



**MANONMANIAM SUNDARANAR UNIVERSITY
TIRUNELVELI-627 012, TAMILNADU, INDIA**

CENTRE FOR INFORMATION TECHNOLOGY AND ENGINEERING

Board of Studies Meeting Held on 29.03.2022

**Regulations, Scheme and LOCF based Syllabus
For those who joined from the academic year 2022-2023 onwards**

M.Sc. Information Technology (CBCS-University Department)

**'PROGRAMME CORE' ADOPTED FROM
TANSICHE STATE INTEGRATED BOS OF
M.Sc. COMPUTER SCIENCE for EQUIVALENCE**

**Submitted by
Chairman, BOS and Head
Centre for Information Technology and Engineering,**

To

**The Registrar
Manonmaniam Sundaranar University
Tirunelveli - 12**

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PREAMBLE

Objective of the Programme: M.Sc. degree programme in Information Technology exposes students, the fundamental setup and latest trends of Information Technology (IT) through a set of hand-picked IT oriented subjects to pursue career in contemporary IT industry and in academics as well.

Curriculum Highlights: The M.Sc.degree programme in Information Technology is to equip post graduate students with an integrated set of skills that will allow them to develop their professional careers in this area of information technology. The focus of the program is to equip students with the theoretical and practical that is necessary to enable them to practical knowledge in the design of complex Computer applications/science. The program not only presents the knowledge in the design and implementation of computer applications but also prepares students to embrace future developments in the field and has a demonstrated professional relevance.

Learning Freedom to Students through MOOCs: Courses can be done by a student on Massive Open Online Courses - MOOC platform SWAYAM, edX, etc that can be credit transferred to the course basket as equivalent to classroom based courses based on the recommendations of Board of Studies approved from time-to-time. With two decades of experienced faculty and industry expertise, the curriculum has contents capable of producing superior student outcomes.

PROGRAMME OBJECTIVES

PO1 Technical Expertise: Implement fundamental domain knowledge of core courses for developing effective computing solutions by incorporating creativity and logical reasoning.

PO2 Successful Career: Deliver professional services with updated technologies in information technology based career.

PO3 Soft Skills: Develop leadership skills and incorporate ethics, team work with effective communication & time management in the profession.

PO4 Research: Graduates of the programme will contribute significantly in the technological developments of Information Technology through research practices

PROGRAM SPECIFIC OUTCOMES

PSO1: Apply knowledge of mathematics, science and algorithm in solving complex Computer engineering problems.

PSO2: Generate solutions by conducting experiments and applying techniques to analyze and interpret data

PSO3: Design component, or processes to meet the needs within realistic constraints.

PSO4: Identify, formulate, and solve Software Engineering, Networking and Data Mining problems.

PSO5: Comprehend professional and ethical responsibility in computing profession.

PSO6: Express effective communication skills.

PSO7: Participate in global, economic, environmental, and societal context.

PSO8: Recognize the need for, and an ability to engage in life-long learning.

PSO9: Knowledge of contemporary issues and emerging developments in computing profession.

PSO10: Utilize the techniques, skills and modern computer Engineering tools, Software and techniques necessary for Engineering practice.

PSO11: Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary settings.

PSO12: Design research problems and conduct research in computing environment.

PO vs. PSO Mapping

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10	PSO11	PSO12
PO1 Technical Expertise	S	S	M	S	M	L	S	S	L	S	L	L
PO2 Successful Career	M	M	S	M	S	S	L	M	L	M	S	M
PO3 Soft Skills	L	M	S	M	M	S	S	L	S	L	M	L
PO4 Research	M	S	M	M	M	L	L	M	L	L	M	S

S- Strong

M – Middle

L – Low

A. REGULATIONS

A0: EQUIVALENCE OF M.Sc. INFORMATION TECHNOLOGY DEGREE with M.Sc. COMPUTER SCIENCE DEGREE:

As per the directive of TANSCHÉ, the ‘PROGRAMME CORE’ OF M.Sc. COMPUTER SCIENCE Degree curriculum and syllabus released by TANSCHÉ has been adopted as CORE for M.Sc. Information Technology degree and hence M.Sc. Information Technology degree offered by this University is EQUIVALENT TO M.Sc. COMPUTER SCIENCE DEGREE. The University shall apply to TANSCHÉ to get the EQUIVALENCE based on the Adoption.

A1: Duration of the Course:

The M.Sc. INFORMATION TECHNOLOGY programme is a 2 years full time programme spread over four semesters.

A2: Eligibility for Admission:

The minimum eligibility conditions for admission to the M.Sc. programme in Information Technology are given below.

The candidates who seek admission into the first semester of the M.Sc. programme in Information Technology course will be required to have passed the Bachelor’s degree (B.Sc./

B.C.A./ equivalent) from Manonmaniam Sundaranar University or any other Indian University or equivalent in any one of the following disciplines:

- 1.Information Technology
- 2.Information Technology and E-Commerce
- 3.Computer Science
- 4.Computer Technology
- 5.Software Engineering
- 6.Computer Applications
- 7.Electronics
8. Any other discipline with Mathematics or Computer Applications as a subject.

A3: Credit Requirement for the Degree:

The general Regulations of the Choice Based Credit System programme of Manonmaniam Sundaranar University are applicable to this programme. The University requirement for the M.Sc. programme is completion of 91 credits of course work. Out of 91 credits, 4 credits should be through the mini project, 10 credits should be through the 4th semester major project work and remaining 77 credits should be through Core, Elective and Supportive Course papers. A Core course has 4 credits, Elective, Supportive Courses weigh 3 credits and Practical courses weigh 2 credits. No candidate will be eligible for the Degree of Master of Science in Information Technology, unless the candidate has undergone the prescribed courses of study for a period not less than 4 semesters and has acquired 91 credits and other passing requirements in all courses of study. The marks, M_i obtained by the student in each course, i shall be multiplied by the credit of that course, C_i ; such marks of all 'n' courses are added up and divided by the total credit (91) to obtain the Consolidated Percentage of Marks.

$$\text{Consolidated Percentage of Marks} = \frac{\sum_{i=1}^n C_i \times M_i}{\sum_{i=1}^n C_i}$$

A4: Specializations:

The M.Sc. degree programme in Information Technology will have two specializations, namely

Specialization A. Data Science and Big Data Analytics

Specialization B. Mobile Applications and Open Source Software

The degree will be offered as M.Sc. Information Technology only. However, the subjects for Specialization A are offered under Group A and the subjects for Specialization B are offered

under Group B. A student can choose all electives either from Group A or Group B only. The Mini-project and Major project are to be done in the chosen specialization only.

A5: Attendance Requirement:

A candidate will be permitted to appear for the semester examination only if the candidate keeps not less than 75 percent attendance. The University condonation rules are applicable for those who lack minimum of 75% attendance. The candidates with less than 60% attendance will have to repeat the concerned entire semester.

A6: Assessment

The assessment will comprise Continuous Internal Assessment (CIA) carrying a maximum of 25% marks and end-semester Examination carrying a maximum of 75% marks in each theory course (Core/Elective/Supportive Course). For practical courses, Mini Project and Major Project, the CIA is carried out for 50% marks and the External Assessment is carried out for 50% marks. The external assessment includes University Final Lab Exam, Lab Report, Viva-Voce for Practical courses and Final Project Presentation, Project Report, Viva-Voce for Mini Project and Major Project.

Semester examination will be conducted for all courses of study, at the end of each Semester.

If a Student wants to carry out the final Major project work in 4th semester in an IT company, the student can get permission from the concerned Project Supervisor, Faculty Members of that semester, Programme Coordinator and Head of the Department after submitting the Acceptance Letter from the IT Company. The student can also carry out industrial internship during the summer and winter vacations of the respective semesters during their course of study.

A7: Passing Requirements

A candidate who secures not less than 50 percent marks in end-semester examination and not less than 50 percent of the total marks (Continuous Internal Assessment + end-semester examination) in any subject of study will be declared to have passed the subject.

A Candidate who successfully completes the course and satisfies the passing requirements in all the courses of study and curricular requirements will be declared to have qualified for the award of the Degree.

A8: Classification of successful candidates

The candidates who passed all theory courses, practical courses and Projects shall be classified as follows. Total Marks secured in theory courses, practical courses and Project work altogether put as overall percentage along with the credits.

The classification is as follows,

Marks Overall %	Classification
1. 75% and above with a First attempt Pass in all courses	I Class with Distinction
2. i) 75% above from multiple attempts	I Class
ii) 60% to below 75%	I Class
3. 50% to below 60%	II Class

A9: Academic Session

The academic year normally begins in July every year and ends in April.

These regulations will come into effect from the academic year 2022-2023 onwards.

A10: Power to Modify

The University may from time to time revise, amend or change the regulations, scheme of examinations and syllabus, if found necessary and such amendments, changes shall come into effect from the date prescribed.

These regulations will come into effect from the academic year 2022-2023 onwards.

B.SCHEME FOR M.Sc. INFORMATION TECHNOLOGY
‘PROGRAMME CORE’ ADOPTED FROM TANSICHE STATE INTEGRATED BOS OF
M.Sc. COMPUTER SCIENCE for EQUIVALENCE
(For those who joined from the academic year 2022-2023 onwards)

Sem-ester	Title of the Subject	Status*	Hrs/ week	Credits	Maximum Marks			Passing Minimum	
					Internal	External	Total	External	Total
FIRST SEMESTER									
I	Design and Analysis of Algorithm	C	4	4	25	75	100	50	50
I	Advanced Web Technology	C	4	4	25	75	100	50	50
I	Advanced Database Management Systems	C	4	4	25	75	100	50	50
I	Object Oriented Programming using C++ (E-Pathshala)	C	4	4	25	75	100	50	50
I	Elective I	E	3	3	25	75	100	50	50
I	Design and Analysis of Algorithm Laboratory	L	2	2	50	50	100	50	50
I	Advanced Web Technology Laboratory	L	2	2	50	50	100	50	50
I Semester Total Credits				23					
SECOND SEMESTER									
II	Supportive Course I	S	3	3	25	75	100	50	50
II	Distributed Operating System	C	4	4	25	75	100	50	50
II	Advanced Java Programming	C	4	4	25	75	100	50	50
II	Cryptography and Network Security(TANSICHE)	C	4	4	25	75	100	50	50
II	Principles of Compiler Design	C	4	4	25	75	100	50	50
II	Elective II	E	3	3	25	75	100	50	50
II	Cryptography and Network Security Laboratory	L	2	2	50	50	100	50	50
II	Advanced Java Programming Laboratory	L	2	2	50	50	100	50	50
II Semester Total Credits				26					

THIRD SEMESTER									
III	Supportive Course II	S	3	3	25	75	100	50	50
III	Digital Image processing	C	4	4	25	75	100	50	50
III	Internet of things(TANSCHE)	C	4	4	25	75	100	50	50
III	Machine Learning	C	4	4	25	75	100	50	50
III	Elective III	E	3	3	25	75	100	50	50
III	Machine Learning – Laboratory	L	2	2	50	50	100	50	50
III	Digital Image processing- Laboratory	L	2	2	50	50	100	50	50
III	Mini Project/Internship/Industrial Training	P	5	4	50	50	100	50	50
III Semester Total Credits					26				
FOURTH SEMESTER									
IV	Major Project	P	10	10	50	50	100	50	50
IV	Elective IV[E-Pathshala]	E	3	3	25	75	100	50	50
IV	Elective V	E	3	3	25	75	100	50	50
IV Semester Total Credits					16				
OVERALL TOTAL CREDITS					91				

*C-Core, L-Laboratory, S-Supportive, E-Elective, P-Project

GROUP A: Subjects for Electives under Specialization A: Data Science and Big Data Analytics									
Sl. No	Title of the Subject	Status	Hrs/week	Credits	Maximum Marks			Passing Minimum	
					Internal	External	Total	External	Total
A1	Data Analytics[E-Pathshala]	E	3	3	25	75	100	50	50
A2	Programming for Data Analytics	E	3	3	25	75	100	50	50
A3	Computing for Data Analytics	E	3	3	25	75	100	50	50
A4	Cloud Computing[E-Pathshala]	E	3	3	25	75	100	50	50
A5	Big Data Security	E	3	3	25	75	100	50	50
A6	Soft Computing	E	3	3	25	75	100	50	50
A7	Data Mining and Warehousing	E	3	3	25	75	100	50	50

GROUP B: Subjects for Electives under Specialization B: Mobile Applications and Open Source Software

B1	Mobile Applications Development	E	3	3	25	75	100	50	50
B2	Mobile Computing[E-Pathshala]	E	3	3	25	75	100	50	50
B3	Open Source Software	E	3	3	25	75	100	50	50
B4	Android Mobile Application Development	E	3	3	25	75	100	50	50
B5	Open Source Technologies	E	3	3	25	75	100	50	50
B6	Mobile and Wireless Security	E	3	3	25	75	100	50	50
B7	Mobile and Digital Forensics	E	3	3	25	75	100	50	50

**CURRICULUM AND DETAILED SYLLABI FOR
M.Sc. INFORMATION TECHNOLOGY DEGREE PROGRAMME
'PROGRAMME CORE' ADOPTED FROM TANSCHÉ State Integrated BOS OF
M.Sc. Computer Science for Equivalence**

**FOR THE STUDENTS ADMITTED in THE
ACADEMIC YEAR 2019-2020 ONWARDS**

**List of CORE Subjects adopted from M.Sc. Computer Science for Equivalence
(For The Candidates Admitted From 2022-2023 Onwards)**

SI. No.	Course code	Course name
1.		Design and Analysis of Algorithm
2.		Advanced Web Technology
3.		Advanced Database Management Systems
4.		Principles of Compiler Design
5.		Design and Analysis of Algorithm Laboratory
6.		Advanced Web Technology Laboratory
7.		Distributed Operating System
8.		Advanced Java Programming
9.		Cryptography and Network Security
10.		Advanced Java Programming Laboratory
11.		Digital Image Processing
12.		Internet of Things
13.		Machine Learning
14.		Digital Image Processing Laboratory
15.		Mini project
16.		Major Project

PC : Program Core

L : Lecture

P : Practical

Note:

1 Hour Lecture is equivalent to 1 credit

1 Hour Practical is equivalent to 1 credit

Preamble

This paper contains many advanced technologies that have been evolved for solving problems analysis is an important part of computational complexity theory, which provides theoretical estimation for the required resources of an algorithm to solve a specific computational problem.

Prerequisite

- Nil

Course Outcomes

On the successful completion of the course, students will be able to

Course Outcomes	Bloom's Level
CO1: Understand the concepts Algorithm Specification	Understand
CO2: Understand Divide and Conquer	Understand
CO3: Gain conceptual understanding of The Greedy Method	Apply
CO4: Understand the concepts Dynamic Programming	Understand
CO5: Identify appropriate techniques and tools to Backtracking	Apply

Mapping with Programme Outcomes
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Course Outcome	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO1 0	PSO1 1	PSO1 2
CO1	M							M				
CO2		M						L	M			
CO3			S					M				S
CO4			S					M				
CO5			M					M				S

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's Category	Continuous Assessment Tests			Terminal Examination
	1	2	3	
Remember	5	5	5	20
Understand	15	10	10	40
Apply	5	10	10	15
Analyse	0	0	0	0
Evaluate	0	0	0	0
Create	0	0	0	0

Syllabus	
DESIGN AND ANALYSIS OF ALGORITHM	

Unit I - Introduction: Algorithm Definition – Algorithm Specification – Performance Analysis-Asymptotic Notations. Elementary Data Structures: Stacks and Queues – Trees – Dictionaries – Priority Queues – Sets and Disjoint Set Union – Graphs **(12hrs)**

Unit II - Divide and Conquer: The General Method – Defective Chessboard – Binary Search – Finding The Maximum And Minimum – Merge Sort – Quick Sort – Selection - Strassen’s Matrix Multiplication. **(10hrs)**

Unit III - The Greedy Method: General Method - Container Loading - Knapsack Problem - Tree Vertex Splitting – Job Sequencing With Deadlines - Minimum Cost Spanning Trees - Optimal Storage On Tapes – Optimal Merge Patterns - Single Source Shortest Paths.**(12hrs)**

Unit IV - Dynamic Programming: The General Method – Multistage Graphs – All-Pairs Shortest Paths – Single-Source Shortest Paths - Optimal Binary Search Trees - String Editing - 0/1 Knapsack - Reliability Design - The Traveling Salesperson Problem - Flow Shop Scheduling. Basic Traversal and Search Techniques: Techniques for Binary Trees – Techniques for Graphs – Connected Components and Spanning Trees– Biconnected Components and DFS. **(14hrs)**

Unit V - Backtracking: The General Method – The 8-Queens Problem – Sum of Subsets – Graph Coloring – Hamiltonian Cycles – Knapsack Problem Branch and Bound: Least Cost searchhod - 0/1 Knapsack Problem. **(12hrs)**

Total (60hrs)

Text Book

1. Ellis Horowitz, Satraj Sahni and Sanguthevar Rajasekaran, Fundamentals of Computer Algorithms, Universities Press, Second Edition, Reprint 2009.

References

1. Data Structures Using C - Langsam, Augenstein, Tenenbaum, PHI
2. Data structures and Algorithms, V.Aho, Hopcroft, Ullman , LPE
3. Introduction to design and Analysis of Algorithms - S.E. Goodman, ST. Hedetniemi- TMH.
4. Carlos A.Coello Coello, Gary B.Lamont, David A.Van Veldhuizen, “Evolutionary Algorithms for Solving Multi-Objective Problems”, Springer 2nd Edition, 2007.

ADVANCED WEB TECHNOLOGY

Category	L	P	Credit
PC	4	0	4

Preamble

This paper includes the concepts of Web technology is the establishment and use of mechanism that make it possible for different computers to communicate.

Prerequisite

- Basics of computer Knowledge.

Course Outcomes

On the successful completion of the course, students will be able to

Course Outcomes	Bloom's Level
CO1: Understand the fundamental concepts overview of asp.net	Understand
CO2: Understand the Developing ASP.NET Applications	Understand
CO3: Gain conceptual understanding Working with Data.	Apply
CO4: Understand the basic Model of Web Services	Understand
CO5: Identify appropriate techniques and tools to solve Advanced ASP.NET	Apply

Mapping with Programme Outcomes

Course Outcome	PSO	PSO	PSO	PSO	PSO	PSO	PSO	PSO	PSO	PSO1	PSO1	PSO1
	1	2	3	4	5	6	7	8	9	0	1	2
CO1		M										
CO2		M										
CO3			S					M				
CO4			L					S				
CO5			L									S

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's Category	Continuous Assessment Tests			Terminal Examination
	1	2	3	
Remember	5	5	5	20
Understand	15	10	10	40
Apply	5	10	10	15
Analyse	0	0	0	0
Evaluate	0	0	0	0
Create	0	0	0	0

ADVANCED WEB TECHNOLOGY

Unit - I overview of asp.net: overview of asp.net - The .NET framework – Learning the .NET languages Data types – Declaring variables- Scope and Accessibility- Variable operations- Object Based manipulation- Conditional Structures- Loop Structures- Functions and Subroutines. Types, Objects and Namespaces : The Basics about Classes- Value types and Reference types- Advanced class programming- Understanding name spaces and assemblies. Setting Up ASP.NET and IIS . **(11hrs)**

Unit – II Developing ASP.NET Applications: Developing ASP.NET Applications - ASP.NET Applications: ASP.NET applications– Code behind- The Global.asax application file- Understanding ASP.NET Classes- ASP.NET Configuration. Web Form fundamentals: A simple page applet- Improving the currency converter- HTML control classes- The page class- Accessing HTML server controls. Web controls: Web Control Classes – Auto Post Back and Web Control events- Accessing web controls. Using Visual Studio.NET: Starting a Visual Studio.NET Project- Web form Designer- Writing code- Visual studio.NET debugging. Validation and Rich Controls: Validation- A simple Validation example- Understanding regular expressions- A validated customer form. State management - Tracing, Logging, and Error Handling.

(14hrs)

Unit – III Working with Data: Working with Data - Overview of ADO.NET - ADO.NET and data management- Characteristics of ADO.NET-ADO.NET object model. ADO.NET data access : SQL basics– Select , Update, Insert, Delete statements- Accessing data- Creating a connection- Using a command with a Data Reader - Accessing Disconnected data - Selecting multiple tables – Updating Disconnected data. Data binding: Single value Data Binding- Repeated value data binding- Data binding with data bases. Data list – Data grid – Repeater – Files, Streams and Email – Using XML **(12hrs)**

Unit - IV Web Services: Web Services - Web services Architecture : Internet programming then and now- WSDL–SOAP- Communicating with a web service-Web service discovery and UDDI. Creating Web services : Web service basics- The StockQuote web service – Documenting the web service- Testing the web service- Web service Data types- ASP.NET intrinsic objects. Using web services: Consuming a web service- Using the proxy class- An example with Terra Service.

(10hrs)

Unit – V Advanced ASP.NET: Advanced ASP.NET - Component Based Programming: Creating a simple component – Properties and state- Database components- Using COM components. Custom controls: User Controls- Deriving Custom controls. Caching and Performance Tuning: Designing and scalability– Profiling- Catching- Output catching- Data catching. Implementing security: Determining security requirements- The ASP.NET security model- Forms authentication- Windows authentication. **(12hrs)**

Total (60hrs)

Text Book

1. Mathew Mac Donald, “ASP.NET Complete Reference”, TMH 2005.

References

1. Crouch Matt J, “ASP.NET and VB.NET Web Programming”, Addison Wesley 2002.
2. J.Liberty, D.Hurwitz, “Programming ASP.NET”, Third Edition, O'REILLY, 2006.

ADVANCED DATABASE MANAGEMENT SYSTEMS

Category L P Credit
PC 4 0 4

Preamble

This paper explains the concepts of Database Management System or DBMS in short refers to the technology of storing and retrieving users' data with utmost efficiency along with appropriate security measures.

Prerequisite

- Basic Database concept

Course Outcomes

On the successful completion of the course, students will be able to

Course Outcomes	Bloom's Level
CO1: Understand the concepts of Relational and parallel Database Design	Understand
CO2: Understand the basics of Distributed and Object based Databases	Understand
CO3: Gain conceptual understanding of Spatial Database	Apply
CO4: Understand the basic concepts of XML Databases:	Understand
CO5: Identify appropriate techniques and tools to Temporal Databases	Apply

Mapping with Programme Outcomes

Course Outcome	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO1 0	PSO1 1	PSO1 2
CO1		M										
CO2		M										
CO3			S					M				
CO4				M				S				
CO5			L									S

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's Category	Continuous Assessment Tests			Terminal Examination
	1	2	3	
Remember	5	5	5	20
Understand	15	10	10	40
Apply	5	10	10	15
Analyse	0	0	0	0
Evaluate	0	0	0	0
Create	0	0	0	0

	ADVANCED DATABASE MANAGEMENT SYSTEMS
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Unit-I Relational and parallel Database Design: Basics, Entity Types, Relationship Types, ER Model, ER-to-Relational Mapping algorithm. Normalization: Functional Dependency, 1NF, 2NF, 3NF, BCNF, 4NF and 5NF. Architecture, I/O Parallelism, Interquery Parallelism, Intraquery Parallelism, Intraoperation Parallelism, Interoperation Parallelism. **(14hrs)**

Unit-II Distributed and Object based Databases: Architecture, Distributed data storage, Distributed transactions, Commit protocols, Concurrency control, Query Processing. Complex Data Types, Structured Types and Inheritance, Table Inheritance, array and Multiset, Object Identity and Reference Types, Object Oriented versus Object Relational. **(12hrs)**

Unit-III Spatial Database: Spatial Database Characteristics, Spatial Data Model, Spatial Database Queries, Techniques of Spatial Database Query, Logic based Databases: Introduction, Overview, Propositional Calculus, Predicate Calculus, Deductive Database Systems, Recursive Query Processing. **(10hrs)**

Unit-IV XML Databases: XML Hierarchical data model, XML Documents, DTD, XML Schema, XML Querying, XHTML, Illustrative Experiments. **(10hrs)**

Unit-V 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. **(14hrs)**

Total (60hrs)

Text Book

1. Abraham Silberschatz, Henry F Korth , S Sudarshan, “Database System Concepts”, 6th edition , McGraw-Hill International Edition , 2011
2. C.J.Date, A.Kannan, S.Swamynathan, “An Introduction to Database Systems”, 8th Edition, Pearson Education Reprint 2016.

Reference Books

1. Ramez Elmasri, Shamkant B Navathe, “Fundamental of Database Systems”, Pearson, 7th edition 2016.
2. Thomas Connolly, Carolyn Begg., “Database Systems a practical approach to Design , Implementation and Management “, Pearson education

**OBJECT ORIENTED PROGRAMMING
USING C++ (e-pathsala)**

Category L P Credit
PC 4 0 4

Preamble

This includes understand the basic to advanced simple and practical approach to describe the concepts of C++.

Prerequisite

- Nil

Course Outcomes

On the successful completion of the course, students will be able to

Course Outcomes

Bloom's Level

CO1: Understand the concepts of

Understand

CO2: Understand the

Understand

CO3: Gain conceptual

Apply

CO4: Understand the

Understand

CO5: Identify

Apply

Mapping with Programme Outcomes

Course Outcome	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO1 0	PSO1 1	PSO1 2
CO1		S										
CO2		M										
CO3			S					M				
CO4					S			S				
CO5			L									S

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's Category	Continuous Assessment Tests			Terminal Examination
	1	2	3	
Remember	5	5	5	20
Understand	15	10	10	40
Apply	5	10	10	15
Analyse	0	0	0	0
Evaluate	0	0	0	0
Create	0	0	0	0

OBJECT ORIENTED PROGRAMMING USING C++

UNIT I Introduction to c++ programming: writing first c++ program-overview of c++- Object oriented programming concepts – objects-classes-functions- objects-classes-constructors and destructors-operator overloading-operator overloading with friend function.

(13hrs)

UNIT II Arrays, Function and Template: Arrays and strings-function Template-class Template-Exception Handling-varieties of Inheritances-multiple and virtual Inheritances- Runtime polymorphism by virtual functions-Implementing Runtime polymorphism-Run Time Type information(RTTI)-casting operators in RTTI.

(14hrs)

UNIT III Input output streams in c++-Formatted Input output operations streams in c++- Working with files in c++-Binary files in c++-Name space in c++-standard template library- Exception handling - Streams and formatted I/O – file handling – namespaces – String Objects - standard template library.

(14hrs)

UNIT IV

Types of containers: Generic Algorithms - c++ object model - c++ model layout. **(9hrs)**

UNIT V Object model: Object model changes to user model-user defined – Types of user defined conversions **(10hrs)**

Total (60hrs)

TEXT BOOKS

<https://epgp.inflibnet.ac.in/ahl.php?csrno=305>

DESIGN AND ANALYSIS OF ALGORITHM LABORATORY

1. Write a program to perform binary search
2. Write a program to perform stack implementation
3. Write a program to perform queue implementation
4. Write a program to perform insertion sort
5. Write a program to perform selection sort
6. Write a program to perform merge sort
7. Write a program to perform quick sort
8. Write a program to perform trees
9. Write a program to perform linked list
10. Write a program to perform knapsack problem
11. Write a program to perform Hamiltonian cycle
12. Write a program to perform traveling sales man

ADVANCED WEB TECHNOLOGY LABORATORY

VB.NET

1. Write a program to perform check the case of character
2. Write a program to perform convert the character
3. Write a program to perform vowel or not
4. Write a program to perform calculator
5. Write a program to perform menu editor
6. Write a program to perform online examination
7. Write a program to perform calander control

ASP.NET

8. Write a program to perform arithmetic calculation
9. write a program to perform student record
10. write a program to perform employee ditails using database

C#.NET

11. Write a program to perform palindrome
12. write a program to perform command line argument
13. write a program to perform exception handling
14. write a program to perform simple calculator
15. write a program to perform virtual and override
16. write a program to perform linked list
17. write a program to perform abstract class and methods

DISTRIBUTED OPERATING SYSTEM

Category	L	P	Credit
PC	4	0	4

Preamble

This includes the distributed system that abstracts resources, such as memory or CPUs, and exposes common services and primitives that in turn are used by (distributed) applications.

Prerequisite

- Nil

Course Outcomes

On the successful completion of the course, students will be able to

Course Outcomes	Bloom's Level
CO1: Understand the concepts of A distributed operating systems	Understand
CO2: Understand the protocols model	Understand
CO3: Gain conceptual understanding Distributed Resource Management	Apply
CO4: Understand the concepts of Failure Classifications	Understand
CO5: Identify appropriate techniques and tools Multiprocessor and Database Operating Systems	Apply

Mapping with Programme Outcomes

Course Outcome	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10	PSO11	PSO12
CO1		S										
CO2		M										
CO3			S					M				
CO4					S			S				
CO5			L									S

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's Category	Continuous Assessment Tests			Terminal Examination
	1	2	3	
Remember	5	5	5	20
Understand	15	10	10	40
Apply	5	10	10	15
Analyse	0	0	0	0
Evaluate	0	0	0	0
Create	0	0	0	0

	DISTRIBUTED OPERATING SYSTEM
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UNIT I Introduction: Operating System Definition – Functions of Operating System – Types of Advanced Operating System – Design Approaches – Synchronization Mechanisms – concepts of a Process – Critical Section Problem – Process Deadlock – Models of Deadlock – Conditions for Deadlock – System with single-unit requests, Consumable Resources , Reusable Resources. **(13hrs)**

UNIT II Distributed Operating Systems: Introduction- Issues – Communication Primitives – Inherent Limitations –Lamport’s Logical Clock , Vector Clock, Global State , Cuts – Termination Detection – Distributed Mutual Exclusion – Non Token Based Algorithms – Lamport’s Algorithm - Token Based Algorithms –Distributed Deadlock Detection – Distributed Deadlock Detection Algorithms – Agreement Protocols **(13hrs)**

UNIT III Distributed Resource Management – Distributed File Systems – Architecture – Mechanisms – Design Issues – Distributed shared Memory – Architecture – Algorithm – Protocols – Design Issues – Distributed Scheduling – Issues – Components – Algorithms. **(10hrs)**

UNIT IV Failure Recovery and Fault Tolerance – Concepts – Failure Classifications – Approaches to Recovery – Recovery in Concurrent Systems – Synchronous and Asynchronous Check pointing and Recovery –Check pointing in Distributed Database Systems – Fault Tolerance Issues – Two-Phase and Nonblocking Commit Protocols – Voting Protocols – Dynamic Voting Protocols. **(12hrs)**

UNIT V Multiprocessor and Database Operating Systems –Structures – Design Issues – Threads – Process Synchronization – Processor Scheduling – Memory management – Reliability/Fault Tolerance – Database Operating Systems – concepts – Features of Android OS, Ubuntu, Google Chrome OS and Linux operating systems. **(12hrs)**

Total (60hrs)

Text Books

1. MukeshSinghalN.G.Shivaratri, “Advanced Concepts in Operating Systems”, McGraw Hill 2000.
2. Distributed Operating System – Andrew S. Tanenbaum, PHI.

Reference Books

1. Abraham Silberschatz, Peter B.Galvin, G.Gagne, “Operating Concepts”, 6th Edition Addison Wesley publications 2003.
2. Andrew S.Tanenbaum, “Modern Operating Systems”, 2nd Edition Addison Wesley 2001

ADVANCED JAVA PROGRAMMING

Category	L	P	Credit
PC	4	0	4

Preamble

This includes the concepts of prepared for the beginners to help them understand the basic to advanced concepts related to Java Programming language.

Prerequisite

- Basic programming Knowledge

Course Outcomes

On the successful completion of the course, students will be able to

Course Outcomes	Bloom's Level
CO1: Understand the concepts of Design Patterns	Understand
CO2: Understand the Applet Fundamentals	Understand
CO3: Gain conceptual understanding of JDBC	Apply
CO4: Understand the concepts of Servlet	Understand
CO5: Identify appropriate techniques and tools Expressions	Apply

Mapping with Programme Outcomes

Course Outcome	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO1 0	PSO1 1	PSO1 2
CO1		S			L							
CO2		M										
CO3			S					M				
CO4			L					S				
CO5			L									S

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's Category	Continuous Assessment Tests			Terminal Examination
	1	2	3	
Remember	5	5	5	20
Understand	15	10	10	40
Apply	5	10	10	15
Analyse	0	0	0	0
Evaluate	0	0	0	0
Create	0	0	0	0

ADVANCED JAVA PROGRAMMING

UNIT-I Design Patterns: Introduction to Design patterns - Catalogue for Design Pattern - Factory Method Pattern, Prototype Pattern, Singleton Pattern- Adapter Pattern- Proxy Pattern- Decorator Pattern- Command Pattern- Template Pattern- Mediator Pattern-Collection Framework – Array List class – Linked List class – Array List vs. Linked List - List Iterator interface - Hash Set class- Linked Hash Set class-Tree Set class Priority Queue class - Map interface-Hash Map class- Linked Hash Map class –Tree Map class - Comparable interface - Comparator interface-Comparable vs. Comparator **(14hrs)**

UNIT-II Applet Fundamentals- Applet Class - Applet lifecycle- Steps for Developing Applet Programs- Passing Values through Parameters- Graphics in Applets- GUI Application - Dialog Boxes - Creating Windows - Layout Managers – AWT Component classes – Swing component classes- Borders – Event handling with AWT components - AWT Graphics classes - File Choosers - Color Choosers – Tree – Table–Tabbed panels–Progressive bar - Sliders.**(10hrs)**

UNIT-III JDBC -Introduction - JDBC Architecture - JDBC Classes and Interfaces – Database Access with MySQL -Steps in Developing JDBC application - Creating a New Database and Table with JDBC - Working with Database Metadata; Java Networking Basics of Networking - Networking in Java- Socket Program using TCP/IP - Socket Program using UDP- URL and Inet address classes. **(12hrs)**

UNIT-IV Servlet: Advantages over Applets - Servlet Alternatives - Servlet Strengths - Servlet Architecture - Servlet Life Cycle – Generic Servlet, Http Servlet - First Servlet - Invoking Servlet - Passing Parameters to Servlets - Retrieving Parameters - Server-Side Include – Cookies- JSP Engines - Working with JSP - JSP and Servlet - Anatomy of a JSP Page- Database Connectivity using Servlets and JSP. **(12hrs)**

UNIT-V Lambda Expressions- Method Reference- Functional Interface- Streams API, Filters- Optional Class- Nashorn- Base 64 Encode Decode- JShell(RPEL)- Collection Factory Methods- Private Interface Methods- Inner Class Diamond Operator- Multiresolution Image API.**(12hrs)**

Total (60hrs)

Textbooks

1. Bert Bates, Karthy Sierra , Eric Freeman, Elisabeth Robson, “Head First Design Patterns”, O’REILLY Media Publishers.(1st- Unit).
2. Herbert Schildt, “Java: A Beginner Guide”, Oracle Pres-Seventh Edition. (2nd and 3rd Unit).
3. Murach’s, “Java Servlets and JSP”, 2nd Edition, Mike Murach & Associates Publishers; 3rd Edition. (4th Unit).
4. Warburton Richard, “Java 8 Lambdas”, Shroff Publishers & Distributors Pvt Ltd. (5th Unit).

References

1. Paul Deitel and Harvey Deitel, “Java: How to Program”, Prentice Hall Publishers; 9th Edition.
2. Jan Graba, “An Introduction to Network Programming with Java-Java 7 Compatible”, 3rd Edition, Springer.

CRYPTOGRAPHY AND NETWORK SECURITY

Category L P Credit
PC 4 0 4

Preamble

This includes the concepts of covers the basics of the science of cryptography. It explains how programmers and network professionals can use cryptography to maintain the privacy of computer data. Starting with the origins of cryptography, it moves on to explain cryptosystems, various traditional and modern ciphers, public key encryption, data integration, message authentication, and digital signatures.

Prerequisite

- Basics of computer Networks

Course Outcomes

On the successful completion of the course, students will be able to

Course Outcomes	Bloom's Level
CO1: Understand the concepts of Advanced Security trends	Understand
CO2: Understand Symmetric Encryption and Message Confidentiality	Understand
CO3: Gain conceptual understanding Authentication Applications	Apply
CO4: Understand the concepts of IP Security	Understand
CO5: Identify appropriate techniques and tools to solve Intruders	Apply

Mapping with Programme Outcomes

Course Outcome	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO1 0	PSO1 1	PSO1 2
CO1		M			S							
CO2		M										
CO3			S					M				
CO4			L		M			S				
CO5			L									S

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's Category	Continuous Assessment Tests			Terminal Examination
	1	2	3	
Remember	5	5	5	20
Understand	15	10	10	40
Apply	5	10	10	15
Analyse	0	0	0	0
Evaluate	0	0	0	0
Create	0	0	0	0

CRYPTOGRAPHY AND NETWORK SECURITY

Unit I Introduction - Security trends – Legal, Ethical and Professional Aspects of Security, Need for Security at Multiple levels, Security Policies – Model of network security – Security attacks, services and mechanisms – OSI security architecture – Classical encryption techniques: substitution techniques, transposition techniques, steganography- Foundations of modern cryptography: perfect security– information theory – product cryptosystem – cryptanalysis. **(14hrs)**

Unit II Symmetric Encryption and Message Confidentiality - Symmetric Encryption Principles, Symmetric Block Encryption Algorithms, Stream Ciphers and RC4 , Cipher Block Modes of Operation, Location of Encryption Devices, Key Distribution. Public-key Cryptography and Message Authentication: Approaches to Message Authentication, Secure Hash Functions and HMAC, Public-Key Cryptography Principles, Public-Key Cryptography Algorithms, Digital Signatures, Key Management. **(12hrs)**

Unit III Authentication Applications - Kerberos, x.509 Authentication Service, Public-Key Infrastructure. Electronic Mail Security: Pretty Good Privacy (PGP), S/MIME. **(10hrs)**

Unit IV IP Security - IP Security Over view, IP Security Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations. Web Security: Web Security Considerations, Secure Socket Layer(SSL) and Transport Layer Security(TLS), Secure Electronic Transaction(SET).Network Management Security: Basic Concepts of SNMP, SNMPv1 Community Facility, SNMPv3. **(12hrs)**

Unit V Intruders - Intruders, Intrusion Detection, Password Management. **Malicious Software:** Virus and Related Threats, Virus Countermeasures, Distributed Denial of Service Attacks. **Firewalls:** Firewall Design Principles, Trusted Systems, Common Criteria for Information Technology Security Evaluation. **(12hrs)**

Total (60hrs)

Text books

1. Behrouz A. Ferouzan, “Cryptography & Network Security”, Tata Mc Graw Hill, 2007, Reprint 2015.
2. Stallings William, “Cryptography and Network Security - Principles and Practice 2017.
3. William Stallings, “Network Security Essentials Applications and Standards” Third Edition, Pearson Education, 2008.

References

1. Man Young Rhee, "Internet Security: Cryptographic Principles", "Algorithms And Protocols", Wiley Publications, 2003.
2. Charles Pfleeger, "Security In Computing", 4th Edition, Prentice Hall Of India, 2006.
3. Ulysess Black, "Internet Security Protocols", Pearson Education Asia, 2000.
4. Charlie Kaufman And Radia Perlman, Mike Speciner, "Network Security, Second Edition, Private Communication In Public World", PHI 2002.
5. Bruce Schneier And Neils Ferguson, "Practical Cryptography", First Edition, Wiley Dreamtech India Pvt Ltd, 2003.
6. Douglas R Simson "Cryptography – Theory And Practice", First Edition, CRC Press, 1995.
7. [Http://Nptel.Ac.In/](http://Nptel.Ac.In/).

	PRINCIPLES OF COMPILER DESIGN
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Unit – I Lexical analysis - Language Processors, The Structure of a Compiler, Parameter passing mechanism – Symbol table - The role of the lexical analyzer - Input buffering - Specification of tokens - Recognition of tokens – Finite automata - Regular expression to automata. **(13hrs)**

Unit – II Syntax Analysis - The role of the parser - Context-free grammars - Writing a grammar - Top down Parsing - Bottom-up Parsing - LR parsers- LALR parsers. **(11hrs)**

Unit – III Semantic Analysis - Inherited and Synthesized attributes – Dependency graphs – Ordering the evaluation of attributes – S- attributed definitions – L-attributed definitions – Applications of Syntax Directed translation – Syntax Directed translations schemes - Storage organization – Stack allocation of space. **(13hrs)**

Unit – IV Intermediate Code Generation - Variants of Syntax trees – Three Address code – Types and Declarations - Translation of Expressions – Type checking - Control flow - Back patching - Switch Statements - Procedure calls. **(12hrs)**

Unit – V Code Generation and Code Optimization - Issues in the design of a code generator - The target language – Address in the Target Code – Basic Block and Flow graphs – Optimization of Basic Blocks - A simple code generator – Peephole Optimization. **(12hrs)**

Total (60hrs)

Text Book

1. Alfred V. Aho, Monica S.Lam, Ravi Sethi and Jeffrey D. Ullman, “Compilers- Principles, Techniques and Tools”, Second Edition, Pearson Education Asia, 2009.

References

1. A.V.Aho, Ravi Sethi, J.D. Ullman, Compilers - Principles, Techniques and Tools, Addison- Wesley, 2003.
2. Fischer Leblanc, Crafting Compiler, Benjamin Cummings, Menlo Park, 1988.
3. Kenneth C.Louden, Compiler Construction Principles and Practice, Vikas publishing House, 2004.
4. Allen I. Holub, Compiler Design in C, Prentice Hall of India, 2001.
5. S.Godfrey Winster, S.Aruna Devi, R.Sujatha, “Compiler Design”, yesdee Publishers, Third Reprint 2019.

CRYPTOGRAPHY AND NETWORK SECURITY LABORATORY

1. Implementation of Caesar Cipher technique Lab
2. Implement the Play fair Cipher Lab
3. Implement the Pure Transposition Cipher
4. Implement DES Encryption and Decryption
5. Implement the AES Encryption and decryption
6. Implement RSA Encryption Algorithm
7. Implementation of Hash Function

ADVANCED JAVA PROGRAMMING LABORATORY

1. Simple Java program
2. Program using JDBC with create,insert table data
3. SQLException,SQLWarning
4. Programs using TCP/IPclient sockets,TCP/IP server sockets
5. Program with URL,URL connection,Datagrams connection
6. Client/Server applications using RMI
7. Simple programs using Bean Development Kit,JAR files
8. Program with Design Patterns,
9. Program with Events and methods
- 10.Create a servlet to read the parameters
- 11.Programs using cookies
- 12.Programs with session tracking
- 13.Programs using JApplet, Buttons, Combo, Trees, Tables,Panes
- 14.Programs with AWTClasses,Working with Graphics,Color and Font

DIGITAL IMAGE PROCESSING

Category	L	P	Credit
PC	4	0	4

Preamble

This includes the requires some of the basic programming skills on any of the popular languages such as C++ , Java , or MATLAB.

Prerequisite

- C++ , Java

Course Outcomes

On the successful completion of the course, students will be able to

Course Outcomes	Bloom's Level
CO1: Understand the concepts of the Scope of Fundamentals	Understand
CO2: Understand domain	Understand
CO3: Gain conceptual understanding Edge Detection	Apply
CO4: Understand the concepts of Image Compression	Understand Apply
CO5: Understand the concepts Image Segmentation	

Mapping with Programme Outcomes

Course Outcome	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO1 0	PSO1 1	PSO1 2
CO1		S										
CO2		M										
CO3			S					M				
CO4			L					S				
CO5			M									S

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's Category	Continuous Assessment Tests			Terminal Examination
	1	2	3	
Remember	5	5	5	20
Understand	15	10	10	40
Apply	5	10	10	15
Analyse	0	0	0	0
Evaluate	0	0	0	0
Create	0	0	0	0

	DIGITAL IMAGE PROCESSING
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UNIT–I Fundamentals: Image Sensing and Acquisition, Image Sampling and Quantization, relationship between Pixels; Random noise; Gaussian Markov Random Field, σ -field, Linear and Non-linear Operations; Image processing models: Causal, Semi-causal, Non-causal models.

Color Models: Color Fundamentals, Color Models, Pseudo-color Image Processing, Full Color Image Processing, Color Transformation, Noise in Color Images. **(14hrs)**

UNIT–II Spatial Domain: Enhancement in spatial domain: Point processing; Mask processing; Smoothing Spatial Filters; Sharpening Spatial Filters; Combining Spatial Enhancement Methods.

Frequency Domain: Image transforms: FFT, DCT, Karhunen-Loeve transform, Hotelling's T^2 transform, Wavelet transforms and their properties. Image filtering in frequency domain. **(14hrs)**

UNIT–III Edge Detection: Types of edges; threshold; zero-crossing; Gradient operators: Roberts, Prewitt, and Sobel operators; residual analysis based technique; Canny edge detection. Edge features and their applications. **(10hrs)**

UNIT–IV Image Compression: Fundamentals, Image Compression Models, Elements of Information Theory. Error Free Compression: Huff-man coding; Arithmetic coding; Wavelet transform based coding; Lossy Compression: FFT; DCT; KLT; DPCM; MRFM based compression; Wavelet transform based; Image Compression standards. **(10hrs)**

UNIT–V Image Segmentation: Detection and Discontinuities: Edge Linking and Boundary Deduction; Threshold; Region-Based Segmentation. Segmentation by Morphological watersheds. The use of motion in segmentation, Image Segmentation based on Color.

Morphological Image Processing: Erosion and Dilation, Opening and Closing, Hit-Or-Miss Transformation, Basic Morphological Algorithms, Gray-Scale Morphology. **(12hrs)**

Total (60hrs)

Text Books

1. Rafael Gonzalez, Richard E. Woods, "Digital Image Processing", Fourth Edition, PHI/Pearson Education, 2013.
2. A. K. Jain, Fundamentals of Image Processing, Second Ed., PHI, New Delhi, 2015.

References

1. B. Chan la, D. Dutta Majumder, "Digital Image Processing and Analysis", PHI, 2003.
2. Nick Eford, "Digital Image Processing a practical introducing using Java", Pearson Education, 2004.
3. Todd R. Reed, "Digital Image Sequence Processing, Compression, and Analysis", CRC Press, 2015.
4. L. Prasad, S. S. Iyengar, "Wavelet Analysis with Applications to Image Processing", CRC Press, 2015.

INTERNET OF THINGS

Category L P Credit
PC 4 0 4

Preamble

This aims to provide you with a thorough introduction to IoT. It introduces the key concepts of IoT, necessary in using and deploying IoT systems.

Prerequisite

- Basic knowledge of computer networks.

Course Outcomes

On the successful completion of the course, students will be able to

Course Outcomes

Bloom's Level

CO1: Understand the concepts of the Scope **IoT**

Understand

CO2: understand iot architecture

Understand

CO3: Gain conceptual understanding IoT protocols

Apply

CO4: understand the concepts of web of things

Understand

Apply

CO5: Understand the **applications**

Mapping with Programme Outcomes

Course Outcome	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10	PSO 11	PSO 12
CO1		S										
CO2		M										
CO3			S					M				
CO4			L					S				
CO5			M									S

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's Category	Continuous Assessment Tests			Terminal Examination
	1	2	3	
Remember	5	5	5	20
Understand	15	10	10	40
Apply	5	10	10	15
Analyse	0	0	0	0
Evaluate	0	0	0	0
Create	0	0	0	0

	INTERNET OF THINGS
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UNIT I INTRODUCTION To IoT: Internet of Things - Physical Design- Logical Design- IoT Enabling Technologies - IoT Levels and Deployment Templates - Domain Specific IoTs - IoT and M2M - IoT System Management with NETCONF-YANG- IoT Platforms Design Methodology. **(14hrs)**

UNIT II IoT ARCHITECTURE: 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 **(10hrs)**

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 **(12hrs)**

UNIT IV WEB OF THINGS: Web of Things versus Internet of Things – Two Pillars of the Web – Architecture Standardization for WoT– Platform Middleware for WoT – Unified Multitier WoT Architecture – WoT Portals and Business Intelligence. Cloud of Things: Grid/SOA and Cloud Computing – Cloud Middleware – Cloud Standards – Cloud Providers and Systems – Mobile Cloud Computing – The Cloud of Things Architecture. **(13hrs)**

UNIT V APPLICATIONS: The Role of the Internet of Things for Increased Autonomy and Agility in Collaborative Production Environments - Resource Management in the Internet of Things: Clustering, Synchronisation and Software Agents. Applications - Smart Grid – Electrical Vehicle Charging. **(11hrs)**

Total (60hrs)

Text Books

1. Arshdeep Bahga, Vijay Madiseti, “Internet of Things – A hands- on approach”, Universities Press, 2015.
2. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), “Architecting the Internet of Things”, Springer, 2011.
3. Jan Ho` ller, Vlasios Tsiatsis , Catherine Mulligan, Stamatis , Karnouskos, Stefan Avesand. David Boyle, "From Machine-to- Machine to the Internet of Things - Introduction to a New Age of Intelligence", Elsevier, 2014.
4. Networks, Crowds, and Markets: Reasoning About a Highly Connected World - David Easley and Jon Kleinberg, Cambridge University Press - 2010.
5. Olivier Hersent, David Boswarthick, Omar Elloumi , “The Internet of Things – Key applications and Protocols”, Wiley, 2012.

MACHINE LEARNING

Category	L	P	Credit
PC	4	0	4

Preamble

This aims prepared for professionals aspiring to learn the basics of Mahout and develop applications involving machine learning techniques such as recommendation, classification, and clustering.

Prerequisite

- Basic knowledge of Mathematics/ Statistics/Algorithmic concept

Course Outcomes

On the successful completion of the course, students will be able to

Course Outcomes	Bloom's Level
CO1: Understand the concepts Learning Problems	Understand
CO2: understand neural networks and genetic algorithms	Understand
CO3: gain conceptual understanding computational learning	Apply
CO4: understand the concepts of based learning	Understand Apply
CO5: Understand the applications	

Mapping with Programme Outcomes

Course Outcome	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10	PSO 11	PSO1 2
CO1		S										
CO2		M										
CO3			S					M				
CO4			L					S				
CO5			M									S

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's Category	Continuous Assessment Tests			Terminal Examination
	1	2	3	
Remember	5	5	5	20
Understand	15	10	10	40
Apply	5	10	10	15
Analyse	0	0	0	0
Evaluate	0	0	0	0
Create	0	0	0	0

MACHINE LEARNING

UNIT I INTRODUCTION: Learning Problems – Perspectives and Issues – Concept Learning – Version Spaces and Candidate Eliminations – Inductive bias – Decision Tree learning – Representation – Algorithm – Heuristic Space Search. **(11hrs)**

UNIT II NEURAL NETWORKS AND GENETIC ALGORITHMS :Neural Network Representation – Problems – Perceptrons – Multilayer Networks and Back Propagation Algorithms – Advanced Topics – Genetic Algorithms– Hypothesis Space Search – Genetic Programming – Models of Evaluation and Learning. **(12hrs)**

UNIT III BAYESIAN AND COMPUTATIONAL LEARNING : Bayes Theorem– Concept Learning – Maximum Likelihood – Minimum Description Length Principle – Bayes Optimal Classifier – Gibbs Algorithm – Naïve Bayes Classifier – Bayesian Belief Network – EM Algorithm – Probability Learning – Sample Complexity – Finite and Infinite Hypothesis Spaces – Mistake Bound Model. **(13hrs)**

UNIT IV INSTANT BASED LEARNING: K- Nearest Neighbour Learning – Locally weighted Regression – Radial Basis Functions – Case Based Learning. **(10hrs)**

UNIT V ADVANCED LEARNING: Learning Sets of Rules – Sequential Covering Algorithm – Learning Rule Set – First Order Rules – Sets of First Order Rules – Induction on Inverted Deduction – Inverting Resolution – Analytical Learning – Perfect Domain Theories – Explanation Base Learning – FOCL Algorithm – Reinforcement Learning – Task – Q-Learning – Temporal Difference Learning **(14hrs)**

Total (60hrs)

TEXT BOOK

1. Tom M. Mitchell, —Machine Learning, McGraw-Hill Education (India) Private Limited, 2013.

REFERENCES

1. Ethem Alpaydin, —Introduction to Machine Learning (Adaptive Computation and Machine Learning), The MIT Press 2004.
2. Stephen Marsland, —Machine Learning: An Algorithmic Perspective, CRC Press, 2009.
3. Michael Affenzeller, Stephan Winkler, Stefan Wagner, Andreas Beham, “Genetic Algorithms and Genetic Programming”, CRC Press Taylor and Francis Group.

MACHINE LEARNING LABORATORY

Lab Exercises using Python and R

1. Working with Python-Tutorials
2. Working with R- tutorials
3. Understanding Machine Learning Problems, Training Dataset, Test Data Set.
4. Execute Linear Regression in Python and R using suitable Training and Testing data set for predicting the cost of a flat.
5. Execute Logistic Regression in Python and R using suitable Training and Testing data to predict discrete outputs.
6. Execute Decision trees in Python and R using suitable Training and Testing data set for making suitable predictions.
7. Execute Support Vector Machine in Python and R using suitable Training and Testing data set for making suitable predictions.
8. Execute K means clustering in Python and R using suitable Training and Testing data set for making suitable predictions.

DIGITAL IMAGE PROCESSING LABORATORY

1. Write a program in Matlab to convert Gray Scale image to Binary Image.
2. Write a program in Matlab for finding Negative of an Image.
3. Write a program in Matlab for Histogram Equalization.
4. Write a program in Matlab for Arithmetic Operators using Image.
5. Write a program in Matlab for Gaussian Low pass Filter.
6. Write a program in Matlab for Gaussian High pass Filter.
7. Write a program in Matlab for Homomorphic Filtering.
8. Write a program in Matlab for Edge Detection.
9. Write a program in Matlab for Erosion of an Image.
10. Write a program in Matlab for Dilation of an Image.
11. Write a program in Matlab for conversion between color spaces.
12. Write a program in Matlab for Segmentation using watershed transform

**M.Sc. INFORMATION TECHNOLOGY PROGRAMME
PROGRAMME ELECTIVES**

**FOR THE STUDENTS ADMITTED IN THE
ACADEMIC YEAR 2022-2023 ONWARDS**

**MANONMANIAM SUNDARANAR UNIVERSITY
TIRUNELVELI, TAMILNADU**

**M.Sc. INFORMATION TECHNOLOGY DEGREE PROGRAMME
LIST OF PROGRAMME ELECTIVES**

(For The Candidates Admitted From 2022-2023 Onwards)

SI. No.	Course code	Course name
Electives – Group A: Data Science and Big Data Analytics		
1.		Data Analytics[E-Pathshala]
2.		Programming for Data Analytics
3.		Computing for Data Analytics
4.		Cloud Computing [E-Pathshala]
5.		Big Data Security
6.		Soft Computing
7.		Data Mining and Warehousing
Electives – Group B: Mobile Applications and Open Source Software		
8.		Mobile Applications Development
9.		Mobile Computing[E-Pathshala]
10.		Open Source Software
11.		Android Mobile Application Development
12.		Open Source Technologies
13.		Mobile and Wireless Security
14.		Mobile and Digital Forensics

PE : Program Elective

L : Lecture

P : Practical

Note:

1 Hour Lecture is equivalent to 1 credit

1 Hour Practical is equivalent to 1 credit

GROUP A: SUBJECTS FOR ELECTIVES UNDER SPECIALIZATION A

Data Analytics (E-Pathshala)	Category	L	P	Credit
	PE	3	0	3

Preamble

To get introduced to the basic concepts in Data analytics. To understand the basic processing, storage and programming models for Data Analytics. To learn the different phases of Data Analytics Project.

Prerequisite

- Advanced Microsoft Excel Operations

Course Outcomes

On the successful completion of the course, students will be able to

Course Outcomes		Bloom's Level
CO1	Able to identify the scope of Data Analytics Project	Understanding
CO2	Able to define the basic hardware and programming requirements needed for a Data Analytics Project.	Apply
CO3	Able to plan the different phases of a Data Analytics Project	Understanding

Mapping with Programme Outcomes

Cos	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	S			L			
CO2	M	S			L		
CO3		S	M			M	M

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (25)			Terminal Examination (75)
member	5	5	5	20
Understand	10	10	10	20
Apply	5	5	5	10
Analyze	5	5	5	10
Evaluate	0	0	0	5
Create	0	0	0	0

Unit I -Introduction to Analytics and Big Data: Data Analytics-Definition-importance--Big Data Analytics- Big Data approach to Analytics & Web– the actual big data-Evolution of Analytical Scalability-Analytic Processes and its evolution -Analytic Framework, Analytic Data Set (ADS) -Data Analysis -Problem Framing-Inference - Open Source Softwares. [10 hrs]

Unit II -Data Analysis: Data Measurement-Types of data, Measurement Scales– Univariate analysis-Bivariate and Multivariate analysis- Probabilistic and Bayesian Approaches-Regression analysis. [10 hrs]

Unit III -Data Analytics-Mining Streams: Data stream -Data Stream processing model- Algorithms for streams-Filtering Data Streams-Moment-The Alon-Matias-Szegedy (AMS) Algorithm for Second Moments-Counting item sets-Sliding Windows-The Datar-Gionis-Indyk-Motwani Algorithm(DGIM)-Real Time application. [9 hrs]

Unit IV -Data Analytics –Association Rule Mining: Association Rule: Basic Concepts - Association rule discovery-The Apriori Algorithm-Mining Frequent Item sets: the Key Step-Computation Model for Finding Frequent Item sets. [8 hrs]

Unit V -Clustering: High Dimensional Data-Clustering High-Dimensional Data-Clustering Problem-Major Clustering Approaches-Introduction to Distance metrics-Non-Euclidean Case-Cohesion Metrics-Partitioning method [8 hrs]

Total (45 hrs)

Reference Books and URLs:

1. “A Guide to Big Data Analytics”, Datameer.com.
2. Vignesh Prajapati, “Big Data Analytics with R and Hadoop”, Packt Publications.
3. D. Dietrich, B.Heller, B.Yang, “Data Science and Big Data Analytics”, EMC Education Services.
4. “Big Data Now”, O’Reily Inc.
5. DeWitt, S. Madden, and M. Stonebraker, “A Comparison of Approaches to Large-Scale Data Analysis”, SIGMOD Conference 2009.
6. www.mercerindustries.com/wp-content/uploads/2015/02/Watson-Tutorial-Big-Data Business-Analytics
7. www.researchgate.net/publication/273961581_Big_Data_analytics_with_applications
8. <http://cs.ulb.ac.be/conferences>
9. www.businessesgrow.com/2016/12/06/big-data-case-studies

<https://epgp.inflibnet.ac.in/ahl.php?csrno=7>

PROGRAMMING FOR DATA ANALYTICS

Category	L	P	Credit
PE	3	0	3

Preamble

Learn how to apply fundamental programming concepts, computational thinking and data analysis techniques to solve real-world data science problems. MapReduce is a framework using which we can write applications to process huge amounts of data, in parallel, on large clusters of commodity hardware in a reliable manner.

Prerequisite

Data Analytics

Course Outcomes

On the successful completion of the course, students will be able to

Course Outcomes	Bloom's Level
CO1: Understand the concepts of network programming and distributed objects	Understand
CO2: Understand the database concepts	Understand
CO3: Gain conceptual understanding of Java Beans.	Apply
CO4: Understand the concepts of files	Understand
CO5: Programming with MapReduce	Apply

Mapping with Programme Outcomes

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1							L			S		M
CO2				M					S	M		
CO3		S										
CO4				M						M		L
CO5		S								S		S

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's Category	Continuous Assessment Tests			Terminal Examination
	1	2	3	
Remember	5	5	5	20
Understand	15	10	10	40
Apply	5	10	10	15
Analyse	0	0	0	0
Evaluate	0	0	0	0
Create	0	0	0	0

UNIT I – NETWORK PROGRAMMING & DISTRIBUTED OBJECTS Connecting to a Server – Implementing Servers and Clients- Advanced Socket Programming – Inet Address – URL Connections – RMI Programming. **(9hrs)**

UNIT II – CONNECTING TO DATABASE The Design of JDBC – Basic Concepts – Executing Queries – Prepared Statements – Result Sets – Metadata –Transactions. **(10hrs)**

UNIT III – JAVABEANS The Bean – Writing Process – Using Beans to Build an Application – Bean Property Types – Property Editors – Customizers. 8 IT2015 SRM (E&T) **(10hrs)**

UNIT IV – STREAMS AND FILES Streams – Text Input and Output – Reading and Writing Binary Data – Zip Archives – Object Streams and Serialization – Memory Mapped Files. **(8hrs)**

UNIT V – PROGRAMMING MAP REDUCE MapReduce program in Java – Map Reduce API – Programming Examples- Combiner Functions – Distributed MapReduce Job. **(8hrs)**

TOTAL (45 hrs)

REFERENCES:

1. White, “Hadoop: The Definitive Guide”, Third Edition - 2012 – O’Reilly – ISBN: 9789350237564.
2. Cay S. Horstmann, Gary Cornell, “Core Java™ 2: Volume II–Advanced Features”, Prentice Hall, 9th edition, ISBN: 978-0137081608.
3. Jean Dollimore, Tim Kindberg, George Coulouris, “Distributed Systems Concepts and Design”, 4th Edition, Jun 2005, Hardback, 944 pages, ISBN: 9780321263544.
4. Y. Daniel Liang, Introduction to Java Programming, Tenth Edition, Pearson, 2015.

Preamble

Learn how to install and configure software necessary for a statistical programming environment and also learn the generic programming language concepts as they are implemented in a high-level statistical language. Topics in statistical data analysis and optimization will provide working examples.

Prerequisite

Data Analytics

Course Outcomes

On the successful completion of the course, students will be able to

Course Outcomes	Bloom's Level
CO1: Understand the concepts of data analytics life cycle	Understand
CO2: Learn the statistics basic concepts	Understand
CO3: Understand the concepts of probability and hypothesis testing	Understand
CO4: Understand the concepts of predictive analytics	Understand
CO5: Learn the time series forecasting and design of experiments	Apply

Mapping with Programme Outcomes

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1										M		S
CO2	M		S									
CO3		S		M								M
CO4		M					M					
CO5	M						M					

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's Category	Continuous Assessment Tests			Terminal Examination
	1	2	3	
Remember	5	5	5	20
Understand	15	10	10	40
Apply	5	10	10	15
Analyse	0	0	0	0
Evaluate	0	0	0	0
Create	0	0	0	0

Syllabus –Computing for Data Analytics

UNIT – I DATA ANALYTICS LIFE CYCLE: Introduction to Big data Business Analytics - State of the practice in analytics role of data scientists - Key roles for successful analytic project - Main phases of life cycle - Developing core deliverables for stakeholders. **(9 hrs)**

UNIT – II STATISTICS Sampling Techniques - Data classification, Tabulation, Frequency and Graphic representation - Measures of central value - Arithmetic mean, Geometric mean, Harmonic mean, Mode, Median, Quartiles, Deciles, Percentile - Measures of variation – Range, IQR, Quartile deviation, Mean deviation, standard deviation, coefficient variance, skewness, Moments & Kurtosis. **(11 hrs)**

UNIT – III PROBABILITY AND HYPOTHESIS TESTING Random variable, distributions, two dimensional R.V, joint probability function, marginal density function. Random vectors - Some special probability distribution - Binomial, Poisson, Geometric, uniform, exponential, normal, gamma and Erlang. Multivariate normal distribution - Sampling distribution – Estimation - point, confidence - Test of significance, 1& 2 tailed test, uses of distribution, F-distribution, χ^2 distribution. **(9 hrs)**

UNIT – IV PREDICTIVE ANALYTICS Predictive modeling and Analysis - Regression Analysis, Multicollinearity , Correlation analysis, Rank correlation coefficient, Multiple correlation, Least square, Curve fitting and goodness of fit. **(8hrs)**

UNIT – V TIME SERIES FORECASTING AND DESIGN OF EXPERIMENTS Forecasting Models for Time series : MA, SES, TS with trend, season - Design of Experiments, one way classification, two way classification, ANOVA, Latin square, Factorial Design. **(8hrs)**

TOTAL (45 Hrs)

REFERENCES:

1. Chris Eaton, Dirk Deroos, Tom Deutsch et al., “Understanding Big Data”, McGrawHill, 2012.
2. Alberto Cordoba, “Understanding the Predictive Analytics Lifecycle”, Wiley, 2014.
3. Eric Siegel, Thomas H. Davenport, “Predictive Analytics: The Power to Predict Who Will Click, Buy, Lie, or Die”, Wiley, 2013.
4. James R Evans, “Business Analytics – Methods, Models and Decisions”, Pearson, 2013.
5. R. N. Prasad, Seema Acharya, “Fundamentals of Business Analytics”, Wiley, 2015.
6. S M Ross, “Introduction to Probability and Statistics for Engineers and Scientists”, Academic Foundation, 2011.
7. David Hand, Heiki Mannila, Padhraic Smyth, “Principles of Data Mining”, PHI 2013.
8. Spyros Makridakis, Steven C Wheelwright, Rob J Hyndman, “Forecasting methods and applications”, Wiley 2013(Reprint).
9. David Hand, Heikki Mannila, Padhraic Smyth, “Principles of Data mining”, PHI 2013.
10. <http://cran.r-project.org/doc/manuals/R-intro.html>
11. W.N. Venables, D.M Smith, “An introduction to R”,
12. R in Nutshell, O Reilly, 2012

CLOUD COMPUTING [E-PATHSHALA]

Category	L	P	Credit
PE	3	0	3

Preamble

To articulate the main concepts, key technologies, strengths, and limitations of cloud computing and the possible applications for state-of-the-art cloud computing and to learn the core issues of cloud computing such as security, privacy, and interoperability.

Prerequisite

Introduction to networking

Course Outcomes

On the successful completion of the course, students will be able to

Course Outcomes		Level
CO1	Able to understand the main concepts, key technologies, strengths, and limitations of cloud computing	Understanding
CO2	Able to know the core issues of cloud computing such as security, privacy, and interoperability	Understanding
CO3	Able to generate new ideas and innovations in cloud computing	Apply

Mapping with Programme Outcomes

Cos	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	M	M					
CO2	M	M		L			
CO3		S	M		M	M	L

Assessment Pattern

Category	Continuous Assessment Tests (25)			Terminal Examination (75)
Remember	5	5	5	20
Understand	10	10	10	20
Apply	5	5	5	10
Analyze	5	5	5	10
Evaluate				5
Create				

UNIT I Introduction to Cloud Computing: Evolution of Computing Paradigms-Utility Computing-Cloud Characteristics-Cloud Architecture-Delivery Models-Software-as-a-Service or SaaS, Platform-as-a-Service or PaaS , Infrastructure-as-a-Service or IaaS-Cloud Deployment Models-cloud storage-cloud security **[10 hrs]**

UNIT II Introduction to Distributed Systems: Distributed Systems and Distributed Computing-Benefits of Distributed Systems-Design Challenges of Distributed Systems-Distributed Systems and Cloud - Communication in Distributed Systems-Distributed Communication Paradigms-Message Passing- Remote Procedure Call-XML-RPC **[10 hrs]**

UNIT III Time Ordering & Replication:Need for Synchronization - The Problem- The Global Clock- The Global Clock Problem – Example- Synchronization Algorithms- Berkeley’s Algorithms,Logical Timestamp of Events -Cloud Election- Bully Algorithm, Ring algorithm-Replication in Distributed Systems- Replication in Cloud- Replication Consistency -Replication System Architecture-Replication Types **[9 hrs]**

UNIT IV Virtualization:Problem with Traditional Systems- A Data Center- Virtualization Technology- Definition , Virtualization Terminologies , Goals of Virtualization,Types of Virtualization- Virtual Machines (VMs)- Virtual Machine Monitor -Virtualization and Emulation-Methods of Virtualization **[8 hrs]**

UNIT V Web Services: Service Oriented Architecture- Services - Web Services Characteristics- Goals of Web Services - Types of Web Services - Components of Web Services Implementation- SOA and Cloud Computing- Resource Oriented Architecture (ROA)- RESTful Web Service **[8 hrs]**

Total (45 hrs)

References:

1. <https://epgp.inflibnet.ac.in/ahl.php?csrno=7>

BIG DATA SECURITY

Category	L	P	Credit
PE	3	0	3

Preamble

In today's world, as organizations changeover to Big data technology, security issues became a critical concern. This course aims to provide knowledge on Big Data Privacy, Ethics and Hadoop Ecosystem Security, Data Security & Event Logging.

Prerequisite

- Data Analytics

Course Outcomes

On the successful completion of the course, students will be able to

Course Outcomes	Bloom's Level
CO1: Understand the concepts of Big Data Privacy, Ethics And Security	Understand
CO2: Understand Security, Compliance, Auditing, And Protection	Understand
CO3: Gain conceptual understanding of Hadoop Security Design.	Understand
CO4: Understand the concepts of Hadoop Ecosystem Security	Understand
CO5: Gain conceptual understanding of Data Security & Event Logging	Apply

Mapping with Programme Outcomes

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M											
CO2										S		L
CO3	M	S										
CO4	M									M		
CO5		S										M

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's Category	Continuous Assessment Tests			Terminal Examination
	1	2	3	
Remember	5	5	5	20
Understand	15	10	10	40
Apply	5	10	10	15
Analyse	0	0	0	0
Evaluate	0	0	0	0
Create	0	0	0	0

UNIT I – BIG DATA PRIVACY, ETHICS AND SECURITY Privacy – Reidentification of Anonymous People – Why Big Data Privacy is self-regulating? – Ethics – Ownership – Ethical Guidelines – Big Data Security – Organizational Security. **(9 hrs)**

UNIT II - SECURITY, COMPLIANCE, AUDITING, AND PROTECTION Steps to secure big data – Classifying Data – Protecting – Big Data Compliance – Intellectual Property Challenge – Research Questions in Cloud Security – Open Problems. **(10 hrs)**

UNIT III – HADOOP SECURITY DESIGN Kerberos – Default Hadoop Model without security - Hadoop Kerberos Security Implementation & Configuration. **(10 hrs)**

UNIT IV – HADOOP ECOSYSTEM SECURITY Configuring Kerberos for Hadoop ecosystem components – Pig, Hive, Oozie, Flume, HBase, Sqoop. **(8 hrs)**

UNIT V – DATA SECURITY & EVENT LOGGING Integrating Hadoop with Enterprise Security Systems - Securing Sensitive Data in Hadoop – SIEM system – Setting up audit logging in hadoop cluster **(8 hrs)**

TOTAL (45 Hrs)

REFERENCES:

1. Mark Van Rijmenam, “Think Bigger: Developing a Successful Big Data Strategy for Your Business”, Amazon, 1 edition, 2014.
2. Frank Ohlhorst John Wiley & Sons, “Big Data Analytics: Turning Big Data into Big Money”, John Wiley & Sons, 2013.
3. Sherif Sakr, “Large Scale and Big Data: Processing and Management”, CRC Press, 2014.
4. Sudeesh Narayanan, “Securing Hadoop”, Packt Publishing, 2013.
5. Ben Spivey, Joey Echeverria, “Hadoop Security Protecting Your Big Data Problem”, O’Reilly Media, 2015.
1. Top Tips for Securing Big Data Environments: e-book (<http://www.ibmbigdatahub.com/whitepaper/top-tips-securing-big-data-environments-ebook>)
2. <http://www.dataguise.com/?q=securing-hadoop-discovering-and-securing-sensitive-data-hadoop-data-stores>
8. Gazzang for Hadoop [http:// www.cloudera.com/ content/cloudera/ en/ solutions/ Enterprise solutions / security-for-hadoop.html](http://www.cloudera.com/content/cloudera/en/solutions/Enterprise_solutions/security-for-hadoop.html)
9. eCryptfs for Hadoop <https://launchpad.net/ecryptfs>.
10. Project Rhino - <https://github.com/intel-hadoop/project-rhino/>

SOFT COMPUTING

Category L P Credit
PE 3 0 3

Preamble

To familiarize the students with soft computing techniques such as Neural networks, fuzzy logic and genetic algorithm and apply the above techniques to real world applications to get the desired optimal solution.

Prerequisite

- Nil

Course Outcomes

On the successful completion of the course, students will be able to

Course Outcomes

Bloom's Level

- CO1:** Explain the concepts of fuzzy logic and neural networks Understand
- CO2:** Analyse the problem nature and select the method to find solution Analyse
- CO3:** Apply soft computing techniques to real world problems and find the optimal solutions Apply

Mapping with Programme Outcomes

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M											
CO2	S	M										
CO3	S	M	M		M							L

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's Category	Continuous Assessment Tests			Terminal Examination
	1	2	3	
Remember	5	5	5	20
Understand	15	10	10	40
Apply	5	10	10	15
Analyse	0	0	0	0
Evaluate	0	0	0	0
Create	0	0	0	0

UNIT- I

INTRODUCTION: Soft computing paradigms - Neural network - Fuzzy logic - Derivation free optimization methods of genetic algorithms - Soft computing characteristics. **(10 hrs)**

UNIT-II

FUZZY LOGIC: Sets - properties - Arithmetics - Members function - Fuzzy relations - Relation equations - Fuzzy measures - Types of uncertainty - Members of uncertainties - Measures of fuzziness - Probabilities Vs Possibility - Measures of fuzzy events. **(10 hrs)**

UNIT-III

NEURAL COMPUTING: Neuron modeling - learning in simple neuron - Perception learning curve - Proof - Limitations of perception **(8hrs)**

UNIT-IV

NEURAL NETWORKS : Multi-level perception - Algorithm - Visualizing network behaviour - Self organizing network - Kohonen algorithm - Hopfield network - Adaptive resonance theory - Pattern classification. **(9hrs)**

UNIT -V

GENTIC ALGORITHMS: Introduction - Biological terminology - Search space and fitness landscapes - Elements of genetic algorithms - Genetic algorithms in problem solving. **(8hrs)**

TOTAL (45 Hrs)

REFERENCES:

1. Theory of Fuzzy subsets, Kauffmann a, Academic Press, 1975.
2. Neural Computing - An Introduction, R.Beale C.T.Jacson, Adam Hilge, 1990
3. An Introduction to Genetic Algorithms, Melanie Mitchell, PHI, 1998
4. Neuro - Fuzzy and Soft Computing, JS Jang, C.T.Sun, E.Mizutani,, Matlab Curriculum Series, Prentice International, 2003,
5. Neural Networks-A Comprehensive foundation, Simon Haykin, Prentice Hall of India,

Preamble

This course provides a basic understanding of how to plan, evaluate and successfully refine a data mining solution, particularly in terms of model building and model evaluation. It describes the process of data mining and its importance in various fields and it also describes the underlying machine learning and statistical techniques involved.

Prerequisite

- Relational Database Management Systems

Course Outcomes

On the successful completion of the course, students will be able to

Course Outcomes	Bloom's Level
CO1: Explain the architecture of data warehousing and data mining process	Understand
CO2: Apply suitable Data pre-processing methods for the given dataset	Apply
CO3: Generate Association rules using algorithms	Apply
CO4: Analyze the performance of Data warehouse Architecture	Analyze
CO5: Use clustering techniques for grouping data	Apply

Mapping with Programme Outcomes

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M											
CO2	M				L							L
CO3	M				L							
CO4	M	L			L							M
CO5	M				L							

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's Category	Continuous Assessment Tests			Terminal Examination
	1	2	3	
Remember	5	5	5	20
Understand	15	10	10	40
Apply	5	10	10	15
Analyse	0	0	0	0
Evaluate	0	0	0	0
Create	0	0	0	0

Syllabus –Data Mining and Warehousing

UNIT I

Data mining – Introduction – Information and production factor – Data mining vs query tools– Data mining in marketing – Self learning computer systems – concept learning – Data mining and Data warehouse. **(10hrs)**

UNIT II

Knowledge discovery process: Data selection – Cleaning – Enrichment – Coding – Preliminary analysis of the data set using traditional query tools – Visualization techniques – OLAP tools – Decision trees – Association rules – Neural networks – Genetic Algorithms KDD (Knowledge discover in Database) environment. **(10hrs)**

UNIT III

Data warehouse Architecture: System Process – Process architecture – Design – Database scheme – Partitioning strategy – Aggregations – Data mart – Meta data – Systems and data Warehouse process managers. **(9hrs)**

UNIT IV

Hardware and operational design of data warehouses – Hardware architecture – Physical layout – security – Backup and recovery – Service level agreement – operating the data warehouse. **(8hrs)**

UNIT V

Planning, Tuning and Testing: Capacity planning – Tuning the data warehouse – Testing the data warehouses – Data warehouse features. **(8hrs)**

TOTAL (45Hrs)

Text Books

1. Pieter Adriaans, Dolf Zantinge, Data Mining, Addison Wesley 1996
2. Sam Anahory, Dennis Muray, Data Warehousing in the real world, Addison Wesley 1996
3. Sean Kelly, Data Warehousing in Action, John Wiley 1997.

GROUP B: SUBJECTS FOR ELECTIVES UNDER SPECIALIZATION B

MOBILE APPLICATION DEVELOPMENT Category L P Credit
PE 3 0 3

Preamble

Mobile app development is the act or process by which a mobile app is developed for mobile devices, such as personal digital assistants, enterprise digital assistants or mobile phones. These applications can be pre-installed on phones during manufacturing platforms, or delivered as web applications using server-side or client-side processing to provide an "application-like" experience within a Web browser.

Prerequisite

- Nil

Course Outcomes

On the successful completion of the course, students will be able to

Course Outcomes	Bloom's Level
CO1: Understand the concepts of Mobile Applications	Understand
CO2: Understand the basic design of embedded systems	Understand
CO3: Gain conceptual understanding of the design patterns for mobile applications.	Apply
CO4: Experiment the concepts of Android technology	Apply
CO5: Experiment the concepts of IOS technology	Apply

Mapping with Programme Outcomes

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M									L		L
CO2	M									L		L
CO3	M									M		L
CO4	S	M	L					M				L
CO5	S	M	L					M				L

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's Category	Continuous Assessment Tests			Terminal Examination
	1	2	3	
Remember	5	5	5	20
Understand	15	10	10	40
Apply	5	10	10	15
Analyse	0	0	0	0
Evaluate	0	0	0	0
Create	0	0	0	0

UNIT I INTRODUCTION

Introduction to mobile applications – Embedded systems - Market and business drivers for mobile applications – Publishing and delivery of mobile applications – Requirements gathering and validation for mobile applications **(10hrs)**

UNIT II BASIC DESIGN

Introduction – Basics of embedded systems design – Embedded OS - Design constraints for mobile applications, both hardware and software related – Architecting mobile applications – User interfaces for mobile applications – touch events and gestures – Achieving quality constraints – performance, usability, security, availability and modifiability. **(10hrs)**

UNIT III ADVANCED DESIGN

Designing applications with multimedia and web access capabilities – Integration with GPS and social media networking applications – Accessing applications hosted in a cloud computing environment – Design patterns for mobile applications. **(9hrs)**

UNIT IV TECHNOLOGY I - ANDROID

Introduction – Establishing the development environment – Android architecture – Activities and views – Interacting with UI – Persisting data using SQLite – Packaging and deployment – Interaction with server side applications – Using Google Maps, GPS and Wifi – Integration with social media applications. **(8hrs)**

UNIT V TECHNOLOGY II - IOS

Introduction to Objective C – iOS features – UI implementation – Touch frameworks – Data persistence using Core Data and SQLite – Location aware applications using Core Location and Map Kit – Integrating calendar and address book with social media application – Using Wifi - iPhone marketplace. **(8hrs)**

TOTAL (45Hrs)

REFERENCES:

1. <http://dper.android.com/develop/index.html>
2. Jeff McWherter and Scott Gowell, "Professional Mobile Application Development", Wrox, 2012
3. Charlie Collins, Michael Galpin and Matthias Kappler, "Android in Practice", DreamTech, 2012
4. James Dovey and Ash Furrow, "Beginning Objective C", Apress, 2012
5. David Mark, Jack Nutting, Jeff LaMarche and Frederic Olsson, "Beginning iOS 6 Development: Exploring the iOS SDK", Apress, 2013.

Preamble

Mobile Computing is a technology that allows transmission of data, voice and video via a computer or any other wireless enabled device without having to be connected to a fixed physical link.

Prerequisite

- Nil

Course Outcomes

On the successful completion of the course, students will be able to

Course Outcomes	Bloom's Level
CO1: Understand the basic concepts of mobile computing	Understand
CO2: Understand the Mobile Internet Protocol And Transport Layer	Understand
CO3: Gain conceptual understanding of Mobile Telecommunication System	Apply
CO4: Understand the concepts of Mobile Ad-Hoc Networks	Understand
CO5: Experiment Mobile Platforms And Applications	Apply

Mapping with Programme Outcomes

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S											L
CO2		S										
CO3	S											M
CO4			M							S		
CO5	L	M										M

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's Category	Continuous Assessment Tests			Terminal Examination
	1	2	3	
Remember	5	5	5	20
Understand	15	10	10	40
Apply	5	10	10	15
Analyse	0	0	0	0
Evaluate	0	0	0	0
Create	0	0	0	0

UNIT I INTRODUCTION

Introduction to Mobile Computing - Characteristics of a mobile computing Environment - Mobile Computing Entities-Introduction to wireless Communication -Types of Wireless Communications -Advantages of Wireless Communications -Challenges for Efficient Wireless Communications-History of Wireless Communications. **(10hrs)**

UNIT II MOBILE INTERNET PROTOCOL AND TRANSPORT LAYER

Understand the problems associated with wireless or mobile networks -TCP handles packet loss - Need of specialized protocols for wireless networks -Goals of specialized protocols for wireless networks - I-TCP architecture and functioning - Advantages and limitations of I-TCP- Introduction to M-TCP -Architecture and TCP layer - Functioning of M-TCP -Advantages and limitations of M-TCP **(10hrs)**

UNIT III MOBILE TELECOMMUNICATION STANDARDS & GENERATIONS

Introduction -Understanding the need of Standards - Bodies of Standardization -ITU History - Generations in Telecommunication -Comparison of 1G,2G,3G,4G & 5G - Introduction to GSM - Advantages of GSM - GSM Specifications - Services provided by GSM - GSM architecture- Understanding the fundamentals of GPRS -GPRS characteristics -GPRS system architecture - GPRS protocol architecture. **(10hrs)**

UNIT IV BLUETOOTH AND MOBILE AD-HOC NETWORKS

Introduction to Bluetooth -History -Technical Specifications -Architecture: Piconets – Scatternets-Overview of Ad hoc Network- Mobile Ad hoc Networks (MANETs)- Routing Protocols for MANETs- Classification of Routing Protocols- Optimized Link State Routing (OLSR) Protocol . **(8hrs)**

UNIT V WAP-WIRELESS APPLICATION PROTOCOL

Introduction -Evolution of WAP -Components of WAP -Architecture of WAP- WAP Gateway- Application of WAP -Challenges of WAP. **(7hrs)**

TOTAL (45hrs)

References:

1.<https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=iLkSuZZ5a+koxhsE1m+YjQ==>

OPEN SOURCE SOFTWARE

Category	L	P	Credit
PE	3	0	3

Preamble

Open-source software is a type of computer software with its source code made available with a license in which the copyright holder provides the rights to study, change, and distribute the software to anyone and for any purpose.

Prerequisite

- Nil

Course Outcomes

On the successful completion of the course, students will be able to

Course Outcomes**Bloom's Level**

CO1: Understand the usage of Open source software	Understand
CO2: Understand the Open Source Database	Understand
CO3: Gain conceptual understanding of Open Source Programming Languages	Apply
CO4: Working with Python and Pearl	Apply

Mapping with Programme Outcomes

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	L									M		L
CO2							M			M		
CO3	S						M					S
CO4	S						M					S

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's Category	Continuous Assessment Tests			Terminal Examination
	1	2	3	
Remember	5	5	5	20
Understand	15	10	10	40
Apply	5	10	10	15
Analyse	0	0	0	0
Evaluate	0	0	0	0
Create	0	0	0	0

Syllabus-Open Source Software

UNIT I INTRODUCTION

Open sources Introduction –Open Sources Need– Advantages of Open Sources– Open Sources Application. Operating systems for Open source: LINUX: Introduction – General Overview – Kernel Mode and user mode – Process – Advanced Concepts – Scheduling – Personalities – Cloning – Signals – Development with Linux. **(10hrs)**

UNIT II OPEN SOURCE DATABASE

MySQL: Introduction – Setting up account – Starting, terminating and writing your own SQL programs –Record selection Technology –Working with strings – Date and Time– Sorting Query Results – Generating Summary – Working with metadata – Using sequences – MySQL and Web. **(10hrs)**

UNIT III OPEN SOURCE PROGRAMMING LANGUAGES

PHP: Introduction –web environment Programming – variables – constants – datatypes – operators –Statements – Functions – Arrays – OOP – String Manipulation and regular expression – File handling and data storage – PHP and SQL database – PHP and LDAP – PHP Connectivity – Sending and receiving E-mails –Debugging and error handling – Security – Templates. **(10hrs)**

UNIT IV PYTHON

Syntax and Style – Python Objects – Numbers – Sequences – Strings – Lists and Tuples – Dictionaries –Conditionals and Loops – Files – Input and Output – Errors and Exceptions – Functions – Modules – Classes and OOPs – Execution Environment. **(8hrs)**

UNIT V PERL

Perl backgrounder – Perl overview – Perl parsing rules – Variables and Data – Statements and Control structures – Subroutines, Packages, and Modules- Working with Files –Data Manipulation. **(7hrs)**

TOTAL (45hrs)

Text Books:

1. Remy Card, Eric Dumas and Frank Mevel, “The Linux Kernel Book”, Wiley Publications, 2003
2. Steve Suchring, “MySQL Bible”, John Wiley, 2002

References:

1. Rasmus Lerdorf and Levin Tatroe, “Programming PHP”, O’Reilly, 2002.
2. Wesley J. Chun, “Core Python Programming”, Prentice Hall, 2001.
3. Martin C. Brown, “Perl: The Complete Reference”, 2nd Edition, Tata McGraw-Hill Publishing Company Limited, Indian Reprint 2009.
4. Steven Holzner, “PHP: The Complete Reference”, 2nd Edition, Tata McGraw-Hill Publishing Company Limited, Indian Reprint 2009.
5. Vikram Vaswani, “MYSQL: The Complete Reference”, 2nd Edition, Tata McGraw- Hill Publishing Company Limited, Indian Reprint 2009.

ANDROID MOBILE APPLICATION DEVELOPMENT

Category L P Credit
PE 3 0 3

Preamble

Android Mobile app development is the act or process by which a mobile app is developed for mobile devices, such as personal digital assistants, enterprise digital assistants or mobile phones. These applications can be pre-installed on phones during manufacturing platforms, or delivered as web applications using server-side or client-side processing to provide an "application-like" experience within a Web browser.

Prerequisite

- Mobile Application Development

Course Outcomes

On the successful completion of the course, students will be able to

Course Outcomes	Bloom's Level
CO1: Understand the concepts of Mobile Application development	Understand
CO2: Understand about Android application	Understand
CO3: Gain conceptual understanding of Android Activities and GUI Design Concepts	Apply
CO4: Understand the concepts of Advanced UI Programming	Understand
CO5: Experiment Android application	Apply

Mapping with Programme Outcomes

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S						L					
CO2	S						L					
CO3		S					L		L			M
CO4		M							S			M
CO5		S							S			M

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's Category	Continuous Assessment Tests			Terminal Examination
	1	2	3	
Remember	5	5	5	20
Understand	15	10	10	40
Apply	5	10	10	15
Analyse	0	0	0	0
Evaluate	0	0	0	0
Create	0	0	0	0

UNIT –I Introduction to Mobile Computing

Mobile Communication Concept - generations of wireless technology – Basics concept of cell, cluster and frequency reuse - Noise effects on mobile - Understanding GSM and CDMA - Basics of GSM architecture, its services like voice call, SMS, MMS, LBS, VAS - Different modes used for Mobile Communication - Architecture of Mobile Computing(3 tier) - Design considerations for mobile computing - Mobile Communication Characteristics - Mobile communication Application - Mobile Computing Security Concerns - Middleware and Gateway needed for mobile Computing - Making Existing Application Mobile Enable - Mobile IP - Basic Mobile Computing Protocol - Mobile Communication through Satellite (Low orbit satellite, Medium orbit satellite, Geo stationary satellite, Satellite phones) **(11hrs)**

UNIT–II Introduction to Android

Overview of Android - What does Android run On - Internals of Android? - Android for mobile apps development - Environment setup for Android apps Development - Framework - Android - SDK, Eclipse - Emulators –What is an Emulator / Android AVD **(10hrs)**

UNIT –III Android Activities and GUI Design Concepts

Android Application Design criteria: Consideration for Hardware Design, Design Demands For Android application, Intent, Activity, Activity Lifecycle and Manifest - Creating Application and new Activities - Simple UI - Layouts and Layout properties : Introducing Android UI Design, Introducing Layouts - XML Introduction to GUI objects viz.: Push Button, Text / Labels , EditText, ToggleButton , Padding **(10hrs)**

UNIT –IV Advanced UI Programming

Event driven Programming in Android - (Text Edit, Button clicked etc.) - Activity Lifecycle of Android **(7hrs)**

UNIT –V

Toast, Menu, Dialog, List and Adapters Menu: Basics, Custom v/s System Menus, Create and Use Handset menu Button (Hardware) - Dialog : Creating and Altering Dialogs - Toast : List & Adapters - Demo Application Development and Application Launching - Basic operation of SQLite Database - Priorities for Android Application **(7hrs)**
[45Hrs]

Text Book

- 1.J.F.De Marzio, Android –A Programmer’s Guide, Mc Graw Hill Pub, 2008.
2. Building Android Apps IN EASY STEPS McGraw - Hill Education
3. Professional Android 2 Application Development by Reto Meier, Wiley India Pvt Ltd.,2012
4. Beginning Android by Mark L Murphy, Wiley India Pvt Ltd.,2015
5. Pro Android, by Sayed Y Hashimi and Satya Komatineni Wiley India Pvt Ltd., 2015

OPEN SOURCE TECHNOLOGIES

Category	L	P	Credit
PE	3	0	3

Preamble

Open source technology means that its source code is freely available to use, modify, and redistribute.

Prerequisite

- Nil

Course Outcomes

On the successful completion of the course, students will be able to

Course Outcomes**Bloom's Level**

CO1: Understand the basic concepts of Open source technologies

Understand

CO2: Understand about Licenses and Patents

Understand

CO3: Experiment open source projects

Apply

Mapping with Programme Outcomes

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	L								M			
CO2	L								M			
CO3	L											S

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's Category	Continuous Assessment Tests			Terminal Examination
	1	2	3	
Remember	5	5	5	20
Understand	15	10	10	40
Apply	5	10	10	15
Analyse	0	0	0	0
Evaluate	0	0	0	0
Create	0	0	0	0

UNIT I

Introduction: Open Source, Free Software, Free Software vs. Open Source software, Public Domain Software, FOSS does not mean no cost. History of BSD, The Free Software Foundation and the GNU Project. **(10hrs)**

UNIT II

Open Source History, Initiatives, Principle and methodologies. Philosophy: Software Freedom, Open Source Development Model Licences and Patents: What Is A License, Important FOSS Licenses (Apache,BSD,GPL, LGPL), copyrights and copylefts, Patents Economics of FOSS : Zero Marginal Cost, Income-generation opportunities, Problems with traditional commercial software, Internationalization. **(10hrs)**

UNIT III

Case Studies: Apache, BSD, Linux, Mozilla (Firefox), Wikipedia, Joomla, GCC, Open Office. **(10hrs)**

UNIT IV

Starting and Maintaining an Open Source Project, Open Source Hardware, Open Source Design, Open source Teaching. and Open source media. **(8hrs)**

UNIT V

Open source vs. closed source Open source government, Open source ethics. Social and Financial impacts of open source technology, Shared software, Shared source. **(7hrs)**

TOTAL (45Hrs)

REFERENCES

1. Andrew M. Laurent. St (2004). Understanding open source and free software licensing. 1st edition, O'Reilly Media, Inc.
2. Feller Joseph (2005). Perspectives on Free and Open Source Software. MIT press. Edition-illustrated.
3. Andrew M. Laurent. St (2004), Understanding open source and free software licensing.
4. Kirk St. Amant, Still Brian. (2007). Handbook of research on open source software: technological, economic, and social perspectives.
5. Agerfalk Par J, Boldyreff Cornelia, Jesus M. Barahona -Gonzalez (2010). Open Source Software. New Horizons.
6. Michael R. Overly, Pike and Fischer (2003). The Open Source Handbook. Inc, Pike & Fischer – A BNA Company.
7. Dixon Rod (2004), Open source software law.
8. Ludvig A, Norin, Fredrik Stockel, Sweden (1998-05-20), Open-Source Software Development Methodology.

Preamble

Big data analytics is the process of examining large and varied data sets. Big data is data sets that are so voluminous and complex that traditional data-processing application software is inadequate to deal with them. Big data challenges include capturing data, data storage, data analysis, search, sharing, transfer, visualization, querying, updating, information privacy and data source.

Prerequisite

- Relational Database Management Systems

Course Outcomes

On the successful completion of the course, students will be able to

Course Outcomes	Bloom's Level
CO1: Understand the concepts of Big data and challenges in processing Big Data	Understand
CO2: Understand Hadoop architecture and eco-system	Understand
CO3: Gain conceptual understanding of Hadoop Distributed File System.	Apply
CO4: Understand the concepts of map and reduce and functional programming	Understand
CO5: Identify appropriate techniques and tools to solve actual Big Data problems	Apply

Mapping with Programme Outcomes

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M							M				
CO2		M						L	M			
CO3			S					M				S
CO4			S					M				
CO5			M					M				S

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's Category	Continuous Assessment Tests			Terminal Examination
	1	2	3	
Remember	5	5	5	20
Understand	15	10	10	40
Apply	5	10	10	15
Analyse	0	0	0	0
Evaluate	0	0	0	0
Create	0	0	0	0

UNIT I INTRODUCTION Security and Privacy for Mobile and Wireless Networks: Introduction- State of the Art- Areas for Future Research- General Recommendation for Research. Pervasive Systems: Enhancing Trust Negotiation with Privacy Support: Trust Negotiation- Weakness of Trust Negotiation- Extending Trust Negotiation to Support Privacy. **(10hrs)**

UNIT II MOBILE SECURITY Mobile system architectures, mobile cellular systems Overview , GSM and UMTS Security & Attacks, Vulnerabilities in Cellular Services, Cellular Jamming Attacks & Mitigation, Security in Cellular VoIP Services, Mobile application security. **(10hrs)**

UNIT III SECURING WIRELESS NETWORKS Overview of Wireless security, Scanning and Enumerating 802.11 Networks, Attacking 802.11 Networks, Attacking WPA protected 802.11 Networks, Bluetooth Scanning and Reconnaissance, Bluetooth Eavesdropping, Attacking and Exploiting Bluetooth, Zigbee Security, Zigbee Attacks. **(10hrs)**

UNIT IV ADHOC NETWORK SECURITY Security in Ad Hoc Wireless Networks, Network Security Requirements, Issues and Challenges in Security Provisioning, Network Security Attacks, Key Management in Adhoc Wireless Networks, Secure Routing in Adhoc Wireless Networks. **(8hrs)**

UNIT V RFID SECURITY Introduction, RFID Security and privacy, RFID chips Techniques and Protocols, RFID anti-counterfeiting, Man-in-the-middle attacks on RFID systems, Digital Signature Transponder, Combining Physics and Cryptography to Enhance Privacy in RFID Systems, Scalability Issues in Large-Scale Applications, An Efficient and Secure RFID Security Method with Ownership Transfer, Policy-based Dynamic Privacy Protection Framework leveraging Globally Mobile RFIDs, User-Centric Security for RFID based Distributed Systems, Optimizing RFID protocols for Low Information Leakage, RFID: an anti-counterfeiting tool. **(7hrs)**

TOTAL (45Hrs)

REFERENCES

1. Kia Makki, Peter Reiher, “Mobile and Wireless Network Security and Privacy “, Springer, ISBN 978-0-387-71057-0, 2007.
2. C. Siva Ram Murthy, B.S. Manoj, “Adhoc Wireless Networks Architectures and Protocols”, Prentice Hall, x ISBN 9788131706885, 2007.
3. NoureddineBoudrigha, ”Security of Mobile Communications”, ISBN 9780849379413, 2010.
4. Kitsos, Paris; Zhang, Yan , “RFID Security Techniques, Protocols and System-On-Chip Design “, ISBN 978-0-387-76481-8, 2008.
5. Johnny Cache, Joshua Wright and Vincent Liu,” Hacking Wireless Exposed: Wireless Security Secrets & Solutions “, second edition, McGraw Hill, ISBN: 978-0-07-166662-6, 2010.

**MOBILE AND DIGITAL
FORENSICS**

Category L P Credit
PE 3 0 3

Preamble

The purpose of computer forensics techniques is to search, preserve and analyze information on computer systems to find potential evidence for a trial. In the early days of computers, it was possible for a single detective to sort through files because storage capacity was so low. SD cards often serve for data transfer from a computer to a mobile device and vice versa and therefore represent important evidence in investigation. The purpose of forensic software is to provide protection of the existing data on the original device which ensures the integrity of the collected data

Prerequisite

- Nil

Course Outcomes

On the successful completion of the course, students will be able to

Course Outcomes	Bloom's Level
CO1: Understand the concepts of mobile forensics	Understand
CO2: Understand Mobile architecture and eco-system	Understand
CO3: Gain conceptual understanding of Mobile System.	Apply
CO4: Understand the concepts mobile and Digital concepts	Understand
CO5: Identify appropriate techniques and tools to solve actual Mobile forensics problems	Apply

Mapping with Programme Outcomes

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		M										
CO2		M										
CO3			S					M				
CO4			L					S				
CO5			L									S

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's Category	Continuous Assessment Tests			Terminal Examination
	1	2	3	
Remember	5	5	5	20
Understand	15	10	10	40
Apply	5	10	10	15
Analyse	0	0	0	0
Evaluate	0	0	0	0
Create	0	0	0	0

Syllabus –Mobile and Digital Forensics

UNIT – I INTRODUCTION TO WIRELESS TECHNOLOGIES Overview of wireless technologies and security: Personal Area Networks, Wireless Local Area Networks, Metropolitan Area Networks, Wide Area Networks. Wireless threats, vulnerabilities and security: Wireless LANs, War Driving, War Chalking, War Flying, Common Wi-fi security recommendations, PDA Security, Cell Phones and Security, Wireless DoS attacks, GPS Jamming, Identity theft. **(10hrs)**

UNIT - II SECURITY FRAMEWORK FOR MOBILE SYSTEMS CIA triad in mobile phones-Voice, SMS and Identification data interception in GSM: Introduction, practical setup and tools, implementation- Software and Hardware Mobile phone tricks: Netmonitor, GSM network service codes, mobile phone codes, catalog tricks and AT command set- SMS security issues. **(10hrs)**

UNIT - III MOBILE PHONE FORENSICS Crime and mobile phones, evidences, forensic procedures, files present in SIM card, device data, external memory dump, evidences in memory card, operators systems- Android forensics: Procedures for handling an android device, imaging android USB mass storage devices, logical and physical techniques. **(10hrs)**

UNIT - IV INTRODUCTION TO DIGITAL FORENSICS Digital forensics: Introduction – Evidential potential of digital devices: closed vs. open systems, evaluating digital evidence potential- Device handling: seizure issues, device identification, networked devices and contamination. **(8hrs)**

UNIT - V ANALYSIS OF DIGITAL FORENSIC TECHNIQUES Digital forensics examination principles: Previewing, imaging, continuity, hashing and evidence locations- Seven element security model- developmental model of digital systems- audit and logs- Evidence interpretation: Data content and context. **(7hrs)**

TOTAL (45hrs)

REFERENCES

1. Gregory Kipper, “Wireless Crime and Forensic Investigation”, Auerbach Publications, 2007.
2. Iosif I. Androulidakis, “ Mobile phone security and forensics: A practical approach”, Springer publications, 2012.
3. Andrew Hoog, “Android Forensics: Investigation, Analysis and Mobile Security for Google Android”, Elsevier publications, 2011.
4. Angus M.Marshall, “ Digital forensics: Digital evidence in criminal investigation”, John – Wiley and Sons, 2008.