GALGOTIAS UNIVERSITY

(Established under Galgotias University Uttar Pradesh Act No. 14 of 2011)

School of Computing Science and Engineering

Program: MCA

Scheme: 2018 – 2021

Curriculum

Semester 1

Sl. No	Course Code	Name of the Course					Assessment Pattern		
			L	T	P	C	IA	MTE	ETE
1	MCAS1150	Statistical Methods and Numerical Techniques	3	1	0	4	20	50	100
2	MCAS1110	Programming in C	3	0	0	3	20	50	100
3	MCAS1120	Digital Computer Fundamentals	3	1	0	4	20	50	100
4	MCAS1130	Web Designing	3	0	0	3	20	50	100
5	MCAS1140	Introduction to Network	3	0	0	3	20	50	100
6	MCAS1111	Programming in C Lab	0	0	2	1	50	-	50
7	MCAS1131	Web Designing Lab	0	0	2	1	50	-	50
8	MCAS1141	Introduction to Network Lab	0	0	2	1	50	-	50
9	SLMC5011	English Proficiency and Aptitude Building - 1	0	0	4	2	50	-	50
		Total	**15**	**2**	**10**	**22**			

Semester II

Sl No	Course Code	Name of the Course					Assessment Pattern		
			L	T	P	C	IA	MTE	ETE
1	MCAS1210	Python Programming	3	0	0	3	20	50	100
2	MCAS1220	Microprocessors	3	0	0	3	20	50	100
3	SFCM5012	Accounting & Financial Management	3	0	0	3	20	50	100
4	MCAS1230	Object Oriented Paradigm	3	0	0	3	20	50	100
5	MCAS1240	Data and File Structure	3	0	0	3	20	50	100
6	MCAS1211	Python Programming Lab	0	0	2	1	50	-	50
7	MCAS1231	Object Oriented Paradigm lab	0	0	2	1	50	-	50
8	MCAS1241	Data and File Structure Lab	0	0	2	1	50	-	50
9	MCAS1221	Microprocessors Lab	0	0	2	1	50	-	50
10	SLMC5012	English Proficiency and Aptitude Building - 2	0	0	4	2	50	-	50
		Total	**15**	**0**	**12**	**21**			

Semester III

Sl No	Course Code	Name of the Course					Assessment Pattern		
			L	T	P	C	IA	MTE	ETE
1	MCAS2310	Algorithm Analysis & Design	3	0	0	3	20	50	100
2	MCAS2320	Computer Architecture	3	0	0	3	20	50	100
3	MCAS2330	Programming in Java	3	0	0	3	20	50	100
4	MCAS2340	Database Management System	3	0	0	3	20	50	100
5	MCAS2350	Software Engineering	3	0	0	3	20	50	100
6	MCAS2360	Theory of Computation	3	0	0	3	20	50	100
7	SLMC6001	Numerical Aptitude	0	0	4	2	50	-	50
8	MCAS2341	Database Management System Lab	0	0	2	1	50	-	50
9	MCAS2351	Software Engineering Lab	0	0	2	1	50	-	50
10	MCAS2331	Programming in Java Lab	0	0	2	1	50	-	50
11	MCAS2311	Algorithm Analysis & Design Lab	0	0	2	1	50	-	50
		Total Credits							**24**

Semester IV									
Sl No	**Course Code**	**Name of the Course**					**Assessment Pattern**		
			L	**T**	**P**	**C**	**IA**	**MTE**	**ETE**
1	MCAS2410	Computer Networks	3	0	0	3	20	50	100
2	MCAS2461	Internet of Things	3	0	0	3	20	50	100
3	MCAS2462	Advanced Operating System(PBL)	3	0	0	3	20	50	100
4	MCAS2450	Cloud Computing(NPTEL)	3	0	0	3	20	50	100
5		ELECTIVE – I	3	0	0	3	20	50	100
6	SLMC6022	Personality Development and Aptitude Building -3	0	0	4	2	50	-	50
8	MCA9002	Industy Oriented Java	0	0	4	2	50	-	50
9	MCA9003	Industy Oriented Python	0	0	4	2	50	-	50
10	MCAS2411	Computer Network Lab	0	0	2	1	50	-	50
11	MCA9004	iOS, Android APP Development Lab(PBL)	0	0	4	2	50	-	50
		Total	**15**	**0**	**18**	**24**			

Semester V									
Sl No	**Course Code**	**Name of the Course**					**Assessment Pattern**		
			L	**T**	**P**	**C**	**IA**	**MTE**	**ETE**
1	MCAS3510	Data Warehousing & Data Mining	3	0	0	3	20	50	100
2	MCAS3520	Complier Construction	3	0	0	3	20	50	100
3	MCAS3530	Artificial Intelligence	3	0	0	3	20	50	100
4	MCAS3540	Mobile Application Development	3	0	0	3	20	50	100
5	MCAS3550	Big Data Technologies & Analytics	3	0	0	3	20	50	100
6	MCAS3581	Project-I	0	0	0	5	50	-	50
7		Elective-II	3	0	0	3	20	50	100
8	MCAS3541	Mobile Application Development Lab	0	0	2	1	50	-	50
		Total	**18**	**0**	**2**	**24**			

Semester VI									
Sl No	**Course Code**	**Name of the Course**					**Assessment Pattern**		
			L	**T**	**P**	**C**	**IA**	**MTE**	**ETE**
1	MCAS3681	Project-2		-	-	15	50	-	50
		Total				**15**			

List of Electives

Basket-1

Sl No	**Course Code**	**Name of the Electives**					**Assessment Pattern**		
			L	**T**	**P**	**C**	**IA**	**MTE**	**ETE**
1	MCAS9110	Cloud Security	3	0	0	3	20	50	100
2	**MCAS9463**	**Cyber Security**	**3**	**0**	**0**	**3**	20	50	100
3	MCAS9130	Network Security	3	0	0	3	20	50	100

Basket-2

Sl No	Course Code	Name of the Elective					Assessment Pattern		
			L	T	P	C	IA	MTE	ETE
1	MCAS9210	Information Retrieval	3	0	0	3	20	50	100
2	MCAS9220	Data Science	3	0	0	3	20	50	100
3	MCAS9230	Network Management & System Administration	3	0	0	3	20	50	100

Detailed Syllabus

Name of The Course	Statistical Methods & Numerical Techniques			
Course Code	MCAS1150			
Prerequisite	None			
Corequisite				
Antirequisite				
	L	T	P	C
	3	1	0	4

Course Objectives:

The objective of this course is to:

1. Learn fundamentals of Statistical Methods
2. Learn fundamentals of Numerical techniques
3. Make student familiar with basic concepts of probability and random variables, distribution of random variables
4. Learn correlation and regression analysis and apply certain statistical concepts in practical applications of computer science areas.
5. Learn how numerical techniques are useful
6. Learn about Linear and Non Linear Equation Systems and their applicability.

Course Outcomes

At the end of the course student will be able to:

CO1	Understand basics of statistical Analysis.
CO2	Understand need for numerical techniques.
CO3	Use statistical techniques in problem solving
CO4	Use numerical techniques in problem solving
CO5	Understand Linear and Non Linear Equations Systems
CO6	Understand the relevanceof the subject

Text Book (s)

1. K.S. Trivedi – Probability and Statistics with reliability, Queuing and Computer Science Applications – Prentice Hall India – 2001.

Reference Book (s)

1. A.M. Mood, F. Graybil and Boes – Introduction to Mathematical Statistics – McGraw Hill – 1974.
2. S.C. Gupta & V.K. Kapoor – Fundamentals of Mathematical Statistics – Sultan Chand & Sons.- 2002.

Course Content:

Unit I: Introduction to Probability **9 hours**
Sample space – Events – Axiomatic approach to probability conditional probability Independent events – Baye's formula Random Variables – Continuous and discrete random variables – distribution function of a random variables – Characteristic of distributions – Expectation, variance, – coefficient of variation, moment generation function Chebyshev's inequality.
Unit-2 Distribution **7 hours**
Bivariate distribution – conditional and marginal distributions discrete distributions – discrete uniform, Binomial poison and geometric Distributions – Continuous distributions – Uniform, Normal, Exponential and Gamma distributions
Unit- Statistical and Optimization techniques **9 hours**

Correlation coefficient – Rank Correlation coefficient of determination – Linear Regression – Method of Least squares – Fitting of the curve of the form ax + b, ax^2+bx+c, ab^x and ax^b multiple and partial correlation (3 – variables only). Zeros of a single transcendental equation and zeros of polynomial using Bisection Method, Iteration Method, Regula-Falsi method, Newton Raphson method, Secant method, Rate of convergence of iterative methods.
Unit-4 Linear Equations System 8 hours
Solutions of system of Linear equations, Gauss Elimination direct method and pivoting, Ill Conditioned system of equations, Refinement of solution. Gauss Seidal iterative method, Rate of Convergence.Finite Differences, Difference tables,Polynomial Interpolation**:** Newton's forward and backward formula.
Unit-5 Non- Linear Equations System 8 hours
Gauss forward and backward formula, Stirling's, Bessel's, Everett's formula.Introduction, Numerical Differentiation, Numerical Integration, Trapezoidal rule, Simpson's rules. Picard's Method, Euler's Method, Taylor's Method, Runge-Kutta methods, Predictor-corrector methodFitting of straight lines, polynomials, exponential curves.

Continuous Assessment Pattern

Internal Assessment (IA)	**Mid Term Exam (MTE)**	**End Term Exam (ETE)**	**Total Marks**
20	30	50	100

Name of The Course	PROGRAMMING IN C				
Course Code	MCAS1110				
Prerequisite	None				
Corequisite					
Antirequisite					
		L	T	P	C
		3	0	2	4

Course Objectives:

The objective of this course is to:

1. To introduce students to the concepts of C programming.
2. Provide more emphasis on several topic of C programming like -functions, arrays, pointers, structures, files handling.
3. Learn to develop program using 'C' language.

Course Outcomes

At the end of the course student will be able to:

CO1	1. The student would acquire the concept of C language.
CO2	2. The stsudent will able to develop application program using C language.
CO3	3. Implement and develop projects using C

Text Book (s)

1. E. Balagurusamy – Programming in ANSIC – Tata McGraw Hill 3rd Edition– 2004.

Reference Book (s)

1. B.S. Gottfried – Programming with C – Schaum's Outline Series – Tata McGraw Hill 2nd Edition – 1998.
2. K.R. Venugopal, Sudeep R. Prasad – Programming with C – Tata McGraw Hill - 2002.
3. Yashavant Kanetkar – Let us C – BPB Publications- 5th Edition - 2004.

Course Content:

Unit-1 Number System	**13 hours**
Identifiers – Keywords– Data Types – Data Type Conversions – Operators – Conditional Controls – Loop Controls– Input/Output operations.	
Unit-2 Function	**8 hours**
Function Prototyping – Function Arguments – Actual vs. Formal Parameters – Pointers – Pointer Variables – Pointers Concepts in Functions – Multiple Indirection.	
Unit-3 Arrays	**8 hours**
Arrays – Accessing Array Elements Pointers and Arrays – Arrays as Function Arguments – Function Returning Addresses – Dynamic Memory Allocation – Storage Classes.	
Unit-4 Structure and Unions	**7 hours**
Structures – Unions – typedef – enum – Array of Structures – Pointers to Structures – Macros and Pre-processor.	
Unit-5 File Handling	**4 hours**
Character I/O – String I/O – Formatting input/output – File I/O – Error Handling during I/O – Command line Arguments	

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
20	30	50	100

Name of The Course	Digital Computer Fundamentals			
Course Code	MCAS1120			
Prerequisite	None			
Corequisite				
Antirequisite				
	L	**T**	**P**	**C**
	3	1	0	4

Course Objectives:

The objective of this course is to:

1. Familiarize the students with the basic mathematical concepts and numerical methods.
2. To understand the concepts and results in Digital logic, Circuit, boolean algebra, sequential and combinational circuits, ALU Design and computer design

Course Outcomes

CO1	On completion of the course the student will be able to design a simple digital system.
CO2	Design and develop various algorithms for problems digital logic, Number theory.
CO3	Easily able to evaluate complex integrals numerically
CO4	Learn concepts of digital logic and its influence to various functional areas like communication system, logics etc.

Text Book (s)

1. Thomas Floyd – Fundamentals of Digital System – Pearson Education.-3rd Edition – 2003.
2. A.P. Malvino and D.P. Leach – Digital Principles and Applications – Tata McGraw Hill 4th Edition – 1999

Reference Book (s)

1. M. Morris Mano – Digital Logic and Computer Design PHI – 5th Edition- 2004

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Course Content:

Unit-1 Number System **8 hours**
Number System – Converting numbers from one base to another – Complements – Binary Codes – Integrated Circuits – Boolean algebra – Properties of Boolean algebra – Boolean functions – Canonical and Standard forms – Logic operations – Logic gates – Karnough Map up to 6 variables – Don't Care Condition – Sum of Products and Products of sum simplification – Tabulation Method.
Unit-2 Combinational Circuit **8 hours**
Adder – Subtractor – Code Converter – Analyzing a Combinational Circuit – Multilevel NAND and NOR circuits – Properties of XOR and equivalence function – Binary Parallel Adder – Decimal Adder – Magnitude Comparator – Decoders – Multiplexers – ROM – PLA.
Unit-3 Sequential Circuit **8 hours**
Flip Flops – Triggering of flip–flops – Analyzing a sequential circuit – State reduction – Excitation tables – Design of sequential circuits – Counters – Design with state equation – Registers – Shift Registers – Ripple and Synchronous Counters.
Unit-4 Memory Unit **8 hours**
Memory Unit – Bus Organization – Scratch Pad Memory – ALU – Design of ALU – Status Register – Effects of Output carry – Design of Shifter – Processor Unit – Microprogramming – Design of specific Arithmetic Circuits.
Unit-5 Micro-Program Control **8 hours**

Accumulator – Design of Accumulator – Computer Configuration – Instructions and Data formats – Instruction sets – Timing and control – Execution of Instruction – Design of Computer – H/W Control – PLA control and Micro-program control.

Continuous Assessment Pattern

Internal Assessment (IA)	**Mid Term Exam (MTE)**	**End Term Exam (ETE)**	**Total Marks**
20	30	50	100

Name of The Course	**Web Designing**			
Course Code	MCAS1130			
Prerequisite	None			
Corequisite				
Antirequisite				
	L	**T**	**P**	**C**
	3	0	2	4

Course Objectives:

The objective of this course is to:

1. Enable the students to understand web-based site planning, management and maintenance.
2. Explain the concept of developing advanced HTML,ASP,JavaScript, XML pages.
3. This course enables students to develop web sites which are secure and dynamic in nature.
4. Design and implement an internet database application using existing tools and techniques.

Course Outcomes

At the end of this course students will be able:

CO1	Demonstrate the ability to create web pages using Students will demonstrate the ability to create images for web pages using.
CO2	Understand range of real world web design approaches and critically evaluate these approaches.
CO3	Develop web pages that present information, graphics and hypertext links to other web pages in a cohesive manner, and build up with peers a website using CSS structure, while demonstrating awareness of usability and other web design issues
CO4	Examine and assess the effectiveness of a web design system in a real time environment.

Text Book (s)

1. .Ramesh Bangia, “Internet and Web Design” , New Age International

2. Xavier, C, “ Web Technology and Design” , New Age International

Reference Book (s)

1. Deitel, “Java for programmers”, Pearson Education
2. Ivan Bayross,” HTML, DHTML, Java Script, Perl & CGI”, BPB Publication.
3. Jackson, “Web Technologies” Pearson Education
4. Patel and Barik, ”Introduction to Web Technology & Internet”, Acme Learning

MCA105: Web Designing	L	T	P	C
	3	0	2	4

Version No.	2.0
Prerequisite	
Objectives:	To make students understand intricacies of the various aspects of web portal development and to enhance the skills of writing content for web pages and to make efficient site maps to navigate web pages. It enables to understand the procedure for hosting the web pages on the internet/intranet and to exploit the client server architecture and it allows to dynamically update web pages using Active server pages and Dynamic HTML.
Expected Outcome:	**After completing this course students will be able to design web sites.**

Module I **Introduction**

Introduction to Web Designing – Web Server, Web Client – Browser & Web Server Communication – HTTP Protocol – HTML Document Basic Structure – Creating Links between Documents – Creating Tables – Creating Forms – The Input Element – Select Element – Text Area Element.

Module II **DHTML and VB Script**

DHTML Object Model – Underlying Principles of the DHTML – Basic Components of DHTML – Introduction of Scripting – Scripts in HTML – VBScript – Variables – Functions – Intrinsic Functions – Conditional & Loops – VBScript Objects – Building a Sample Form.

Module III **Java Script**

JavaScript – Introduction to JavaScript – Variables – Conditional and Loops – Events – Functions – Frames – HTML document – Predefined Objects – Image Object – Layers – Drag and Drop – Building a Sample Form.

Module IV **Cascading Style Sheets**

CSS – Introduction to Cascading Style Sheets – Inline Styles – Style Sheets – Grouping & Short Hand Properties – Inheritances – Classes – Link – Cascading Styles – Dynamic Style – Multimedia on the Web – Playing Multimedia – Streaming Multimedia – Animated GIFs – Creating Video Audio for the Web.

Module V **Active Server Page**

Web Services – ASP Fundamentals – ASP Objects – Application Object – Session Object – Request Object – Response Object – Session Object – Design a Simple Web Page Using ASP –Design a simple web page with database connectivity.

Reference Books

1. Eric M. Schurman William J. Pardi.-Dynamic HTML in Action, 2nd Edition, Web Technology-1999.
2. Microsoft Visual Interdev 6.0, Microsoft Press-1998.
3. William Martiner -VB Programmer's Guide to Web Development,.- 1999.
4. Ivan Bayross -Web Enabled Commercial Application Development Using HTML, DHTML, Java Script, Perl, CGI-2000.
5. Scot Hillies and Daniel Mezick -Programming Active Server Pages, Microsoft Press.-1997.

Mode of Evaluation | Quiz/Assignment/ Seminar/Written Examination

Recommended by the Board of Studies on:

Date of Approval by the Academic Council:

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
20	30	50	100

Name of The Course	Python Programming				
Course Code	MCAS1210				
Prerequisite	None				
Corequisite					
Antirequisite					
		L	T	P	C
		3	0	2	4

Course Objectives:

1. Learn basic programming constructs –data types, decision structures, control structures in python.
2. Know how to use libraries for string manipulation and File handling.
3. Learn to use in-built data structures in python – Lists, Tuples, Dictionary.
4. Learn the fundamental principles of Object-Oriented Programming.

Solve problems through application of OO concepts and using Files/database.

Course Outcomes

CO1	Gain knowledge of Basic Programming with Python.
CO2	Familiarize with python string handling techniques and user defined functions.
CO3	Understand and use data structures like Lists, tuples and dictionaries.
CO4	Understand File handling.
CO5	Use object oriented programming techniques.
CO6	Understanding integration of database with python and develop applications using databases.

Text Book (s)

1. 1. Tony Gaddis, Starting Out with Python, 3rd edition, Pearson
2. Y. Daniel Liang, Introduction to Programming Using Python, Pearson
3. Budd T A, Exploring Python , 2011, Tata McGraw Hill Education
4. Learning Python, Fourth Edition, Mark Lutz, O'Re illy publication

Reference Book (s)

1. Downey, Allen B., Think Python: How to Think Like a Computer Scientist. O'Reilly, 2012. Obtain free PDF at http://www.greenteapress.com/thinkpython/
2. Python Programming: An Introduction to Computer Science (Second Edition) John Zelle, ISBN 978-1-59028-241-0-9, Franklin, Beedle & Associates Inc., 2004.

Course Content:

Unit-1 Introduction **6 hours**
History , Features , Working with Python, Installing Python, basic syntax, interactive shell, editing, saving, and running a script. The concept of data types; variables, assignments; immutable variables; numerical types; Arithmetic and Logical operators and Boolean expressions. Debugging, comments in the program; understanding error messages; Catching exceptions using try and except. Built-in functions – type(), id(), eval(), random, chr(), ord(); Conditional Statements : If, If-else, Nested if-else; Looping: For, While, Nested loops; Control Statements: Break, Continue, Pass;

Unit-2 Function and Strings 6 hours
Functions in Python: Defining a function, Calling a function, Types of functions, Function Arguments, Global and local variables. String manipulations: subscript operator, indexing, slicing a string; strings and number system: converting strings to numbers and vice versa.
Unit-3 Lists, Tuples and Dictionaries 7 hours
Basic List operators, iterating over a list, replacing, inserting, removing an element; searching and sorting lists, calculating the sum and average of items in a list ; Tuples - sequence of values , immutability, Comparing tuples, Tuple assignment: Dictionary- Store data as key-value pairs in dictionaries, search for values, change existing values, add new, key-value pairs, and delete key-value pairs, nesting objects, sorting, dictionary literals, adding and removing keys, accessing and replacing values; traversing dictionaries.
Unit-4 Files and Regular Expressions and Object Oriented Programming and Database Connectivity 9 hours
Manipulating files and directories, os and sys modules; text files: reading/writing text and numbers from/to a file; regular expressions
Unit-5 Web Programming 5 hours
Web Services – ASP Fundamentals – ASP Objects – Application Object – Session Object – Request Object – Response Object – Session Object – Design a Simple Web Page Using ASP –Design a simple web page with database connectivity.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
20	30	50	100

Name of The Course	Microprocessor			
Course Code	MCAS1220			
Prerequisite	None			
Corequisite				
Antirequisite				
	L	T	P	C
	3	0	2	4

Course Objectives:

The objective of this course is to:

1. To gain an in-depth understanding of the Architecture & functionality of microprocessor's (Specifically 8086).
2. Apply the programming techniques in designing simple assembly language programs for solving simple problems by using assembly language instruction set of microprocessor .
3. Interfacing techniques for interfacing Microprocessor with peripheral devices and interrupt handling.
4. To gain an understanding of applications of microprocessors in designing processor-based automated electronics system.

Course Outcomes

CO1	Develop programs using assembly language having hands on experience on 8086 microprocessor.
CO2	Use assembly language instruction set of a microprocessor and assembler directives.
CO3	Manipulate strings, use procedures and Macros in assembly language.
CO4	Understand and handle Interrupts.
CO5	Interface Input and output devices with Microprocessor.
CO6	Emulate real hardware including the CPU, the screen, RAM and input-output devices.

Text Book (s)

1. D.V. Hall, Microprocessors & Interfacing, TMH, 3rd edition

.**Reference Book (s)**

1 Barry B Brey, The intel microprocessor: architecture, programming and interfacing, Prentice hall of India, NewDelhi, 2003.ISBN-0138027455, 4th Edition

2 Alan Clements, "Principles of Computer Hardware", Oxford University Press, 3rd Edition, 2003, ISBN-9780198564539

Course Content:

Unit-1 Introduction	**9 hours**
Computers, Microcomputer and Microprocessors-An introduction . Introduction to 8086 assembly language programming – Development steps – Construction – Writing Programs and Development Tools	
Unit-2 Programming Techniques	**9 hours**
Standard program structures – Simple Programs – Jumps – While–do – repeat–until – Delay loops. Strings – Procedures – Macros – Instruction Descriptions – Assembler Directives.	
Unit-3 Microprocessor Architecture	**10 hours**

8086 Microcomputer – Observing Bus signals – Minimum mode System – Troubleshooting – 8086 interrupts – Interrupt Applications – Programmable timer/Counter – Interrupt Controller.
Unit-4 Interfacing **6 hours**
Parallel Ports – Handshaking – Interfacing, Digital Devices, Analog Interfacing.
Unit-5 Advance Microprocessor **6 hours**
DMA – DRAMS – Cache Memories – Co–Processors – EDA Tools – 80286, 80386 and 80486, Pentiums microprocessors

Continuous Assessment Pattern

Internal Assessment (IA)	**Mid Term Exam (MTE)**	**End Term Exam (ETE)**	**Total Marks**
20	30	50	100

Name of The Course	Accounting & Financial Management			
Course Code	SFCM5012			
Prerequisite	None			
Corequisite				
Antirequisite				
	L	T	P	C
	3	0	0	3

Course Objectives:

The main objective of this subject is to provide basic working knowledge of accounting and financial management and to know how accounting and financial management helps the management to take decision. It provides analysis and interpretation of financial statements of organizations and understand the budget and budgetary control in organizations. It helps to find out marginal cost incurred and acquire knowledge in project proposal method using capital budgeting.

Course Outcomes

CO1	Predict the financial statement of public limited company
CO2	Capable of preparing the various budgets
CO3	Forecasting the future needs of the business

Text Book (s)

1. Maheswari"costAccounting"Vikas publishing house

Reference Book (s)

1. S. N. Maheswari, Elements of Management Accountancy, Sultan Chand & Co., 3rd Edition, 1996.
2. P.C. Tulisan – Financial Accounting – Tata McGraw Hill Publication, New Delhi – First Edition, 2002.
3. I .M Pandey"Financialmanagement"vikas publishing house

Course Content:

Unit-1 Introduction To Accounting 8 hours
Principles of Double entry – Journalizing, Ledger – Posting and preparation of Trial Balance – Preparation of Trading Account, Profit and loss Account and Balance Sheet including Adjustments (Simple problems only) .
Unit-2 Ratio Analysis 8 hours
Ratio analysis – uses of ratios in interpreting the Final Accounts (Trading a/c–Profit and Loss A/c and Balance Sheet) – Final Accounts to as well as Ratios to Final Accounts Problems. (Simple problems only).
Unit-3 Profit Analysis 8 hours
Meaning of variable cost and fixed cost – Cost–Volume – Profit Analysis – Calculation of Break–even point.
Unit-4 Budgets 8 hours
Preparation of and Characteristics of functional Budgets – Production, Sales, Purchases, Cash and Flexible budgets.
Unit-5 Cash Flow 8 hours

Method of Capital investment decision making: Pay back Method, ARR Method – Discounted Cash Flow – Methods including Net Present Value and IRR Method.

Continuous Assessment Pattern

Internal Assessment (IA)	**Mid Term Exam (MTE)**	**End Term Exam (ETE)**	**Total Marks**
20	30	50	100

Name of The Course	Object Oriented Paradigm			
Course Code	MCAS1230			
Prerequisite	None			
Corequisite				
Antirequisite				
	L	**T**	**P**	**C**
	3	0	2	4

Course Objectives:

The objective of this course is to:

To introduce students to the concept of object oriented programming. The emphasis is on the following features of object oriented programming: data hiding, operator overloading, inheritance, array based input / output and standard template library.

Course Outcomes

CO1	Overview of OOP and C++ basics
CO2	Understand about dynamic memory allocation, overloading concepts
CO3	Understand the use and write program based on Inheritance, Polymorphism, Encapsulation, virtual keyword, Operator overloading
CO4	Understand the Templates and Exception Handling in C++.
CO5	Know the file handling concepts and Input-Output Stream in C++.
CO6	Preparing a project based on the learning acquired in this course.

Text Book (s)

1. Herbert Schildt, C++ – The Complete Reference, Third Edition – Tata McGraw Hill – 1999.

Reference Book (s)

1. Bruce Eckel, Thinking in C++, Second Edition, Volume One, Pearson Education Asia, 2000.
2. Venugopal – Mastering C++ - Tata McGraw Hill-2001.

Course Content:

Unit-1 Introduction **8 hours**
Introduction to OOP– Overview of C++ – Classes – Structures – Unions – Friend Functions – Friend Classes – Inline functions – Constructors – Destructors – Static Members – Scope Resolution Operator – Passing objects to functions – Function returning objects.
Unit-2 Function Overloading **8 hours**
Arrays – Pointers – The this pointer – References – Dynamic Allocation Operators – Function Overloading – Default function arguments – Overloading Constructors – Ambiguity in function overloading
Unit-3 Operator Overloading **8 hours**
Operator Overloading – Member Operator Function – Friend Operator Function – Overloading some special operators – Overloading [ ], ( ), —> and comma operator – Inheritance – Types of Inheritance – Protected members – Virtual Base Class Polymorphism – Virtual Functions – Pure virtual functions.
Unit-4 Templates and Exception Handling **8 hours**

Class templates and generic classes – Function templates and generic functions – Overloading a function template – power of templates – Exception Handling – Derived class exception – Exception handling options – terminate() and unexpected() – uncaught_exception() function.
Unit-5 Input-Output Stream **8 hours**
I/O Streams – formations I/O with ios class functions and manipulators – overloading << and >> – creating own manipulator – File I/O – Name spaces – the std name space – conversion functions – Array based I/O – An overview of the STL – The container classes – General theory of operation – Vectors.

Continuous Assessment Pattern

Internal Assessment (IA)	**Mid Term Exam (MTE)**	**End Term Exam (ETE)**	**Total Marks**
20	30	50	100

Name of The Course	Data and File Structure				
Course Code	MCAS1240				
Prerequisite	C				
Corequisite					
Antirequisite					
		L	T	P	C
		3	0	2	4

Course Objectives:

The objective of this course is to:

1. Be familiar with basic techniques of algorithm analysis
2. Be familiar with writing recursive methods
3. Master the implementation of linked data structures such as linked lists and Stack and binary trees
4. Understanding several sorting algorithms including quicksort, mergesort and heapsort
5. Understanding graph algorithms such as shortest path and minimum spanning tree and file organization
6. Master analyzing problems and writing program solutions to problems using the above techniques

Course Outcomes

CO1	Identify and define the most appropriate data structure(s) for a given problem
CO2	Expert in application of linear and non linear data structure(s) to solve various problems.
CO3	Expert in developing programs using STACK and QUEUE principles and Linked List to solve various problems.
CO4	Expert in calculating and comparing complexities of various searching and sorting algorithms.
CO5	Understand comparison of Recursion and Loops.

Text Book (s)

1. Horowitz and Sahani, “Fundamentals of Data Structures”, Galgotia Publication

Reference Book (s)

1 Aaron M. Tenenbaum, Yedidyah Langsam and Moshe J. Augenstein “Data Structures Using C and C++” , PHI
2 Jean Paul Trembley and Paul G. Sorenson, “An Introduction to Data Structures with applications”, McGraw Hill
3 R. Kruse etal, “Data Structures and Program Design in C”, Pearson Education
4 Lipschutz, “Data Structures” Schaum’s Outline Series, TMH
5 G A V Pai, “Data Structures and Algorithms”, TMH

Course Content:

Unit-1 Introduction **6 hours**
Array Definition, Single and Multidimensional Arrays, application of arrays, String Operation, Ordered List, Sparse Matrices, Lower and Upper Triangular matrices, and tri-diagonal matrices.
Unit-2 Link List and Stack **6 hours**
Array Representation and Implementation of stack, Operations on Stacks: Push & Pop, Linked Representation of Stack, Operations Associated with Stacks, Applications of stack: Conversion of Infix to Prefix and Postfix Expressions, Evaluation of postfix expression using stack.
Unit-3 Queues **7 hours**

Array and linked representation and implementation of queues, Operations on Queue: Create, Add, Delete, Full and Empty. Circular queue, Deque, and Priority Queue
Unit-4 Tree and Graph 7 hours
Trees – Binary Trees – Binary Tree Traversals – Binary Tree Representations – Binary Search Trees – Threaded binary Trees – Application of Trees (Sets) – Binary Search Tree (BST), Insertion and Deletion in BST, AVL Trees -Representation of Graphs – Graph Implementation – Graph Traversals– Application of Graph Traversals– Minimum Cost Spanning Trees – Shortest Path Problems.
Unit-5 Sorting ,Searching and File Structure 7 hours
Linear & Binary search, Hash table and Hashing. Sorting: Bubble sort, Insertion sort,Selection sort, Quicksort, Shellsort, Mergesort. Physical Storage Media File Organization, Organization of records into Blocks, Sequential Files, Indexing and Hashing, Primary indices, Secondary indices, Multi-level Indexing.

Continuous Assessment Pattern

Internal Assessment (IA)	**Mid Term Exam (MTE)**	**End Term Exam (ETE)**	**Total Marks**
20	30	50	100

Name of The Course	Algorithm Analysis & Design			
Course Code	MCAS2310			
Prerequisite				
Corequisite				
Antirequisite				
	L	**T**	**P**	**C**
	3	0	2	4

Course Objectives:

To introduce students, the concepts of algorithm analysis for find out the space and time complexity of different algorithms. Different design techniques such as greedy method, divide and conquer, backtracking, dynamic programming, branch and bound are to be studied for finding the solution to the different problems. It also provides an insight into the basic concepts of NP and NP-hard problems and their relevance in research.

Course Outcomes

CO1	Analyze algorithms and determine efficiency of algorithm.
CO2	Ability to analyze asymptotic runtime complexity of algorithms including formulating recurrence relations.
CO3	Understand advanced abstract data type (ADT), data structures and their implementations.
CO4	Design algorithms using the Dynamic, greedy, divide and conquer, branch and bound etc. methodologies.
CO5	Prove problems of P, NP, or NP-Complete.
CO6	Apply important algorithmic design paradigms, implement learned algorithm using appropriate techniques to solve real world problems

Text Book (s)

1. Thomas H. Coreman, Charles E. Leiserson and Ronald L. Rivest, "Introduction to Algorithms", Printice Hall of India.

Reference Book (s)

1. Adam Drozdek, "Data Structures and Algorithms in C++", Thomson Asia
2. Knuth E. Donald, Art of Computer Programming Sorting and Searching Vol3, Second Edition, Pearson Education.
3. Brassard Bratley, "Fundamental of Algorithms", PHI
4. A V Aho etal, "The Design and analysis of Algorithms", Pearson Education

Course Content:

Unit-1 Introduction to Algorithms **8 hours**
Introduction to Algorithms & Analysis- Mathematical Preliminaries , Design of Algorithms, Growth of function, Complexity of Algorithms, Asymptotic Notations, Recurrences. **Sorting:** Insertion Sort, Quick Sort, Merge Sort, Heap Sort, Radix sort, Bucket Sort, Counting sort, Sorting in linear time, Medians and order statistics.

Unit-2 Advance Data Structure	**8 hours**
Advanced Data Structure: Binary Search Trees, Red Black Trees, Augmenting Data Structure Binomial Heap, B-Tree, Fibonacci Heap, and Data Structure for Disjoint Sets, Union-find Algorithm, Dictionaries and priority Queues.	
Unit-3 Advance Design and Analysis Techniques	**8 hours**
Advanced Design and Analysis Techniques: Dynamic programming, Greedy Algorithm, Backtracking, Branch-and-Bound, Amortized Analysis	
Unit-4 Graph Algorithms	**8 hours**
Graph Algorithms: Elementary Graph Algorithms, Breadth First Search, Depth First Search, Minimum Spanning Tree, Kruskal's Algorithms, Prim's Algorithms, Single Source Shortest Path, All pair Shortest Path, Maximum flow and Traveling Salesman Problem	
Unit-5 Special Topics in AAD	**8 hours**
Randomized Algorithms, String Matching, NP-Hard and NP-Completeness Approximation Algorithms, Sorting Network, Matrix Operations, Polynomials & FFT, Number Theoretic Algorithms.	

Continuous Assessment Pattern

Internal Assessment (IA)	**Mid Term Exam (MTE)**	**End Term Exam (ETE)**	**Total Marks**
20	30	50	100

Name of The Course	Computer Architecture			
Course Code	MCAS2320			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	0	0	3

Course Objectives:

1. Explain the organization of the classical von Neumann machine and its major functional Modules.
2. Explain how an instruction is executed in a classical von Neumann machine.
3. Provide knowledge of computer system organization and structure through instruction cycles.
4. Provide knowledge of system interconnection and the different I/O techniques.
5. Explain the basic concepts of interrupts and how interrupts are used to implement I/Ocontrol and data transfers.
6. Identify various types of buses in a computer system and illustrate how data transfers is performed.

Course Outcomes

CO1	Understand the organization of basic computer.
CO2	Compare different types of instructions.
CO3	Apply the principles and the implementation of computer arithmetic.
CO4	Understand the operation of modern CPUs and use of Pipelining.
CO5	Apply memory hierarchy to achieve efficient memory system. And Analyze different I/O Techniques.

Text Book (s)

1. M. M. Mano – Computer System Architecture – 3rd Edition – PHI – 1994

Reference Book (s)

1 . Patterson, Computer Organisation and Design, Elsevier Pub. 2009
2. William Stallings, "Computer Organization and Architecture – Designing for Performance", 6th Edition, Pearson Education, 2003.
3. David A.Patterson and John L.Hennessy, "Computer Organization and Design: The hardware / software interface", 2nd Edition, Morgan Kaufmann, 2002.
4. John P.Hayes, "Computer Architecture and Organization", 3rd Edition, McGraw Hill, 1998.

Course Content:

Unit-1 Central Processing Unit	**8 hours**
Central Processing Unit ,General Register and Stack Organization – Instruction Formats – Addressing Modes– Data Transfer and manipulation – Program Control – RISC.	
Unit-2 Pipeline and Vector Processing	**8 hours**

Pipelining – Arithmetic Instruction and RISC Pipelining– Vector Processing – Array Processors.
Unit-3 Computer Arithmetic 8 hours
Computer Arithmetic – Addition and Subtraction – Multiplication and Division Algorithms – Floating-Point and decimal Arithmetic operations.
Unit-4 Input Output Organization 8 hours
Input–Output Organization – Peripheral devices – I/O Interface – Asynchronous Data Transfer – Modes of Transfer – Priority Interrupt – Direct Memory – Access I/O Processor – Serial Communications.
Unit-5 Memory Organization 8 hours
Memory Organization – Memory Hierarchy – Main Memory Auxiliary Memory– Associative Cache and Virtual Memory – Interconnection Structures – lnterprocessor Arbitration.

Continuous Assessment Pattern

Internal Assessment (IA)	**Mid Term Exam (MTE)**	**End Term Exam (ETE)**	**Total Marks**
20	30	50	100

Name of The Course	Programming in Java				
Course Code	MCAS2330				
Prerequisite	None				
Corequisite					
Antirequisite					
		L	T	P	C
		3	0	2	4

Course Objectives:

1. The aim of the course is to introduce students Core Java Concepts and to teach students the basic concepts of Java programming.
2. This course covers preliminaries, I/O streaming and file handling and teach students how to programme applets in Java, networking and allow the students to implement effectively remote method invocation (industrial java) to understand applets.
3. There are programs that can be embedded in a Web page and accessed over the Internet with database access (may be remote database).

Course Outcomes

CO1	Understand basic concepts of Java Programming
CO2	At the end of the course the student will be able to write efficiently the java programs,
CO3	To design and develop various Exeception Handling Process.
CO4	Can develop applets, able to access database with JDBC, work with networking protocols using java with attractive GUI

Text Book (s)

1. R. Naughton and H. Schildt – Java2 (The Complete Reference) – Fifth Edition – TMH – 2004.

Reference Book (s)

1. K. Arnold and J. Gosling – The Java Programming Language – 3rd Edition., Pearson Edu, 2005
2. David Flanagan – Java in a Nutshell: A Desktop Quick Reference for Java Programmers – O'Reilly & Associates, Inc. 1999
3. Bruce Eckel –Thinking in Java – Prentice Hall, 2nd Ed 2002.

Course Content:

Unit-1 Introduction **8 hours**
Object oriented fundamentals, Features of Java, Java Virtual Machine (JMV), Byte-Code ,JAVA buzzwords, JAVA Environments, Command Line Arguments, Java program structure, Reserved keywords, Identifiers, Literals, Operators, Separators, Variables, Declaring a variable, Scope and lifetime of variables, Data types, Control Statements.
Unit-2 Class and Methods **8 hours**
Arrays: One-Dimensional Arrays, Two-dimension Array, Strings, String Handling, Vectors, Wrapper Classes. Class :Fundamentals ,The General Form of a Class ,A Simple Declaring Objects ,Assigning Object Reference Variables. Methods: Overloading Methods, Using Objects as Parameters, A Closer Look at Argument Passing ,Returning Objects, Recursion Introducing Access Control, Overriding Methods, Final Variables and Methods, Final class, Finalizer Methods, Abstract Methods and Class, Visibility Control.
Unit-3 Packages and Interface **8 hours**

Inheritance : basic ,Types of Inheritance, Member Access, Creating a Multilevel Hierarchy, When Constructors Are Called Method Overriding ,Dynamic Method Dispatch ,Why Overridden Methods?, Applying Method Overriding, Using Abstract Classes, Using final with Inheritance, Using final to Prevent Overriding . Using final to Prevent Inheritance, Object Class, Packages and Interfaces.
Unit-4 Multithreading and Exception Handling 8 hours
Exception Handling: Exception as Objects, Exception hierarchy, Try, Catch, Finally, Throw. Multi threading: Creating threads, Thread Life Cycle, Main Thread, Multiple Threads ,Isalive() and join() ,Simple thread program ,Threads Priorities, Thread synchronization.
Unit-5 Applet and Graphic Programming 8 hours
Applet Programming: Local and remote applets, Building Applets Code, Applet Life Cycle, Creating an Executable Applet, Designing a web page, Applet Tag, , Passing parameters to Applets, AWT, Graphic Programming: Graphic Class, Drawing lines, Arcs, Rectangles, Polygon, Ellipse, Circle. I/O file in JAVA,: Stream Classes, Byte Stream Classes, Character Stream Classes and Stream Benefits.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
20	30	50	100

Name of The Course	DATABASE MANAGEMENT SYSTEMS			
Course Code	MCAS2340			
Prerequisite	None			
Corequisite				
Antirequisite				
	L	**T**	**P**	**C**
	3	0	2	4

Course Objectives:

The aim of this course is to introduce the students to basic concepts of databases and database management systems with emphasize on relational databases. The entity relationship diagram helps the students to design the database and the concept of normalization. The SQL and PL/SQL are taught so as teach how to create tables, manipulate table and how to create stored procedure. The objective of the course is make the students well versed with relational database and introduce them to the concepts of object-oriented database, multimedia database and distributed databases.

Course Outcomes

CO1	Understand the relational database theory, application of database system in real life.
CO2	Describe DBMS architecture, physical and logical database designs, database modeling, relational, hierarchical and network models.
CO3	Learn and apply Structured query language (SQL) for database definition and database manipulation.
CO4	Demonstrate an understanding of normalization theory and apply such knowledge to the normalization of a database.
CO5	Understand various issues of transaction processing and concurrency control mechanism.

Text Book (s)

1.Henry F. Korth and Abraham Silberschatz, Database System Concepts, McGraw Hill International Publications, 2002.

Reference Book (s)

1. Gerald V. Post – Database management systems – Designing and Building Business Applications – McGraw Hill International edition – 2nd Ed , 2002.
2. Thomas Connolly, Carolyn Begg - Database System – Pearson Education
3. Raghu Ramakrishnan – Database Management Systems – WCB/McGraw Hill , 3rd Ed, 2003.
4. Ivan Bayross - Pl Sql book
5. C.J.Date: Introduction to Database Systems, Pearson Education.
6. Elmasri Navrate: Data base Management System, Pearson Education.

Course Content:

Unit-1 Introduction to Database Management System **8 hours**
An overview of database management system, Database System Vs File System, Database system concepts and architecture, data models, schema and instances, data independence and data base language and interfaces, Data definitions language, DML, Overall Database Structure.
Unit-2 Entity Relationship Model **8 hours**
An overview of database management system, Database System Vs File System, Database system concepts and architecture, data models, schema and instances, data independence and data base language and interfaces, Data definitions language, DML, Overall Database Structure.

Unit-3 Relational Model and SQL Query	**8 hours**
Relational data model concepts, integrity constraints, entity integrity, referential integrity, Keys constraints, Domain constraints, relational algebra, relational calculus, tuple and domain calculus. Introduction on SQL, Characteristics of SQL, advantage of SQL. SQl data type and literals. Types of SQL commands. SQL operators and their procedure. Tables, views and indexes. Queries and sub queries. Aggregate functions. Insert, update and delete operations, Joins, Unions, Intersection, Minus, Cursors, Triggers, Procedures in SQL/PLSQL.	
Unit-4 Normalization	**8 hours**
Normalization: Functional dependencies, normal forms, first, second, third normal forms, BCNF, inclusion dependence, loss less join decompositions, normalization using FD, MVD, and JDs, Alternative approaches to database design.	
Unit-5 Overview of Transaction Management and Concurrency Control	**8 hours**
Overview of Transaction Management: ACID Properties, Transactions and Schedules, Concurrent Execution of transaction, Lock Based Concurrency Control, Performance Locking, Transaction Support in SQL, Introduction to Crash recovery. **Concurrency Control:** Serializability, and recoverability, Introduction to Lock Management, Lock Conversions, Dealing with Dead Locks, Specialized Locking Techniques, Concurrency without Locking.	

Continuous Assessment Pattern

Internal Assessment (IA)	**Mid Term Exam (MTE)**	**End Term Exam (ETE)**	**Total Marks**
20	30	50	100

Name of The Course	Software Engineering			
Course Code	MCAS2350			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	0	2	4

Course Objectives:

1. Develop complex systems (including analysis, design, construction, maintenance, quality assurance and project management) using the appropriate theory, principles, tools and processes.
2. Use appropriate computer science and mathematics principles in the development of software systems.
3. Solve problems in a team environment through effective use of written and oral communication skills.
4. Have knowledge of current issues presently involved in effectively performing duties as a software practitioner in an ethical and professional manner for the benefit of society.
5. Practice the lifelong learning needed in order to keep current as new issues emerge.
6. Develop software in at least one application domain.

Course Outcomes

CO1	The ability to apply software engineering theory, principles, tools and processes, as well as the theory and principles of computer science and mathematics, to the development and maintenance of complex software systems.
CO2	The ability to design and experiment with software prototypes.
CO3	The ability to select and use software metrics.
CO4	The ability to participate productively on software project teams involving students from both software engineering and other majors.
CO5	Effective communications skills through oral and written reports and software documentation evaluated by both peers and faculty

Text Book (s)

1.R. S. Pressman, Software Engineering: A Practitioners Approach, McGraw Hill

2. Pankaj Jalote, Software Engineering, Wiley

Reference Book (s)

1. Rajib Mall, Fundamentals of Software Engineering, PHI Publication.
2. K. K. Aggarwal and Yogesh Singh, Software Engineering, New Age International
3. Publishers.
4. S. Desikan and G. Ramesh, “Software Testing: Principles and Practices”, Pearson Education.
5. Aditya P. Mathur, “Fundamentals of Software Testing”, Pearson Education.
6. Naik and Tripathy, “Software Testing and Quality Assurance”, Wiley

Course Content:

Unit-1 Introduction	**8 hours**

Introduction to Software Engineering, Software Components, Software Characteristics, Software Crisis, Software Engineering Processes, Similarity and Differences from Conventional Engineering Processes, Software Quality Attributes. Software Development Life Cycle (SDLC) Models: Water Fall Model, Prototype Model, Spiral Model, Evolutionary Development Models, Iterative Enhancement Models, Selection of Software Process models.
Unit-2Requirement Engineering Process 8 hours
Elicitation, Analysis, Documentation, Review and Management of User Needs, Feasibility Study, Information Modeling, Data Flow Diagrams, Entity Relationship Diagrams, Decision Tables, SRS Document, IEEE Standards for SRS. **Software Quality Assurance (SQA):** Verification and Validation, SQA Plans, Software Quality Frameworks, ISO 9000 Models, SEI-CMM Model.
Unit-3Software Design 8 hours
Software design, Abstraction, Modularity, Software architecture, Effective modular design, Cohesion and Coupling, Architectural design and procedural design, Data flow oriented design, Design Structure Charts, Pseudo Codes, Flow Charts, Coupling and Cohesion Measures. **Design Strategies:**Function Oriented Design, Object Oriented Design, Top-Down and Bottom-Up Design. **User Interface Design:** User Interface design, Human factors, Human computer interaction, Human, Computer interface design, Interface design, Interface standards.
Unit-4 Coding & Testing 8 hours
Coding: Language classes, Structured Programming, need for structured programming, Coding standards, Coding style, Maintainability of programs, Code documentation – Code efficiency **Testing :**Software testing , Testing Objectives, Levels of testing– Unit Testing, Integration Testing, System testing, Acceptance Testing, Path testing – Control structures testing –Verification vs Validation and system testing, Regression Testing, Testing for Functionality and Testing for Performance, Top-Down and Bottom-Up Testing , Incremental vs Nonincremental testing. **Strategies:** Test Drivers and Test Stubs, Structural Testing (White Box Testing), Functional Testing (Black Box Testing), Test Data Suite Preparation, Alpha and Beta Testing of Products. **Static Testing Strategies:** Formal Technical Reviews (Peer Reviews), Walk Through, Code Inspection, Compliance with Design and Coding Standards. **Software Measurement and Metrics:** Various Size Oriented Measures: Halestead's Software Science, Function Point (FP) Based Measures, Bang Metrics, Cyclomatic Complexity Measures: -Control Flow Graphs, DD Graph.
Unit-5Maintenance 8 hours
Maintenance: Software as an Evolutionary Entity, Need for Maintenance, Categories of Maintenance: Preventive, Corrective and Perfective Maintenance, Cost of Maintenance, Software Re- Engineering, Reverse Engineering. Software Configuration Management Activities, Change Control Process, Software Version Control, An Overview of CASE Tools. Estimation of Various Parameters such as Cost, Efforts, Schedule/Duration, Constructive Cost Models (COCOMO), Resource Allocation Models, Software Risk Analysis and Management.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
20	30	50	100

Name of The Course	Theory of Computation			
Course Code	MCAS2360			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	0	0	3

Course Objectives:

1. The goal of this course is to provide students with an understanding of basic concepts in the theory of computation theory of computation theory of computation
2. Introduce students to the mathematical foundations of computation including automata theory; the theory of formal languages and grammars; the notions of algorithm, decidability, complexity, and computability.
3. Enhance/develop students' ability to understand and conduct mathematical proofs for computation and algorithms.
4. Introduce concepts in automata theory and theory of computation.
5. Identify different formal language classes and their relationships.
6. Design grammars and recognizers for different formal languages.

Course Outcomes

CO1	The goal of this course is to provide students with an understanding of basic concepts in the theory of computation theory of computation theory of computation
CO2	Introduce students to the mathematical foundations of computation including automata theory; the theory of formal languages and grammars; the notions of algorithm, decidability, complexity, and computability.
CO3	Enhance/develop students' ability to understand and conduct mathematical proofs for computation and algorithms.
CO4	Introduce concepts in automata theory and theory of computation.
CO5	Identify different formal language classes and their relationships.

Text Book (s)

1. J.E.Hopcroft, R.Motwani and J.D Ullman, “Introduction to Automata Theory, Languages and Computations”, Second Edition, Pearson Education, 2003.

Reference Book (s)

1. K.L.P. Mishra and N.Chandrasekaran, “Theory of Computer Science : Automata, Languages and Co mputation”, PHI

Course Content:

Unit-1Introduction **8 hours**
Alphabets, Strings and Languages; Automata and Grammars, Finite Automata (FA), Deterministic finite Automata (DFA)-Formal Definition, State transition diagram, Transition table, Language of DFA, Nondeterministic finite Automata (NFA), NFA with epsilon transition, Language of NFA, Equivalence of NFA and DFA, Minimization of Finite Automata, , Myhill-Nerode Theorem
Unit-2 Regular Expressions **8 hours**

Regular expression (RE) , Definition, Operators of regular expression and their precedence, Algebraic laws for Regular expressions,Regular expression to FA, DFA to Regular expression, Arden Theorem, Non Regular Languages, Pumping Lemma for regular Languages. Application of Pumping Lemma, Closure properties of Regular Languages, Decision properties of Regular Languages, FA with output: Moore and Mealy machine, Equivalence of Moore and Mealy Machine, Applications and Limitation of FA.
Unit- Context Free Grammer 8 hours
Context free grammar (CFG) and Context Free Languages (CFL): Definition, Examples, Derivation , Derivation trees, Ambiguity in Grammar, Inherent ambiguity, Ambiguous to Unambiguous CFG, Useless symbols, Simplification of CFGs, Normal forms for CFGs: CNF and GNF, Closure properties of CFLs, Decision Properties of CFLs: Emptiness, Finiteness and Membership,Equivalence of Pushdown automata and CFG, Deterministic Pushdown Automata.
Unit-4 Push Down Automata 8 hours
Push Down Automata (PDA): Description and definition,Language of PDA, Acceptance by Final state, Acceptance by empty stack, Deterministic PDA, Equivalence of PDA and CFG, CFG to PDA and PDA to CFG, Two stack PDA
Unit-5 Turing Machine 8 hours
Basic model, definition and representation, Language acceptance by TM, Variants of Turing Machine, TM as Computer of Integer functions, Universal TM, Recursive and recursively enumerable languages, Halting problem, Introduction to Undecidability, Undecidable problems about TMs.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
20	30	50	100

Name of The Course	Computer Networks				
Course Code	MCAS2410				
Prerequisite					
Corequisite					
Antirequisite					
		L	T	P	C
		3	0	2	4

Course Objectives:

To produce a core knowledge of networking concepts and techniques to design simple network, provide in-depth knowledge about the various communication technology and enable the student to understand how information are transmitted in networks. To introduce the students the concepts of wireless communications and various applications in computer networks.

Course Outcomes

CO1	Develop knowledge about physical structure of computer network
CO2	Analysis the problem in different layer during the communication in network
CO3	Identify the security issue in network during the data transfer
CO4	Expert to use of Internet and public network
CO5	Understand the connection management in network at transport layer
CO6	Develop the knowledge about congestion control over the network during the data transmission

Text Book (s)

L. L. Peterson and B. S. Davie, Computer Networks: A Systems Approach, 4th Ed, Elsevier India,
2. A. S. Tanenbaum, Computer Networks, 4th Ed, Pearson India

Reference Books.

1. . Forouzen, "Data Communication and Networking", TMH
2. A.S. Tanenbaum, Computer Networks, Pearson Education
3. W. Stallings, Data and Computer Communication, Macmillan Press
4. S. Keshav, An Engineering Approach to Computer Networking, 1st Ed, Pearson India, 1999.
5. 4. J. F. Kurose and K. W. Ross, Computer Networking: A Top Down Approach, 3rd Ed, Pearson India, 2005

Course Content:

Unit-1 Introduction **8 hours**
Terminology used in Computer Networks, Evolution of computer networks, Goals and Applications of Networks, Basic communications model, – types of Connections, Network structure and architecture, The OSI reference model, services, Network Topology Design - Delay Analysis, Back Bone Design, Local Access Network Design, – Transmission Media – Coaxial Cable – Fiber Optics – Line Coding – Modems – RS232 Interfacing sequences, Switching methods, ISDN, Terminal Handling.
Unit-2 Data link layer **8 hours**
Framing, HDLC, PPP, sliding window protocols, medium access control, Token Ring, Wireless LAN; Virtual circuit switching: Frame relay **MAC Sub Layer:** Channel Allocations, LAN protocols: ALOHA protocols - Overview of IEEE standards - FDDI. Data Link Layer - Elementary Data Link Protocols, Error Handling: Parity – LRC – CRC – Hamming code. Flow Control: stop and wait – go

back-N ARQ – selective repeat ARQ- sliding window – HDLC. - LAN - Ethernet IEEE 802.3 - IEEE 802.4 - IEEE 802.5 - IEEE 802.11 – FDDI - SONET – Bridges.
Unit-3 Network Layer **8 hours**
Network Layer - Point-to-Pont Networks, routing, Congestion control, Internetworking: – Packet Switching and Datagram approach, IP addressing methods: Subletting, Routing, Distance Vector Routing, Link State Routing, Structure of a router. TCP / IP, IP packet, IPv4, IPv6.
Unit-4 Transport Layer **8 hours**
Design issues, **Duties of transport layer:** Multiplexing, De-multiplexing, connection management, Sockets, User Datagram Protocol (UDP), Transmission Control Protocol (TCP), Congestion Control, Quality of services (QOS), TCP Window Management. Integrated Services. TCP RTT estimation, Overlay Networks. **Session Layer:** Design issues, remote procedure call. **Presentation Layer:** Design issues, Data compression techniques,
Unit-5 Application Layer **8 hours**
File Transfer, Access and Management, Electronic mail, Virtual Terminals, Other application. Example Networks: Internet and Public Networks. Domain Name Space (DNS), SMTP, FTP, HTTP, WWW, Peer-to-peer file sharing networks **Security:** Symmetric & Public Cryptography, RSA, Digital Signature, Hash Functions, IP Security, Web Security, System Security

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
20	30	50	100

Name of The Course	Internet of Things				
Course Code	MCAS2461				
Prerequisite					
Corequisite					
Antirequisite					
		L	T	P	C
		3	0	0	3

Course Objectives:

1. To utilize various Embedded Technologies related to IoT, Sensor Networks, Communication Protocols, Accessing Resources and Services needed to perform machine to machine communications.
2. To understand the arduino board and Concepts for IoT environment.
3. To understand the raspberry pi board and integration with IoT environment.
4. To explore Modern IoT Trends in data analytics in cloud sensors
5. To understand and analyse IoT case studies and infere crucial information from that.

Course Outcomes

CO1	Elaborate the need for IoT and purpose of sensor network
CO2	Understand about Arduino board and basic programs to connect sensors and actuators.
CO3	Understand about Raspberry board and basic programs to connect sensors and actuators.
CO4	Configure and understand data analytics in cloud sensor
CO5	Case studies relevant to IoT and able to analyse / infer results from case studies

Text Book (s)

1. "Building the internet of things: implement new business models, disrupt competitors, and transform your industry" , Kranz, M. (2018).Hoboken, NJ: Wiley.
2. "Enabling things to talk.Designing IoT solutions with the IoT Architectural Reference Model", Alessandro Bassi, Martin Bauer, Martin Fiedler, Thorsten Kramp, Rob van Kranenburg, Sebastian Lange, Stefan Meissner,Springer-Verlag Berlin An.(2016).

Reference Book (s)

1. "Internet of Things - A Hands-on Approach", Arshdeep Bahga and Vijay Madisetti, Universities Press, 2015, ISBN: 978817371954722.
2. "Getting Started with Raspberry Pi," Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014, ISBN: 9789350239759
3. "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1 st Edition,Francis daCosta, Apress Publications, 2013
4. "Getting Started with the Internet of Things", Cuno Pfister, O"Reilly Media, 2011, ISBN: 978-1-4493- 9357-1

Course Content:

Unit-1 Introduction	**8 hours**
Introduction to IoT, Sensors, Actuators, Basics of Networking, Communication Protocols, Sensor Networks, Machine-to-Machine Communications.	
Unit-2 Arduino Programming	**8 hours**

Introduction to Arduino Programming, Arduino board, I/O functions, math library, pulse width modulation, Integration of Sensors, Integration of Actuators, interrupts, serial peripheral interface.
Unit-3 Raspberry Programming **8 hours**
Introduction to Python programming, list, dictionary, user defined modules, Introduction to Raspberry, Raspberry Architecture, raspbian Operating System, modules and components, GPIO pins, senseHat board, camera module, Implementation of IoT with Raspberry Pi
Unit-4 Data Analytics in sensor cloud **8 hours**
Cloud Computing, Sensor-Cloud, Fog Computing, smart Cities, Smart Homes, Connected Vehicles, Smart Grid, Industrial IoT
Unit-5 Technological Aggregation & Case Studies **8 hours**
Case Study: Activity Monitoring, precision Agriculture, Healthcare System, Wearables, Open Data & IoT

Continuous Assessment Pattern

Internal Assessment (IA)	**Mid Term Exam (MTE)**	**End Term Exam (ETE)**	**Total Marks**
20	30	50	100

Name of The Course	Advance Operating Systems(PBL)			
Course Code	MCAS2462			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	0	2	4

Course Objectives:

1. Learn fundamental operating system abstractions such as processes, threads, files, Semaphores, IPC abstractions, shared memory regions, etc.,
2. Learn how the operating system abstractions can be used in the development of application programs, or to build higher level abstractions,
3. Learn how the operating system abstractions can be implemented,
4. Learn the principles of concurrency and synchronization, and apply them to write correct concurrent programs/software,
5. Learn basic resource management techniques (scheduling, time management, space management) and principles and how they can be implemented. These also include issues of performance and fairness objectives, avoiding deadlocks, as well as security and protection.

Course Outcomes

CO1	Understand functions and services of Operating system and identify the use of system calls.
CO2	Understand different type of CPU Scheduling Algorithm.
CO3	Understand process concept and synchronization of concurrent processes.
CO4	Understand classical problems of concurrent processes and their solution.
CO5	Understand concept of deadlock in system and its methods of handling deadlocks.
CO6	Understand the concept of memory management and how it is realize in system.

Text Book (s)

1. Silberschatz, Galvin and Gagne, “Operating Systems Concepts”, Wiley
2. D M Dhamdhere, “Operating Systems : A Concept based Approach”, 2nd Edition

Reference Book (s)

1. 1 Sibsankar Halder and Alex A Aravind, “Operating Systems”, Pearson Education
2. Harvey M Dietel, “ An Introduction to Operating System”, Pearson Education
3. D M Dhamdhere, “Operating Systems : A Concept based Approach”, 2nd Edition.

Course Content:

Unit-1 Fundamentals Concepts of OS **8 hours**
Introduction, Types of Operating Systems, I/O structure ,General system architecture. Implementation of processes, Threads, Implementation of Thread in user space and kernel space , Architecture of Android. Android Directory Structure, Structure of Manifest files, Android Development Tools.
Unit-2 Process Management **8 hours**
Process Management: Process concept, Process scheduling, CPU scheduling , Scheduling algorithms, , lnter process communication. Deadlocks, Component s of Android: Activities,

Activity life cycle, Fragment, fragment lifecycle, Services, service life cycle, Broadcast receivers, Content providers, Intents.
Unit-3 Memory Management **8 hours**
paging, segmentation , page segmentation, virtual memory – demand paging – page replacement and algorithms– disk scheduling , User interface **:**Views, Views Group, Widgets - Button, EditText, CheckBox, ToggleButton, Spinner, Picker, Layouts, Styles, Themes, Events, Event listener,
Unit-4 I/O Control and Information Management **8 hours**
Files protection – file system organisation – file operations – access methods – SQLite database, Creation of Database ,SQLite data type , inseret /delete /update data in database , Sensors, Network connectivity , Bluetooth, Location Discovery , Geo Location, Graphics and Animation.
Unit-5 Distributed Operating Systems **8 hours**
Distributed operating system concept Real Time Operating Systems: Introduction to Real Time Operating Systems, Networked File system , Publishing on Google Play, Monetization strategies, Application promotion strategies, Using Google Analytics, App development , Sending /Receving SMS/MMS ,News group

Continuous Assessment Pattern

Internal Assessment (IA)	**Mid Term Exam (MTE)**	**End Term Exam (ETE)**	**Total Marks**
20	30	50	100

Name of The Course	Cloud Computing			
Course Code	MCAS2450			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	0	0	3

Course Objectives:

The objective of this course is to:
1. To study the importance of virtualization.
2. To study the cloud delivery models
3. To study the cloud deployment models.
4. To Study Cloud security and applications

Course Outcomes

CO1	Learn knowledge of Cloud Computing.
CO2	Understand cloud computing delivery models.
CO3	Understand briefly cloud computing deployment models
CO4	Understand briefly cloud computing by deploying application on cloud.
CO5	**Understanding of security and workload in cloud.**
CO6	Assessment of the economics , financial, and technological implications for selecting cloud computing for own organization

Text Book (s)

1. *1.Cloud Computing: Principles and Paradigms,* Editors: Rajkumar Buyya, James Broberg,
2. Andrzej M. Goscinski, *Wile*, 2011
3. 2. *Cloud Computing First Steps: Cloud Computing for Beginners*, Ravi Shankar, Navin Sabharwal, PBC Distributors

Reference Book (s)

1. *Computing: Principles, Systems and Applications, Editors:* Nikos Antonopoulos, Lee Gillam,*Springer*, 2012
2. *Virtualization For Dummies*, 3rd HP Special Edition (Bernard Golden)
3. *Cloud Computing Bible,* Barrie Sosinsky, *Wiley-India*, 2010 T10: D.Ulman, " Principles of Database and Knowledge base System", Computer Science Press.

Course Content:

Unit-1 Introduction to Virtualization **7 hours**
Traditional IT Infrastructure, Benefits of Virtualization, Compare. Study of Hypervisors, VM
Unit- Introduction to Cloud Computing **9 hours**
History Cloud Computing, Cloud Benefits, Limitations, challenges; Importance of Virtualization in Cloud, Anatomy of Cloud, Cloud deployment models; Cloud delivery models; Stepping stones for the development of cloud, Grid Computing
Unit-3 Cloud Models **10hours**

Decision Factors for Cloud Implementations, Public, Private and Hybrid Cloud, Infrastructure as a Service (IaaS) Cloud Delivery Model, Platform as a Service (PaaS) , Software as a Service (SaaS)
Unit-4 Cloud Workloads and Security 6 hours
Cloud workload Overview, Workloads most suitable for Cloud, Workloads not suitable for Cloud. Intro to cloud security, Trust, and Privacy.
Unit-5 Design & Development of Cloud Applications 8 hours
Economics of choosing a Cloud platform for an organization based on application requirements, economic constraints and business needs , Applications deployment on Amazon, Microsoft , IBM, Google, Salesforce.com.

Continuous Assessment Pattern

Internal Assessment (IA)	**Mid Term Exam (MTE)**	**End Term Exam (ETE)**	**Total Marks**
20	30	50	100

Name of The Course	Industry Oriented Java			
Course Code	MCA9002			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	0	0	4	2

Course Objectives:

The objective of this course is to:

1. The aim of the course is to introduce students Core Java Concepts and to teach students the basic concepts of Java programming.
2. This course covers preliminaries, I/O streaming and file handling and teach students how to programme applets in Java, networking and allow the students to implement effectively remote method invocation (industrial java) to understand applets.
3. There are programs that can be embedded in a Web page and accessed over the Internet with database access (may be remote database).

Course Outcomes

CO1	Understand basic concepts of Java Programming
CO2	Write efficiently the java programs,
CO3	Design and develop various Exeception Handling Process.
CO4	Can develop applets, able to access database with JDBC, work with networking protocols using java with attractive GUI .
CO5	Understand basic concepts of Java Programming

Text Book (s)

1. R. Naughton and H. Schildt – Java2 (The Complete Reference) – Fifth Edition – TMH – 2004.

Reference Book (s)

1. K. Arnold and J. Gosling – The Java Programming Language – 3rd Edition., Pearson Edu, 2005
2. David Flanagan – Java in a Nutshell: A Desktop Quick Reference for Java Programmers – O'Reilly & Associates, Inc. 1999
3. Bruce Eckel –Thinking in Java – Prentice Hall, 2nd Ed 2002.

Java Programming		
Day	**Topic**	**Description**
1	Basic Programming Concepts	Java Architecture
		Language Basic
		Creating First Java Program
		Java Programs - Data Types, Variables, initialization and assignment
		Arithmetic Operators

		Relational and Logical Operators
		Bitwise Operator
		Control Statements
2	OOPs	Introduction to Object Oriented Programming,Classes and Objects,Methods - invoking methods,Passing parameters to methods, Returning values from methods, Constructors, Encapsulation, Object Class-toString
3	String	String, StringBuffer, StringBuilder Classes, Arrays
4	Inheritance and Polymorphism	Inheritance
		Access specifiers
		Super keyword
		InstanceOf
		Runtime Polymorphism
		Conversion and casting
5	Abstraction	Abstract methods and Abstract classes
		Abstract classes and runtime polymorphism
		Interfaces
6	Exception Handling	Introduction to Exception Handling
		The try-catch blocks and flow of programs
		The finally block
		Throwing an exception
		The throws clause
		Rethrowing an exception
		Checked and Unchecked exceptions
		User defined exceptions
7	IO	Java input and output, Streams, byte streams and character streams, InputStream, OutputStream, Reader, Writer, Java input and output, Streams, byte streams and character streams, InputStream, OutputStream, Reader, Writer, FileReader, BufferedReader,

		FileWriter, BufferedWriter
8	Serialization	Serialization-Object writing in file and reading
9	Multithreading & Lambda Expression	Multithreaded programs, Thread class and Runnable interface Lambda Expression
10	Collection Framework	Collection framework and collection interfaces List, Queue, Set and Map, List classes, For-each method for collection and iterators
11	Collections	The equals method and hashcode method, Comparator and hashCode (),Collections Class
12	JDBC	Introduction to JDBC API,Types of drivers Statement, Prepared Statement and Callable Statement, ResultSet, Performing CRUD operation
	Grand Test	**4 hrs**

Continuous Assessment Pattern

Internal Assessment (IA)	**Mid Term Exam (MTE)**	**End Term Exam (ETE)**	**Total Marks**
20	30	50	100

Name of The Course	Industry Oriented Python				
Course Code	MCA9003				
Prerequisite	None				
Corequisite					
Antirequisite					
		L	T	P	C
		0	0	4	2

Course Objectives:

The objective of this course is to:

1. Learn basic programming constructs –data types, decision structures, control structures in python.
2. Know how to use libraries for string manipulation and File handling.
3. Learn to use in-built data structures in python – Lists, Tuples, Dictionary.
4. Learn the fundamental principles of Object-Oriented Programming.
5. Solve problems through application of OO concepts and using Files/database.

Course Outcomes

CO1	Write, test and debug simple python programs.
CO2	Implement Python Programs with conditional and loops.
CO3	Develop Python Program with conditionals and loops.
CO4	To understand Python lists, tuples dictionaries for representing compound data.
CO5	Read and write data to /from files in Python.

List of Experiments

1) Write a Python program to find GCD of two numbers.
2) Write a Python Program to find the square root of a number by Newton's Method.
3) Write a Python program to find the exponentiation of a number.
4) Write a Python Program to find the maximum from a list of numbers.
5) write a Python Program to perform Linear Search
6) write a Python Program to perform Binary Search
7) Write a Python Program to perform selection sort.
8) Write a Python Program to perform insertion sort.
9) Write a Python Program to perform Merge sort.
10) Write a Python program to find first n prime numbers.
11) Write a Python program to multiply matrices.

Text Book (s)

1. Tony Gaddis, Starting Out with Python, 3rd edition, Pearson
2. Y. Daniel Liang, Introduction to Programming Using Python, Pearson

3. Budd T A, Exploring Python , 2011, Tata McGraw Hill Education
4. Learning Python, Fourth Edition, Mark Lutz, O'Reilly publication

Reference Book (s)

1. Downey, Allen B., Think Python: How to Think Like a Computer Scientist. O'Reilly, 2012.Obtain free PDF at http://www.greenteapress.com/thinkpython/
2. Python Programming: An Introduction to Computer Science (Second Edition) John Zelle, ISBN 978-1-59028-241-0-9, Franklin, Beedle& Associates Inc., 2004.

Continuous Assessment Pattern

Internal Assessment (IA)	**Mid Term Exam (MTE)**	**End Term Exam (ETE)**	**Total Marks**
20	30	50	100

Name of The Course	Data Warehousing & Data Mining			
Course Code	MCAS3510			
Prerequisite	Database Management System			
Corequisite				
Antirequisite				
	L	T	P	C
	3	0	0	3

Course Objectives:

The objective of this course is to:

1. Understand the Concept of data warehousing.
2. Understand the multidimensional data storage for system.
3. Learn OLAP techniques for data analysis.
4. Decision making through Hypothesis Testing.
5. Make students understand the knowledge discoveries in database.
6. Learn data mining techniques.

Course Outcomes

CO1	Design issues of data warehousing**.**
CO2	Learn various mining tools
CO3	Identify the real time problems and able to design solution using various mining tools.
CO4	Prediction of AI techniques
CO5	Classification of machine learning algorithm.

Text Book (s)

1. Data Warehousing In the Real World; Sam Anahory& Dennis Murray; 1997, Pearson

Reference Book (s)

1. Data Mining- Concepts & Techniques; Jiawei Han &MichelineKamber- 2001, Morgan Kaufmann.
2. Data Mining Techniques; ArunPujar; 2001, University Press; Hyderbad.
3. Data Mining; Pieter Adriaans&DolfZantinge; 1997, Pearon,
4. Data Warehousing, Data Miniing and OLTP; Alex Berson, 1997, McGraw Hill.
5. Building the Data Warehouse; W.H. Inman, 1996, John Wiley & Sons.

Course Content:

Unit-1 Introduction to Data Warehousing and Data Mining	**8 hours**
Data warehousing Definition, usage and trends. DBMS vs data warehouse, Data marts, Metadata, Multidimensional data mode, Data cubes, Schemas for Multidimensional Database: stars, snowflakes and fact constellations.	
Unit-2 Data Warehousing concepts and ETL process	**8 hours**

Data warehouse implementation, computation of data cubes, modeling OLAP data, OLAP queries manager, data warehouse back end tools, complex aggregation at multiple granularities, tuning and testing of data warehouse, ETL process.
Unit-3 Business Analysis **8 hours**
Business Analysis. Reporting & Query Tools & Applications. On line Analytical processing(OLAP). Patterns & Models. Statistics. Artificial Intelligence. Data mining definition & task, KDD versus data mining, data mining techniques, tools and applications.
Unit-4 Data Mining Techniques **8 hours**
Data mining query languages, data specification, specifying knowledge, hierarchy specification, pattern presentation & visualization specification, data mining languages and standardization of data mining. Data mining techniques: Association rules, Clustering techniques, Decision tree.
Unit-5 Miscellaneous topics **8 hours**
Mining complex data objects, Spatial databases, Multimedia databases, Time series and Sequence data; mining Text Databases and mining Word Wide Web.

Continuous Assessment Pattern

Internal Assessment (IA)	**Mid Term Exam (MTE)**	**End Term Exam (ETE)**	**Total Marks**
20	30	50	100

Name of The Course	Compiler Construction				
Course Code	MCAS3520				
Prerequisite					
Corequisite					
Antirequisite					
		L	T	P	C
		3	0	0	3

Course Objectives:

The objective of this course is to:

1. Know working of compiler.
2. Study lexical and syntax analysis in compiler.
3. Study type checking and use of storage.
4. Understand use of activation tree and activation records
5. Study and analyze code generation and code optimization

Course Outcomes

CO1	Understand different tools used in compiler.
CO2	Have idea about how lexical analysis works.
CO3	Know about the working and generation of parsing in compiler
CO4	Understand use of type checking and L and S attributes of expression
CO5	Gain the knowledge about use of storage, activation tree and records in compiler
CO6	Learn how compilers optimize code and use it

Text Book (s)

1. Aho, Sethi, Ullman, Compilers: Principles, Techniques, and Tools, Addison-Wesley.

Reference Book (s)

1. Steven S. Muchnick, Advanced *compiler design* and implementation

Course Content:

Unit-1 Introduction **8 hours**
analysis-synthesis model of compilation, various phases of a compiler, tool based approach to compiler construction
Unit-2 Lexical and Syntax Analysis **8 hours**
Lexical analysis: interface with input, parser and symbol table, token, lexeme and patterns, difficulties in lexical analysis, error reporting, and implementation. Regular definition, Transition diagrams, LEX. Syntax analysis: context free grammars, ambiguity, associativity, precedence, top down parsing, recursive descent parsing, transformation on the grammars, predictive parsing, Bottom up parsing, operator precedence grammars, LR parsers (SLR, LALR, LR), YACC.
Unit-3 Syntax directed definitions and Type checking **8 hours**
Inherited and synthesized attributes, dependency graph, evaluation order, bottom up and top down evaluation of attributes, L- and S-attributed definitions.type system, type expressions, structural and

name equivalence of types, type conversion, overloaded functions and operators, polymorphic functions.
Unit-4 Run time system **8 hours**
Storage organization, activation tree, activation record, parameter passing, symbol table, dynamic storage allocation.
Unit-5 Intermediate code generation **8 hours**
Intermediate representations, translation of declarations, assignments, Intermediate Code generation for control flow, Boolean expressions and procedure calls, implementation issues.Code generation and instruction selection: issues, basic blocks and flow graphs, register allocation, code generation

Continuous Assessment Pattern

Internal Assessment (IA)	**Mid Term Exam (MTE)**	**End Term Exam (ETE)**	**Total Marks**
20	30	50	100

Name of The Course	Artificial Intelligence			
Course Code	MCAS3530			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	0	0	3

Course Objectives:

The objective of this course is to learn:

1. To provide a strong foundation of fundamental concepts in Artificial Intelligence
2. To provide a basic exposition to the goals and methods of Artificial Intelligence
3. To enable the student to apply these techniques in applications which involve perception, reasoning and learning.
4. Distinguish between a conventional system and an intelligent system.
5. Artificial Intelligent techniques in solving problems of a particular domain

Course Outcomes

CO1	Understand different types of AI agents .
CO2	Know various AI search algorithms (uninformed, informed, heuristic, constraint satisfaction, genetic algorithms) .
CO3	Understand the fundamentals of knowledge representation (logic-based, frame-based, semantic nets), inference and theorem proving .
CO4	Know how to build simple knowledge-based systems .
CO5	Demonstrate working knowledge of reasoning in the presence of incomplete and/or uncertain information .
CO6	Ability to apply knowledge representation, reasoning, and machine learning techniques to real-world problems .

Text Book (s)

1. Stuart Russell, Peter Norvig, "Artificial Intelligence – A Modern Approach", 2nd Edition, Pearson Education / Prentice Hall of India, 2004.

Reference Book (s)

1. Elaine Rich and Kevin Knight, "Artificial Intelligence", 2nd Edition, Tata McGraw- Hill, 2003

Course Content:

Unit-1 Introduction	**8 hours**
Intelligent agents – agents and environments - good behavior – the nature of Environments – structure of agents - Problem Solving - problem solving agents – example problems – searching	

for solutions – uniformed search strategies – avoiding repeated states – searching with partial information.
Unit-2 SEARCHING TECHNIQUES **8 hours**
Informed search and exploration – Informed search strategies – heuristic function – local search algorithms and optimistic problems – local search in continuous spaces – online search agents and unknown environments - Constraint satisfaction problems (CSP) – Backtracking search and Local search for CSP – Structure of problems - Adversarial Search – Games – Optimal decisions in games – Alpha – Beta Pruning – imperfect real-time decision – games that include an element of chance.
Unit-3 KNOWLEDGE REPRESENTATION **8 hours**
First order logic – representation revisited – Syntax and semantics for first order logic – Using first order logic – Knowledge engineering in first order logic - Inference in First order logic – prepositional versus first order logic – unification and lifting – forward chaining – backward chaining - Resolution - Knowledge representation – Ontological Engineering - Categories and objects – Actions - Simulation and events - Mental events and mental objects
Unit-4 LEARNING **8 hours**
Learning from observations - forms of learning - Inductive learning - Learning decision trees - Ensemble learning - Knowledge in learning – Logical formulation of learning – Explanation based learning – Learning using relevant information – Inductive logic programming - Statistical learning methods - Learning with complete data – Learning with hidden variable - EM algorithm - Instance based learning - Neural networks - Reinforcement learning – Passive reinforcement learning -

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
20	30	50	100

Name of The Course	Big Data Technologies & Analytics			
Course Code	MCAS3550			
Prerequisite	Data Warehousing and Data Mining			
Corequisite				
Antirequisite				
	L	T	P	C
	3	0	0	3

Course Objectives:

1. Understand concepts of big data
2. Understand the architecture of Hadoop.
3. Learn types of analytics and techniques.
4. Make students understand different clustering techniques
5. Learn Hadoop and NoSQL

Course Outcomes

CO1	Students should know about design issues of Hadoop Architecture.
CO2	Students should learn various techniques for big data analytics.
CO3	Students able to identify the real time problems and able to design solution using various big data analytics techniques.
CO4	Students use prediction of supervised and unsupervised learning.
CO5	Students can use classification of clustering algorithms

Text Book (s)

1. Seema Acharya ,Subhashini Chellappan ,"Big Data and Analytics (WIND)", Wiley, ISBN: 8126554789, 2015.
2. Boris lublinsky, Kevin t. Smith, Alexey Yakubovich, "Professional Hadoop Solutions", Wiley, ISBN: 9788126551071, 2015.
3. Chris Eaton, Dirk deroos et al. , "Understanding Big data ", McGraw Hill, 2012.
4. Alberto Cordoba, "Understanding the Predictive Analytics Lifecycle", Wiley, 2014.

Reference Book (s)

1. Tom White, "HADOOP: The definitive Guide" , O Reilly 2012. 6 IT2015 SRM(E&T)
2. VigneshPrajapati, "Big Data Analytics with R and Haoop", Packet Publishing 2013.
3. Tom Plunkett, Brian Macdonald et al, "Oracle Big Data Handbook", Oracle Press, 2014.
4. Jay Liebowitz, "Big Data and Business analytics",CRC press, 2013.

Course Content:

Unit-1 Introduction to Big Data **8 hours**
Classification of Digital Data, Big Data and its importance, Four Vs, Drivers for Big data, Big data analytics, Classification of Analytics , Top Challenges Facing Big Data, Responsibilities of data scientists, Big data applications in healthcare, medicine, advertising.
Unit-2 Hadoop Architecture **8 hours**
Hadoop Architecture, Hadoop Storage: HDFS, Common Hadoop Shell commands , Anatomy of File Write and Read., NameNode, Secondary NameNode, and DataNode, Hadoop MapReduce paradigm, Map and Reduce tasks, Job, Task trackers - Cluster Setup – SSH & Hadoop Configuration – HDFS Administering –Monitoring & Maintenance, Managing Resources and Applications with Hadoop YARN. Interacting with Hadoop Ecosystem. Introduction to Hive, Introduction to Pig.
Unit-3 Introduction to NoSQL & Hadoop **8 hours**
Introduction to NoSQL Advantages of NoSQL, SQL versus No SQL, Introduction to Hadoop, Features of Hadoop, Hadoop Versions, Hadoop Ecosystems, Hadoop Distributions, Hadoop Versus SQL.
Unit-4 Types of Analytics & Techniques **8 hours**
Open source technology for Big Data Analytics – cloud and Big Data – Mobile Business Intelligence and Big Data – Crowd Sourcing Analytics – Inter- and Trans-Firewall Analytics In-Memory Analytics, In-Database Processing, Symmetric Multiprocessor System, Massively Parallel Processing, Shared Nothing Architecture, Open source Analytical Tools, Sampling Techniques, Data classification, Tabulation, Frequency and Graphic representation, Measures of central value - Arithmetic mean, Geometric mean, Harmonic mean, Mode, Median, Regression Analysis, Correlation analysis.
Unit-5 Predictive Analysis **8 hours**
Predictive Analytics, Supervised, Unsupervised learning, Clustering Techniques, Hierarchical, K-Means, Basics of R, Working of R - Creating, listing and deleting the objects in memory - The on-line help Data with R Objects, R data Frames and Matrices, Reading data in a file , Saving data, Generating data, Manipulating objects Graphics with R Managing graphics , Graphical functions

Continuous Assessment Pattern

Internal Assessment (IA)	**Mid Term Exam (MTE)**	**End Term Exam (ETE)**	**Total Marks**
20	30	50	100

Name of The Course	Mobile Application Development				
Course Code	MCAS3540				
Prerequisite	XML, Java				
Corequisite					
Antirequisite					
		L	T	P	C
		3	0	2	4

Course Objectives:

1. Basics of Android OS
2. Develop Basic and advance Android Apps
3. Publishing and Monetizing the app

Course Outcomes

CO1	Understand about Android OS and its Development Environment
CO2	Concept of concepts of android application development, user interface design, shared preferences.
CO3	DevelopBasic and advance android app development for android devices.
CO4	Publish the app
CO5	Monetize from app development.

Text Book (s)

1. W.M Lee, "Begning Android 4 Application Development",Wiley
2. Retro Meier,"Android 4 Application Development",Wiley

Reference Book (s)

1. B. Phillips et al., Android Programming: Big Nerd Ranch Guide (as mentioned above);
2. Christian Keur and Aaron Hillegass, iOS Programming: The Big Nerd Ranch Guide, 6th edition, 2016;
3. Valentino Lee, Heather Schneider, and Robbie Schell, Mobile Applications: Architecture, Design and Development, Prentice Hall, 2004;
4. Tomasz Nurkiewicz and Ben Christensen, Reactive Programming with RxJava, O'Reilly Media, 2016;
5. Raoul-Gabriel Urma, Mario Fusco, and Alan Mycroft, Java 8 in Action: Lambdas, Streams, and Functional-Style Programming, Manning Publications, 2015;

Course Content:

Unit-1 Introduction and Architecture of Android **5 hours**
History of Android, Features of Android, Android Devices, Android Versions, Open Handset Alliance (OHA) , Advantages of Android, Comparing Android with other platform, Architecture of Android. Android Directory Structure, Structure of Manifest files, Android Development Tools.
Unit-2 User Interfaces **10 hours**

Views, Views Group, Widgets - Button, EditText, CheckBox, TextView, ToggleButton, Layouts, Styles, Themes, Orientation, Screen Size and Density, Unit of measurement - px, dp, sp and dpi,pt, conversion of dp to px
Unit-3 Component s of Android **10 hours**
Activities, Activity life cycle,Intents, types of intents, Intent Filter, Fragment, fragment lifecycle, Services, Broadcast receivers, Content providers, Starting a new activity, Sending and Receiving of data.
Unit-4 Advance App Development **10 hours**
SQLite database, Cursors and content values, Opening and closing Database, Sensors, Bluetooth, GeoLocation, SMS & MMS, Graphics and Animation
Unit-5 Security, Publishing, Monetizing **5 hours**
Security Creating a signing certificate, Signing your applications for distribution, Publishing on Google Play, Monetization strategies, Application promotion strategies, Using Google Analytics

Continuous Assessment Pattern

Internal Assessment (IA)	**Mid Term Exam (MTE)**	**End Term Exam (ETE)**	**Total Marks**
20	30	50	100

Name of The Course	Cloud Security				
Course Code	MCAS9110				
Prerequisite					
Corequisite					
Antirequisite					
		L	T	P	C
		3	0	0	3

Course Objectives:

The objective of this course is to:

1. Understand Security Risks/Issues in the Cloud
2. Address -Tools/ Solutions on Security in Cloud

Course Outcomes

CO1	Understand cloud computing, security challenges and risk analysis
CO2	Learn different Policy, Governance, Compliance and Legal Considerations
CO3	Gain Knowledge of Security in Cloud
CO4	Understand Authentication and Authorization
CO5	Understand intrusion detection in the cloud

Text Book (s)

1. **The Cloud Security Ecosystem: Technical, Legal, Business and Management Issues**

Reference Book (s)

1. Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance Tim Mather, Subra Kumaraswamy, Shahed Latif , O'Reilly
2. Cloud Security: A Comprehensive Guide to Secure Cloud Computing
   Ronald L. Krutz, Russell Dean Vines, John Wiley & Sons,

Course Content:

Unit-1 Introduction to Cloud Computing **8 hours**
Delivery models: Software as a Service (SaaS) - Platform as a Service (PaaS) - Infrastructure as a Service (IaaS) - Cloud types (public, private, hybrid) - Jericho Cloud Cube Model
Unit-2 Security Challenges and Risk Analysis **8 hours**
Virtualization and multi-tenancy – Risk management - Risk assessment for cloud migration-Unique SaaS challenges- Cloud Access Security Brokers (CASBs) – Auditing the cloud
Unit-3 Policy, Governance, Compliance and Legal Considerations **8 hours**
Internal policy needs - Contract requirements for security-Service-level agreements-Governance models for the cloud. Compliance challenges for the cloud - Legal and geographic jurisdiction - Privacy concerns
Unit-4 Data and Infrastructure Security in the cloud **8 hours**
Encryption types and availability - Key management and encryption architectures -Data/information lifecycle – Retention – Disposal – Classification. Patch and configuration management - Change management - Network and virtualization security - Application security for SaaS, PaaS, and IaaS
Unit-5 Intrusion Detection in the cloud **8 hours**
Incident detection for different cloud models - Managing Intrusion Detection System/Intrusion Prevention System (IDS/IPS) and alerting - The event management feedback loop

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
20	30	50	100

Name of The Course	**Cyber Security**				
Course Code	MCAS9463				
Prerequisite	Wireless technologies and internet				
Corequisite					
Antirequisite					
		L	**T**	**P**	**C**
		3	0	0	3

Course Objectives:

1. Identify the key components of cyber security network architecture
2. Apply cyber security architecture principles
3. Describe risk management processes and practices

Course Outcomes

CO1	Understand the concept of Data and the information. To know how the information system can be developed keeping in mind the security of data over the internet.
CO2	Knowledge on security threats to the data and Applications developed and the e-commerce like Trojan horses, Worms, Bombs etc.
CO3	Compare Cryptography Algorithms, different categories of Cryptography algorithms
CO4	Analysis of Encryption and Decryption Techniques
CO5	Knowledge of different methods of information Security, Data Security, hardware and software security.

Text Book (s)

1. Schou, Shoemaker, "Information Assurance for the Enterprise", Tata McGraw Hill.

2. CHANDER, HARISH**, "**Cyber Laws And It Protection**"**, PHI Learning Private Limited, Delhi, India

Reference Book (s)

1. Charles P. Pfleeger, Shari Lawerance Pfleeger, "Analysing Computer Security", Pearson Education India.
2. V.K. Pachghare, "Cryptography and information Security", PHI Learning Private Limited, Delhi India.
3. Dr. Surya Prakash Tripathi, Ritendra Goyal, Praveen kumar Shukla ,"Introduction to Information Security and Cyber Law" Willey Dreamtech Press

Course Content:

Unit-1 Introduction to Information System 8 hours
Introduction to information systems, Types of information Systems, Development of Information Systems, Introduction to information security, Need for Information security, Threats to Information Systems, Information Assurance, and Cyber Security
Unit-2 Information Security Threats 8 hours
Introduction to information systems, Types of information Systems, Development of Information Systems, Introduction to information security, Need for Information security, Threats to Information Systems, Information Assurance, and Cyber Security
Unit-3 Cryptography Techniques 8 hours

Cryptography Algorithms and Techniques- Rail fence Algorithm, RSA Algorithm, Diffie- Hellman Key Exchange Algorithm, Simple Data Encryption Standard (SDES) Algorithm, Caesar Cipher, Hill Cipher, and Play Fair Cipher.
Unit-4 Cryptography Techniques 8 hours
Application security (Database, E-mail and Internet), Archival Storage and Disposal of Data, Security Technology-Firewall and VPNs, Intrusion Detection, Access Control Security Issues in Hardware, Data Storage & Downloadable Devices, Physical Security of IT Assets, Access Control, Backup Security Measures Application Development Security, Information Security Governance & Risk Management, Security Architecture & Design.
Unit-5 Information Security Policies and Cyber Law 8 hours
Security Policies, WWW policies, Email Security policies, Policy Review Process-Corporate policies-Sample Security Policies, Publishing and Notification Requirement of the Policies. Information Security Standards-ISO, IT Act, Copyright Act, Patent Law, IPR. Cyber Laws in India; IT Act 2000 Provisions, Intellectual Property Law: Copy Right Law, Software License, Semiconductor Law and Patent Law.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
20	30	50	100

Name of The Course	Network Security			
Course Code	MCAS9130			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	0	0	3

Course Objectives:

1. Analyze, implement and maintain security requirements and mechanisms in various computer systems and networks.
2. Explain networking protocols and their hierarchical relationship hardware and software. Compare protocol models and select appropriate protocols for a particular design.
3. Explain common network vulnerabilities and attacks, defense mechanisms against network attacks, and cryptographic protection mechanisms
4. Explain the requirements of real-time communication security and issues related to the security of web services.

Course Outcomes

CO1	Understand the network security, services, attacks, mechanisms, types of attacks on TCP/IP protocol suite.
CO2	Comprehend and apply authentication services, authentication algorithms
CO3	Comprehend and apply network layer security protocols, Transport layer security protocols, Web security protocols.
CO4	Understand the wireless network security threats.
CO5	Determine firewall requirements, and configure a firewall.

Text Book (s)

1) Stallings, W.,.Cryptography and Network Security: Principles and Practice, 4th ed., Prentice Hall PTR.,2006

Reference Book (s)

1) Kaufman, c., Perlman, R., and Speciner, M., Network Security, Private Communication in a public world, 2nd ed., Prentice Hall PTR., 2002.
2) Cryptography and Network Security; McGraw Hill; Behrouz A Forouzan.
3) AtulKahate, Cryptography and Network Security, McGraw Hill.
4) Johannes A. Buchmann, “Introduction to Cryptography”, Springer-Verlag.

Course Content:

Unit-1 Introduction	**8 hours**

Overview of Network Security, Security services, attacks, Security Issues in TCP/IP suite- Sniffing, spoofing, buffer overflow, ARP poisoning, ICMP Exploits, IP address spoofing, IP fragment attack, routing exploits, UDP exploits, TCP exploits.
Unit-2 Public Key Encryption and Hash Functions 8 hours
Authentication requirements, Authentication functions - Message Authentication Codes - Hash Functions - Security of Hash Functions and MACs - MD5 message Digest algorithm - Secure Hash Algorithm - RIPEMD - HMAC Digital Signatures, Authentication protocols-Kerberos, X.509
Unit-3 IP Security 8 hours
IP Security-AH and ESP, SSL/TLS, SSH, Web Security-HTTPS, DNS Security, Electronic Mail Security (PGP, S/MIME).
Unit-4 Intruders and Viruses 8 hours
Intruders, Viruses, Worms, Trojan horses, Distributed Denial-Of-Service (DDoS), Firewalls, IDS, Honey nets, Honey pots.
Unit-5 Wireless Network Security 8hours
Introduction to wireless network security, Risks and Threats of Wireless networks, Wireless LAN Security (WEP, WPA).

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
20	30	50	100

Name of The Course	INFORMATION RETRIEVAL			
Course Code	MCAS9210			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	0	0	3

Course Objectives:

The Student should be made to:

- Learn the information retrieval models.
- Be familiar with Web Search Engine.
- Be exposed to Link Analysis.
- Understand Hadoop and Map Reduce.
- Learn document text mining techniques.

Course Outcomes

CO1	Apply information retrieval models.
CO2	Design Web Search Engine
CO3	Use Link Analysis
CO4	Use Hadoop and Map Reduce
CO5	Apply document Text Mining Techniques

Text Book (s)

1. C. Manning, P. Raghavan, and H. Schütze, Introduction to Information Retrieval , Cambridge University Press, 2008.
2. Ricardo Baeza -Yates and Berthier Ribeiro - Neto, Modern Information Retrieval: The Concepts and Technology behind Search 2 nd Edition, ACM Press Books 2011.
3. Bruce Croft, Donald Metzler and Trevor Strohman, Search Engines: Information Retrieval in Practice, 1 st Edition Addison Wesley, 2009.
4. Mark Levene, An Introduction to Search Engines and Web Navigation, 2 nd Edition Wiley, 2010.

Reference Book (s)

1. Stefan Buettcher, Charles L. A. Clarke, Gordon V. Cormack, Information Retrieval: Implementing and Evaluating Search Engines, The MIT Press, 2010.
2. Ophir Frieder "Information Retrieval: Algorithms and Heuristics: The Information Retrieval Series ", 2 nd Edition, Springer, 2004.
3. Manu Konchady, "Building Search Applications: Lucene, Ling Pipe", and First Edition, Gate Mustru Publishing, 2008.

Course Content:

Unit-1 Introduction	8 hours

Introduction - History of IR - Components of IR - Issues – Open source Search engine Frameworks - The impact of the web on IR - The role of artificial intelligence (AI) in IR – IR Versus Web Search - Components of a Search engine - Characterizing the web
Unit-2 Information Retrieval 8 hours
Boolean and vector-space retrieval models - Term weighting - TF-IDF weighting - cosine similarity – Preprocessing - Inverted indices - efficient processing with sparse vectors – Language Model based IR - Probabilistic IR – Latent Semantic Indexing - Relevance feedback and query expansion.
Unit-3 Web Search Engine – Introduction and Crawling 8 hours
Web search overview, web structure, the user, paid placement, search engine optimization/ spam. Web size measurement - search engine optimization/spam – Web Search Architectures - crawling - meta-crawlers- Focused Crawling - web indexes –- Near-duplicate detection - Index Compression – XML retrieval
Unit-4 Web Search – Link Analysis and Specialized Search 8 hours
Link Analysis – hubs and authorities – Page Rank and HITS algorithms - Searching and Ranking – Relevance Scoring and ranking for Web – Similarity - Hadoop & Map Reduce - Evaluation - Personalized search - Collaborative filtering and content-based recommendation of documents and products – handling “invisible” Web - Snippet generation, Summarization, Question Answering, Cross-Lingual Retrieval
Unit-5 Document Text Mining 8 hours
Information filtering; organization and relevance feedback – Text Mining - Text classification and clustering - Categorization algorithms: naive Bayes; decision trees; and nearest neighbor - Clustering algorithms: agglomerative clustering; k-means; expectation maximization (EM).

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
20	30	50	100

Name of The Course	Network Management & System Administration			
Course Code	MCAS9230			
Prerequisite	Computer Network			
Corequisite				
Antirequisite				
	L	T	P	C
	3	0	0	3

Course Objectives:

Students will learn and apply basic concepts and methodologies of System Administration and Security by building from the ground up a miniature corporate network. They will be responsible for installing backend servers that users would normally require for day to day operations. They will also be responsible for validating, from a user's perspective that their network is functional. Lastly, they will implement security measures into the network and do a risk assessment as to how effective their security measures are and their fellow students. Students will use Microsoft Windows Server 2008 for the Active Directories servers, and Microsoft Windows XP and/or 7 for the clients. Also, Ubuntu 10.10 and/or CentOS 5.6 will be used for the networking part of the class. All server and client computers are Virtual Machines working on a VMware environment.

Course Outcomes

CO1	Explain Directory Services and Remote Access
CO2	Set-up and use Virtual Private Network
CO3	Explain Network protocols and services
CO4	Install and configure Network server operating system
CO5	Configure various services on Windows server platform

Text Book (s)

1. 98-366: "Networking Fundamentals, Microsoft Official Academic Course (MicrosoftCorporation)", Wiley, 2011.
2. 98-367: "MTA Security Fundamentals, Microsoft Official Academic Course(MicrosoftCorporation)", Wiley, 2011.

Reference Book (s)

1. Thomas A. Limoncelli, Christine Hogan, Strata R. Chalup , The Practice of System and Network Administration , 2nd ed., 2007
2. Mark Burgess , Principles of Network and System Administration , 2004
3. Aeleen Frisch , Essential System Administration , 3rd ed., 2002
4. Evi Nemeth, Garth Snyder, Trent R. Hein, Ben Whaley , UNIX and Linux System Administration , 4th ed., 2010

Course Content:

Unit-1 Exploring Directory Services and Remote Access **8 hours**
Directory Services: Define Directory Service, Definition of Novelle Directory, Windows Domain, MS Active Directory, X500 Directory Access Protocol, Lightweight Directory Access Protocol, Forests, Trees, Roots and Leaves.,Active Directory Architecture: Object Types, Object Naming, Canonical Names, LDAP Notation, Globally unique identifiers, User Principle Names, Domain, Trees & Forests.,Remote Network Access: Need of Remote Network Access, PSTN, ISDN, DSL, CATV.Virtual Private Network: VPN Protocols, Types of VPN, VPN Clients, SSL VPNs.
Unit-2 Network Protocols and Services **8 hours**

Dynamic Host Control Protocol(DHCP): DHCP Origins, Reverse Address Resolution Protocol (RARP), The Bootstrap Protocol (BOOTP), DHCP Objectives, IP Address assignments, DHCP Architecture. ,Introduction to Domain Name Systems (DNS): DNS Objectives, Domain Naming, Top Lavel Domains, Second Level Domains, Sub-domains, DNS Functions, Resource Records, DNS Name Resolution, Resolves, DNS Requests, Root Name Servers, Resolving a Domain Name, DNS Name Registration.
Unit-3 Network Planning and Implementation 8 hours
Designing Network – Accessing Network Needs, Applications, Users, Network Services, Security and Safety, Growth and Capacity Planning, Meeting Network Needs – Choosing Network Type, Choosing Network Structure, Choosing Servers.Installing and Configuring Windows Server - Preparing for Installation, Creating windows server boot disk, Installing windows server, Configuring server/ client. Setting windows server - Creating Domain controller, Adding the DHCP and WINS roles, Adding file server and print server, Adding Web based Administration.
Unit-4 Network Configuration 8 hours
Working With User Accounts - Adding a User, Modifying User Account, Deleting or Disabling a User Account. Working With Windows Security Groups – Creating Group, Maintaining Group Membership. Working with Shares – Understanding Share Security, Cresting Shares, Mapping Drives Administering Printer Shares – Setting up Network Printer Working with Windows Backup – Using Windows Servers Backup Software
Unit-5 Troubleshooting of Networking 8 hours
Understanding the Problem – Troubleshooting, Segmenting the Problem, and Isolating the Problem, Setting Priorities. Troubleshooting Tools – Hardware Tools, Software Tools, Monitoring and Troubleshooting Tools ,Internal Security – Account Security, File and Directory permissions, Practices and user education

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
20	30	50	100

Name of The Course	Foundation to Data Science			
Course Code	MCAS9220			
Prerequisite				
Corequisite				
Antirequisite				
	L	**T**	**P**	**C**
	3	0	0	3

Course Objectives:

The student should be made to:

- To understand the basic concept of cloud computing.
- To describe the virtualization fundamentals in cloud.
- To use SAAS and PAAS in cloud environment.
- To compare various cloud storage mechanisms.
- To develop applications in cloud

Course Outcomes

CO1	Describe what Data Science is and the skill sets needed to be a data scientist.
CO2	Explain in basic terms what Statistical Inference means. Identify probability distributions commonly used as foundations for statistical modeling. Fit a model to data
CO3	Explain the significance of exploratory data analysis (EDA) in data science. Apply basic tools (plots, graphs, summary statistics) to carry out EDA.
CO4	Describe the Data Science Process and how its components interact. Use APIs and other tools to scrap the Web and collect data.
CO5	Identify and explain fundamental mathematical and algorithmic ingredients that constitute a Recommendation Engine (dimensionality reduction, singular value decomposition, principal component analysis). Build their own recommendation system using existing components.

Text Book (s)

1.Cathy O'Neil and Rachel Schutt. Doing Data Science, Straight Talk From The Frontline. O'Reilly. 2014.

Reference Book (s)

1. Jure Leskovek, Anand Rajaraman and Jeffrey Ullman. Mining of Massive Datasets. v2.1, Cambridge University Press. 2014. (free online)
2. Kevin P. Murphy. Machine Learning: A Probabilistic Perspective. ISBN 0262018020. 2013.
3. Foster Provost and Tom Fawcett. Data Science for Business: What You Need to Know about Data Mining and Data-analytic Thinking. ISBN 1449361323. 2013.
4. Trevor Hastie, Robert Tibshirani and Jerome Friedman. Elements of Statistical Learning, Second Edition. ISBN 0387952845. 2009. (free online)
5. Avrim Blum, John Hopcroft and Ravindran Kannan. Foundations of Data Science. (Note: this is a book currently being written by the three authors. The authors have made the first draft of their notes for the book available online. The material is intended for a modern theoretical course in computer science.)

6. Mohammed J. Zaki and Wagner Miera Jr. Data Mining and Analysis: Fundamental Concepts and Algorithms. Cambridge University Press. 2014.
7. Jiawei Han, Micheline Kamber and Jian Pei. Data Mining: Concepts and Techniques, Third Edition. ISBN 0123814790. 2011.

Course Content:

Unit-1 Introduction to BI	**8 hours**
What is Data Science? - Big Data and Data Science hype – and getting past the hype - Why now? – Datafication - Current landscape of perspectives - Skill sets needed 2. Statistical Inference - Populations and samples - Statistical modeling, probability distributions, fitting a model - Intro to R	
Unit-2 . Exploratory Data Analysis and the Data Science Process	**8 hours**
Exploratory Data Analysis and the Data Science Process - Basic tools (plots, graphs and summary statistics) of EDA - Philosophy of EDA - The Data Science Process - Case Study: RealDirect (online real estate firm) 4. Three Basic Machine Learning Algorithms - Linear Regression - k-Nearest Neighbors (k-NN) - k-means	
Unit-3 Machine Learning Algorithm and Usage in Applications	**8 hours**
Motivating application: Filtering Spam - Why Linear Regression and k-NN are poor choices for Filtering Spam - Naive Bayes and why it works for Filtering Spam - Data Wrangling: APIs and other tools for scrapping the Web 6. Feature Generation and Feature Selection (Extracting Meaning From Data) - Motivating application: user (customer) retention - Feature Generation (brainstorming, role of domain expertise, and place for imagination) - Feature Selection algorithms – Filters; Wrappers; Decision Trees; Random Forests	
Unit-4 Building a User-Facing Data Product	**8 hours**
Algorithmic ingredients of a Recommendation Engine - Dimensionality Reduction - Singular Value Decomposition - Principal Component Analysis - Exercise: build your own recommendation system 8. Mining Social-Network Graphs - Social networks as graphs - Clustering of graphs - Direct discovery of communities in graphs - Partitioning of graphs - Neighborhood properties in graphs	
Unit-5 Data Visualization and Ethical Issues	**8 hours**
Basic principles, ideas and tools for data visualization , Examples of inspiring (industry) projects - Exercise: create your own visualization of a complex dataset Discussions on privacy, security, ethics - A look back at Data Science - Next-generation data scientists	

Continuous Assessment Pattern

Internal Assessment (IA)	**Mid Term Exam (MTE)**	**End Term Exam (ETE)**	**Total Marks**
20	30	50	100