



ALAGAPPA UNIVERSITY

(A State University Established in 1985)
Karaikudi - 630003, Tamil Nadu, India



2017 Accredited with A+ Grade by NAAC (CGPA : 3.64)	2018 MHRD Govt. of India Graded as Category - 1 & Granted Autonomy UGC University Grants Commission	2018 MHRD GOVERNMENT OF INDIA Swachh Campus Rank : 4	2019 NIRF NATIONAL INSTITUTIONAL RANKING FRAMEWORK Rank : 20	2019 QS India Rank : 20 BRICS Rank : 104 Asia Rank : 216
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DEPARTMENT OF COMPUTATIONAL LOGISTICS



M.Sc., INFORMATION TECHNOLOGY

[Choice Based Credit System (CBCS)]

[For the candidates admitted from the academic year 2019-2020]

ALAGAPPA UNIVERSITY, KARAIKUDI
Department of Computational Logistics
M.Sc(Information Technology)

General Programme Objective

M.Sc(Information Technology) is a two-year Post Graduate programme established to provide advanced and in-depth knowledge of Information Technology and its applications. It is designed to equip post graduate students with an integrated set of skills that will allow them to develop their professional careers in area of information technology. The general objective is to equip students with the theoretical and practical that is necessary to enable them to analyze, design and develop complex application software solutions and to pursue careers in IT industries.

Specific Programme Objective

The objective of this programme is

- To provide theoretical and practical knowledge in the key areas of Computer Science and to impart knowledge and practice in emerging, cutting edge technologies in Information Technology.
- To train the students to shine in the most competitive field of Information Technology.
- To impart knowledge in making precious contributions to design, development, and production in the practice of Information Technology related application areas, particularly in software development and system management. .

Programme Outcome

After completion of the programme, the students are able to

- Acquire knowledge in core areas of Computer Science, current and emerging technologies in Information Technology.
- Work higher end applications in Internet Technologies; also managerial ability to analyze, design, develop and to maintain software development.
- Understand, apply and synthesize the higher level concepts in the domain of Information Technology.
- Acquire application competence in selected areas and to find optimal solutions with analytical approaches, which they can comprehensively implement and evaluate.
- Use and apply current technical concepts and practices in the core information technologies
- Communicate effectively with team members and apply communication skills to effectively promote ideas, goals or products.
- Understand professional, ethical, legal, security and social issues and responsibilities

ALAGAPPA UNIVERSITY, KARAIKUDI – 630003
(Accredited with 'A+' Grade by NAAC (CGPA:3.64) in the Third Cycle and
Graded as Category-I University by MHRD-UGC)
DEPARTMENT OF COMPUTATIONAL LOGISTICS
School of Computational Sciences

Master of Science in Information Technology
M.Sc. (Information Technology)
Choice Based Credit System (CBCS)

Regulations (2019-2020)

1. Candidates for admission to the first year of the Master of Science in Information Technology [M.Sc. (Information Technology)] programme are required to pass in any one of the following Examinations of any recognized University with a minimum of 55% marks in Part-III (minimum 50% marks for SC/ST candidates):

B.Sc. Degree in Information Technology / Computer Science/ B.C.A./B.Voc (Software Development) or any qualification equivalent thereto in 10+2+3 pattern.

2. The M.Sc. (Information Technology) programme is a two year programme consisting of four semesters. Each semester consists of minimum of 75 working days at the rate of 6 hours per day.
3. The courses of study and the scheme of examinations are shown in Appendix A.
4. The End-Semester Examinations are conducted in November and April of every academic year by the University in different courses according to the scheme given in Appendix A. A candidate is permitted to appear for the End-Semester examination in a particular course at the end of each semester provided he/she secures not less than 75% of attendance in each course in that semester.
5. The programme curriculum is offered from the academic year 2019-2020.
6. Each student should take 90 credits to complete M.Sc. (Information Technology) Programme.
7.
 - a) Each student is allowed to take elective courses from the respective groups to fulfill the Courses of study.
 - b) Students are allowed to take interdisciplinary courses (Non-Major Elective) in a semester from the interdisciplinary courses offered by other Departments as suggested by the advisory staff.
8. Each student has to register for 4 credits in the interdisciplinary courses for the entire period of study. Credits earned through Self Learning Courses (MOOCs) shall be transferred in the credit plan of the program as extra credits.
9. Each core theory course carries 5 credits or 4 credits and each elective theory course carries 4 credits with 75 marks in the Semester (University) Examination and 25 marks in the Internal Assessment and each Lab (Practical) course carries 2 credits (in the First Semester 3 credits) with 75 marks in the Semester examination and 25 marks in the Internal Assessment.
10. The Semester Examinations are conducted for three hours duration.
11. The project work shall span for a period of one semester duration. The students have to submit a project report at the end of the IV Semester. It carries 15 credits with 150 marks in the End-

Semester examination (100 marks for Project Evaluation by External Examiner and 50 marks for Viva-Voce jointly awarded by both Internal and External Examiners) and 50 marks in the Internal Assessment (Project monitoring and Evaluation by the Internal Examiner).

12. To pass in each course, a candidate is required to secure 40% marks in the Semester examination and 40% marks in the Internal assessment and 50% marks in the aggregate (marks in Semester Examination + marks in Internal Assessment).
13. A student is permitted to continue the Programme from I to IV semesters irrespective of failure(s) in the courses of the earlier semesters. The candidate will qualify for the M.Sc. (Information Technology) degree only if the student passes all the prescribed courses of the Programme within a period of FOUR years.
14. Results will be declared after the completion of each Semester examination and the marks/grades obtained by the candidate will be forwarded to them through the Head of the Department.
15. A Candidate who has passed all the examinations in the first attempt within two years of admission shall be declared to have passed in First Class with Distinction provided the candidate secures more than 75% marks in the aggregate
 - a) A candidate who has passed all the examinations within two years of admission shall be declared to have passed in First Class provided he/she secures not less than 60% marks in the aggregate.
 - b) All other candidates who have passed all the examinations in the prescribed courses shall be declared to have passed in Second Class.
16. All the candidates who have passed all prescribed courses in all Examinations shall be eligible for the award of the Degree of Master of Science in Information Technology [M.Sc. (Information Technology)].
17. The common CBCS regulations prescribed for the Departments by the Alagappa University will be followed in all respect.
18. This revised curriculum will come to effect from the academic year 2019-2020.

Department of Computational Logistics

Courses of Study and Scheme of Evaluation

M.Sc. (Information Technology)

Course Code	Title of the Course	Credit	Hours / week	Exam Duration (in Hrs)	IA Marks (Max)	ES Marks (Max)	Total marks (Max)
I Semester							
546101	Mathematics for Computing	5	5	3	25	75	100
546102	Distributed Operating System	5	5	3	25	75	100
546103	Web Technology	5	5	3	25	75	100
546104	Python Programming	5	5	3	25	75	100
	Elective - I	4	4	3	25	75	100
546105	Lab I: Web Technology and Python Lab	3	6	3	25	75	100
Total		27	30				600
II Semester							
546201	Database Systems	5	5	3	25	75	100
546202	Data Mining	5	5	3	25	75	100
546203	Software Testing and Quality assurance	4	4	3	25	75	100
	Elective-II	4	4	3	25	75	100
546204	Lab II: Data Mining Lab	2	4	3	25	75	100
546205	Lab III: Software Testing Lab	2	4	3	25	75	100
	Non-Major Elective –II	2	3	3	25	75	100
	Library, Yoga & Career Guidance		1	-	-	-	-
MOOC'S	SLC-I	Extra Credit	-	-	-	-	-
Total		24	30				700
III Semester							
546301	Internet of Things	5	5	3	25	75	100
546302	Big Data Analytics and R Programming	5	5	3	25	75	100
546303	Machine Learning	4	4	3	25	75	100
	Elective-III	4	4	3	25	75	100
546304	LabIII – Data Analytics Lab	2	4	3	25	75	100
546305	Lab IV – Machine Learning Lab	2	4	3	25	75	100
	Non-Major Elective –II	2	3	3	25	75	100
	Library, Yoga & Career Guidance	-	1	-	-	-	-
MOOC'S	SLC-II	Extra Credit	-	-	-	-	-
Total		24	30				700
IV Semester							
546999	Project Work and Viva Voice (Industry/Research)	15	30		50	150	200
Total		15	30		50	150	200
Grand Total		90 + EC			Total Marks		2200

IA – Internal Assessment; ES – End-Semester; SLC – Self Learning Course;

ELECTIVE COURSES

	Elective Group I
546501	Object Oriented Software Engineering
546502	Software Project Management
546503	Object Oriented Analysis and Design

	Elective Group II
546504	Virtualization & Cloud Computing
546505	Embedded Systems
546506	Soft Computing

	Elective Group III
546507	Mobile Computing
546508	Mobile Application Development
546509	Wireless Ad hoc and Sensor Networks

Semester - I			
Course code: 546101	MATHEMATICS FOR COMPUTING	Credits:5	Hours: 5
Objectives	<ul style="list-style-type: none"> ➤ To develop problem-solving techniques and explore topics in fundamental mathematics required for Information Technology field. ➤ To express statements in the language of formal logic and draw conclusions, model situations in terms of graph and set theory, find and interpret recursive definitions for mathematical sequences. ➤ Use combinatorial methods to approach counting problems and find solutions for decision making problems using fundamental statistics and probability. 		
Unit -I	<p>Mathematical Logic: Statements and notations, Connectives, Well formed formulas – Truth Tables – tautology - Equivalence implication -Normal forms -Theory of inference for the statement calculus: Rules of inference – Consistency - proof of contradiction – Automatic Theorem Proving. Predicate calculus: Predicates, statement function - variables – Quantifiers - Free and Bound variables – The Universe of Discourse. Inference theory of predicate calculus.</p>		
Unit-II	<p>Set theory: Basic Concepts and Notations – Ordered Pairs and Cartesian Product – Set Operations Relations: Properties of binary Relations, equivalence, transitive closure, compatibility and partial ordering relations, Lattices, Hasse diagram. Functions: Composition of functions, Inverse Function, Hashing functions, Natural numbers, recursive functions.</p>		
Unit III	<p>Elementary Combinatorics: Basics of counting, Combinations & Permutations, with repetitions, Constrained repetitions, Binomial Coefficients, Binomial and Multinomial theorems, the principles of Inclusion – Exclusion, Pigeon hole principles and its application - Mathematical Induction –Recurrence Relations – Particular Solutions – Solution of Recurrence Relations by using Generating Functions.</p>		
Unit IV	<p>Probability and Statistics: Introduction to Statistics – Frequency Distribution – Measures of Central Tendency – Covariance – Correlation and Linear regression - Introduction to Probability – Terminologies – Event – Sample Space – Rules of probability – conditional probability – Bayes Theorem – Distributions : Binomial – Poisson – Other type of Distribution – Testing of Hypothesis - Sampling distributions - Estimation of parameters - Statistical hypothesis - Large sample tests based on Normal distribution for single mean and difference of means -Tests based on T, Chi-square and F distributions for mean, variance and proportion - Goodness of fit.</p>		
Unit V	<p>Graphs: Basic Concepts – Representation of Graphs - Isomorphism and Sub graphs, Trees and their properties, Spanning – Trees - Directed trees - Binary trees - Planar Graphs -Multi graphs and Euler circuits -Hamiltonian graphs, Chromatic Numbers.</p>		
<p>REFERENCE AND TEXTBOOKS:- Gupta, S.C., & Kapoor, V.K. (2009). <i>Fundamentals of Mathematical Statistics</i>. Mott, J.L., Kandel, A., & Baker, T.P. (2012). <i>Discrete Mathematics for Computer Scientists & Mathematician</i>. Trembley, J. P., & Manohar, R. (2008). <i>Discrete Mathematics with Applications to Computer Science</i>.</p> <p>REFERENCE BOOKS:- Chakraborty, S. K., & Sarkar, B.K. (2011). <i>Discrete Mathematics</i>. Oxford Publications. Devore, J. L. (2014). <i>Probability and Statistics for Engineering and the Sciences</i>, (8th ed.). Kolman, B., Busby, R.C., & Ross, S.C. (2007). <i>Discrete Mathematical Structures</i>. Mallik, & Sen. (2009). <i>.Discrete Mathematical Structures</i>. Milton, J. S., & Arnold, J.C. (2007). <i>Introduction to Probability & Statistics</i> (4th ed.): TMH. Rosen, K. H. (2012). <i>Discrete Mathematics & its Applications</i>, (6th ed.).</p>			
Outcomes	<ul style="list-style-type: none"> ➤ Ability to Illustrate by examples the basic terminology of functions, relations, and sets and demonstrate knowledge of their associated operations. ➤ Ability to Demonstrate in practical applications the use of basic counting principles of permutations, combinations, inclusion/exclusion principle and the 		

	<p>pigeonhole methodology.</p> <ul style="list-style-type: none">➤ Ability to represent and Apply Graph theory in solving Information Technology application problems.➤ Ability to apply the statistical techniques in solving decision making problems.
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Course code: 546102		DISTRIBUTED OPERATING SYSTEM		Credits:5	Hours: 5
Objectives	<ul style="list-style-type: none"> ➤ This Subject provides students with an in-depth knowledge about the operating system. ➤ This subject covers distributed operating system in detail, including communication process, file system and memory management synchronization. ➤ To learn the mechanisms of OS to handle processes and threads and their communication 				
Unit -I	Introduction to Distributed Systems: Distributed systems: Goals Hardware and Software Concepts - Design issues- Communication in distributed systems: Layered Protocol: ATM Networks client server model- remote procedure call – group communication – Implementation issues. Case Studies: SUN RPC, DEC RPC.				
Unit-II	Synchronization: Clock synchronization – mutual exclusion – election algorithm - atomic transactions – Dead Lock in Distributed systems. Process and Processors: Threads – System models - Processor allocation – scheduling in distributed systems: Load balancing and sharing approach, fault tolerance, Real time distributed systems, Process migration and related issues.				
Unit III	Distributed File Systems: Introduction, features – goal – System Design : File Service Interface – Directory Service Interface – Naming Transparency – Two level naming - file models - file accessing models - file sharing semantics, file caching scheme, file replication, fault tolerance, trends in distributed file system, case study.				
Unit IV	Distributed Shared Memory (DSM): Introduction - Architecture - design and implementation issues – granularity - structure of shared memory space - replacement strategy – thrashing. - Bus based multi processors ring based multiprocessors switched multiprocessors – Consistency models – page based distributed shared memory – shared variable distributed shared memory – object based distributed shared memory- Case studies: MACH and CHORUS.				
Unit V	Distributed Web-based Systems : Architecture, Processes, Communication, Naming, Synchronization, Consistency and Replication: Web Proxy Caching, Replication for Web Hosting Systems, Replication of Web Applications Security : Introduction of Security in Distributed OS - Overview of security techniques, features, Need, Access Control, Security Management Case Study Java RMI, Sun Network File System, Google case study.				
TEXTBOOKS:- Sinha, P. K. (1997). <i>Distributed Operating Systems Concepts and Design</i> . PHI. Tannebaum, A. S. (2002). <i>Distributed Operating Systems</i> . Pearson Education.					
REFERENCE BOOKS:- Chow, R., & Johnson, T. (1997). <i>Distributed Operating systems & Algorithms</i> . Coulouris, G., Dollimore, J., & Kindberg, T. (2011). <i>Distributed Systems: Concepts and Design</i> , (5 th ed.): Addison Wesley. Mahajan, S., & Shah, S. (2013). <i>Distributed Computing</i> . Oxford.					
Outcomes	<ul style="list-style-type: none"> ➤ Knowledge and understanding of potential benefits of Distributed OS. ➤ Apply standard design principles in the construction of these systems. ➤ Analyze the various device and resource management techniques for timesharing and distributed systems. 				

Course code: 546103		WEB TECHNOLOGY	Credits:5	Hours: 5
Objectives	<ul style="list-style-type: none"> ➤ To develop the knowledge & skill in Advanced web Technology. ➤ Enrich knowledge about HTML5 control and XML control classes. ➤ Understand the need of usability, evaluation methods for web services. 			
Unit -I	Introduction to HTML5: Overview - New Elements - Canvas - Video and Audio - Web Storage – Geolocation - Offline Web Pages - Microdata - HTML5 APIs - Migrating From HTML4 to HTML5 - Advanced CSS: Introduction to CSS3 - What is CSS3 - Differences between CSS3 and earlier CSS specifications - How browsers are handling CSS3? - Selectors Overview - Explore specific selectors - Designing and Developing with CSS3 – Implementing CSS3.			
Unit-II	Introduction to XML: Overview - document tree structure – DTD - Concept of Well Formed XML and valid XML – parser – XSLT - Advanced Client side programming: Document Object Model (DOM) - Overview of DOM – JQuery – Plugins - Feature detection - Browser detection – Modernizer – polyfills.			
Unit III	Basics of PHP and PHP Arrays : The Origin of PHP – Working of PHP with Web Server-Hardware and Software requirements - Pros and Cons-Strength - Basic PHP Development- PHP scripts –syntax – variables - data types- Operators- Variable and String manipulation - Control Structures-The if statement-if else statement, multiple if, nested if - The switch statement. Loops-The while, do while and for statements - Break & continue statements - Nesting loops.			
Unit IV	PHP Arrays: Single, Multidimensional, Casting and Associative Arrays-Associative arrays-Accessing arrays - Looping through an array - Sorting arrays- Sorting an associative arrays . PHP Functions and File Handling : Functions-Introduction - Library Function-Array functions-String functions-Date and time functions- User Defined Function-Defining with and without parameters - Returning value from function- Function calls with the static statement- Passing arguments to a function by value and by reference.			
Unit V	Working With the File System : File Creation, deletion, opening, Reading, writing and appending - Working with directories - Writing Data to the file-Reading characters. Working With Forms: Forms-Super global variables-The server array-A script to acquire user input-Importing user input -Accessing user input-Combine HTML and PHP code-Using hidden fields -Redirecting the user - File upload and scripts .			
TEXTBOOKS:-				
Holzner, S. (2009). <i>PHP: The Complete Reference</i> , (2 nd ed.): Tata McGraw-Hill Publishing Company Limited.				
Kogent, (2011). <i>HTML 5 in simple steps</i> . Dreamtech Press.				
Schneider, F., Powell, T. (2013). <i>Java Script : The Complete Reference</i> , (3 rd ed.): Tata McGraw - Hill Education.				
Sklar, D., Torkington, N. (2004). <i>Learning PHP 5</i> . O'Reilly.				
REFERENCE BOOKS:-				
Bari, A. (2008). <i>Cake Php Application Development</i> , (1 st ed.). Packet Publishing Ltd.				
Bayross, I. (2010). <i>Web Enabled Commercial Application Development Using HTML, Java script, DHTML & PHP by Ivan Bayross</i> . BPB Publication.				
Gilmore, W. J. (2006). <i>Beginning PHP & MySQL 5</i> , (2 nd ed.): Apress.				
Yank, K. (2011). <i>Build Your Own Database Driven Web Site Using PHP & MySQL</i> , (4 th ed.). Sitepoint.				

Course code: 546104		PYTHON PROGRAMMING		Credits:5	Hours: 5
Objectives	<ul style="list-style-type: none"> ➤ To develop the knowledge & skill in Advanced web Technology. ➤ Enrich knowledge about HTML5 control and XML control classes. ➤ Understand the need of usability, evaluation methods for web services. 				
Unit -I	Introduction: History of Python – Basics of Python Programming – Python Character set – Token – Data types –Python Inbuilt Functions – Operators and Expressions – Decision Statements: Boolean type and Operators - If Statement – If-else Statement – Nested if Statement – Multi-way if-elif-else Statements – Conditional Expressions.				
Unit-II	Loop Control Statements: The While loop – For loop – Nested loops – Break and Continue Statement – Functions: Syntax and Basics of a Function – Parameters and Arguments in a Function – Local and Global scope of a Variable – The return statement – Recursive Functions – Lambda Function.				
Unit III	Strings: The str class – Inbuilt Python Functions for String – Immutable strings – String operators and operations – Lists: Creating Lists – List Slicing – Inbuilt functions for lists – List Operator – List Comprehensions – Searching and Sorting: Searching techniques – Introduction to sorting – Types of Sorting				
Unit IV	Tuples, Sets and Dictionaries: Creating Tuples – tuple() Function – Indexing and Slicing – Operations on Tuples – Sort Tuples – zip() Function – Creating Sets – In and Not in Operator – Set operations – Basics of Dictionaries – Creating a Dictionary – Add and Replace the values – Formatting Dictionaries – Traversing Dictionaries – Nested Dictionaries – Polynomials as Dictionaries.				
Unit V	Graphics and File Handling: Started with the turtle module – Moving Turtle to any location – Drawing with Colors – Turtles to create Barcharts – File Open(), Write() – Close() – Read text, numbers and multiple items from the file – seek() Function – Binary Files.				
TEXTBOOKS:- Kamthane, A.N. (2018). <i>Programming & Problem Solving with PYTHON</i> . McGraw Hill Education. Thareja, R. (2016). <i>PYTHON Programming Using Problem Solving Approach</i> . Oxford University Press.					
REFERENCE BOOKS:- Mark, L. (2009). <i>Learning Python</i> , (4 th ed.). O Rielly. Paul, B. (2010). <i>Head First Python</i> , (2 nd ed.). O Rielly.					
Outcomes	<ul style="list-style-type: none"> ➤ Understand the basics of python programming language. ➤ Illustrate simple programs with control structures. ➤ Apply advanced concepts like data structures and make use of functions. ➤ Develop simple applications by using modules, packages and exception handling mechanisms. ➤ Demonstrate projects that make use of libraries and generate test cases for the projects. 				

Course code: 546105	LAB I: WEB TECHNOLOGY AND PYTHON LAB	Credits: 3	Hours: 6
Objectives:	<ul style="list-style-type: none"> ➤ To develop an ability to design and implement static and dynamic website. ➤ Be familiar with Web page design using HTML5 and style sheets. ➤ Understand, analyze and build web applications using PHP. ➤ To write, test, and debug simple Python programs. ➤ To implement Python programs with conditionals and loops. 		
S.No	Web Technology Lab Exercises		
1	Write a HTML page that has one input, which can take multi-line text and a submit button. Once the user clicks the submit button, it should show the number of characters, words and lines in the text entered using an alert message. Words are separated with white spaces and lines are separated with new line character.		
2	Develop static pages (using only HTML) of an online Book store. The pages should resemble: www.amazon.com The website should consist the following pages. Home page, Registration and user Login, User profile page, Books catalog, Shopping cart, Payment By credit card, order confirmation.		
3	Write an XML file which will display the Book information which includes the following: 1) Title of the book 2) Author Name 3) ISBN number 4) Publisher name 5) Edition 6) Price Write a Document Type Definition (DTD) to validate the above XML file. Display the XML file as follows. Use XML schemas XSL and CSS for the above purpose.		
4	Create and save an XML document at the server, which contains 10 users information. Write a program which takes User Id as input and returns the user details by taking the user information from the XML document.		
5	Implement a CSS programs describing layers, inline, internal and external style sheets.		
6	Develop a web page to display a digital clock at the status bar using JavaScript.		
7	Write a PHP program that demonstrate passing variable using URL.		
8	Write a PHP program to display a digital clock which displays the current time of the server.		
9	Write a program to Develop student registration form and display all the submitted data on another page.		
10	Write a PHP program to keep track of the number of visitors visiting the web page and to display this count of visitors, with proper headings.		

S.No	Python Lab Exercises
1	Write python programs to understand Expressions, Variables, Quotes, Basic Math operations, Strings: Basic String Operations & String Methods, List, Tuples, Dictionaries, Arrays.
2	Write python programs to understand GUI designing and database operations (Minimum Three programs based on GUI designing using Tkinter, Mysql database creation & Database connectivity with DML operations using python.
3	Programs that take command line arguments (word count)
4	Simulate elliptical orbits in Pygame.
5	Simulate bouncing ball using Pygame.
6	Create Comma Separate Files (CSV), Load CSV files into internal Data Structure.
7	Demonstrate use of advanced regular expressions for data validation.
8	Write python programs to understand different File handling operations.
9	Demonstrate Exceptions in Python.
10	Write python programs to understand TCP and UDP Sockets in Python
Outcomes:	<ul style="list-style-type: none"> ➤ Understand, analyze and apply the role of languages like HTML5, CSS3, XML, JavaScript, PHP and protocols in the workings of the web and web applications. ➤ Design and Implement database applications. ➤ Develop Python programs step-wise by defining functions and calling them. ➤ Read and write data from/to files in Python.

Semester - II			
Course code: 546201	DATABASE SYSTEMS	Credits:5	Hours: 5
Objectives	<ul style="list-style-type: none"> ➤ To study the physical and logical database designs, database modeling, relational, hierarchical, and network models. ➤ To understand and use data manipulation language to query, update, and manage a database. ➤ Understand the role of a database management system in an organization. 		
Unit -I	Database System: Introduction-Data Independence-Database System Architecture- The External Level – The Conceptual Level – The Internal Level – Mappings – The Database Administrator – Data Dictionary – Data Models – Record-Based Data Models – Object based Data Models – Physical Data Models-Hierarchical Data Models – Network Data Models-Relational Data Model-Entity-Relationship Models – Object Oriented Data Model-Comparison Between Data Models.		
Unit-II	Distributed Databases: Introduction-Preliminaries-The Twelve Objectives-Problems – Client/Server Systems – DBMS Independence-SQL Facilities – Decision Support-Data Preparation-Data Warehouses and Data Marts – Online Analytical Processing – Object Oriented Databases: Introduction-Object Oriented Data Models-Object Oriented Database-Object Oriented DBMS – Object Oriented Languages.		
Unit III	Temporal Databases: Introduction-Intervals-Packing and Unpacking relations- Generalizing the relational operators – Database Design – Integrity Constraints – Multimedia Databases: Multimedia Sources – Multimedia Database Queries – Multimedia Database Applications		
Unit IV	Spatial Databases: Spatial Data- Spatial Database Characteristics – Spatial Data Model-Spatial Database Queries – Techniques of Special Database Query- Logic based Databases: Introduction-Overview-Proportional calculus – Predicate Calculus – Deductive Database Systems – Recursive Query Processing.		
Unit V	Emerging Database Technologies: Introduction – Internet Databases: Internet Technology – The World Wide Web-Web Technology – Web Databases – Advantages-Mobile Databases: Architecture of Mobile Databases – Characteristics of Mobile Computing – Mobile DBMS.		
TEXTBOOKS:- Date, C. J., Kannan, A., & Swamynathan, S. (2006). <i>An Introduction to Database Systems</i> , (8 th ed.). Pearson Education.			
REFERENCE BOOKS:- Silberschatz, A., Korth, H. F., & Sudarshan, S. (2010). <i>Database Management System Concepts</i> , (6 th ed.). McGraw Hill International. Singh, S. K. (2008). <i>Database Systems: Concepts, Design and Applications</i> , (2 nd ed.). Person Education.			
Outcomes	<ul style="list-style-type: none"> ➤ Upon successful completion of this course, students should be able to, improve the database design. ➤ Familiar with basic database storage structures and access techniques: file and page organizations, indexing methods. ➤ Analyze and design a real database application. 		

Course code: 546202	DATA MINING	Credits:5	Hours: 5
Objectives	<ul style="list-style-type: none"> ➤ To develop the abilities of critical analysis to data mining systems and applications. ➤ Develop a general framework for decision support within organizations. ➤ Analyze and design a real database application. 		
Unit -I	Data Mining And Data Preprocessing: Data Mining – Motivation – Definition – Data Mining on Kind of Data –Functionalities – Classification – Data Mining Task Primitives – Major Issues in Data Mining – Data Preprocessing – Definition – Data Clearing – Integration and Transformation – Data Reduction.		
Unit-II	Data Warehousing: Multidimensional Data Model –Data Warehouse Architecture – Data Warehouse Implementation –From data Warehousing to Data Mining – On Line Analytical Processing - On Line Analytical Mining.		
Unit III	Frequent Patterns, Associations And Classification: The Apriori Algorithm – Definition of Classification and Prediction – Classification by Decision Tree Induction - Bayesian Classification – Rule Based Classification – Classification by Back Propagation – Lazy Learners – K-Nearest Neighbor – Other Classification Methods.		
Unit IV	Cluster Analysis: Definition – Types of data in Cluster Analysis – Categorization of major Clustering Techniques – Partitioning Methods – Hierarchical Clustering – BIRCH - ROCK – Grid Based Methods – Model Based Clustering Methods – Outlier Analysis.		
Unit V	Spatial, Multimedia, Text And Web Data: Spatial Data Mining – Multimedia Data Mining – Text Mining – Mining the World Wide Web – Data Mining Applications – Trends in Data Mining.		
TEXTBOOKS:-			
Han, J., & Kamber, M. (2011). <i>Data Mining: Concepts and Techniques (The Morgan Kaufmann Series in Data Management Systems</i> , (3 rd ed.)			
Witten, I. H., Frank, E., & Hall, M. A. (2014). <i>Data Mining: Practical Machine Learning Tools & Techniques</i> . (3 rd ed.). Elsevier.			
REFERENCE BOOKS:-			
Awad, M., Khan, L., Thuraisingham, B., Wang, L. (2015). <i>Design & Implementation of Data Mining Tools</i> . CRC Press-Taylor & Francis Group.			
Dunham, M. H. (2003). <i>Data Mining: Introductory & Advanced Topics</i> . Pearson Education.			
Ebook: https://repo.palkeo.com/algo/information-retrieval/Data mining and analysis.pdf			
Ning Tan, P., Steinbach, M., & Kumar, V. (2016). <i>Introduction to Data Mining-Instructor's Solution Manual</i> (1 st ed.). Pearson Education.			
Zaki, M. J., & Wagner Meira, J. R. (2016). <i>Data Mining & Analysis: Fundamental Concepts & Algorithms</i> . India: Cambridge .			
Outcomes	<ul style="list-style-type: none"> ➤ Demonstrate advanced knowledge of data mining concepts and techniques. ➤ Analyze and evaluate performance of algorithms for Association Rules. ➤ Deploy Classification and Clustering algorithms. ➤ Determine whether a real world problem has a data mining solution. 		

Course code: 546203		SOFTWARE TESTING AND QUALITY ASSURANCE	Credits:4	Hours: 4
Objectives	<ul style="list-style-type: none"> ➤ Student learn systematic approach to the development, operation, maintenance, and retirement of software. ➤ Methods and tools of testing and maintenance of software's. ➤ The students will be able to differentiate between quality control, quality management and quality assurance. ➤ Understand the importance of standards in the quality management process and their impact on the final product. 			
Unit -I	Testing Principles Need of testing, Basic concepts – errors, faults, defects, failures, test bed, unit testing, integration testing system, system testing, regression testing, alpha, beta and acceptance testing , functional testing, performance testing, recovery testing, white box testing, black box testing, verification and validation.			
Unit-II	Test Management Testing Life Cycle – Roles and activities, Test Planning – forming a test team, develop test plan review Test Cases design strategies black box approach: random testing, equivalence class partitioning and boundary value analysis. white box approach: test adequacy criteria, coverage and control flow graphs, paths, loop testing, mutation testing. Test execution: build test data, life cycle of defect, defect tracking, defect detection stages, defect detection stages, defect types, defect severity, defect analysis and prevention.			
Unit III	Software Metrics Scope of software metrics, Classifying software measures, Measurement basics – representational theory, scales, meaningfulness - GOM technique, Control flow structure, product quality metrics – MTTF, defect density, customer problems, customer satisfaction, function point, Metrics for software maintenance, In-process quality metrics.			
Unit IV	Quality Assurance Quality concepts – quality, quality control, quality assurance, cost of quality Software quality assurance – SQA activities, software reviews, inspections, audits, Software reviews, inspections, audits, Software reliability Quality Attributes: correctness, reliability, usability, integrity, portability, maintainability, interoperability. Ishikawa's Seven Basic Tools.			
Unit V	Quality Standards Basic concept of – ISO 9000 & 9001, CMM, six sigma. Development of CMM CMM – Following KPAs : requirements management (RM), software project tracking and oversight (SPTO), software configuration management (SCM), organization process definition (OPD), software product engineering (SPE), peer reviews (PR), quantitative process management (QPM), defect prevention (DP), process change management.			
TEXTBOOKS:-				
Burnstein, I. (2003). <i>Practical Software Testing</i> . Springer Publication.				
Perry, W. E. (2006). <i>Effective Methods for Software Testing</i> , (3 rd ed.). Wiley Publication.				
REFERENCE BOOKS:-				
Fenton, N. E. (1994). <i>Software Metrics A Rigorous and Practical Approach</i> , (2 nd ed.): Thomson Publication.				
Jalote, P. (2000). <i>CMM Practice</i> . Pearson Education.				
Kan, S. H. (2003). <i>Metrics and Models in Software Quality Engineering</i> . Pearson Education.				
Pressman, (2010). <i>Software Engineering</i> , (7 th ed.). TATA McGraw Hill.				
Outcomes	<ul style="list-style-type: none"> ➤ Create test strategies and plans, design test cases, prioritize and execute them. ➤ Manage incidents and risks within a project. ➤ Understand the basics of software quality system and how to undertake the system processes. ➤ Prepare test plans and schedules for testing and quality assurance project. 			

Course code: 546204		LAB II: DATA MINING LAB	Credits:2	Hours: 4
Objectives	<ul style="list-style-type: none"> ➤ To obtain practical experience using data mining techniques on real world data sets. ➤ Emphasize hands-on experience working with all real data sets. 			
S. NO	LAB EXPERIMENTS			
1.	Demonstration of preprocessing on dataset student.arff.			
2.	Implementation of preprocessing on dataset labor.arff.			
3.	Demonstration of Association rule process on dataset contactlenses.arff using apriori Algorithm.			
4..	Implement Association rule process on dataset test.arff using apriori algorithm			
5.	Apply classification rule process on dataset student.arff using j48 algorithm.			
6.	Perform classification rule process on dataset employee.arff using j48 algorithm.			
7.	Use classification rule process on dataset employee.arff using id3 algorithm.			
8.	Deploy classification rule process on dataset employee.arff using naïve bayes Algorithm.			
9.	Implement clustering rule process on dataset iris.arff using simple k-means.			
10.	Make use of clustering rule process on dataset student.arff using simple k-means.			
11.	Design a decision tree by pruning the nodes on your own. Convert the decision trees into “if-then-else rules”. The decision tree must consists of 2-3 levels and convert it into a set of rules.			
Outcomes	<ul style="list-style-type: none"> ➤ Create test strategies and plans, design test cases, prioritize and execute them. ➤ Manage incidents and risks within a project. ➤ Understand the basics of software quality system and how to undertake the system processes. ➤ Prepare test plans and schedules for testing and quality assurance project. 			

Course code: 546204	LAB III: SOFTWARE TESTING LAB	Credits:2	Hours: 4
Objectives	<ul style="list-style-type: none"> ➤ To provide knowledge of Software Testing Methods . ➤ To develop skills in software test automation and management using latest tools 		
S. NO	LAB EXERCISES		
1.	Write and test a program to login a specific web page.		
2.	Write and test a program to update 10 student records into table into Excel file .		
3.	Write and test a program to count number of check boxes on the page checked and unchecked count.		
4.	4..a) Data driven test for dynamic test data submission. b) Data driven test through flat files. c) Data driven test through front grids. d) Data driven test through excel test.		
5.	5.a) Batch testing without parameter passing . b) Batch testing with parameter passing. c) Data driven batch.		
6.	Silent mode test execution without any interruption.		
7.	Test case for calculator in windows application.		
8.	Test usage of web applications with Graph Results using Jmeter.		
9.	GUI checkpoint for single property .		
10.	GUI checkpoint for single object/window.		
Outcomes	Design and develop the best test strategies in accordance to the development model.		

Semester - III			
Course code: 546301	INTERNET OF THINGS	Credits:5	Hours: 5
Objectives	To understand the basic concept of Internet of Things, IoT protocols and implementation in the real world scenario. Providing hands on training in constructing systems using Raspberry Pi and Arduino.		
Unit -I	Introduction to Internet of Things: Definition – Characteristics - Design Concepts – Physical – Things in IoT - IoT Protocols – Logical Design : IoT Functional Blocks – Communication Models - IoT Enabling Technologies - IoT Levels - Deployment Templates - Domain Specific IoTs - IoT and M2M – Difference between IoT and M2M – Software Defined Network (SDN) and Network Function Virtualization (NFV) for IoT - IoT System Management – Need – SNMP – Network Operator Requirements – System Management with NETCONF-YANG.		
Unit-II	Deveoping IoT and IoT Architecture : IoT Platforms Design Methodology - M2M high-level ETSI architecture - IETF architecture for IoT - OGC architecture - IoT reference model - Domain model - information model - functional model - communication model - IoT reference architecture.		
Unit III	IoT Protocols : Protocol Standardization for IoT – Efforts – M2M and WSN Protocols – SCADA and RFID Protocols – Unified Data Standards – Protocols – IEEE 802.15.4 – BACNet Protocol – Modbus– Zigbee Architecture – Network layer – 6LowPAN - CoAP – Security.		
Unit IV	Building IoT With Raspberry Pi & Arduino : Building IOT with RASPBERRY PI- IoT Systems - Logical Design using Python – IoT Physical Devices & Endpoints - IoT Device -Building blocks -Raspberry Pi -Board - Linux on Raspberry Pi – Raspberry Pi Interfaces -Programming Raspberry Pi with Python - Other IoT Platforms - Arduino.		
Unit V	Case Studies : Real world design constraints - Applications - Asset management, Industrial automation, smart grid, Commercial building automation, Smart cities - participatory sensing - Data Analytics for IoT – Software & Management Tools for IoT Cloud Storage Models & Communication APIs - Cloud for IoT - Amazon Web Services for IoT.		
TEXTBOOKS:- Bahga, A., & Madiseti, V. (2015). <i>Internet of Things – A Hands-on Approach</i> . Universities Press.			
REFERENCE BOOKS:- daCosta, F. (2013). <i>Rethinking the Internet of Things: A Scalable Approach to Connecting Everything</i> , (1 st ed.). Apress Publications. Hersent, O., Boswarthick, D., & Elloumi, O. (2012). <i>The Internet of Things – Key applications & Protocols</i> . Wiley. Holler, J., Tsiatsis, V., Mulligan, C., Avesand, S., Karnouskos, S., & Boyle, D. (2014). <i>From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence</i> , (1 st ed.): Academic Press. Pfister, C. (2011). <i>Getting started with Internet of Things</i> . O’Reilly Media. Uckelmann, D., Harrison, M., & Florian, M. (2011) <i>Architecting the Internet of Things</i> . Springer. Zhou, H. (2012). <i>The Internet of Things in the Cloud: A Middleware Perspective</i> . CRC Press.			
Outcomes	➤ Under the fundamental concept of IoT.		

	<ul style="list-style-type: none">➤ Describe the function of IoT systems.➤ Analyze different protocols for IoT.➤ Explain the web services related to IoT device access controls.➤ Design a portable IoT using Raspberry Pi.➤ Deploy an IoT application and connect to the cloud.➤ Analyze applications of IoT in real time scenario.
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Course code: 546302	BIG DATA ANALYTICS AND R PROGRAMMING	Credits:5	Hours: 5
Objectives	<ul style="list-style-type: none"> ➤ Learning basic and advanced methods to big data technology and tools, including MapReduce and Hadoop and its ecosystem. ➤ Understanding the Concept of R programming and its implementation in Data Analysis. 		
Unit -I	Introduction to Big Data Analytics : Big Data Overview – Data Structures – Analyst Perspective on Data Repositories - State of the Practice in Analytics – BI Versus Data Science - Current Analytical Architecture – Drivers of Big Data – Big Data Ecosystem - Data Analytics Lifecycle – Data Discovery – Data Preparation – Model Planning – Model Building – Communicate Results – Operationalize.		
Unit-II	Basic Data Analytic Methods Using R : Introduction to R programming – R Graphical User Interfaces – Data Import and Export – Attribute and Data Types – Descriptive Statistics Exploratory Data Analysis : Visualization Before Analysis – Dirty Data – Visualizing a Single Variable – Examining Multiple Variables Data Exploration Versus Presentation -- Statistical Methods of Evaluation : Hypothesis Testing – Difference of Means – Wilcoxon Rank-Sum Test – Type I and Type II Errors – Power and Sample Size – ANOVA..		
Unit III	Advanced Analytical Theory and Methods: Clustering – K Means – Use Cases – Overview – Determining number of clusters – Diagnostics – Reasons to choose and cautions – Additional Algorithms - Association Rules : Apriori Algorithm – Evaluation of Candidate Rules – Applications of Association Rules – Validation and Testing – Diagnostics. Regression : Linear Regression and Logistic Regression – Use cases – Model Description – Diagnostics - Additional Regression Models.		
Unit IV	Classification : Decision Trees – Overview – Genetic Algorithm – Decision Tree Algorithms – Evaluating Decision Tree – Decision Trees in R - Naïve Bayes – Bayes Theorem – Naïve Bayes Classifier – Smoothing – Diagnostics – Naïve Bayes in R – Diagnostics of Classifiers – Additional Classification Methods - Time Series Analysis : Overview – Box – Jenkins Methodology – ARIMA Model – Autocorrelation Function – Autoregressive Models – Moving Average Models – ARMA and ARIMA Models – Building and Evaluating and ARIMA Model - Text Analysis : Text Analysis Steps – Example – Collecting – Representing Term Frequency – Categorizing – Determining Sentiments – Gaining Insights.		
Unit V	Advanced Analytics-Technology and Tools: MapReduce and Hadoop - Analytics for Unstructured Data .- UseCases - MapReduce - Apache Hadoop – The Hadoop Ecosystem – pig – Hive – Hbase – Manout – NoSQL - Tools in Database Analytics : SQL Essentials – Joins – Set operations – Grouping Extensions – In Database Text Analysis - Advanced SQL – Windows Functions – User Defined Functions and Aggregates – ordered aggregates- MADiib - Analytics Reports Consolidation – Communicating and operationalizing and Analytics Project – Creating the Final Deliverables : Developing Core Material for Multiple Audiences – Project Goals – Main Findings – Approach Model Description – Key points support with Data - Model details – Recommendations – Data Visualization.		
TEXTBOOKS:- Wiley, J., & Sons. (2015). <i>Data Science & Big Data Analytics: Discovering, Analyzing, Visualizing & Presenting Data.</i> EMC Education Services Inc.			

REFERENCE BOOKS:-

Burlingame, N. (2012). *The Little Book on Big Data*. New Street Publishers.

<http://bigdatauniversity.com/>.

<http://home.ubalt.edu/ntsbarsh/stat-data/topics.htm#rintroduction>.

http://www.johndcook.com/R_language_for_programmers.html.

Maheshwari, A. (2017). *Data Analytics*. McGraw Hill Education.

Matloff, N. (2011). *The Art of R Programming: A Tour of Statistical Software Design*, (1st ed.). No Starch Press.

Rakshit, S. (2017). *R for Beginners*. McGraw Hill Education.

Outcomes

- Able to understand the key concepts of Data Analytics.
- Able to apply Hadoop ecosystem components.
- Able to participate in big data analytics projects.

Course code: 546303	MACHINE LEARNING	Credits:4	Hours: 4
Objectives	<ul style="list-style-type: none"> ➤ Comprehensive introduction to various topics in machine learning. ➤ To introduce students to the basic concepts and techniques of Machine Learning. ➤ To become familiar with regression methods, classification methods, clustering methods. 		
Unit -I	Overview and Introduction to Bayes Decision Theory: Machine intelligence and Applications - pattern recognition concepts classification – regression - feature selection -supervised learning class conditional probability distributions - Examples of classifiers bayes optimal classifier and error - learning classification approaches.		
Unit-II	Linear machines: General and linear discriminants - decision regions - single layer neural Network - linear separability - general gradient descent - perceptron learning algorithm – mean square criterion and widrow - Hoff learning algorithm - Multi-Layer perceptrons: two-layers universal approximators - backpropagation learning - on-line - off-line error surface - important parameters.		
Unit III	Learning decision trees: Inference model - general domains - symbolic decision trees –consistency - learning trees from training examples entropy - mutual information - ID3 algorithm Criterion - C4.5 algorithm continuous test nodes – confidence – pruning - learning with incomplete data. Instance-based Learning: Nearest neighbor classification - k-nearest neighbor – nearest neighbor error probability.		
Unit IV	Machine learning concepts and limitations: Learning theory - formal model of the learnable -sample complexity - learning in zero-bayes and realizable case - VC-dimension – fundamental algorithm independent concepts - hypothesis class - target class - inductive bias -occam's razor -empirical risk - limitations of inference machines - approximation and estimation errors - Tradeoff.		
Unit V	Machine learning assessment and Improvement: Statistical model selection - structural risk Minimization – bootstrapping – bagging – boosting - Support Vector Machines: Margin of a classifier - dual perceptron algorithm - learning nonlinear - hypotheses with perceptron kernel functions - implicit non-linear feature space – theory – zero - Bayes - realizable infinite hypothesis class - finite covering - margin-based bounds on risk - maximal margin classifier.		
TEXTBOOKS:- Alpaydin, E. (2014). <i>Introduction to Machine Learning</i> . Prentice Hall of India. Mitchell, T. M. (2017). <i>Machine Learning</i> . McGraw-Hill, First Edition.			
REFERENCE BOOKS:- Bishop, C. M. (2011). <i>Pattern Recognition and Machine Learning</i> . Springer. Duda, R. O., Hart, P. E., & Stork, D.G. (2001). <i>Pattern Classification</i> . John Wiley and Sons. Shawe-Taylor, J., & Cristianini, N. (2000). <i>Introduction to Support Vector Machines</i> . Cambridge: University Press. Vapnik, V. N. (1998). <i>Statistical Learning Theory</i> . John Wiley and Sons.			
Outcomes	<ul style="list-style-type: none"> ➤ Gain knowledge about basic concepts of Machine Learning. ➤ Identify machine learning techniques suitable for a given problem. ➤ Solve the problems using various machine learning techniques. 		

Course code: 546304		LAB III: DATA ANALYTICS LAB	Credits:2	Hours: 4
Objectives	<ul style="list-style-type: none"> ➤ Imparting the architectural concepts of Hadoop and introducing map reduce paradigm. ➤ Introduce programming tools PIG & HIVE in Hadoop ecosystem. ➤ Understand the basics of R programming including objects, classes, vectors etc. ➤ Become proficient in writing a fundamental program and perform analytics with R. 			
S. NO	LAB EXPERIMENTS			
1.	(i) Perform setting up and Installing Hadoop in its two operating modes: Pseudo distributed, Fully distributed. (ii) Use web based tools to monitor your Hadoop setup.			
2.	(i) Implement the following file management tasks in Hadoop: Adding files and directories, Retrieving files, Deleting files. (ii) Benchmark and stress test an Apache Hadoop cluster.			
3.	Assignments on Basic Concepts of R			
4.	Assignments on Data structures in R			
5.	Assignments on R packages, R Data Reshaping			
6.	Assignments on Working with files, R object and Class			
7.	Assignments on Data visualization in R and Data Management			
8.	Assignments on Statistical modelling and Databases in R			
9.	Write a Map Reduce program that mines weather data. Weather sensors collecting data every hour at many locations across the globe gather large volume of log data, which is a good candidate for analysis with MapReduce, since it is semi structured and record-oriented. Data available at: https://github.com/tomwhite/hadoopbook/tree/master/input/ncdc/all . Find average, max and min temperature for each year in NCDC data set?			
10.	Purchases.txt Dataset Instead of breaking the sales down by store, give us a sales breakdown by product category across all of our stores. What is the value of total sales for the following categories? a) Toys b) Consumer Electronics			
11.	Implement An Map Reduce Program That Processes A Weather Dataset.			
12.	Implement Linear And Logistic Regression.			
13.	Visualize Data Using Any Plotting Framework.			
14.	Implement An Application That Stores Big Data In Hbase / MongoDB / Pig Using Hadoop / R.			
15.	Develop Pig Latin scripts for big data processing.			
Outcomes	<ul style="list-style-type: none"> ➤ Prepare and equip students for opportunities in ever changing technology with hands-on industrial training. ➤ Transform the students to become globally competent professionals through internship. 			

Course code: 546305		LAB IV: MACHINE LEARNING LAB	Credits:2	Hours: 4
Objectives	<ul style="list-style-type: none"> ➤ To introduce students to the basic concepts and techniques of Machine Learning using Python/Java. ➤ To become familiar with regression methods, classification methods, clustering methods. 			
S. NO	LAB EXERCISES			
1.	Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file.			
2.	For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.			
3.	Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.			
4.	Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate data sets.			
5.	Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.			
6.	Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set			
7.	Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set. You can use Java/Python ML library classes/API.			
8.	Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.			
9.	Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem.			
10.	Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.			
Outcomes	<ul style="list-style-type: none"> ➤ Apply the apt machine learning strategy for any given problem. ➤ Modify existing machine learning algorithms to improve classification efficiency. ➤ Design systems that uses the appropriate graph models of machine learning. 			

Elective Courses			
Course code: 546501	OBJECT ORIENTED SOFTWARE ENGINEERING	Credits:4	Hours: 4
Objectives	<ul style="list-style-type: none"> ➤ To learn and understand various O-O concepts along with their applicability contexts. ➤ Develop design solutions for problems on various O-O concepts. ➤ To learn various modeling techniques to model different perspectives of object-oriented software design (UML). 		
Unit -I	Introduction to Software Engineering: Software engineering concepts, Software engineering development activities, Managing software development, Object oriented paradigm, Modeling with Unified Modeling Languages: Introduction, An overview of UML, Modeling concepts and deeper view into UML, Project Organization and Communication-Introduction: A rocket example, An overview of projects, Project organization concepts, Project communication concepts, Organizational activities.		
Unit-II	Requirements Elicitation-Introduction: Usability examples, An overview of requirements elicitation, Requirements elicitation concepts, Requirements elicitation activities, Managing requirements elicitation, Analysis-Introduction: An optical illusion, An overview of analysis, Analysis concepts, Analysis Activities: From use cases to objects, Managing analysis.		
Unit III	System Design: Decomposing the System-Introduction: A floor plan example, An overview of system design, System design concepts, System Design Activities: From objects to subsystems, System Design: Addressing design goals, Introduction, A redundancy example, An overview of system design activities, Concepts: UML deployment diagrams, System Design Activities: Addressing design goals, Managing system design.		
Unit IV	Object Design Reusing Pattern Solutions: Introduction- Bloopers, An overview of object design, Reuse Concepts: Solution objects, Inheritance and design patterns, Reuse activities: Selecting design patterns and components, Managing reuse, Object Design Specifying Interfaces: Introduction, A relational example, An overview of interface specification, Interface specification concepts, Interface specification activities, Managing object design,		
Unit V	Mapping Models to Code: An overview of mapping, Mapping concepts, Mapping activities and managing implementation, Mapping Object Model to Database Schema. Testing: Introduction: Testing the space shuttle, overview of testing - Testing concepts, Testing activities, Managing testing. Testing FTR – Walkthrough and Inspection -Unit Testing, Integration, System and Regression Testing - User Acceptance Testing - Software Quality – Quality Standards, Quality Matrices -Testing & SQA: FTR, unit testing, integration testing, product testing, and acceptance testing.		
TEXTBOOKS:- Bruegge, B., & Dutoit, A. H. (2010). <i>Object Oriented Software Engineering Using UML, Patterns & Java</i> , (3 rd ed.). Pearson Education. Schach, S. R. (2005). <i>Object Oriented & Classical Software Engineering</i> , (6 th ed.).TMH Edition.			
REFERENCE BOOKS:- Booch, G., Rambaugh, J., & Jacobson, I. (2006). <i>The Unified Modeling Language user guide</i> . Pearson Education. Lethbridge, T. C., & Laganier, R. (2004). <i>Object Oriented Software Engineering Practical Software Development using UML & Java</i> . TMH Edition.			

Outcomes	<ul style="list-style-type: none">➤ Apply various software architectures, including frameworks and design patterns, when developing software projects.➤ Extract an Object Model and Dynamic Model of system functionality and performance from the requirements.
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Course code: 546502	SOFTWARE PROJECT MANAGEMENT	Credits:4	Hours: 4
Objectives	<ul style="list-style-type: none"> ➤ Define roles and responsibilities of process group include initiating, planning, executing controlling, and closing of the process model. ➤ Conduct project planning activities that accurately forecast project costs, timelines, and quality. ➤ Implement processes for successful resource, communication, and risk and change management. ➤ Be familiar with the different methods and techniques used for project management. 		
Unit -I	<p>Introduction: Project - Definition - Software projects vs other types of project-Project Management Activities - plans, methods and methodologies-categorizing software projects - Management definition-problems with software projects-setting objectives-stakeholders-Requirement specification-Management control-Project Planning : Overview - Step wise project planning- project selection - identifying project scope, objectives and project infrastructure-Identify project products and activities-estimate effort-Identify activity risks-Allocate resources-review/publicize plan-Execute plan and lower levels of planning.</p>		
Unit-II	<p>Project evaluation: Strategic assessment-technical assessment – Cost-benefit analysis-cash flow forecasting-cast-benefit evaluation techniques-Risk evaluation - Selection of an appropriate project approach: Technologies-Technical plan contents list- Process models- Waterfall model- V-process model- spiral model- software prototyping-categorizing prototypes-controlling changes during prototyping-incremental delivery-Dynamic system Development method-Extreme programming-Managing iterative processes-selecting the most appropriate process model.</p>		
Unit III	<p>Software effort estimation : Stages of estimation-problems with over-and under-estimates-software effort estimation techniques-function point analysis-function points mark II-Objects points- code-oriented approach-COCOMO - Activity planning : objectives-project schedules-projects and activities-sequencing and scheduling activities-network planning models-formulating a network model-forward pass- backward pass-Identifying the critical path-Activity float-shortening the project duration-Identifying critical activities.</p>		
Unit IV	<p>Risks management : Risks – Nature – Types – Managing Risks - Hazard identification-Hazard analysis-Risk planning and control-Evaluating risks to the schedule - Resource allocation: Nature of resources-Identifying resource requirements-Scheduling resources-creating critical paths-counting the cost-Publishing the resource schedule-cost schedules- Scheduling sequence - Monitoring and control : creating the framework-collecting the data-visualizing progress-cost monitoring-Earned value-prioritizing monitoring- change control.</p>		
Unit V	<p>Managing contracts : Types of contract- stages in contract placement-contract management-acceptance-managing people and organizing teams: Understanding behavior-organizational behavior : Selecting persons and methods -Motivation-job characteristics model-working in groups- Decision making-Leadership-Organizational structures – stress-Health and safety- Software quality in project planning - importance -ISO 9126-practical software quality measures-product versus process quality management-External standards-techniques to help enhance software quality-Quality plans.</p>		
TEXTBOOKS:-			
Hughes, B., & Cotterill, M. (2011). <i>Software Project Management</i> , (5 th ed.). TMH Edition.			
REFERENCE BOOKS:-			

Henry, J. (2004). *Software Project Management*. Pearson Edition.

Jalote, P. (2005). *Software Project Management in Practice*. Pearson Edition.

Royce, W. (2012). *Software Project Management*. Pearson Edition.

Outcomes	<ul style="list-style-type: none">➤ Plan and manage projects at each stage of the software development life cycle (SDLC).➤ Apply estimating and risk management techniques to projects.➤ Work in groups to analyze a project and implement a solution.
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Course code: 546503		OBJECT ORIENTED ANALYSIS AND DESIGN	Credits:4	Hours: 4
Objectives	<ul style="list-style-type: none"> ➤ To understand the basics of object oriented analysis and design concepts. ➤ To learn the UML design diagram and map to code. Be expose to various testing techniques. 			
Unit -I	Object Oriented System Development : Introduction – Object basics - The Object Model : Evolution – Elements - Classes and Objects: Object nature – Relationship among objects – Class nature – Relationships among classes – Building quality classes and objects – System Development Life Cycle.			
Unit-II	Object Oriented Methodologies : - Rumbaugh Object Modeling Technique – Booch – Jacobson – Shaler/Mellor – Coad/Yardon – Patterns – Frame Works – The Unified Approach – UML – Static and Dynamic Model – UML diagrams.			
Unit III	Object Oriented Analysis - Identifying Use Cases – Use Case Model – Documentation – Classification: Identifying Classes – Noun Phrases Approach – Common Class Pattern Approach – Use Case Driven Approach – Identifying Object Relationship Attributes and Methods.			
Unit IV	Object Oriented Design : Introduction – Design Process – Design Axioms – Designing Classes – Visibility – Refining Attributes – Designing Methods - Access Layer Design – View Layer Design.			
Unit V	Managing Analysis And Design – Evaluation Testing – Impact of object oriented testing - Coding – Maintenance – Metrics – Case Study Foundation Class Library – Client/Server Computing.			
TEXTBOOKS:-				
Bahrami, A. (2008). <i>Object Oriented System Development</i> . Tata McGraw Hill Edition.				
Booch, G., & Maksimchuk, R. A. (2009). <i>Object Oriented Analysis & Design with applications</i> , (3 rd ed.). Pearson Education.				
REFERENCE BOOKS:-				
Larman. (2003). <i>Applying UML & Patterns, An Introduction to Object Oriented Analysis & Design</i> , (2 nd ed.). Pearson Education.				
Rumbaugh, J. (2002). <i>Object Oriented Modeling & Design</i> . PHI Edition.				
Outcomes	<ul style="list-style-type: none"> ➤ Design and implement projects using OO concepts. ➤ Use the UML analysis and design diagrams and apply appropriate design pattern. ➤ Create code from design and be familiar with various testing techniques 			

Course code: 546504		VIRTUALIZATION AND CLOUD COMPUTING	Credits:4	Hours: 4
Objectives	<ul style="list-style-type: none"> ➤ In-depth knowledge of Cloud Computing concepts, technologies, architecture and applications. ➤ To expose the students to frontier areas of Cloud Computing and information systems. ➤ To implement Virtualization. ➤ To build Private Cloud. 			
Unit -I	INTRODUCTION : Introduction to Cloud Computing – Definition of Cloud – Evolution of Cloud Computing – Underlying Principles of Parallel and Distributed Computing – Cloud Characteristics – Cloud Services – Cloud models – Elasticity in Cloud – On-demand Provisioning.			
Unit-II	VIRTUALIZATION : Basics of Virtualization – Types of Virtualization – Implementation Levels of Virtualization – Virtualization Structures – Tools and Mechanisms – Virtualization of CPU – Memory – I/O Devices – Desktop Virtualization – Server Virtualization.			
Unit III	CLOUD ENABLING TECHNOLOGIES AND INFRASTRUCTURE : Service Oriented Architecture – RESTful Web Services – NIST Cloud Computing Reference Architecture – IaaS – PaaS – SaaS – Public, Private and Hybrid Clouds – Cloud Storage – Design Challenges in Cloud – Peer-to-Peer Architecture.			
Unit IV	RESOURCE MANAGEMENT AND SECURITY IN CLOUD : Inter Cloud Resource Management – Resource Provisioning and Platform Deployment – Global Exchange of Cloud Resources – Security Overview – Cloud Security Challenges – Software-as-a-Service Security – Security Governance – Virtual Machine Security.			
Unit V	PROGRAMMING MODELS : Parallel and Distributed programming Paradigms – MapReduce – Hadoop – Mapping Applications – Google App Engine – Amazon AWS – Cloud Software Environments – Eucalyptus – Open Nebula – Open Stack.			
TEXTBOOKS:-				
Hwang, K., Fox, G. C., & Dongarra, J. G. (2012). <i>Distributed & Cloud Computing, From Parallel Processing to the Internet of Things</i> . Morgan Kaufmann Publishers.				
Smith, J. E., & Nair, R. (2005). <i>Virtual Machines: Versatile Platforms for Systems & Processes</i> . Elsevier/Morgan Kaufmann.				
REFERENCE BOOKS:-				
Buyya, R., Vecchiola, C., ThamaraiSelvi, S. (2013). <i>Mastering Cloud Computing</i> . TMGH.				
Miller, M. (2008). <i>Cloud Computing</i> . Que Publishing.				
Reese, G. (2009). <i>Cloud Application Architectures: Building Applications and Infrastructure in the Cloud: Transactional Systems for EC2 and Beyond (Theory in Practice)</i> . O'Reilly.				
Rittinghouse, J. W., & Ransome, J. F. (2010). <i>Cloud Computing: Implementation Management, & Security</i> . CRC Press.				
Saurabh, K. (2011). <i>Cloud Computing – Insights into New-Era Infrastructure</i> . India:Wiley.				
Shroff, G. (2011). <i>Enterprise Cloud Computing</i> . Cambridge University Press.				
Velte, A. T., Velte, T. J., & Elsenpeter, R. (2010). <i>Cloud Computing – A Practical Approach</i> . McGraw Hill Education.				
Outcomes	<ul style="list-style-type: none"> ➤ Articulate the main concepts, key technologies, strengths, and limitations of cloud computing and the possible applications for state-of-the-art cloud computing. ➤ Identify problems, and explain, analyze, and evaluate various cloud computing solutions. ➤ Apply and design suitable Virtualization concept, Cloud Resource Management and design scheduling algorithms. 			

Course code: 546505		EMBEDDED SYSTEMS	Credits:4	Hours: 4
Objectives	<ul style="list-style-type: none"> ➤ Discuss the major components that constitute an embedded system. ➤ Develop familiarity with tools used to develop in an embedded environment. ➤ In-depth understanding of fundamental concepts on embedded systems 			
Unit -I	Introduction to Embedded Systems : Embedded Systems – Processor Embedded into a System – Embedded Hardware Units and Devices in a System – Embedded Software in a System – Examples – Design Process in Embedded System – Classification of Embedded Systems – Skills required for an Embedded Designer.			
Unit-II	Devices and Communication Buses for Devices Network: I/O Types and Examples – Serial Communication Devices – Parallel Device Ports– Wireless Devices – Timer and Counting Devices – WATCHDOG Timer – Real Time Clock – Networked Embedded Systems – Serial Bus Communication Protocols – ARM Bus – Wireless and Mobile System Protocols.			
Unit III	Programming Concepts : Assembly & Highlevel Language Programming – C Program Elements – Macros and functions – Data Types, Data Structures, Modifiers, Statements, Loops & Pointers – Embedded Programming in C++ – Embedded Programming in Java – Program Modeling Concepts : Program Models – DFG Models – Multiple Threads in an Application – Concept of Semaphores.			
Unit IV	Real Time Operating Systems OS Services – Process Management – Timer Functions –Event Functions - Memory Management – Basic Design using an RTOS –RTOS Task Scheduling Models –OS Security Issues.			
Unit V	Design Examples & Case Studies: ACVM Case Study – Embedded System for Smart Card –Linking and Locating Software – Introduction to Embedded Software Development Process and Tools -Testing, Simulation and Debugging Techniques: Testing on Host Machine –Simulators Laboratory Tools.			
REFERENCE AND TEXTBOOKS:-				
Raj Kamal, (2009). <i>Embedded Systems Architecture: Programming and Design</i> , (2 nd ed.). Tata McGraw-Hill Publishing Company.				
REFERENCE BOOKS:-				
Noergaard, T. (2004). <i>Embedded Systems Architecture: A Comprehensive Guide for Engineers & Programmers</i> , (1 st ed.).				
Simon, D. E. (2002). <i>An Embedded Software Primer</i> (2 nd ed.). Addition Wesley.				
Vahid, F., & Givargis, T. (2011). <i>Embedded System Design</i> . Wiley.				
Outcomes	<ul style="list-style-type: none"> ➤ Become familiar with programming environment used to develop embedded systems. ➤ Foster ability to understand the role of embedded systems in industry. ➤ Experience common aspects of embedded system development. 			

Course code: 546506	SOFT COMPUTING	Credits:4	Hours: 4
Objectives	<ul style="list-style-type: none"> ➤ Develop the skills to gain a basic understanding of neural network theory and fuzzy logic theory. ➤ Introducing the fundamental theory and concepts of computational intelligence methods, in particular neural networks, fuzzy systems, genetic algorithms and their applications. ➤ Provide the mathematical background for carrying out the optimization associated with neural network learning. 		
Unit -I	Introduction: Soft Computing Constituents – Soft Computing Vs Hard Computing – Characteristics - Applications - Artificial Neural Network (ANN): Fundamental Concept – Application Scope - Basic Terminologies – Neural Network Architecture – Learning Process – Basic Models of ANN: McCulloch-Pitts Model – Hebb Network – Linear Separability.		
Unit-II	Supervised Learning Networks: Perceptron Networks – Adaline and Madaline Networks – Back Propagation Network – Radial Basis Function Network. Associative Memory Networks – BAM - Hopfield Network - Boltzmann Machine. Unsupervised Learning Networks: Kohonen Self Organizing Network – Counter Propagation Network – ART Network.		
Unit III	Fuzzy Sets: Basic Concept – Crisp Set Vs Fuzzy Set - Operations on Fuzzy Set – Properties of Fuzzy Sets – Fuzzy Relations: Concept – Fuzzy Composition – Fuzzy Equivalence and Tolerance Relation - Membership Functions: Features – Fuzzification – Methods of Membership value assignments – Defuzzification – Methods.		
Unit IV	Fuzzy Arithmetic – Extension Principle – Fuzzy Measures – Fuzzy Rules and Fuzzy Reasoning: Fuzzy Propositions – Formation of Rules – Decomposition of Rules – Aggregation of Rules – Approximate Reasoning – Fuzzy Inference and Expert Systems – Fuzzy Decision Making – Fuzzy Logic Control Systems.		
Unit V	Genetic Algorithm: Fundamental Concept – Basic Terminologies – Traditional Vs Genetic Algorithm - Elements of GA - Encoding - Fitness Function – Genetic Operators: Selection – Cross Over - Inversion and Deletion - Mutation – Simple and General GA - The Schema Theorem - Classification of Genetic Algorithm – Genetic Programming – Applications of GA.		
TEXTBOOKS:- Sivanandam, S. N., & Deepa, S. N. (2011). <i>Principles of Soft Computing</i> , (2 nd ed.): India: Wiley.			
REFERENCE BOOKS:- Rajasekaran, S., & Pai, G. A.V. (2004). <i>Neural Networks, Fuzzy Logic, Genetic Algorithms</i> . India: Prentice Hall.			
Outcomes	<ul style="list-style-type: none"> ➤ Understand soft computing techniques and their role in problem solving. ➤ Comprehend the fuzzy logic and the concept of fuzziness involved in various systems and fuzzy set theory. ➤ Analyze the genetic algorithms and their applications. 		

Course code: 546507		MOBILE COMPUTING	Credits:4	Hours: 4
Objectives	<ul style="list-style-type: none"> ➤ Evaluate the architecture and principles of operation of computer systems and networks. ➤ To learn about the concepts and principles of mobile computing. ➤ To explore both theoretical and practical issues of mobile computing. ➤ To develop skills of finding solutions and building software for mobile computing applications. 			
Unit -I	<p>Introduction:Wireless Concept - dialogue control, networks, middleware and gateways, applications and services, developing mobile computing applications, security in mobile computing, standards - Mobile computing architecture: History of computers, history of Internet, Internet - ubiquitous network, Architecture of mobile computing, three tier architecture, design considerations for mobile computing, mobile computing through Internet, making existing applications mobile – enabled Mobile computing through telephony: Evolution of telephony, multiple access procedure, mobile computing through telephone, developing an IVR application, voice XML, telephony application programming interface (TAPI).</p>			
Unit-II	<p>Emerging technologies: Introduction, Bluetooth, radio frequency identification {RFid}, wireless broadband {WiMAX}, mobile IP, Internet protocol version 6 {IPv6}, java card Global system for mobile communications (GSM): Global system for mobile communications, GSM Architecture, GSM Entities, Call routing in GSM, PLMN Interfaces, GSM Addresses and identifiers, network aspects in GSM, GSM frequency allocation, Authentication and security Short message service (SMS): Mobile computing over SMS, short message services (SMS), value added services through SMS, accessing SMS bearer.</p>			
Unit III	<p>General packet radio service (GPRS): Introduction, GPRS and packet data network, GPRS network architecture, GPRS network operations, data services in GPRS, applications for GPRS, limitations of GPRS, billing and charging in GPRS.</p>			
Unit IV	<p>Wireless application protocol (WAP): Introduction, WAP, MMS, GPRS applications - CDMA and 3G: Introduction, spread - spectrum technology, Is - 95, CDMA Vs GSM, wireless data, third generation networks, applications on 3G - Wireless LAN: Introduction, wireless LAN advantages, IEEE 802.11 standards, wireless LAN Architecture, mobility in wireless LAN, deploying wireless LAN, mobile Ad Hoc networks and sensor networks, wireless LAN security, Wi-Fi vs. 3G.</p>			
Unit V	<p>Voice over Internet protocol and convergence: Voice over IP, H.323 frame work for voice over IP, Session initiation protocol (SIP),comparison between H.323 and SIP, real time protocols, convergence technologies, call routing, voice over IP applications, IP Multimedia subsystem (IMS), mobile VoIP Security issues in mobile computing: Introduction, information security, security techniques and algorithms, security protocols, public key infrastructure, trust, security models, security frameworks for mobile environment.</p>			
<p>TEXTBOOKS:- Talukder, A. K., & Yavagal, R. R. (2008). <i>Mobile Computing</i>. TMH</p> <p>REFERENCE BOOKS:- Rajkamal. (2008). <i>Mobile Computing</i>. Oxford.</p>				

Outcomes	<ul style="list-style-type: none">➤ Grasp the concepts and features of mobile computing technologies and applications.➤ Identify the important issues of developing mobile computing systems and applications.➤ Organize the functionalities and components of mobile computing systems into different layers and apply various techniques for realizing the functionalities.
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Course code: 546508		MOBILE APPLICATION DEVELOPMENT	Credits:4	Hours: 4
Objectives	<ul style="list-style-type: none"> ➤ Fundamental design paradigms and technologies to mobile computing applications. ➤ Describe different mobile application models/architectures and patterns. ➤ Characteristics of mobile applications. ➤ User-interface design for mobile applications. 			
Unit -I	INTRODUCTION: Mobile Applications – Characteristics and Benefits – Application Model – Infrastructure and Managing Resources – Mobile Software Engineering – Frameworks and Tools – Mobile devices Profiles.			
Unit-II	USER INTERFACE : Generic UI Development – VUIs and Mobile Applications – Text to Speech techniques – Designing the right UI – Multimodal and Multichannel UI – Gesture based UIs – Screen Elements and Layouts – Voice XML – Java API.			
Unit III	APPLICATION DESIGN: Memory Management – Design patterns for limited memory – Work flow for Application Development – Techniques for composing Applications – Dynamic Linking – Plug ins and rules of thumb for using DLLs – Concurrency and Resource Management – Look and feel.			
Unit IV	APPLICATION DEVELOPMENT: Intents and Services – Storing and Retrieving data – Communication via the Web – Notification and Alarms – Graphics and Multimedia – Telephony – Location based services – Packaging and Deployment – Security and Hacking.			
Unit V	TOOLS GOOGLE ANDROID PLATFORM: Eclipse Simulator – Android Application Architecture – Android Application Life Cycle - Event based programming – Apple iPhone Platform – UI tool kit interfaces – Event handling and Graphics services – Layer Animation.			
TEXTBOOKS:-				
Conder, S., & Darcey, L. (2014). <i>Android Wireless Application Development</i> , (4 th ed.). Pearson.				
Mednieks, Z., Dornin, L., Blake Meike, G., & Nakamura, M. (2012). <i>Programming Android</i> (2 nd ed.). Reilly.				
REFERENCE BOOKS:-				
Allan, A. (2010). <i>iPhone Programming</i> . Reilly.				
Beer, P., & Simmons, C. (2015). <i>Android App Development for Young Adults & The Rest of US Paperback</i> .				
Burd, B. A. (2015). <i>Android Application Development For Dummies All in One</i> . Wiley.				
Ed Burnette. (2012). <i>Hello, Android: Introducing Googles Mobile Development Platform</i> , (3 rd ed.). Pragmatic Programmers.				
Jerome, J.F., & Marzio, D. (2010). <i>Android A programmers Guide</i> . Tata McGraw-Hill Edition.				
Mcherter, J., & Gowell, S. (2012). <i>Professional Mobile Application Development</i> . Wiley India Private Limited.				
Meier, R., & Wiley, W. (2010). <i>Professional Android 2 Application Development</i> .				
Sauter, M. (2011). <i>From GSM to LTE: An Introduction to Mobile Networks & Mobile Broadband</i> . John Wiley and Sons.				
Outcomes	<ul style="list-style-type: none"> ➤ Be competent with the characterization and architecture of mobile applications. ➤ Be competent with designing and developing mobile applications using one application development framework. ➤ Evaluate the role of mobile applications in software intensive systems. 			

Course code: 546509	WIRELESS AD HOC AND SENSOR NETWORKS	Credits:4	Hours: 4
Objectives	<ul style="list-style-type: none"> ➤ To understand the basics of Ad-hoc & Sensor Networks. ➤ To study about the issues pertaining to major obstacles in establishment and efficient management of Ad-hoc and sensor networks. ➤ To understand various security practices and protocols of Ad-hoc and Sensor Networks. 		
Unit -I	MAC & TCP IN AD HOC NETWORKS: Fundamentals of WLANs – IEEE 802.11 Architecture - Self configuration and Auto configuration-Issues in Ad-Hoc Wireless Networks – MAC Protocols for Ad-Hoc Wireless Networks – Contention Based Protocols - TCP over Ad-Hoc networks-TCP protocol overview - TCP and MANETs – Solutions for TCP over Ad-Hoc Networks.		
Unit-II	ROUTING IN AD HOC NETWORKS: Routing in Ad-Hoc Networks-Introduction-Topology based versus Position based Approaches-Proactive, Reactive, Hybrid Routing Approach-Principles and issues – Location services - DREAM – Quorums based location service – Grid – Forwarding strategies – Greedy packet forwarding – Restricted directional flooding- Hierarchical Routing- Issues and Challenges in providing QoS.		
Unit III	MAC, ROUTING & QOS IN WIRELESS SENSOR NETWORKS: Introduction – Architecture - Single node architecture – Sensor network design considerations – Energy Efficient Design principles for WSNs – Protocols for WSN – Physical Layer : Transceiver Design considerations – MAC Layer Protocols – IEEE 802.15.4 Zigbee – Link Layer and Error Control issues - Routing Protocols – Mobile Nodes and Mobile Robots - Data Centric & Contention Based Networking – Transport Protocols & QOS – Congestion Control issues – Application Layer support.		
Unit IV	SENSOR MANAGEMENT: Sensor Management - Topology Control Protocols and Sensing Mode Selection Protocols - Time synchronization - Localization and positioning – Operating systems and Sensor Network programming – Sensor Network Simulators.		
Unit V	SECURITY IN AD HOC AND SENSOR NETWORKS: Security in Ad-Hoc and Sensor networks – Key Distribution and Management – Software based Anti-tamper techniques – water marking techniques – Defense against routing attacks - Secure Adhoc routing protocols – Broadcast authentication WSN protocols – TESLA – Biba – Sensor Network Security Protocols – SPINS.		
TEXTBOOKS:- De Morais Cordeiro, C., & Agrawal, D. P. (2011). <i>Ad Hoc and Sensor Networks: Theory & Applications</i> (2 nd ed.): World Scientific Publishing. Siva Ram Murthy, C., & Manoj, B. S. (2004). <i>Ad Hoc Wireless Networks – Architectures & Protocols</i> . Pearson Education. REFERENCE BOOKS:- Çayırıcı , E., & Rong, C. (2009). <i>Security in Wireless Ad Hoc & Sensor Networks</i> . John Wiley & Sons. Perrig, A., & Tygar, J. D. (2006). <i>Secure Broadcast Communication: In Wired and Wireless Networks</i> . Springer, Toh, C. K. (2002). <i>Ad Hoc Mobile Wireless Networks</i> . Pearson Education.			

Outcomes	<ul style="list-style-type: none">➤ Identify different issues in wireless ad hoc and sensor networks.➤ To analyze protocols developed for ad hoc and sensor networks.➤ Establish a Sensor network environment for different type of applications.
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**DEPARTMENT OF COMPUTATIONAL LOGISTICS
ALAGAPPA UNIVERSITY, KARAİKUDI
NON – MAJOR ELECTIVE COURSES OFFERED BY THE DEPARTMENT
EFFECTIVE FROM ACADEMIC YEAR 2019-2020**

II Semester					
Code No.	Title of Courses	Credits	CIA Marks	ESE Marks	Total Marks
	Principles of Information Technology.	3	25	75	100
	Office Automation and E-Governance	3	25	75	100

III Semester					
Code No.	Title of Courses	Credits	CIA Marks	ESE Marks	Total Marks
	Object Oriented Programming with C++	3	25	75	100
	Internet and Web Design	3	25	75	100

NON – MAJOR ELECTIVE COURSES			
PRINCIPLES OF INFORMATION TECHNOLOGY		Credits:2	Hours: 3
Objectives	<ul style="list-style-type: none"> ➤ To impart adequate knowledge in the information Technology and its current Trends. ➤ To understand fundamental Concepts of computer and programming languages. ➤ To provide knowledge in computer networks and services of internet. 		
Unit -I	Introduction to computers: Computer system concepts - Characteristics of computer -Generations of computes - Components of computer system - Classification of digital computer system – Computer Architecture - Input and Output devices, Storage devices.		
Unit-II	Computer software : System software - Application software - Programming languages classification: Machine language - Assembly language - High-level language. Evolution of programming languages: First – Second – Third and fourth generation languages, Language translator: Compiler, Interpreter, Assembler. Operating System – Definition – Functions - Evolution of operating system, Types of operating systems. Introduction to Database Management Systems - Database Architecture and Design - Relational Database Management Systems (RDBMS) and Structured Query Language (SQL) - Modern Database Management Systems		
Unit III	Network Communication : Computer Networks - Definition - Criteria - Advantages and limitations of Computer networking - Communication process – Types of computer network - Network topology - LAN and other network related protocols - OSI model - TCP/IP model - Networking Components.		
Unit IV	Network Applications- Internet: Introduction – Basics - Internet protocols, Internet addressing –World Wide Web – Browser- E-mail – telnet – ftp – application - benefits and limitation of internet, electronic conferencing - and teleconferencing.		
Unit V	IT Trends:-E-Commerce and E-Business – Web Design - Artificial Intelligence, Computational Intelligence, Geographic Information System (GIS), Data Mining and Warehouse, Multimedia and applications - Cloud and Green Computing, Internet of Things, Internet of . Role of IT in Education, Industry, Banking, Marketing, Public Services and others.		
TEXTBOOKS:-			
Lean, A., & Leon, M. (2009). <i>Fundamentals of Information Technology</i> , (2 nd ed.): New Delhi: Vikas Publicatio House.			
REFERENCE BOOKS:-			
Cyganski, D., Orr, J.A., Vaz, R. F. (2000). <i>Information Technology: Inside & Outside</i> . Pearson Publication.			
I. T. L. Education Solutions Limited, Itl Esl. (2004). <i>Introduction to Computer Science</i> . India: Pearson Education.			
Leon (1999). <i>Fundamentals of IT</i> (1 st ed.): Leon Tec World.			
Rajaraman, V., & Adabala, N. (2014). <i>Fundamentals of Computers</i> , (6 th ed.): PHI Learning Private Limited.			
Outcomes	After completing the course the students able to <ul style="list-style-type: none"> ➤ Explain the current trends in information technology . ➤ Describe the components of computer and programming languages. 		

	<ul style="list-style-type: none">➤ Elaborate concepts, types of computer networks and various network topologies.➤ Use internet and its services like E-Mail, Navigation in the web.➤ Implement IT concepts in real time applications.
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OFFICE AUTOMATION AND E-GOVERNANCE		Credits:2	Hours: 3
Objectives	To provide an in-depth training in use of Office Automation packages, internet and intranet tools, web hosting etc. Essential for a modern office for day to day office management, and e-governance. The course also helps candidates to get acquainted with IT and Cyber laws, Taxes, Financial rules to be followed in public and Private offices.		
Unit -I	Fundamentals of Computer: Overview Of a Computer, Functional Components of a computer (Working of each unit), Evolution Of Computers, Generations Of Computers, Classification of Computers, Applications Of Computers Hardware: Block diagram of computer, Input and Output devices, Memory and storages devices, Different ports and its uses, Different type of printers.		
Unit-II	Operating system (Windows XP): Windows concepts, Features, Windows Structure, Desktop, Task bar, Start Menu, My Computer, Recycle Bin, Windows Accessories, calculator, Notepad, Paint, Word pad, Character Map, Windows Explorer, Entertainment, Installation of Hardware and Software, Using scanner, system tools, communication, sharing information between computers.		
Unit III	Word Processing: Typing, Editing, Proofing & Reviewing, Formatting Text & Paragraphs, Automatic Formatting and Styles, Working with Tables, Graphics and Frames, Mail Merge, Automating Your Work & printing Documents. Excel Spreadsheet: Working & Editing in Workbooks, Creating Formats & Links, Formatting a Worksheet & creating graphic objects, Creating Charts (Graphs), formatting and analyzing data, Organizing Data in a List (Data Management), Sharing & Importing Data, Printing. PowerPoint Presentations: Getting started in PowerPoint, Creating a presentation, Creating & editing slides, Previewing a slide show, Adding picture & graph, Adding sound & video, Adding auto shape, Animating objects.		
Unit IV	Introduction to Internet Intranet tools: E-mail: Anatomy of e-mail, e-mail address, finding e-mail address, adding signature, attaching files, opening attachments, managing e-mail account, Web mail, and Case study: Yahoo Mail, Outlook express. FTP, ftp commands, ftp software, Telnet, using telnet, Web pages, HTML, basics of HTML, computer virus and antivirus software, Voice and Video chat, web browsers etc.		
Unit V	E-Governance E-government, need of e-governance, e-assistance, e-democracy, e-administration, citizen services, e-procurement, Mobile government, Software and Hardware required for E-governance Implementation, E-governance in a Small Office, and Web Portal for E-governance.		
REFERENCE BOOKS:-			
Acklen, L., Bird, L., Ferrett, R., Matherly, D. M. (1999). <i>Microsoft Office 97 Professional Essentials</i> . Pearson College Div.			
Calkins, (2002). <i>Technology & Procedures for Administrative Professionals</i> . Thomson Learning.			
Cooperman, S. H. <i>Professional Office Procedure</i> . Prentice Hall.			
Garson, G. D. (2006). <i>Public Information Technology and e-Governance: Managing the Virtual</i>			

State. Jones & Bartlett Publishers.

O'Hara, S. (1998). *Discover Office 97*. EEE GUE E & T Prentice – Hall India.

Senn, J. A. *Information Technology: Principles , Practices & Opportunities*. Prentice Hall. Patsy Fulton.

Outcomes	<ul style="list-style-type: none">➤ The course focuses on computer fundamentals.➤ To understand the concept of Office.➤ To comprehend the administrative process in office.
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OBJECT ORIENTED PROGRAMMING WITH C++		Credits:2	Hours: 3
Objectives	<ul style="list-style-type: none"> ➤ To impart adequate knowledge on the need of programming languages and problem solving techniques. ➤ To develop programming skills using the fundamentals and basics of C++ Language. ➤ To enable effective usage of arrays, functions, constructor, destructor. ➤ To develop program using class and objects. 		
Unit -I	Principles Of Object Oriented Programming. Procedure Oriented Programming – Object Oriented Programming – Basic Concepts And benefits Of OOP – Object Oriented Language – Applications Of OOP – Structure Of C++ – Applications Of C++.		
Unit-II	Tokens, Expression And Control Structure – Operators – Manipulators – Functions In C++: Function Prototyping – Call By Reference – Return By Reference – Inline Functions – Default Const Arguments – Function Overloading – Friend And Virtual Functions.		
Unit III	Objects And Classes – Member Functions – Nesting Of Member Functions – Private Member Functions – Memory Allocation Of Objects – Static Data Member Functions – Arrays Of Objects – Objects As Functions – Arguments – Pointers To Be Members.		
Unit IV	Constructors: Parameterized Constructors – Multiple Constructors – Constructor With Default Parameters – Copy And Dynamic Constructors – Destructors – Operator Overloading –Overloading Unary And Binary Operators – Overloading Binary Operators Using Friend Functions.		
Unit V	Inheritance: Defining Derived Classes – Single Inheritance – Making Private Member Inheritable – Multiple Inheritance – Hybrid Inheritance – Virtual Base Classes – Abstract Classes – Constructors In Derived Class – Member Classes – Nesting Of Classes.		
TEXTBOOKS:-			
Balagurusamy , E. (2013). <i>Object Oriented Programming with C++: 6e</i> . Tata McGraw Hill Education Private Limited.			
Barakati, N. <i>Object Oriented Programming in C++</i> . SAMS PHI Pvt. Ltd.			
REFERENCE BOOKS:-			
Lafore, R. (2001). <i>Object Oriented Programming in C++</i> , (4 th ed.). Sams Publishing.			
Lippman, S. B., Lajoie, J., & Moo, B. E. (2011). <i>C++ Primer</i> , (5 th ed.).			
Shukla, R. K. (2008). <i>Object-Oriented Programming in C++</i> . Wiley India Pvt Ltd.			
Outcomes	<ul style="list-style-type: none"> ➤ To obtain the knowledge about the number systems this will be very useful for bitwise operations. ➤ To develop programs using the basic elements like control statements, Arrays and Strings. ➤ To understand about the code reusability with the help of user defined functions. 		

INTERNET AND WEB DESIGN		Credits:2	Hours: 3
Objectives	<ul style="list-style-type: none"> ➤ Describe network types, topologies and structural arrangements. ➤ Compare features of different Internet communication tools. ➤ Describe categories of individual and organisational Internet users and their values and goals. ➤ Describe Internet providers and compare ways individuals and organisations obtain connections to the Internet. ➤ Describe Internet-related careers and professions and the roles taken by members of a large web development team. 		
Unit -I	Introduction to Internet - Anatomy – Terminology – History – Connecting and Accessing Internet - Internet Services : Protocols, Email, Newsgroup, Net Meeting, Chatting – Applications – Impact – Internet Technology and Protocols : TCP/IP, SLIP, PPP, SMTP, POP3 – FTP – HTTP – Addressing on Internet – Domain Name System. Hazards on the Internet (viruses, spam, worms, hoaxes, and scams).		
Unit-II	Introduction to World Wide Web and Web Design: WWW – History – Basic Features – Browsers – Servers – Search Engines and their categories – Functions – Search Criterion – Hypertext. Basic Web Design principles - Planning process - Rules of web designing - Designing navigation bar - Page design - Home Page Layout - Web Design concept – Web site’s purpose, specification, creating user profiles and website prototypes - Web Standards – Web Development Models- Website classifications. Different website structures and web design approaches		
Unit III	HTML : Definition - HTML Documents - Basic structure of an HTML document - Creating an HTML document - Mark up Tags - Heading-Paragraphs - Line Breaks - HTML Tags.Elements of HTML : Introduction - Working with Text- Working with Lists, Tables and Frames - Working with Hyperlinks, Images and Multimedia – Working with Forms and controls.		
Unit IV	Introduction to Cascading Style Sheets - Concept of CSS - Creating Style Sheet - CSS Properties - CSS Styling(Background, Text Format, Controlling Fonts) - Working with block elements and objects - Working with Lists and Tables - CSS Id and Class – Box Model(Introduction, Border properties, Padding - Properties, Margin properties) - CSS Advanced(Grouping, Dimension, Display, Positioning, Floating, Align,Pseudo class, Navigation Bar, Image Sprites, Attribute sector) - CSS Color - Creating page Layout and Site Designs		
Unit V	Web Publishing or Hosting : Creating the Web Site - Saving the site - Working on the web site - Creating web site structure - Creating Titles for web pages - Themes-Publishing web sites. Interactive Tools (Fundamental only) : ASP, Javascript, Microsoft Front Page, Dreamweaver		
TEXTBOOKS:-			
Deitel, & Nieto. (2000). <i>Internet & World Wide Web – How to program</i> . Pearson Education Publishers.			
Kogent learning solutions.pdf. (2005). <i>HTML 5 in Simple Steps Dreamtech Press</i> . Kogent Learning Solutions Inc.			

REFERENCE BOOKS:-

Bangia, R. (2005). *Internet & Web Design, (2nd ed.)*. Firewall Media Publications.

Duckett, J. (2004). *Beginning HTML, XHTML, CSS, & JavaScript*. India: Wiley.

Krishnamoorthy, R., & Prabhu, S. (2004). *Internet & Java Programming*. New Age International Publishers.

Powell, T. A. (2003). *The Complete Reference HTML & XHTML, (4th ed.)*. Tata McGraw Hill.

Steven, M. *Web Designing & Architecture-Educational Technology Centre University of Buffalo Schafer HTML, XHTML, & CSS Bible, (5th ed.)*. India:Wiley.

Outcomes

- Review the current topics in Web & Internet technologies.
- Describe the basic concepts for network implementation.
- Learn the basic working scheme of the Internet and World Wide Web.
- Understand fundamental tools and technologies for web design.
- Comprehend the technologies for Hypertext Mark-up Language (HTML).
- Specify design rules in constructing web pages and sites.

CURRICULUM VITAE

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Professional experience: Teaching : 30 years Research : 14 years

Honours and Awards:

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Recent publications:

- “Data Replication Using Data Mining Techniques”, Asian Journal of Computer Science and Technology”, (ISSN: 2249-0701) Vol.8 No.S1, Feb.2019, pp. 107-109. (UGC approved)
- “Cloud Security System With Sequel Homomorphic Encryption and Diffie Hellman Algorithm”, International Journal of Computer Sciences and Engineering, Vol.7(2), Jan 2019, (E-ISSN: 2347-2693) (UGC approved)
- “Ripple Wavelet-Rank Based Splitting Trees Method (RWRBST) for Quick Image Compression”, International Journal of Pure and Applied Mathematics (ISSN: 1311-8080), Volume 118 No. 8 Feb. 2018, pp.573-577 (Scopus Indexed : SJR 0.14)
- “Hybridization of ICBC and Genetic Algorithm for Optimizing Encryption Process in Cloud Computing Application Service”, Fundamenta Informaticae, (ISSN 0169-2968) Vol. 157, No. 1-2, pp.79-109, Jan. 2018. (SCI Journal) (*I.F. 0.725*)
- “Optimized Hash based Security System for Big Data”, International Journal of Engineering Sciences & Research Technology (IJESRT) (ISSN: 2277-9655), Vol. 6 No. 04 Apr 2017, pp 28-33.
- “Security-as-a-Service” for files in cloud computing — A novel application model”, *IEEE Xplorer (ISBN: 978-1-4673-7807-9)*, 5, Nov. 2016. (I.F. 5.629)

Cumulative Impact factor: 89.86

Total Citation: 255

h- index: 9

i10- index: 9

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Professional experience: Teaching : 21 Years Research : 09 Years

Honours and Awards:

-
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Recent publications:

- “Segmentation Chick’s Image Using Artificial Neural Network”, International Conference on Computing, Communication and Information Technology (CCIT 2018), PP. 27-28, 2018 , Rome, Italy.

Cumulative Impact factor: 26.7

Total Citation: 35

h- index: 3

i10- index: 2

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Honours and Awards:

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Recent publications:

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Educational qualification: M.Sc(Physics), M. Sc(CS), M.Phil., Ph. D.,

Professional experience: 33 Years (As Academician and software professional)

Honours and Awards:

- Certificates received for computerising the Annual Accounts.
- Certificate received for completing 25 years of unblemished service on 2011.

Recent publications:

- Two papers published in the International Conference on Advances in Applicable Mathematics(ICAAM – 2017) organized by the Dept. of Mathematics, Bharathiyar University, Coimbatore on 7th & 8th December 2017.