above mentioned practical using MATLAB or C.

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First Year MCA :

Trimester III

Subject Code: MCA 135 **Subject:** Management Systems

Lectures per week (hours) : 3 Lectures + 1 Tutorial

Practicals per week (hours) : 0

Internal Assessment : 50 Marks

External Assessment : 50 Marks

Total Credits : 4

Prerequisite: None

Aim:

The course is aimed to help the student understand and appreciate the basic concepts of Management Systems and importance of Management Systems for an organization.

Objectives:

- (1) To understand the basic concept of Management Systems
- (2) To understand the basic functioning of various departments in an organization.
- (3) To gain knowledge of basic financial and cost accounting systems and Analysis and interpretation of financial statements.

| Unit No. | Topics to be Covered | No. of Lectures | Marks per Unit |
|----------|---|-----------------|----------------|
| Unit I | <p>Introduction to Business Systems and Management Information System. Functional departments in Non-Manufacturing Organizations</p> <p>Introduction – Definition – Evolution of modern day concept of MIS – MIS and other disciplines – Manual and automated manifestations – need, Purpose and objective of MIS – Conceptual, logical and physical depiction of MIS - Role and place of MIS in Business Org – Types of Business Org and relevance to MIS – Classification of Info Systems (TPS, MIS, EIS , OIS , DSS, ES) - TPS checks and controls – Functional departments in Nonmanufacturing organizations like Banks and Financial Institutions, Insurance Sector, Hospitality, Healthcare, Transportation etc.</p> | 7 | 10 |

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| Unit II | <p>Functional departments in Manufacturing Organizations and their Functioning Functional departments like Manufacturing, Sales and Marketing, Materials, Research and Development, Finance and Accounting, Transportation and logistics, Share, Human Resources etc., their functioning and the MIS requirement in these departments.</p> | 9 | 15 |
| Unit III | <p>Introduction to Accounting System Role of accounting system in an enterprise, accounting as in information system, basic transactions in business, difference between transactions and events (adjustments), cash and credit transactions, accounting mechanics (procedure), accounting books: journal, ledger and trial balance, interpreting the results using P and L a/c and Balance sheet, recording the transactions in journal (only basic transactions of business), single rule of debit and credit (personal a/c, real a/c and nominal a/c), format of journal and recording the transaction in journal, classifying the transactions in ledger and summarizing using trial-balance, basic adjustments (simple), understand the format and preparing P and L a/c and Balance sheet.</p> <p>Exposure to Tally FAS Basic understanding of Tally as an information system, creation of company and ledgers, voucher entry, how to record basic transactions in Tally, generation of Leger and Trial balance and its effect on Balance sheet.</p> | 12 | 10 |
| Unit IV | <p>Analysis and interpretation of financial statements using ratio analysis Introduction to ratios and their benefits to different stake holders in business, functional classification of ratio analysis, (only basic ratios to be covered) liquidity ratios, profitability ratios, asset turnover ratios, financial structure ratios, duo pont chart (return on investment), calculating different ratios from financial statements (P and L a/c and Balance sheet)</p> <p>Introduction to Cost Accounting Difference between financial accounting and cost accounting, different elements of cost (material, labor and expenses), classification into direct and indirect costs, overheads and classification of overheads, preparing cost sheet, uses of cost accounting,</p> <p>Introduction to Standard costing, variances and variance analysis, calculating material cost variance,</p> | 08 | 15 |

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labor cost variance and overhead variance and simple examples to apply the above variance formulae.

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| Total | 36 | 50 |
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Outcomes:

Upon the completion of this course, the student will be able to:

- (1) Understand and appreciate the basic concepts of Management Systems.
- (2) Understand and appreciate the basic functioning of various departments in manufacturing and nonmanufacturing organizations.
- (3) Understand and appreciate the importance of Financial and cost accounting and able to contribute effectively in the development of such systems.

Prescribed Reference Books:

1. Management Information Systems, Dr Milind Oka, Everest Publishing House, 16th Edition
2. Textbook of financial cost and management accounting, P Periasamy, Himalaya Publishing House, third edition, 2008.
3. Financial Accounting for Business Managers, Asish K Bhattacharyya, PHI, Third Edition, 2008.

Additional Reference Books:

- (1) Management Information Systems Managing the Digital Firm, Laudon and Laudon, Pearson Education, 10th Edition
- (2) Information Systems for Modern Management. Robert G. Murdick, Joel E. Ross, James R. Claggett. PHI, 3rd Edition
- (3) Financial Accounting, R. Narayanaswamy, PHI, Third edition, 2008.
- (4) Accounting and financial management by D R Patel, Atul Prakashan, First edition (2003).