BHARATHIAR UNIVERSITY, COIMBATORE – 641046

M. Sc. COMPUTER SCIENCE (CBCS)

(Effective from the academic Year 2018 - 2019)

1. **Eligibility for Admission to the Programme**

Candidates for admission to the first year programme leading to the Degree of Master of Science in Computer Science (M.Sc. – CS) will be required to possess:

A Pass with 50% of marks in B.Sc. Computer Science / BCA /B.Sc. Computer Technology / B.Sc. Information Technology / B.Sc. Information Science / B.Sc. Information Systems / B.Sc. Software Science / B.Sc. Software Engineering / B.Sc. Software Systems. In case of SC/ST candidates, a mere pass in any of the above Bachelor's degree will be sufficient.

2. **Duration of the Programme**

The programme shall be offered on a full-time basis. The programme will consist of three semesters of course work and laboratory work and the fourth semester consists of project work.

3. **Regulations**

The general Regulations of the Bharathiar University Choice Based Credit System Programme are applicable to this programme.

4. **The Medium of Instruction and Examinations**

The medium of instruction and Examinations shall be in English.

5. **Submission of Record Notebooks for Practical Examinations & Project Viva-Voce.**

Candidates taking the Practical Examinations should submit bonafide Record Note Books prescribed for the Examinations. Otherwise the candidates will not be permitted to take the Practical Examinations.

Candidates taking the Project Viva Examination should submit Project Report prescribed for the Examinations. Otherwise the candidates will not be permitted to take the Project Viva-voce Examination.

CURRICULUM FRAMEWORK AND SYLLABUS

FOR

OUTCOME BASED EDUCATION

IN M.SC. COMPUTER SCIENCE DEGREE PROGRAM

FOR THE STUDENTS

ADMITTED FROM THE

ACADEMIC YEAR 2018-19 ONWARDS

BHARATHIAR UNIVERSITY

State University, Accredited with NAAC "A" grade and 13th Rank in MHRD-NIRF&

COIMBATORE – 641046, TAMILANDU

Department of Computer Science

Vision

To serve as a higher educational leader in academics and research to provide excellent resources for technological, educational and allied sectors to transform the lives of mankind in the ever changing global scenario.

Mission

- Creating and disseminating of world class knowledge in global context
- Equip students with knowledge on up-to-date technological developments to take part in global software industry
- Promote state of art inter disciplinary research in computer science
- Imbibe entrepreneurial culture through curriculum, pedagogy, research and mentoring

Programme Educational Objectives (PEOs)

Post graduate of M.Sc. Programme graduates will be

PEO1: Employed in software industry and engaging in understanding and applying new ideas and thoughts as the field evolves.

PEO2: Promotion of inter disciplinary research for inventions/innovations for professional careers to meet the needs of the society.

PEO3: Enhanced to cope up with the changing technologies in the frontier of computer science and allied field.

Programme Outcomes (POs)

On completion of M.Sc. Programme, the students are expected to

PO1: Gain and apply the knowledge of computer science concepts in appropriate domain of interest.

PO2: Ability to analyze the problem, identify the required computing facility and implement it to obtain solutions.

PO3: Ability to create a new design for the complex computational problems which meets the specific needs for societal impact domains.

PO4: Solve complex real-time problems by considering professional, ethical, legal and social issues

PO5: Understand and choose the appropriate modern techniques and tools for the complex systems of various domains and understands the advantages and limitations.

PO6: Ability to work in a group with an effective rapport building with team members in computer industries to accomplish a common goal.

PO7: Ability to communicate effectively in the basis of presenting their research work and gain knowledge on documentation and reports writing in a professional way.

PO8: Ability to distinguish the ethical, legal and societal issues of computing surroundings and will take the responsibility by applying computer skill practices.

PO9: Ability to analyze the local and global impact of computing on individuals, organizations and society.

PO10: Demonstrate the principles of computer science and apply these in the multidisciplinary environments to manage project.

PO11: Understand the impact of computer science in societal and environmental contexts and demonstrate the knowledge for the sustainable development.

PO12: Students can independently enable to acquire the innovative ideas as per the modern era and they can create a value and wealth for the futuristic world.

I Year M.Sc Computer Science (2018-19 Onwards)

SCHEME OF EXAMINATION

Core/ Elective/ General/ General Supportive	Suggested Code	Sem.	Title of the Paper	No. of Credits		Hrs.		Marks
				Theory	Practical	L	P	
Core 1	18CS1C1	I	Compiler Design	4	0	4	0	100
Core 2	18CS1C2	I	Advanced Operating System	4	0	4	0	100
Core 3	18CS1C3	I	Data Structures and Algorithms	2	2	2	4	100
Core 4	18CS1C4	I	Advanced Java Programming	2	2	2	4	100
Core 5	18CS1C5	I	Python Programming	2	2	2	4	100
Elective -I	18CS1EXX	I	Elective – I	4	0	4	0	100
PDC 1	18CS1PDC1	I	PC Trouble Shooting & Installation	0	1	-	-	25
General	18CS1G1	I	Industry Literacy	0	1	-	-	25
General Supportive	18CSGSXX	I	General Supportive - I	2	0	2	0	50
Core 6	18CS2C1	II	Linux Programming	2	2	2	4	100
Core 7	18CS2C2	II	Data Base Administration and Management	2	2	2	4	100
Core 8	18CS2C3	II	Information Security	4	0	4	0	100
Core 9	18CS2C4	II	Internet of Things	4	0	4	0	100
Core 10	18CS2C5	II	Data Mining Techniques and Tools	2	2	2	4	100
Elective -II	18CS2EXX	II	Elective - II	4	0	4	0	100
PDC 2	18CS2PDC1	II	Network Administration & Maintenance	0	1	-	-	25
General	18CS2G1	II	Literature Survey	0	1	-	-	25
General Supportive	18CSGSXX	II	General Supportive - II	2	0	2	0	50
Total				56				1400

COMPILER DESIGN

Subject Code: 18CS1C1 **Number of Credits: L P T**
4 0 4

Preamble

The objective of this course is to provide an understanding of language translation and compiler design. To enrich student knowledge in various phases of compiler and to optimize and effectively generate machine codes. The topics cover various design principles and basic about LEX and YACC design.

Prerequisite

Basic knowledge on computational theory (Automata and Grammar)

Course Outcome:

CO1	To know about the different phases of a compiler and the principles behind each phase.	Understand
CO2	To understand the concepts of regular expressions, automata and apply the same to implement lexical analyzer using LEX tool.	Understand / Apply
CO3	To understand the concepts of context free grammars and able to know the LR parsers and various methods to generate intermediate code.	Analyse / Apply
CO4	Ability to implement semantic rules into a parser that performs attribution while parsing.	Apply
CO5	To understand how the code is optimized and the target code is generated.	Evaluate

Mapping with Programme Outcomes :

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

S- Strong; M-Medium; L-Low

Assessment pattern :

Bloom's Category	**Continuous Assessment Test (%)**			**Terminal Examination**
	1	**2**	**3**	
Remember	30	20	20	20
Understand	30	30	20	20
Apply	30	20	30	20
Analyse	10	20	20	30
Evaluate	0	10	10	10
Create	0	0	0	0

Course level assessment questions:

Introduction about Compiler (CO1) :

1. Define two parts of compilation.
2. List the cousins of compiler.
3. Outline the phases of compiler. Explain the phases in detail.
4. What is a symbol table?
5. List the various compiler construction tools.

Lexical Analysis (CO2):

1. Compare tokens, patterns and lexeme.
2. Write a note on the role of lexical analyzer in detail.
3. What are the various parts in LEX program?
4. Analyze how a finite automaton is used to represent tokens and perform lexical analyses.
5. Simplify the regular expression abb(a | b)* to DFA using direct method and minimize it.

Syntax Analysis(CO3):

1. Define ambiguous grammar.
2. Construct parse tree for the input string w = cad using top down parser: S ->cAd, A ->ab| a
3. Explain LL(1) grammar for the sentence S->iEts | iEtSeS | aE-> b.
4. Construct a parse tree for – (id+id).
5. Examine the various conflicts that occur during shift reduce parsing.

Syntax Directed Translator (CO4):

1. Mention the rules for type checking.
2. Write down syntax directed definition for simple desk calculator.
3. List dynamic storage allocation techniques.
4. Discuss different storage allocation strategies.
5. Explain in detail about specification of simple type checker.

Code Optimization and Generation (CO5):

1. Illustrate an assignment statement with the three address code sequence.
2. Explain principle sources of optimization with examples.
3. Does DAG have cycles? Justify.
4. Outline basic block with example.
5. Interpret the various issues involved in design of code generator.

Syllabus:

Unit I : Introduction to Compilers: Translators-Compilation and Interpretation-Language processors –The Phases of Compiler-Errors Encountered in Different Phases-The Grouping of Phases Compiler Construction Tools – Programming Language basics.

Unit – II : Lexical Analysis: Need and Role of Lexical Analyzer-Lexical Errors-Expressing Tokens by Regular Expressions Converting Regular Expression to DFA- Minimization of DFA Language for Specifying Lexical Analyzers-LEX-Design of Lexical Analyzer for a sample Language.

Unit – III : Syntax Analysis: Need and Role of the Parser-Context Free Grammars –Top Down Parsing –General Strategies Recursive Descent Parser Predictive Parser-LL(1) Parser-Shift Reduce Parser-LR Parser- LR (0)Item Construction of SLR Parsing Table –Introduction to LALR Parser – Error Handling and Recovery in Syntax Analyzer-YACC-Design of a syntax Analyzer for a Sample Language

Unit – IV : Syntax Directed Translation & Run Time Environment: Syntax directed Definitions Construction of Syntax Tree-Bottom-up Evaluation of S-Attribute Definitions- Design of predictive translator – Type Systems-Specification of a simple type checker Equivalence of Type Expressions-Type Conversions – Run-Time Environment: Source Language Issues Storage Organization-Storage Allocation Parameter Passing-Symbol Tables-Dynamic Storage Allocation

Unit – V : Code Optimization and Code Generation: Principal Sources of Optimization-DAG Optimization of Basic Blocks-Global Data Flow Analysis Efficient Data Flow Algorithms Issues in Design of a Code Generator – A Simple Code Generator Algorithm.

Reference Books:

1. Alfred V Aho, Monica S. Lam, Ravi Sethi and Jeffrey D Ullman, "Compilers – Principles, Techniques and Tools", Edition, Pearson Education, 2007.
2. Steven S. Muchnick, "Advanced Compiler Design and Implementation", Morgan Kaufmann Publishers an imprint of Elseviert 2014.

E-Resources:

1. **http://nptel.ac.in/downloads/106108113/**

Course content and lecture schedule:

Module no	Topic	No of Lectures
1	**Introduction to Compilers**	
1.1	Introduction on compilation ,interpretation and translators	1

1.2	Phases of compiler	2
1.3	Errors in different phases	1
1.4	Compiler construction tools and programming logics	2
2	**Lexical Analysis:**	
2.1	Role of Lexical analyzer and errors	1
2.2	Tokens to regular expression	2
2.3	Regular expression to DFA	2
2.4	Minimization of DFA	1
2.5	Design using LEX	2
3	**Syntax Analysis :**	
3.1	Role of Parser	1
3.2	Context Free Grammar	2
3.3	Top Down Parsing	2
3.4	LL(1)	2
3.5	LR`	2
3.6	SLR	2
3.7	LALR	2
3.8	Error handling and Recovery	1
3.9	Design using YACC	2
4	**Syntax Directed Translation & Run Time Environment**	
4.1	Syntax Directed Definition and Syntax tree	1
4.2	Evaluation of S- Attribute	1
4.3	Design of Predictive translator	1
4.4	Specification of simple type checker	1
4.5	Storage organization	1
4.6	Equivalence of type expression & Type conversion	2
4.7	Storage allocation and symbol tables	1

4.8	Dynamic Storage allocation	1
5	**Code Optimization and Code Generation**	
5.1	Principles sources of optimization	1
5.2	DAG optimization for Basic blocks	2
5.3	Data flow Analysis	1
5.4	Issues in design of code generator	1
5.5	A simple code generator algorithm	1
	Total	**45**

Course Prepared by: Dr.P.B.pankajavalli

Course Verified by:Dr.E.Chandra

ADVANCED OPERATING SYSTEMS

Subject Code: 18CS1C2 **No. of Credits L P T**
4 0 4

Preamble

An operating system is a significant part in any computer system. The primary objective of this course is to study the basic concepts of operating system and to introduce the advance concepts. This includes process synchronization, distributed operating systems, real time operating systems, operating system for handheld systems, LINUX OS and iOS. This course facilitates the students to learn the working principles, features, various services, limitations and different types of operating system.

Prerequisite:

Fundamentals of operating systems.

Course outcomes:

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

CO1	Understand about functions and types of operating system. Describe about advanced concepts in operating system.	Understand
CO2	Understand process concepts, execution of concurrent processes and analyse the critical sections of process. .	Understand/Analyse
CO3	Analyse deadlock situations. Understand the reason for deadlock, recovery of deadlocks. Analysehow to avoid deadlocks.	Understand/Analyse
C04	Understand about distributed operating systems and its issues.Write and understand about file system coding in distributed system.	Understand/Analyse
C05	Exploring the concepts of Real time operating system and describe about security issues and applications of real time operating system.	Analyse
C06	Understand about working of operating system in handheld devices. Design and develop applications to work with files in LINUX.	Understand/Analyse/Apply

Mapping with programme outcomes:

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**S**	**M**								**L**		
CO2	**S**	**M**	**M**									
CO3	**S**	**L**	**L**									
CO4	**S**	**M**										
CO5	**S**	**L**	**M**									
CO6	**S**	**M**								**S**		

S- Strong; M-Medium; L-Low

Assessment pattern:

Bloom's Category	Continuous Assessment Test (%)			Terminal Examination
	1	2	3	
Remember	20	20	20	20
Understand	30	30	30	30
Apply	20	20	20	20
Analyse	30	30	30	30
Evaluate	0	0	0	0
Create	0	0	0	0

Course level assessment questions:

Basics in OS (CO1):

1. What are the different types of operating system?
2. What are the basic functions of operating system?
3. What are the purposes of operating system?
4. Explain in detail about history of operating system.
5. Brief the architecture of operating system.

Process Concepts (CO2):

1. Brief about process in operating system.
2. What is a critical section of a process?
3. List out the states of process in operating system.
4. How concurrent processes work?

5. How does a process changes from one state to other?

Deadlock (CO3):

1. Illustrate the reasons for deadlock.
2. Explain in detail about deadlock situations.
3. How to recover processes from deadlocks?
4. How to set the priority for process?
5. What is the role of process dispatcher?

Distributed Operating Systems (CO4):

1. Define distributed operating systems.
2. Briefly discuss about the issues in distributed operating systems.
3. Write a note about file systems in distributed operating systems.
4. Discuss the concept of communication primitives.
5. What is Lamport's logical clock?

Real time operating system (CO5):

1. What is Real time operating system?
2. Elaborate the applications of Real time operating system.
3. Write in detail about task scheduling in Real time operating system.
4. List out the applications of Real time operating system.
5. Write a brief note on model of Real time operating system.

Handheld operating system and LINUX (CO6):

1. Briefly elaborate hand held operating system.
2. Explain about technology in hand held operating system.
3. Define: PalmOS.
4. Write the commands used to access a file in LINUX.
5. Describe the architecture of LINUX.

Syllabus:

Unit I: Process Synchronization: Overview - Introduction – Functions of an operating system – Design approaches – Why advance operating systems – Types of advanced operating systems. Synchronization mechanisms: Introduction – Concept of a process – Concurrent processes – The critical section problem – Other synchronization problems. Process deadlocks: Introduction – preliminaries – models of deadlocks.

Unit II: Distributed Operating Systems: Issues – Communication Primitives – Lamport's Logical Clocks – Deadlock handling strategies – Issues in deadlock detection and resolution-distributed file systems –design issues – Case studies – The Sun Network File System-Coda.

Unit III: Realtime Operating Systems : Introduction – Applications of Real Time Systems – Basic Model of Real Time System – Characteristics – Safety and Reliability - Real Time Task Scheduling

Unit IV: Operating Systems for Handheld Systems: Requirements – Technology Overview – Handheld Operating Systems – PalmOS - Android –Architecture of android – Securing handheld systems

Unit V: Case Studies :Linux System: Introduction – Memory Management – Process Scheduling – Scheduling Policy - Managing I/O devices – Accessing Files- iOS : Architecture and SDK Framework - Media Layer - Services Layer - Core OS Layer - File System.

Reference books:

1. MukeshSinghal and Niranjan G. Shivaratri, "Advanced Concepts in Operating Systems – Distributed Database, and Multiprocessor Operating Systems", Tata McGraw-Hill Publishers, 2011.
2. Rajib Mall, "Real-Time Systems: Theory and Practice", Pearson Education India Publishers, Second Edition, 2008.
3. Pramod Chandra P.Bhatt, "An introduction to operating systems, concept and practice", PHI publishers, Third edition, 2013.
4. Daniel.P.Bovet& Marco Cesati, "Understanding the Linux kernel", O"ReillyPublishers , 3rd edition, 2005
5. Neil Smyth, "iPhone iOS 4 Development Essentials – Xcode", Payload media Publishers, Fourth Edition 2011.

E-Resources

1. http://nptel.ac.in/courses/Webcourse-contents/IIScBANG/Operating%20Systems/New_index1.html
2. https://www.tutorialspoint.com/operating_system/index.htm
3. https://www.coursera.org/courses?languages=en&query=operating+system
4. https://in.udacity.com/course/advanced-operating-systems--ud189

Course content and lecture schedule:

Module no	Topic	No of Lectures
1	**Process Synchronization**	

1.1	Overview - Introduction – Functions of an operating system	2
1.2	Design approaches – Why advance operating systems – Types of advanced operating systems	3
1.3	Synchronization mechanisms - Introduction	2
1.4	Concept of a process – Concurrent processes	2
1.5	The critical section problem – Other synchronization problems	2
1.6	Process deadlocks: Introduction – preliminaries – models of deadlocks.	3
2	**Distributed Operating Systems**	
2.1	Issues – Communication Primitives – Lamport's Logical Clocks	2
2.2	Deadlock handling strategies – Issues in deadlock detection and resolution	2
2.3	distributed file systems - design issues	3
2.4	Case studies – The Sun Network File System-Coda.	2
3	**Realtime Operating Systems**	
3.1	Introduction – Applications of Real Time System	2
3.2	Basic Model of Real Time System	2
3.3	Characteristics	2
3.4	Safety and Reliability	2
3.5	Real Time Task Scheduling	2
4	**Operating Systems for Handheld Systems**:	
4.1	Requirements – Technology Overview	2
4.2	Handheld Operating Systems	2
4.3	PalmOS	2
4.4	Symbian Operating System	2
4.5	Android - Architecture of android	2
4.6	Securing handheld systems	2
5	**Case Studies**	
5.1	Linux System: Introduction	2
5.2	Memory Management	2
5.3	Process Scheduling – Scheduling Policy	2
5.4	Managing I/O devices	2
5.5	Accessing Files- iOS : Architecture and SDK Framework - Media Layer - Services Layer - Core OS Layer.	3
5.6	File System.	2
	Total	**58**

Course Prepared by: Dr.S.Vijayarani

Course Verified by:Dr.E.Chandra

DATA STRUCTURES AND ALGORITHMS

Subject Code: 18CS1C3 **No. of Credits** **L P T**
2 2 4

Preamble The main objective of this course is to provide strong foundation to students to understand the concepts of data structures and algorithms, concepts about searching and sorting techniques, concepts about stacks, queues, lists, trees and graph and to understanding about writing algorithms and step by step approach in solving problems with the help of fundamental data structures. This subject focuses on area that comprises of a number of activities, which contains the ability to analyse algorithms, searching and sorting techniques. Accordingly, Data Structures and Algorithms about writing algorithms and step by step approach in solving problems with the help of fundamental data structures are included at the end of each chapter.

Prerequisite

Understanding data structures algorithms and writing algorithms step by step

Course Outcomes

On the successful achievement of the course, students will able to

CO1	Understand about the Data Structures and algorithms, Analysis of algorithms	**Understand / Analyse**
CO2	Understand about Stacks, Queues, Linked Lists	**Understand / Apply**
CO3	Understand about Binary Trees, Graphs	**Understand / Apply**
CO4	Understand about Divide and Conquer and Greedy Method	**Understand / Analyse**
CO5	Understand about Dynamic Programming, Traveling Salesman Problem	**Understand / Apply**
CO6	Understand about Branch and Bound	**Understand / Apply**

Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**S**	**M**	**S**									
CO2	**S**	**M**	**S**									
CO3	**S**	**S**	**M**									
CO4	**S**	**M**	**M**									
CO5	**M**	**S**	**S**									
CO6	**S**	**M**	**S**									

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's Category	Continuous Assessment Tests			Terminal Examination
	1	2	3	
Remember	10	10	10	10
Understand	30	30	30	30
Apply	30	30	30	30
Analyse	30	30	30	30
Evaluate	0	0	0	0
Create	0	0	0	0

Course Level Assessment Questions

Understand about Data Structures and algorithms, Analysis of algorithms (CO1):

1. What is an algorithm?
2. What are the main objectives of Data structure?
3. What is space complexity?
4. Give the two major phases of performance evaluation
5. What is time complexity?

Understand about Stacks, Queues, Linked Lists (CO2):

1. What is stack?
2. What is Queue?
3. What is Circular queues?
4. List out the different ways to implement the list?
5. Define singly linked list with neat diagram.

Understand about Binary Trees, Graphs (CO3):

1. What is binary tree?
2. How do we represent a tree?
3. What are search trees?
4. What is graph?

5. Define topological sorting.

Understand about Divide and Conquer and Greedy Method (CO4):

1. What is Divide and conquer?
2. What is binary search?
3. What is merge sort?
4. What is quick sort?
5. How is minimum spanning tree plays important role in finding the path?

Understand about Dynamic Programming, Traveling Salesman Problem (CO5):

1. What is Dynamic programming?
2. What are multistage graphs?
3. Define backtracking.
4. Define Hamiltonian cycles.
5. Write a note on Hamiltonian cycles?

Understand the concepts of Branch and Bound (CO6):

1. What is Branch and bound?
2. What is Knapsack Problem?
3. Define salesman problem?
4. How is travelling salesman problem helps in algorithm?
5. What is travelling salesman problem?

Syllabus

Unit - I : Introduction: Definition, Structure and Properties of algorithms –Development of an algorithm –Data Structures and algorithms –Data Structure definition and classification. Analysis of algorithms: Efficiency of algorithms –Apriori analysis –Asymptotic notations –Time complexity of an algorithm using O notation –Polynomial Vs Exponential algorithms –Average, Best and Worst case complexities –Analyzing recursive programs. X2

Unit – II: Stacks: Introduction -Stack Operations –Applications –Recursion -Evaluation of Expressions. Queues: Introduction -Operations on Queues –Circular queues –Application of a linear queue. Linked Lists: Introduction -Singly linked lists -Circularly linked lists -Doubly linked lists -Applications –polynomial addition

Unit - III : Binary Trees: Introduction –Representation of Trees –Binary Tree Traversals. Binary Search Trees: Introduction –Operations. AVL Trees: Definition -Operations. B-Trees: Introduction –m-way search trees -B trees definition and operations. Graphs: Introduction – Definitions –Representation of Graphs –Graph Traversal -Depth-First and Breadth-First Algorithms -Topological Sorting.

Unit - IV : Divide and Conquer: General Method –Binary Search –Merge Sort –Quick Sort. Greedy Method: General Method –Knapsack Problem –Minimum Cost Spanning Tree – Single Source Shortest Path.

Unit - V : Dynamic Programming: General Method –Multistage Graphs –All Pair Shortest Path –Traveling Salesman Problem.Backtracking: General Method –8-Queens Problem –Sum of Subsets –Hamiltonian Cycles. Branch and Bound: The Method –0/1 Knapsack Problem – Traveling Salesperson.

Reference Books:

1. GAV Pai, Data Structures and Algorithms Concepts, Techniques and Applications, Tata McGraw Hill.
2. Jean Paul Tremblay, Paul G. Sorenson, An Introduction to Data Structures with Applications, Tata McGraw Hill, Second Edition.
3. Sahini, "Data Structures, Algorithms and Applications in C++", McGrawHill, 1998.
4. Ellis Horowitz, SartajSahni, SanguthevarRajasekaran, "Fundamentals of Computer Algorithms", Second Edition, Universities Press, 2008
5. Robert Sedgewick, PhillipeFlajolet, "An Introduction to the Analysis of Algorithms", Addison- Wesley Publishing Company, 1996.
6. Alfred V. Aho, John E. Hocroft, Jeffrey D.Ullman, "Data Structures and Algorithms".

Course Contents and Lecture Schedule

Module No.	Topic	No.of lectures
1	**UNIT-I**	
1.1	Definition, Structure and Properties of algorithms –Development of an algorithm	2
1.2	Data Structures and algorithms –Data Structure definition and classification	2
1.3	Efficiency of algorithms –Apriori analysis –Asymptotic notations	2
1.4	Time complexity of an algorithm using O notation –Polynomial Vs Exponential algorithms	2
1.5	Average, Best and Worst case complexities –Analyzing recursive programs. X2	2
2	**UNIT-II**	
2.1	Introduction -Stack Operations –Applications –Recursion	2
2.2	Evaluation of Expressions. Queues: Introduction -Operations on Queues – Circular queues	2
2.3	Application of a linear queue. Linked Lists: Introduction -Singly linked lists	2
2.4	Circularly linked lists -Doubly linked lists -Applications –polynomial addition.	2
3	**UNIT-III**	

3.1	Binary Trees: Introduction –Representation of Trees –Binary Tree Traversals	2
3.2	Binary Search Trees: Introduction –Operations. AVL Trees: Definition - Operations.	2
3.3	B-Trees: Introduction –m-way search trees -B trees definition and operations	2
3.4	Graphs: Introduction –Definitions –Representation of Graphs	2
3.5	Graph Traversal -Depth-First and Breadth-First Algorithms -Topological Sorting	2
4	**UNIT-IV**	
4.1	Divide and Conquer: General Method Binary Search –Merge Sort	2
4.2	Quick Sort. Greedy Method: General Method	2
4.3	Knapsack Problem –Minimum Cost Spanning Tree	2
4.4	Single Source Shortest Path	1
5	**UNIT-V**	
5.1	Dynamic Programming: General Method –Multistage Graphs –All Pair Shortest Path	2
5.2	Traveling Salesman Problem	2
5.3	Backtracking: General Method –8-Queens Problem	2
5.4	Sum of Subsets –Hamiltonian Cycles	2
5.5	Branch and Bound: The Method –0/1 Knapsack Problem	2
5.5	Traveling Salesperson	2
	Total	47

Course prepared by: Dr.D.Napoleon

Course Verified by: Dr.E.Chandra

ADVANCED JAVA PROGRAMMING

Subject Code: 18CS1C4 **No. of Credits L P T**
22 4

Preamble

This course aims at exploring the knowledge to the student to understand the advanced JAVA concepts, to develop Java based applications and hands on practices by applying these advanced concepts to implement in web based applications.

Prerequisite:
Basic Java, Object Oriented Programming concepts.

Course outcomes:
On the successful completion of the course students will be able to

CO1	Apply events through swing.	Understand/Analyse/Apply
CO2	Develop distributed application using RMI	Understand/Analyse/Apply
CO3	Establishing DATABASE Connectivity using JAVA	Understand/Analyse/Apply
C04	Understand the JavaScript language & the Document Object Model.	Understand/Analyse/Apply
C05	Able to describe Well-Formed XML, Define XML, Identify Document Type Definitions, List the different types of XML Schemas	Understand/Analyse/Apply
C06	To familiarize about AJAX	Understand/Analyse
C07	Web application using Servlets and JSP	Understand/Analyse/Apply
C08	To familiarize Struts, Spring and Hibernate frameworks	Understand

Mapping with programme outcomes:

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**S**	**S**	**S**	**M**								
CO2	**S**	**S**	**S**	**M**	**M**							
CO3	**S**	**S**	**S**	**L**	**L**							
CO4	**S**	**S**	**S**	**M**								
CO5	**S**	**S**	**S**	**L**	**M**							
CO6	**S**	**S**	**S**	**M**								

CO7	**S**	**S**	**S**									
CO8	**S**	**S**										

S- Strong; M-Medium; L-Low

Assessment pattern:

Bloom's Category	**Continuous Assessment Test (%)**			**Terminal Examination**
	1	**2**	**3**	
Remember	20	20	20	20
Understand	30	30	30	30
Apply	20	20	20	20
Analyse	30	30	30	30
Evaluate	0	0	0	0
Create	0	0	0	0

Course level assessment questions:

Java Swing (CO1):

6. Implement simple calculator using swing components.
7. What are differences between Swing and AWT?
8. Why Swing components are called lightweight components?

Remote Method Invocation (CO2):

1. Define skeletons and stubs in RMI
2. Implement RMI to invoke a function.
3. What are the layers of RMI Architecture?

Database Handling (CO3):

6. Explain the Database Connection Pools and Data sources of JDBC in J2EE?
7. What are the JDBC API components?
8. Which interface is responsible for transaction management in JDBC?

JavaScript (CO4):

1. JavaScript to program the behavior of web pages
2. Is it possible to break JavaScript Code into several lines? If yes, explain how?

XML (CO5):

1. Discuss the benefits of XML.
2. What is XSLT?

3. Is XML meant to be a replacement of HTML?

AJAX (CO6):

1. What are the real web applications of AJAX currently running in the market?
2. What is the difference between synchronous and asynchronous requests?
3. What are the technologies used by AJAX?

Servlet and JSP(CO7):

1. What are Directives in JSP?
2. Write java Server Page to display the information.
3. How do deploy JSP?
4. What is the difference between GET and POST method?

Hibernate, Spring, Struts(CO8):

1. Describe the architecture of Struts
2. Describe the architecture of Spring
3. Describe the architecture of Hibernate.
4. Discuss how to chose a frame work for the application

Syllabus:

Unit I: Java Swing – Features – Classes and Packages – MVC architecture – Swing basic components – Buttons – Labels – List – Combo box – Menu Simple AWT application using Swing Components.

Unit II: Remote Method Invocation: RMI overview - RMI architecture - Example demonstrating RMI. Database Handling**:** Accessing Database using JDBC

Unit III: JAVA in WEB: Java Scripts: JavaScript language syntax, Built In Functions, HTML Forms, HTML DOM, XML: XML documents, XML schemes, and Extensible Style Language (XSL), Introduction to AJAX

Unit IV: Servlet:Introduction to servlet - Developing and Deploying Servlets - Handling Request and Response - Reading Servlet Parameters - Cookies - Session Tracking. Java Server Pages: Basic JSP Architecture - Life Cycle of JSP - JSP Tags and Expressions – Directives- JSP applications. Java Creating and using JavaBean components –Setting and retrieving JavaBean components – Java Server Faces Application.

Unit V: Hibernate, Spring, Struts: Introduction to Hibernate – Advantages – Architecture – Spring Framework -Struts Framework: Introduction to Struts- Struts Architecture.

Reference books:

1. Herbert Schildt - JAVA 2 (The Complete Reference)- Ninth Edition, TMH, 2014

2. Patrick Naughton, "The Java Hand Book, Tata McGraw Hill, 1996.

3.Brian Cole, Robert Eckstein, James Elliott, Marc Loy, David Wood, Java Swing, O'Reilly Publishers, second edition, 2002

4 Jim Keogh, "The Complete Reference J2EE, Tata McGraw-Hill, 2002.

5.KogentSolutionss, Java Server Programming Java Ee5 Black Book,Dreamtech Press, 2008

E-Resources

1. https://www.tutorialspoint.com/javascript
2. https://www.tutorialspoint.com/java_xml
3. https://www.tutorialspoint.com/ajax

List of Concepts to be covered in Practical:

1. Creating java program using swing components
2. Implementing RMI
3. Establishing JDBC Connectivity
4. Simple exercise in JavaScript, XML
5. Creating simple web applications using Servlets using GET POST methods
6. Creating simple web applications using JSP

Course content and lecture schedule:

Module no	Topic	No of Lectures
1	**Java Swing**	
1.1	Features , Classes and Packages	2
1.2	MVC architecture	1
1.3	Swing basic components, Buttons, Labels, List, Combo box	3
1.4	Menu Simple AWT application using Swing Components	2
2	**RMI**	
2.1	RMI overview, RMI architecture	3
2.2	Example demonstrating RMI	3
3	**Database Handling**	
3.1	Accessing Database using JDBC	4
4	**JAVA in WEB**:	
4.1	Java Scripts: JavaScript language syntax, Built In Functions,	3
4.2	HTML Forms, HTML DOM,	3
5	**XML**	
5.1	XML documents, XML schemes, and Extensible Style Language (XSL)	3
6	AJAX	
6.1	Introduction to AJAX	3
7	**Servlet**	

7.1	Introduction to servlet, Developing and Deploying Servlets	3
7.2	Handling Request and Response, Reading Servlet Parameters	3
7.3	Cookies, Session Tracking	3
7.4	**Java Server Pages**	
	Basic JSP Architecture , Life Cycle of JSP ,	**3**
7.5	JSP Tags and Expressions, Directives, JSP applications	**3**
7.6	JavaBean components,Setting and retrieving JavaBean components, Java Server Faces Application	**3**
8	**Struts, Spring, Hypernate**	
8.1	Struts framework introduction, Architecture	**3**
8.2	Spring framework introduction, Architecture	**3**
8.3	Hypernate framework introduction, Architecture	**3**
	Total	**58**

Course prepared by:Mrs.K.Geetha

Course Verified by: Dr.E.Chandra

PYTHON PROGRAMMING

Subject Code: 18CS1C5	**No. of Credits**	**L**	**P**	**T**
		2	**2**	**4**

Preamble This course provides the knowledge to the students of gaining a comprehensive knowledge and understanding of the basic components of Python programming language. Emphasis the principle of algorithm design, procedural programming, and language constructs common to most high level programming languages. It also enables the students to design, code, test, and debug Python language programs. At the end of this course, the students will be able to design real life situational problems and think creatively about solutions of them. Also, it enables the students to use the free open-source Python programming to write basic programs and high level applications using various concepts.

Prerequisite

Knowledge in different concepts of programming languages.

Course Outcomes

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

CO1:	Develop python programs for core python and data types using objects and functions	Apply
CO2:	Develop python programs for list and control statements and understand the different loops such as “for”, “while” and “do-while”	Apply/Create
CO3:	Apply the Mapping and the Dictionary technique for the given problem	Apply
CO4:	Implement File Objects and Object-Oriented Programming using python	Analyse
CO5:	Explain about the functions and packages involved in modules	Remember/ Understand
CO6:	Manage Errors and Exceptions and summarize the Network Programming	Understand
CO7:	Be exposed to advanced applications such as Internet Client Programming and GUI Programming	Analyse/Evaluate
CO8:	Describe about the methods involved in DB programming	Understand

Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M	M	L						M		
CO2	S	S	M	M						M		
CO3	M	S	M									
CO4	S	S	S	S						S		
CO5	S	S	M									
CO6	M	S	L									
CO7	M	S	S							M		
CO8	S	S	M									

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's Category	Continuous Assessment Tests			Terminal Examination
	1	2	3	
Remember	**10**	**10**	**10**	**10**
Understand	**20**	**20**	**20**	**20**
Apply	**30**	**30**	**30**	**30**
Analyse	**20**	**20**	**20**	**20**
Evaluate	**10**	**10**	**10**	**10**
Create	**10**	**10**	**10**	**10**

Course Level Assessment Questions

Develop python programs for core python and data types using objects and functions (CO1):

1. What is a python object?
2. Explain about the Variables and Assignments.
3. Discuss about the Built-in and factory functions.
4. List out the various operators used in python.

Develop python programs for list and control statements and understand the different loops such as "for", "while" and "do-while" (CO2):

1. Write a python program using control statements.
2. Differentiate between the loop statements.
3. List out the built in methods in control statements?
4. Explain in detail about the Python Objects and shallow and deep copies.

Apply the Mapping the Dictionary technique for the given problem (CO3):

1. List out the mapping type operators.
2. Discuss about the Dictionary Keys in detail.
3. Explain about the Built-in and Factory Functions.

Implement File Objects and Object-Oriented Programming using python (CO4):

1. Define : File objects
2. Explain about the Persistent Storage Modules.
3. Write a python program using inheritance concept.
4. Discuss in detail about the Object-Oriented Programming in python.

Explain about the functions and packages involved in modules (CO5):

1. Describe about the Modules and Files in python.
2. Define : Namespace
3. Explain about the Built-in Functions-Packages in Modules.

Manage Errors and Exceptions and summarize the Network Programming (CO6):

1. Discuss about the Exceptions in python.
2. Explain in detail about the Regular Expression.
3. Write a python program using Regexes.
4. Describe about the Network Programming.

Be exposed to use advanced applications such as Internet Client Programming and GUI Programming (CO7):

1. Explain about the Internet Client Programming in detail
2. Develop a python program for Internet Client and GUI Programming.
3. Describe about the Threads and Processes.
4. Elucidate about the Tkinter and Python?

Describe about the methods involved in DB programming (CO8):

1. Discuss about the DB Programming in detail.

2. Explain about the API in DB Programming.
3. What is Object Relational Managers?

Syllabus

Unit - I Core Python: Introduction-features-Comparative Study-Comments-Variables and Assignments. Python Objects: Standard types-Built-in-type Internal type-Standard type operator and Built-in functions-Categorizing standard type Unsupported type. Numbers: Introduction-Integer-Floating Point-Complex numbers-Operators-Built-in and factory functions. Sequences-Strings-Strings and Operator-String only operator- Built-in-Functions-Built-in-Methods-String Features-Unicode.

Unit – II List: List-Operators-Built-in-Functions-Built-in-Methods-Features of List. Tuple: Introduction Operators and Built-in-Functions-Features of tuples-Copying Python Objects and shallow and deep copies. Mapping type: Dictionaries- mapping type Operators-Built-in and Factory Functions-Built-in- Methods- Dictionary Keys. Set type: Introduction Operators-Built-in Function-Built-in Methods--Conditional and looping statement.

Unit – III File: File Objects- Built in Functions-Methods-Attributes-Standard files-Command line Argument-File System-File Execution-Persistent Storage Modules. Object-Oriented Programming: Classes and Instance- Binding and Method Invocation-Static Methods and Class methods-Inheritance. Modules: Modules and Files-Namespace-Importing Modules- Features-Built-in Functions-Packages.

Unit – IV Errors and Exceptions: Exceptions in python-Detecting and Handling Exceptions-Context Management-Raising Exception-Assertions. Regular Expression: Introduction-Special Symbols and characters-Regexes and Python Examples of Regexes. Network Programming: Introduction-Socket.

Unit – V Internet Client Programming - Transferring files-Email. Multi-threaded Programming: Threads and Processes- Global Interpreter Lock-Thread Module- Threading Module. GUI Programming: Introduction-Tkinter and Python. DB Programming: Introduction-Python DB-API-Object Relational Managers (ORM).

Reference books

1. Wesley J Chun. Core Python Programming, 2nd Edition, Pearson, Prentice Hall PTR Upper Saddle River, NJ, USA ©2006.

2. Wesley J Chun. Core Python Application Programming.3rd Edition, Prentice Hall Press Upper Saddle River, NJ, USA ©2012.

3. Mark Lutz. Learning Python, 5th Edition, O'Reilly & Associates, Inc. Sebastopol, CA, USA ©2003.

Course Contents and Lecture Schedule

Module No.	Topic	No. of

		Lectures
1	**UNIT-I**	
1.1	Introduction to Core Python	1
1.2	Python Objects	3
1.3	Numbers	3
1.4	Sequences	3
2	**UNIT-II**	
2.1	List	3
2.2	Introduction to Tuple	3
2.3	Mapping type	3
2.4	Set type	3
3	**UNIT-III**	
3.1	Introduction to File	3
3.2	Object-Oriented Programming	4
3.3	Modules	4
4	**UNIT-IV**	
4.1	Errors and Exceptions	4
4.2	Regular Expression	4
4.3	Network Programming	4
5	**UNIT-V**	
5.1	Internet Client Programming	4
5.2	GUI Programming	4
5.3	DB Programming	4
	Total	57

Online course detail

The students will also learn this course through online tutorials.

1. Swayam- Computational Science and Engineering using python.
2. Nptel- Data Structures and algorithms using python
3. Spoken Tutorial-Python

Course Prepared by:Dr.D.Ramyachitra

Course Verified by: Dr.E.Chandra

LINUX PROGRAMMING

Subject Code: 18CS2C1 **No. of Credits LP T**
2 2 4

Preamble:

The main objective of this courseis to provide the strong foundation to students on open source Linux operating system basics and advanced concepts such as processes, signals, pipes and inter-process communication using different IPC facilities. The course covers history of Linux OS, features of Linux OS, file structures, Basic Linux commands, file and directory manipulation commands, filters in Linux, VI editor, writing of shell scripts, creating shell programing in c library and system calls. This paper also focuses on processes, threads and signals aims to give adequate knowledge on handling of processes in a better way. The paper also train the students to equip their knowledge in Inter-process communications and networking using shared memory, message queue, semaphore and TCP and UDP sockets.

Prerequisite:

Fundamentals of Operating systems and basics of C language.

Course outcomes:

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

CO1:	Understand about Unix and Linux history, Unix architecture, GNU, Free software foundation, Distributions, Work with files and directories.	Remember/Understand
CO2:	Writing simple Shell scripts, Work with files using shell scripts.	Understand/Apply
CO3:	Understand System calls and library functions and create applications using c language	Understand/Apply
CO4:	Understand about processes, process structure, Analyse the process states, process controls and process	Understand/Analyse/Apply

relationships and zombie process.

CO5: Exploring the concepts of signals and threads and illustrate the use of signals and threads — Understand/Apply

CO6: Examine the use of inter-process communication facilities in Linux such as pipes, named pipes and message queues. — Understand/Analyse/Apply

CO7: Design and develop the client/server applications using shared memory with semaphores — Apply

CO8: Understand sockets and Create network based applications using TCP and UDP sockets. — Understand/Apply

Mapping with programme outcomes:

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**M**	**L**	**L**	**L**								
CO2	**S**	**L**	**L**	**L**							**L**	
CO3	**S**	**M**	**M**	**M**		**L**	**L**			**L**	**L**	**M**
CO4	**S**	**S**	**S**	**M**		**L**	**M**			**L**	**M**	**M**
CO5	**S**	**S**	**S**	**M**		**M**	**M**			**M**	**M**	**M**
CO6	**S**	**S**	**S**	**M**		**M**	**M**			**M**	**M**	**M**
CO7	**S**	**S**	**S**	**M**		**M**	**M**			**M**	**M**	**M**

S- Strong; M-Medium; L-Low

Assessment pattern:

Bloom's Category	Continuous Assessment Test (%)			Terminal Examination
	1	2	3	
Remember	20	20	20	20
Understand	30	30	30	30
Apply	20	20	20	20
Analyse	30	30	30	30
Evaluate	0	0	0	0

Create	0	0	0	0

Course level assessment questions:

Basicsin Linux OS (CO1):

1. Brief about Unix architecture
2. What are the features of UNIX?
3. What are the basic commands of Linux?
4. What are the different filters available in Linux?
5. Explain in details about system calls and libraries available in Linux?

Shell Programming (CO2):

1. Write a simple shell script to copy a file
2. Write a shell script to create a file with some contents.
3. List out the Linux commands available to working with files.
4. How to lock the file in Linux?
5. Write a simple shell script for copying content from one to another file.

File Permission (CO3):

1. Illustrate the steps behind the creation of special files.
2. Explain in details about the adjusting the file I/O.
3. Write the command for changing from one to another directory.
4. How to set the permissions for a file?
5. Differentiate stat and fstat.

Process control in Linux (CO4):

1. Define Linux process structure.
2. Briefly discuss about the process states.
3. Write about command line arguments
4. Distinguish the process controls.
5. What is Zombie process?

Signals and Threads (CO5):

1. Explain in details about signals.

2. Elaborate the signal sets.
3. Write in detail about Threads.
4. Define Thread synchronization.
5. Write a brief note on cancelling the Thread.

Inter-process communications in Linux (CO6):

1. Give an elaborate note on IPC.
2. Define the uses of popen() and pclose().
3. Define pipe.
4. Distinguish the difference between pipes and named pipes.
5. Write in detail about message queue?

Client/Server application using IPC (CO7):

1. Write in detail about shared memory
2. Briefly discuss about semaphores.
3. Explain in details about Client and server application using IPC.
4. Write a program to communicate client and server using IPC.

Socket programming (CO8):

1. What is Socket programming?
2. What are the differences between TCP and UDP sockets?
3. Write a TCP echo client server program
4. Write a UDP echo client server program
5. What are the options available in Sockets?

Syllabus:

Unit I: Introduction: History - Architecture of UNIX operating system – Features of UNIX - Basic commands – Working with files and directories – Commands - File types - File access processes permissions redirection - filters –What is Linux? – Distributions – The GNU Project and the Free Software Foundation.

Unit II: Shell programming in Linux**:** – vi editor – Shell syntax - variables – conditions and control structures- command execution – simple programs – System calls and library: Read –

Write – File and record locking – Adjusting the position of file I/O – Lseek - Close – File creation – Creation of special files – Changing directory, root, owner, mode – stat and fstat.

Unit III: Processes and Signals: Processes: Introduction of process – Process structure - Process states - Process termination – command line arguments - Process control – Process identifiers - Process relationships – Zombie process - Signals: Sending signals – Signal sets–Threads: Synchronization – Thread attributes – Cancelling a Threads.

Unit IV: Inter process Communication**:** Process – popen() and pclose() – Pipes –Named pipes (FIFO) – Message queues – Semaphores - Shared Memory – Client-Server application using IPC.

Unit V: Sockets: Introduction – Socket Connections - TCP sockets -TCP echo client server – UDP sockets - UDP echo client server - Socket options.

Reference books:

1. Neil Matthew, Richard Stones, Beginning Linux Programming, Third Edition, Wrox, Wiley Publishing Inc., 2004.
2. W. Richard Stevens, Bill Fenner, Andrew Rudoff, "UNIX Network Programming", Vol. 1 , The Sockets Networking API, Third Edition, Pearson education, Nov 2003.
3. W.Richard Stevens, Stephen A. Rago, Advanced programming in the UNIX environment, second edition, Addison Wesley, 2005.

E-Resources

- www.tutorialspoint.com/listtutorials/linux
- https://lecturenotes.in/subject/455/linux-programming-lp
- https://examupdates.in/unix-and-shell-programming/

List of Concepts to be covered in Practical:

1. Write shell scripts using basic Linux commands, File and Directory commands and Filtering commands.
2. Illustrate the use of control structures in Linux
3. Illustrate the use of Processes
4. Illustrate the use of signals and threads
5. Illustrate the use of pipes
6. Illustrate the use of named pipes (FIFO)
7. Develop the client/server applications using shared memory
8. Create the client/server applications using message queue

9. Develop the client/server applications using any IPC facility along with semaphore
10. Create Networking application using sockets

Course content and lecture schedule:

Module no	Topic	No of Lectures
1	**Introduction**	
1.1	History - Architecture of UNIX OS - Features of UNIX	2
1.2	Basic Commands	2
1.3	Working with files and directories - File access process and permissions redirections	3
1.4	Filters	2
1.5	What is LINUX? – Distributions - The GNU project and Free Software Foundation	1
2	**Shell Programming in Linux**	
2.1	Vi editor - Shell syntax - variables	2
2.2	Conditions and control structures	3
2.3	Command execution and simple program	2
2.4	System calls and Library: Read – Write - file and record locking - adjusting the position of the file I/O	3
2.5	Lseek, - close - file creation - creation of special files - changing directory, root, owner, mode – stat and fstat	2
3	**Processes and Signals**	
3.1	Introduction of process – Process structure	2
3.2	Process states – process termination	2
3.3	Command line argument – process controls	1
3.4	Process identifiers – process relationships – Zombie process	2
3.5	Signals	3
3.6	Threads	2
4	**Inter process Communication**	
4.1	Process – Popen() and Pclose()	2
4.2	Pipes and named pipes	2
4.3	Message queues	2
4.4	Semaphores	2
4.5	Shared memory	2
4.6	Client-Server application using IPC	2
5	**Sockets**	
5.1	Introduction	1
5.2	Socket connection	1
5.3	TCP sockets	2
5.4	TCP echo client server	2
5.5	UDP sockets	2

5.6	UDP echo client server	2
5.7	Socket options	1
	Total	**57**

Course Prepared by: Dr.R.Porkodi

Course verified by: Dr.E.Chandra

DATABASE ADMINISTRATION AND MANAGEMENT

Subject Code: 18CS2C2 **No. of Credits** **L P T**
2 2 4

Preamble

The aim of this course is to bring the database management and administration concepts for the post graduate students in the second semester. The course covers Advanced SQL, PL/SQL, triggers, sub queries, advanced transaction processing, recovery and data security. This course focuses on DDBMS, distributed database design and client/server vs DDBMS. The course also covers Business intelligence and data warehouses and access control. At the end of this course, the students will be able to understand and effectively explain the key concepts of database technologies. They will gain knowledge about programming in PL/SQL including stored procedures, stored functions, cursors and packages.

Prerequisite

Knowledge in programming languages.

Course Outcomes

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

CO1:	Acquire knowledge to design and create tables in databases	Understand/ Remember
CO2:	Explain advanced SQL, sub queries	Understand/Apply
CO3:	Analyse the requirements of transaction processing, recovery and data security	Understand/ Analyse
CO4:	Learn advantages, disadvantages, design and development of distributed database management systems	Understand/ Analyse
CO5:	Explain business intelligence and data warehouses, security and authorization	Understand/Apply
CO6:	Understand about issues related to internet application	Understand /Apply

Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M	M									
CO2	M	S	M									
CO3	M	L	L									
CO4	M	L	M									
CO5	S	M	L									
CO6	S	M	L									

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's Category	Continuous Assessment Tests			Terminal Examination
	1	2	3	
Remember	**20**	**20**	**20**	**20**
Understand	**30**	**30**	**30**	**30**
Apply	**20**	**20**	**20**	**20**
Analyse	**30**	**30**	**30**	**30**
Evaluate	**0**	**0**	**0**	**0**
Create	**0**	**0**	**0**	**0**

Course Level Assessment Questions

Acquire knowledge to design and create tables in databases (CO1):

1. What is database management system?
2. Define database schema?
3. Explain the structure of a DBMS.
4 Explain the structure of relational models?
5. What is the purpose of database system?
6. Define keys?
7. Define relational operators?
8. Describe about database languages?

Explain advanced SQL, sub queries (CO2):

1. Explain SQL functions?
2. Define SQL alias and SQL join?
3. What is a trigger?
4. Explain in detail about function sand procedures?
5. Describe embedded SQL and dynamic SQL?

Analyse the requirements of transaction processing, recovery and data security (CO3):

1. Explain concurrent transaction in DBMS?
2. Describe deadlock handling?
3. Define RAID?
4. Explain data security?
5. What is mandatory access control?

Learn advantages, disadvantages, design and development of distributed database management systems (CO4):

1. Explain the evolution of distributed database management system?
2. Describe advantages and disadvantages of DDBMS?
3. Define DDBMS components?
4. What is distribution transparency?
5. Explain in detail about distributed database design?

Explain business intelligence and data warehouses, security and authorization (CO5):

1. What is the need for data analysis?
2. Explain business intelligence and architecture?
3. Define access control?
4. Describe security for internet applications?
5. What are the issues related to security?

Syllabus

Unit - I Introduction: Purpose of Database Systems -View of Data -Database Languages -Data Storage and Querying-Transaction Management –Storage Management –Data Mining and Information Retrieval -Speciality Databases -Database Users and Administrators–Relational Databases: Introduction to the Relational Model -Structure of Relational Databases-Database Schema -Keys-Schema Diagrams -Relational Query Languages -Relational Operations.

Unit - II Advanced SQL: Constraints- SQL CREATE INDEX- SQL functions-The GROUP BY statement-The HAVING clause- SQL special functions- SQL alias- SQL join – Sub queries-Recursive queries-Data control language-Views and assertion- PL/SQL- a basic introduction-Triggers- Event condition action model-Functions and procedures-Embedded SQL and dynamic SQL- The java way to access RDBMS: JDBC- SQLJ.

Unit - III Advanced transaction processing and recovery: Defining a transaction in DBMS-Defining a concurrent transaction in DBMS- Serializability and Recoverability- Enhanced lock-based and time-stamp based concepts-Multiple granularity-Multi version schemes-optimistic concurrency control techniques-Deadlock handling-Recovery in DBMS-write Ahead logging protocol-Advanced recovery techniques-Use of SQL in recovery -RAID. Data security: Data security issues- Discretionary access control- Mandatory access control- Role based access control- SQL injection- Statistical databases- Introduction to flow control.

Unit - IV Distributed Database Management Systems: The Evolution of Distributed Database Management Systems -DDBMS Advantages and Disadvantages -Distributed Processing and Databases -Characteristics of Distributed DBMS -DDBMS Components -Levels of Data and Process Distribution -Distribution Transparency -Transaction Transparency-Distributed Database Design -Client/Server vs. DDBMS.

Unit - V Business Intelligence and Data Warehouses: The Need for Data Analysis -Business Intelligence and Architecture -Data Warehouse-OLAP -Star Schemas -Implementing a Data Warehouse -SQL Extensions for OLAP. Database Connectivity - Internet Databases. Security and authorization: Access control- Discretionary access control-Mandatory access control – security for internet applications-Issues related to security-case study.

Reference books

1.Henry F Korth, Abraham Silberschatz, S. Sudharshan, “Database SystemConcepts”, Fifth Edition, McGraw Hill, 2006.
2.RaghuRamakrishnan, Johannes Gehrke, “Database Management Systems”, McGraw Hill, Third Edition 2004.

3.RiniChakrabarti, ShilbadraDasgupta, Subhash K. Shinde, ”Advanced database management system”, KLSI, Dreamtech press, 2014.

Course Contents and Lecture Schedule

Module No.	Topic	No.of lectures
1	**UNIT-I**	
1.1	Introduction to database system	1
1.2	Database Languages	1
1.3	Data storage and querying	1
1.4	Transaction and Storage management	2
1.5	Data mining and information retrieval	1
1.6	Databases users and administrators	1
1.7	Relational databases: Introduction to the relational model	1
1.8	Structural of relational databases and database schema	1
1.9	Relational query languages and Relational operations	2
2	**UNIT-II**	
2.1	Advanced sql	2
2.2	Constraints sql create index	2
2.3	Sql functions	3
2.4	Data control language	2
2.5	PL/SQL- a basic introduction	2
2.6	Triggers	2
3	**UNIT-III**	
3.1	Advanced transaction processing and recovery	2
3.2	Defining a concurrent transactions in DBMS	2
3.3	Optimistic concurrency control techniques	3
3.4	Deadlock handling	3
3.5	Recovery in DBMS	2

3.6	Data security and Access control	3
4	**UNIT-IV**	
4.1	Distributed database management system	1
4.2	DDBMS components	2
4.3	Distributed database design	2
4.4	Client/server vs DDBMS	2
5	**UNIT-V**	
5.1	Business intelligence and data warehouses	2
5.2	OLAP & Star schema	2
5.3	Database connectivity	3
5.4	Security and authorization	2
5.5	Security for internet application	2
	Total	57

Course Prepared by:Dr.D.ramyachitra

Course Verified by: Dr.E.Chandra

INFORMATION SECURITY

Subject Code: 18CS2C3 **No. of Credits L P T**
4 0 4

Preamble

This course aims on the fundamentals of information security, to study legal ethic in information security, risk management, planning for security management, security technologies and cryptography. The student should know the possible threats and vulnerabilities of their system. By the end of this course, the student will be able to describe major threats, attacks, possible vulnerabilities, risk management, plan for security and able to advise an individual seeking protection to their data.

Prerequisite:

Degree level knowledge in the field of computer and internets.

Course outcomes:

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

CO1	Define information security Enumerate the phases of the security systems development life cycle Describe the issues facing software developers	Understand
CO2	Describe the functions of and relationships among laws, regulations, and professional organizations in information security and to differentiate between laws and ethics	Understand
CO3	Define risk management, risk identification, and risk control Assess risk based on probability of occurrence and likely impact Describe the various risk mitigation strategy options Recognize the existing conceptual frameworks for evaluating risk controls and formulate a cost benefit analysis Describe how to maintain and perpetuate risk controls	Understand /Analyse
C04	Describe what an information security blueprint is, identify its major components, and explain how it supports the information security program Discuss how an organization institutionalizes its policies, standards, and practices using education, training, and awareness programs Explain what contingency planning is and how it relates to incident response planning, disaster recovery planning, and business continuity plans	Understand/ Apply

C05	Recognize the important role of access control in computerized information systems, and identify and discuss widely-used authentication factors Describe the technology that enables the use of virtual private networks	Understand/ Apply
C06	Explain the basic principles of cryptography Describe the operating principles of the most popular cryptographic tools Discuss the nature and execution of the dominant methods of attack used against cryptosystems	Understand/ Apply/ Analyse

Mapping with programme outcomes:

Cos	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1		**S**	**M**									
CO2					**M**			**S**				
CO3				**S**		**M**						
CO4		**L**		**M**					**S**			
CO5		**S**	**M**									
CO6		**M**	**S**	**M**								

S- Strong; M-Medium; L-Low

Assessment pattern:

Bloom's Category	**Continuous Assessment Test (%)**			**Terminal Examination**
	1	**2**	**3**	
Remember	30	20	20	20
Understand	40	40	40	40
Apply	30	30	30	30
Analyse	0	10	10	10
Evaluate	0	0	0	0
Create	0	0	0	0

Course level assessment questions:

Introduction:(CO1):

1. What is the difference between a threat agent and a threat?

2. Describe the critical characteristics of information. How are they used in the study of computer security?
3. Which management groups are responsible for implementing information security to protect the organization's ability to function? What are the different types of operating system?
4. Describe how such an attack can cause losses.

Legal, Ethical And Professional Issues(CO2):

1. What is the difference between law and ethics?
2. Give examples of public law.

Risk Management (CO3):

1. Why is the identification of risks, by listing assets and their vulnerabilities, so important to the risk management process?
2. What are vulnerabilities? How do you identify them?
3. What is a cost benefit analysis?

Planning for Security(CO4):

1. Where can a security administrator find information on established security frameworks?
2. Discuss any one information security frameworks
3. What are the five elements of a business impact analysis?

Security Technology(CO5):

1. Discuss the relationship among the untrusted network, the firewall, and the trusted network
2. How is an application layer firewall different from a packet-filtering firewall?
3. What is a VPN? Why is it becoming more widely used?

Cryptography (CO6):

1. What are the three basic operations in cryptography?
2. What is the difference between digital signatures and digital certificates?
3. Encrypt the message " Bharathiar" by the Caesar Cipher using a left shift of 3

Syllabus:

Unit - I INTRODUCTION: History, What is Security, CNSS Security Model, Components of an Information System, Balancing Information Security and Access, The Systems Development

Life Cycle, The Security Systems Development Life Cycle. Communities of interest-Need for security: Threats, Attacks

Unit - II LEGAL, ETHICAL AND PROFESSIONAL ISSUES: Law and Ethics in Information Security, International Laws and Legal Bodies, Ethics and Information Security, Codes of Ethics and Professional Organizations Risk Management: An Overview of Risk Management, Risk Identification, Risk Assessment, Risk Control Strategies, Selecting a Risk Control Strategy

Unit - III PLANNING FOR SECURITY: Information Security Policy, Standards and Practices, The Information Security Blueprint, Security Education, Training and Awareness Program, Continuity Strategies

Unit - IV SECURITY TECHNOLOGY: Firewalls and VPNs- Intrusion Detection and Prevention Systems, Honeypots, Honeynets and padded cell systems -Scanning and Analysis Tools- bio metric access control.

Unit - V Cryptography: Cipher Methods, Cryptographic Algorithms, Cryptographic Tools, Protocols for secured communication-Attacks on Cryptosystems

Reference books:

1. Michael E Whitman and Herbert J Mattord, "Principles of Information Security", 4th Edition, Course Technology, Cengage Learning.
2. Micki Krause, Harold F. Tipton, "Handbook of Information Security Management", Vol 1-3 CRC Press LLC, 2008.
3. Stuart McClure, Joel Scrambray, George Kurtz, "Hacking Exposed", Tata McGraw- Hill, 2003
4. William Stallings, Cryptography and Network Security, Pearson Education, 2000.
5. Nina Godbole, Information Systems Security, Wiley-2009.

E-Resources

https://www.coursera.org/learn/information-security-data

Course content and lecture schedule:

Module no	Topic	No of Lectures
1	**Introduction**	
1.1	History, What is Security	1
1.2	CNSS Security Model	1
1.3	Components of an Information System	1
1.4	Balancing Information Security and Access	2

1.5	The Systems Development Life Cycle, The Security Systems Development Life Cycle. Communities of interest	2
1.6	Need for security: Threats, Attacks	3
2	**Legal, Ethical and Professional Issues**	
2.1	Law and Ethics in Information Security, International Laws and Legal Bodies,	3
2.2	Ethics and Information Security, Codes of Ethics and Professional Organizations	3
2.3	Risk Management: An Overview of Risk Management, Risk Identification, Risk Assessment,	3
2.4	Risk Control Strategies, Selecting a Risk Control Strategy	3
3	**Planning for security**	
3.1	Information Security Policy, Standards and Practices	2
3.2	The Information Security Blueprint	2
3.3	Security Education, Training and Awareness Program	2
3.4	Continuity Strategies	2
4	**Security technology**	
4.1	Firewalls and VPNs- Intrusion Detection and Prevention Systems	3
4.2	Honeypots, Honeynets and padded cell systems	3
4.3	Scanning and Analysis Tools- bio metric access control	3
5	**Cryptography**	
5.1	Cipher Methods,	2
5.2	Cryptographic Algorithms,	2
5.3	Cryptographic Tools, Protocols for secured communication-Attacks on Cryptosystems	2
5.4	Protocols for secured communication	2
5.5	Attacks on Cryptosystems	3
	Total	**50**

Course Prepared by: Mrs.K.Geetha

Course Verified by: Dr.E.Chandra

INTERNET OF THINGS

Subject Code: 18CS2C4 **Number of Credits: L P T**
4 0 4

Preamble:

The objectives of this course is to provide in-depth understanding of the underlying concepts of Internet of Things, Physical and Logical Design of IoT, Enabling Technologies and Deployment templates. The course presents the IoT design methodology, architectures and communication protocols used in IoT, Web of Things, Cloud of Things, Applications and case studies of IoT.

Prerequisite:

Sensors, Network Reference Model

Course Outcomes:

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

CO1:	Understand the basics of IoT and its characteristics	Remember/Understand
CO2:	Interpret the building blocks of IoT from physical and logical context	Understand/Analyze
CO3:	Understand the functionality of various architectures and protocols of IoT	Understand/Analyze
CO4:	Recognize the importance of Web of Things and Cloud of Things	Remember/Understand
CO5:	Explore the applications of IoT in various domains and analyze the real world design constraints	Analyze/Apply/Create

Mapping with Programme Outcomes:

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

S- Strong; M-Medium; L-Low

Assessment pattern:

Bloom's Category	Continuous Assessment Test (%)			Terminal Examination
	1	2	3	
Remember	40	20	10	20
Understand	40	20	10	20
Apply	20	30	30	20
Analyze	0	30	20	20
Evaluate	0	0	0	0
Create	0	0	30	20

Course level assessment questions:

Understand the basics of IoT and its characteristics (CO1):

1. Define Internet of Things.
2. What are the characteristics of IoT?
3. List the various IoT enabling technologies.
4. Illustrate the four pillars of IoT.

Interpret the building blocks of IoT from physical and logical context (CO2):

1. Compare IoT and M2M.
2. Illustrate the IoT Design Methodology.
3. Deduce the importance of SDN and NFV for IoT.
4. Infer the role of OGC architecture in developing IoT systems.

Understand the functionality of various architectures and protocols of IoT (CO3)

1. Examine the functions of IoT reference Architecture.
2. Explain the M2M High-Level ETSI architecture.
3. Infer the difference between functional and communication model.
4. Identify the traditional protocols used in IoT.

Recognize the importance of Web of Things and Cloud of Things (CO4):

1. Distinguish between Web of Things and Internet of Things.

2. How IoT transformed into WoT?

3. Outline the features of Cloud of Things.

4. Interpret the facilities offered by Cloud of Things to Internet of Things.

Explore the applications of IoT in various domains and analyze the real world design constraints (CO5):

1. "Short range communication technologies are highly affordable to home automation"- Justify.

2. Analyze and Classify the IoT enabling technologies used in Domain Specific IoT.

3. Examine the privacy issues to be considered while designing healthcare systems.

4. Assume an application of cattle monitoring system in a farm field. A farmer consists of 500 cows, 250 goats in his field. These are to be protected from wild animals like tiger, fox, and wild dogs attacking them during night. Develop an IoT-based system which detect the wild animals entering into field and intimate it to the farmer. Choose the appropriate technology and standards to implement this system. Explain with proper reasons for choosing that standards.

Syllabus:

UNIT- I: Fundamentals of IoT and Design MethodologyIntroduction to Internet of Things: Definition & Characteristics of IoT-Physical Design of IoT- Logical Design of IoT-IoT Enabling Technologies- IoT Levels & Deployment Templates- Four Pillars of IoT.

IoT and M2M: Introduction- M2M- Difference between IoT and M2M – SDN and NFV for IoT. IoT Platforms Design Methodology: Introduction- IoT Design Methodology.

UNIT- II: ArchitectureIoT Architecture: M2M High-Level ETSI Architecture - OGC Architecture - IoT Reference Model - Domain Model - Information Model - Functional Model - Communication Model – IoT Reference Architecture.

UNIT- III: Internet of Things Protocols and StandardsIntroduction- IoT Ecosystem -IoT Data Link Protocol-Network Layer Routing Protocols- Network Layer Encapsulation Protocols- Session Layer Protocols- Transport Layer Protocols- IoT Management Protocol- Security in IoT Protocols-IoT Challenges.

UNIT- IV: Web of Things and Cloud of ThingsWeb of Things versus Internet of Things – Two Pillars of the Web – Architecture Standardization forWoT– Platform Middleware for WoT – Unified Multitier WoT Architecture – WoT Portals and BusinessIntelligence. Cloud of Things: Grid/SOA and Cloud Computing – Cloud Middleware – Cloud Standards– Cloud Providers and Systems – Mobile Cloud Computing – The Cloud of Things Architecture.

UNIT-V: Applications and Case StudiesDomain Specific IoT: Introduction- Home Automation- Cities- Environment- Energy- Retail- Logistics- Agriculture- Industry- Health & Lifestyle and Case Studies.

Reference Books:

1. ArshdeepBahga, Vijay Madisetti, "Internet of Things – A hands-on approach", Universities Press, 2015.
2. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, StamatisKarnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1st Edition, Academic Press, 2014.
3. HwaiyuGeng, "Internet of Things and Data Analytics Handbook", John Wiley & Sons, 2017.
4. Honbo Zhou, The Internet of Things in the Cloud: A Middleware Perspective, CRC Press, 2012.

E-Resources:

1. NPTEL - http://nptel.ac.in/courses/106105166/
2. edX - https://www.edx.org/course/iot-networks-protocols-curtinx-iot3x

Course content and lecture schedule:

Module no	Topic	No of Lectures
1	**Introduction to Internet of Things**	
1.1	Definition & Characteristics of IoT	1
1.2	Physical Design of IoT	1
1.3	Logical Design of IoT	1
1.4	IoT Enabling Technologies	2
1.5	IoT Levels & Deployment Templates	2
1.6	Four Pillars of IoT	1
1.7	IoT and M2M	1
1.8	IoT Platforms Design Methodology	1
2	**IoT Architectures**	
2.1	M2M High-Level ETSI Architecture	2
2.2	OGC Architecture	1
2.3	IoT Reference Model	1
2.4	Domain Model	1
2.5	Information Model	1
2.6	Functional Model	1
2.7	Communication Model	1
2.8	IoT Reference Architecture.	1
3	**Internet of Things Protocols and Standards**	
3.1	Introduction- IoT Ecosystem	1
3.2	IoT Data Link Protocol	1
3.3	Network Layer Routing Protocols	1

3.4	Network Layer Encapsulation Protocols	1
3.5	Session Layer Protocols	1
3.6	Transport Layer Protocols	1
3.7	IoT Management Protocol	1
3.8	Security in IoT Protocols	1
3.9	IoT Challenges	1
4	**Web of Things and Cloud of Things**	
4.1	Web of Things versus Internet of Things – Two Pillars of the Web	1
4.2	Architecture Standardization for WoT	1
4.3	Platform Middleware for WoT	1
4.4	Unified Multitier WoT Architecture	2
4.5	WoT Portals and Business Intelligence	1
4.6	Grid/SOA and Cloud Computing – Cloud Middleware	1
4.7	Cloud Standards - Cloud Providers and Systems- Mobile Cloud Computing	1
4.8	The Cloud of Things Architecture.	1
5	**Applications and Case Studies**	
5.1	Domain Specific IoT: Introduction	1
5.2	Home Automation- Cities	1
5.3	Environment- Energy	1
5.4	Retail- Logistics	1
5.5	Agriculture	1
5.6	Industry	1
5.7	Health & Lifestyle	1
5.8	Case Studies.	2
	Total	**45**

Course Prepared by: Dr.P.B.Pankajavalli

Course Verified by: Dr.E.Chandra

DATA MINING TECHNIQUES AND TOOLS

Subject Code: 18CS2C5 **No. of Credits** **L** **P** **T**
2 **24**

Preamble

This course aims at facilitating the student to understand the concepts of data mining. Students can understand the various techniques involved in mining the data from the databases. The main objective of this course is to understand the data mining techniques, to know the concept of web mining and to learn the usage of data mining tools, WEKA and R.

Prerequisite:

Fundamentals of Database Management Systems.

Course outcomes:

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

CO1	Understand about data mining basics and data mining techniques.	Understand
CO2	Understand classification and clustering techniques.	Understand/Analyse
CO3	Understand about Association rules, discovery of association rules, techniques to retrieve association rules.	Understand/Analyse
C04	Understand about Web mining, Text mining and sequence mining.	Understand/Analyse
C05	Understand and develop applications using WEKA.	Understand/Analyse/Apply
C06	Understand and develop applications using R.	Understand/Analyse/Apply

Mapping with programme outcomes:

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**S**	**M**								**L**		
CO2	**S**	**M**	**M**									
CO3	**S**	**L**	**L**									
CO4	**S**	**M**										
CO5	**S**	**L**	**M**									
CO6	**S**	**M**								**S**		

S- Strong; M-Medium; L-Low

Assessment pattern:

Bloom's Category	**Continuous Assessment Test (%)**			**Terminal Examination**
	1	**2**	**3**	
Remember	20	20	20	20
Understand	30	30	30	30
Apply	20	20	20	20
Analyse	30	30	30	30
Evaluate	0	0	0	0
Create	0	0	0	0

Course level assessment questions:

Basics in Data Mining (CO1):

1. What is data mining?
2. What are the applications of data mining?
3. What are the challenges of data mining?
4. Explain in detail about decision tree.
5. Brief the working of CLOUDS algorithm.

Clustering Techniques(CO2):

1. What do you mean by clustering?
2. Explain the working of CLARA algorithm.
3. How does BIRCH algorithm works?
4. Explain in brief about Neural Networks.
5. Explain the steps in Genetic algorithm.

Association Rules (CO3):

1. Illustrate the working about Apriori algorithm.
2. Explain in detail about Dynamic Item set Counting algorithm.
3. How to retrieve rules using FP-tree growth algorithm?
4. Explain about Incremental algorithm.
5. What do you mean by Partition algorithm?

Web mining (CO4):

1. Define Web content mining.

2. Briefly discuss about the Web structure mining.
3. Write a note about Text clustering.
4. Discuss the concept of GSP algorithm.
5. How SPADE algorithm works?

Tools (CO5):

1. What is the need for data mining tool?
2. Elaborate the Explorer in WEKA.
3. Write in detail aboutClassification task in WEKA.
4. List out the decision making loop in R.
5. Write a brief note on Charts and graphsin R.

Syllabus:

Unit I: Data mining**:** Introduction – Definitions - KDD vs. Data mining - DM techniques – Issues and Challenges in Data Mining – Data mining application areas. Classification Technique: Introduction – Decision Trees: Tree Construction Principle - Decision Tree construction Algorithm –CART – ID3 – Rainforest –CLOUDS.

Unit II: Clustering techniques**:** Clustering paradigms – Partitioning algorithm - K-Means – KMedeoid algorithms – CLARA – Hierarchical Clustering - DBSCAN – BIRCH – Categorical clustering algorithms – STIRR - Other techniques. Introduction to neural network - learning in NN – Unsupervised Learning - Genetic algorithm.

Unit III: Association Rules: Concepts - Methods to discover association rules - A priori algorithm – Partition algorithm - Dynamic Item set Counting algorithm - FP-tree growth algorithm - Incremental algorithm - Generalized association rule.

Unit IV: Web mining: Basic concepts – Web content mining – Web structure mining – Web usage mining – Text mining: Text clustering - Sequence mining: The GSP algorithm – SPADE.

Unit V: Tools: Need for data mining tools - Introduction to WEKA – The Explorer – The Experimenter – Classification-Regression-Clustering- Nearest neighbor - Introduction to RData types-Variables Operators-Decision Making-Loop Control –Function-Strings-VectorsLists-Matrices-Arrays-Factors-Data Frames-Packages- Charts and graphs- Statistics.

Reference books:

1. Arun K. Pujari, Data Mining Techniques, Third Edition, Universities Press (India) Limited. Hyderabad, 2009.
2. Margaret H. Dunham, Data Mining Introductory and Advanced Topics, Pearson Education 2004.
3. Jaiwei Han and MichelineKamber, Data Mining Concepts and Techniques, MorganKaufmann Publishers, 2011, 3rd Edition.
4. Pieter Adriaans, DolfZantinge, Data Mining, Addison Wesley, 2008.
5. Ian H. Witten, Eibe Frank, Mark A. Hall, Data Mining: Practical Machine Learning Tools and Techniques. Elsevier, 2011.
6. Mark Gardener, Beginning R: The Statistical Programming Language
7. Robert Kabacoff, R in Action: Data Analysis and Graphics R

E-Resources

1. http://ucanalytics.com/blogs/learn-r-12-books-and-online-resources/
2. https://www.rstudio.com/online-learning/
3. https://www.datacamp.com/
4. https://www.futurelearn.com/courses/data-mining-with-weka
5. https://www.ibm.com/developerworks/library/os-weka1/index.html

List of Concepts to be covered in Practical:

WEKA

1. lassification – labor.arff – SimpleCART algorithm
2. Classification -vote.arff - ID3 algorithm
3. Classification - diabetes.arff - J48 algorithm
4. Classification -contact-lenses.arff - Random Forest algorithm
5. Clustering - weather.arff- Simple k-means using Euclidean distance and Manhattan distance measure
6. Clustering - iris.arff - Hierarchical clustering and DBSCAN algorithm.
7. Association Rule Mining - supermarket.arff - Apriorialgorithm
8. Association Rule Mining - wholesalecustomers.arff - FP-Tree Growth algorithm

R

9. Decision tree classification - iris dataset in R
10. Random forest classification algorithm -USArrests dataset in R
11. K-means clustering algorithm - weather dataset in R
12. K-medoids clustering algorithm - iris dataset in R
13. CLARA clustering algorithm - iris dataset in R
14. Hierarchical clustering algorithm - employee dataset in R
15. AprioriAssociation Rule Mining algorithm - wholesalecustomers dataset in R

Course content and lecture schedule:

Module no	Topic	No of Lectures
1	**Data mining:**	
1.1	Introduction – Definitions - KDD vs. Data mining - DM techniques.	1
1.2	– Issues and Challenges in Data Mining – Data mining application areas	1
1.3	Classification Technique: Introduction – Decision Trees: Tree Construction Principle - Decision Tree construction Algorithm	1
1.4	CART – ID3 - Rainforest –CLOUDS	2
2	**Clustering techniques**	
2.1	Clustering paradigms – Partitioning algorithm	1
2.2	K Means – KMedeoid algorithms	1
2.3	CLARA – Hierarchical Clustering - DBSCAN – BIRCH –	2
2.4	Categorical clustering algorithms – STIRR Other techniques	1
2.5	Introduction to neural network - learning in NN	2
2.6	Unsupervised Learning - Genetic algorithm.	1
3	**Association Rules**	
3.1	Concepts- Methods to discover association rules	1
3.2	A priori algorithm – Partition algorithm	1
3.3	Dynamic Item set Counting algorithm - FPtree growth algorithm	2
3.4	Incremental algorithm - Generalized association rule.	1
4	**Web mining**	
4.1	Basic concepts – Web content mining – Web structure mining – Web usage mining	1
4.2	Text mining: Text clustering	1
4.3	Sequence mining: The GSP algorithm – SPADE.	1
5	**Tools**	
5.1	Need for data mining tools - Introduction to WEKA – The Explorer – The Experimenter –	1
5.2	Classification – Regression – Clustering - Nearest neighbour	2

5.3	Introduction to RData types - Variables Operators	1
5.4	Decision Making - Loop Control –Function	1
5.5	Strings – Vectors - Lists – Matrices – Arrays – Factors.	1
5.6	Data Frames – Packages - Charts and graphs - Statistics.	1
	Total	**28**

Course Prepared by: Dr.S.Vijayarani

Course Verified by: Dr.E.Chandra

Elective Papers

Sem.	Suggested Code	Title of the Paper	No. of Credits
I	18CS1E01	Mathematical Foundations of Computer Science	4
	18CS1E02	Parallel Processing	4
	18CS1E03	Software Reliability	4
	18CS1E04	Web Services	4
	18CS1E05	Bio-Informatics	4
II	18CS1E06	Operation Research	4
	18CS1E07	Mobile Communication	4
	18CS1E08	Image Processing	4
	18CS1E09	Artificial Intelligence and Expert Systems	4
	18CS1E010	Software Quality Assurance	4

MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE

Subject Code: 18CS1E01 **No. of Credits L P T**
4 0 4

Preamble

The main objective of this course is to introduce the basic mathematical terminologies required to understand the various designing concepts, storage methods, concepts in digital principles, managing databases and to improve the skill of logical thinking for solving different kinds of problems.

The course aims at giving adequate exposure in the matrices, theory and applications of Set theory, probability, Mathematical Logic such as Propositional logic, Predicate logic, Lattices and Boolean Algebra, Automata theory which helps the learner to use them eventually in practical applications of computer science. These topics supports the advanced courses in computer science such as Image processing, data analytics, artificial intelligence, compiler and design, DBMS, etc.

Prerequisite:

Higher secondary level of mathematics and statistics.

Course outcomes:

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

CO1	Matrices: To lean about Matrix operations, determinant of a matrix, its properties and where it can be incorporated in computer applications	Apply
CO2	Set Theory: To introduce the basic of theory of sets, functions and relations and its applications	Apply
CO3	Probability: To understand and apply experiments, events, space; to understand bayse;sThorem	Apply
C04	Grammars and Languages: understand FA, NFA,DFA, Conversion of NFA to DFA, Derivation trees	Apply
C05	Mathematical Logic:The ability to translate natural language sentences into precise symbolic form, construction of truth table	Apply

and verification of tautology or contradiction

C06 Numerical Methods:derive appropriate numerical methods to solve algebraic and transcendental equations Apply

Mapping with programme outcomes:

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**S**	**S**	**S**	**M**	**L**							
CO2	**S**	**S**	**S**	**M**	**L**							
CO3	**S**	**S**	**S**	**M**	**M**							
CO4	**S**	**S**	**S**	**M**	**M**							
CO5	**S**	**S**	**S**	**M**	**M**							
CO6	**S**	**S**	**S**	**M**	**M**							

S- Strong; M-Medium; L-Low

Assessment pattern:

Bloom's Category	**Continuous Assessment Test (%)**			**Terminal Examination**
	1	**2**	**3**	
Remember	20	20	20	20
Understand	40	40	40	40
Apply	40	40	40	40
Analyse	0	0	0	0
Evaluate	0	0	0	0
Create	0	0	0	0

Course level assessment questions:

Matrices (CO1):

1. Obtain the inverse of a Matrix $\begin{bmatrix} 8 & -1 & -3 \\ -5 & 1 & 2 \\ 10 & -1 & -4 \end{bmatrix}$
2. Find the characteristic equation for A= $\begin{pmatrix} -1 & 3 \\ 2 & 4 \end{pmatrix}$
3. Construct 3X3 matrix with the elements, $a_{ij} = \frac{(i-2j)}{2}$

4. Let $A = \begin{pmatrix} 7 & 2 & 1 \\ 0 & 3 & -1 \\ -3 & 4 & -2 \end{pmatrix}$ Find A^{-1} using Adjoint of A
5. Prove by mathematical Induction $1 + 2 + 3 + \cdots + n - \frac{n(n+1)}{2}$

Set Theory(CO2):

1. if AUB = AUC and A∩B = A∩C, prove that B=C
2. What is a equivalence function?
3. Let f: R→ *R* and g: R→ *R* where R is the set of real numbers be given by $f(x)=x^2-2$ and g(x) =x+4. Find f•g and g•f. State whether these functions are one to one

Probability (CO3):

1. A bag contains 3 red , 6 white and 7 green balls. What is the probability that two balls drawn are white and green?

2. Find the probability of selecting a black card or a 6 from a deck of 52 cards
3. A pack contains 4 blue, 2 red and 3 black pens. If 2 pens are drawn at random from the pack, NOT replaced and then another pen is drawn. What is the probability of drawing 2 blue pens and 1 black pen?
4. Fit a straight line to the following data

X	1	2	3	4	6	8
Y	2.4	3	3.6	4	5	6

5. Calculate the coefficient of correlation between X and Y for the following

X	1	3	4	5	7	8	10
Y	2	6	8	10	14	16	20

Grammars and Languages(CO4):

1. Show the context free language are closed under union operation but not under intersection
2. Construct an FA accepting all string in $\{0.1\}^*$ having even number of 0's.
3. Prove that the Grammar is G= ({S, A, B},{a,b} , P, S) Where P S→aB|ab; S→aAB|a; S→ABb|b. ambiguous.
4. Consider the grammar G= ({S},{a,b} , P, S) where P is S→aSa; S→bSb; S→ε. Find the derivation tree for the language $a^3b^3b^3a^3$
5. Construct a finite DFA equivalent to the regular expression $10+(0+11)0^*1$.

Mathematical Logic(CO5):

1. Show that S ∨R is tautology implied by $(P \vee Q) \wedge (P \rightarrow R) \wedge (Q \rightarrow S)$

2. Write the truth table for ⌉(⌉P∨⌉Q)
3. Show that Q∨(P∧⌉Q)∨(⌉P∧⌉Q) is a tautology
4. Establish that ⌉(P∧Q) → (⌉P∨(P∨Q)) ⟹ (⌉P∨Q).
5. Verify the following implication by truth table. (*P*□ (*Q*□*R*))□ ((*P*□*Q*)□ (*P*□*R*))

Numerical Methods(CO6):

1. Find the root of the equationx^3-5x+3=0 using Newton Raphson method correct to 3 decimal places..
2. Find the root of the equation x^3+2x-5=0 using Bisection method correct to 3 decimal places
3. Solve equation using RegulaFalsi method of getting a root of $x^2 + 5x + 6 = 0$
4. Solve by Gauss elimination method
    a. 2x+y+4z=12
    b. 8x-3y+2z=20
    c. 4x+11y-z=33
5. Compute the value of $\int_0^1 \frac{dx}{1+x^2}$ by using Traphizoidal rule with h=0.5, 0.25 and 0.125.

Syllabus:

Unit I: Matrices: Types of Matrices - Matrix Operations - Inverse of a Matrix - Properties of Determinants - Eigen Values - Cayley-Hamilton Theorem. Set Theory: Basic Set Operations - Relations and Functions – Relation Matrices - Principle of Mathematical Induction

Unit II: Introduction to Probability: Sample Space and Events - Axioms of Probability - Conditional Probability – Independence of Events - Bayes Theorem. Regression and Correlation : Introduction – Linear Regression – Method of Least Squares – Normal Regression Analysis – Normal Correlation Analysis..

Unit III: Grammars and Languages: Context Free Grammars – Introduction – Context Free Grammars – Derivation Trees. Finite Automata: Finite State Systems – Basic Definitions – Non Deterministic Finite Automata

Unit IV: Mathematical Logic: Statements and Notations – Connectives – Consistency of Premises and Indirect Method of Proof – Automatic Theorem Proving

Unit V: Numerical Methods Finding Roots : Bisection Method - Regula–Falsi Method - Newton–RaphsonMethod. Solution of Simultaneous Linear Equations: Gaussian Elimination - Gauss-Seidal Method. Numerical Integration: Trapezoidal Rule - Simpson s Rule.

Reference books:

1. M. K. Venkataraman, “Engineering Mathematics, Volume II, National Publishing Company.

2. John E. Freunds, Irwin Miller, Marylees Miller, "Mathematical Statistics, Pearson Education, Sixth Edition.
3. Hopcroft and Ullman, "Introduction to Automata Theory, Languages and Computation , Pearson Education, Second Edition.
4. Tremblay and Manohar, "Discrete Mathematical Structures with Applications to Computer Science , Tata McGraw-Hill.
5. Rama B. Bhat, SnehashishChakraverty, "Numerical Analysis in Engineering ,Narosa Publishing House, 2004.
6. RadhaMuthu, T. Santha, "Discrete Mathematics for Computer Science and Applications, KalaikathirAchchagam, Coimbatore, 2003.

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E-Resources

1. https://www.math.hmc.edu/calculus/tutorials/matrixalgebra/
2. https://www.tutorialspoint.com/automata_theory/index.htm

Course content and lecture schedule:

Module no	Topic	No of Lectures
1	**Matrices and Set Theory**	
1.1	Types of Matrices	2
1.2	Matrix Operations and Inverse of a Matrix	2
1.3	Properties of Determinants, Eigen Values	2
1.4	Cayley-Hamilton Theorem	2
1.5	Set Theory: Basic Set Operations	2
1.6	Relations and Functions , Relation Matrices	2
1.7	Principle of Mathematical Induction	1
2	**Probability**	
2.1	Introduction to Probability: Sample Space and Events, Axioms of Probability - Conditional Probability	3
2.2	Independence of Events, Bayes Theorem.	3
2.3	Regression and Correlation : Introduction, Linear Regression	3
2.4	Method of Least Squares, Normal Regression Analysis, Normal Correlation Analysis	3
3	**Grammars and Languages**	
3.1	Context Free Grammars, Introduction, Context Free Grammars	3
	Derivation Trees	
3.2	Finite Automata: Finite State Systems, Basic Definitions	2
3.3	Non Deterministic Finite Automata Introduction, Applications of Real Time System	3

4	**Mathematical Logic**	
4.1	Statements and Notations	3
4.2	Connectives	3
4.3	Consistency of Premises and Indirect Method of Proof	3
4.4	Automatic Theorem Proving	3
5	**Numerical Methods**	
5.1	Finding Roots : Bisection Method, Regula–Falsi Method, Newton–Raphson Method	3
5.2	Solution of Simultaneous Linear Equations: Gaussian Elimination, Gauss-Seidal Method	3
5.3	Numerical Integration: Trapezoidal Rule, Simpson s Rule	3
	Total	**54**

Course Prepared by: Mrs.K.Geetha

Course Verified by: Dr.E.Chandra

PARALLEL PROCESSING

Subject Code: 18CS1E02 No. of Credits LP T

4 0 4

Preamble:

The main objective of this courseis to enable the student to be familiar with the definition and functions of parallel processing, Interrupt Mechanism and special hardware, principles of linear pipelining. The course covers the Overview of the parallel processing, pipeline computing, application of parallel processing, memory and I/O system, hierarchical memory structure, virtual memory, pipeline computers, types of pipelining and its applications. This paper also aims to provide the deep knowledge on vector processing, array processor, array processor, SIMD processor, types of SIMD computer organization, multiprocessor architecture, inter-process communication mechanism, time shared or common bus, parallel memory organization and classification of multi-processor operating system.

Prerequisite:

Fundamentals of processor and parallel processing.

Course outcomes:

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

CO1:	Understand about the concept of parallel processing, parallel computers and pipeline computers and also to acquire adequate information about applications of parallel processor.	Remember/Understand
CO2:	Understand the concepts behind the memory management and I/O systems. And also to obtain the deep knowledge on interrupt mechanism and special hardware.	Understand
CO3:	Understand the concepts of I/O processor and channel architecture.	Understand
CO4:	Understand the concept of pipeline computers and its structures. And also provides the better understanding on designing either a static or dynamic pipeline processor.	Understand/Analyse
CO5:	Analysing the concept of array processor, SIMD processor, and its interconnection networks.	Understand/Analyse
CO6:	Analysing the concept of static and dynamic networks construction and parallel algorithms for array processors.	Understand/Analyse
CO7:	Understanding the concept of multiprocessor architecture and functional structure of multiprocessor.	Analyse
CO8:	Analysing the concept of inter-process communication mechanism and classifying the multiprocessor operating system.	Understand/Apply

Mapping with programme outcomes:

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

CO6	**S**											
CO7	**M**											
CO8	**L**	**M**			**S**							

S- Strong; M-Medium; L-Low

Assessment pattern:

Bloom's Category	**Continuous Assessment Test (%)**			**Terminal Examination**
	1	**2**	**3**	
Remember	20	20	20	20
Understand	30	30	30	30
Apply	40	40	40	40
Analyse	10	10	10	10
Evaluate	0	0	0	0
Create	0	0	0	0

Course level assessment questions:

Introduction to parallel processor(CO1):

1. Describe about parallel processing.
2. What are the differences between uni-processing and parallel processing system.
3. Briefly explain about parallel computers.
4. Describe performance of parallel computers.
5. Discuss about applications of parallel processor.

Memory management in parallel processor (CO2):

1. Explain about hierarchical memory structures.
2. Describe brief notes on virtual memory system.
3. Briefly write a note on segmented memory system.
4. What are the characteristics of cache memories in parallel processing.
5. Define cache memory organization.

Input output management in parallel processor (CO3):

1. Define Input/Output subsystems.

2. Describe the characteristics of Input/Output subsystem.
3. Explain about Interrupt Mechanism and special hardware.
4. Briefly explain about I/O processor and channel architecture.
5. What are the feature of parallel processing.

Pipeline computers (CO4):

1. What are the principles of linear pipelining.
2. Describe about pipelined structures of a typical central processing unit.
3. Define classification of pipeline processors.
4. Explain about S access memory organization.
5. Distinguish between S access memory organization and C access memory organization.

Basics of Array processor (CO5):

1. What are the differences between Single Instruction stream and multiple data stream.
2. Explain about SIMD processors.
3. Describe about types of SIMD computer organization.
4. Briefly explain about array processor computer organization
5. Define SIMD interconnection networks.

Static and dynamic network construction (CO6):

1. Define static network construction.
2. Explain about dynamic network.
3. Distinguish between static and dynamic network construction.

Multiprocessor architecture and functional architecture (CO7):

1. Briefly explain about multiprocessor architecture.
2. Discuss about loosely and tightly coupled multiprocessor.
3. What are the characteristics of multiprocessors.
4. Explain about functional structures of multiprocessor.
5. Define functional architecture.

Inter-process communication mechanism (CO8):

1. Describe Interconnection networks.
2. Define inter processor communication mechanism.

3. Explain about parallel memory organization.
4. Discuss about classification of multiprocessor operating sytem.
5. What is interleaved memory configuration.

Syllabus:

Unit I: Introduction to parallel processing – definition and functions of parallel processing – uni-processor and parallel processing systems – parallel computers – pipeline computers – array processor – multiprocessor systems – performance of parallel computers – application of parallel processor.

Unit II: Memory and input/output system – memory system for parallel processor computers – hierarchical memory structures – virtual memory system – paged system – segmented system with paged segments – memory management policies – fixed partitioning and variable partitioning – cache memories and management – characteristics of cache memories – cache memory organization – input/output subsystem – characteristics of I/O subsystem – Interrupt Mechanism and special hardware – I/O processor and channel architecture.

Unit III: Pipeline computers – principles of linear pipelining – pipelined structures of a typical central processing unit – classification of pipeline processors – interleaved memory organization – S access memory organization – C access memory organization – C & S access memory organization – Static & dynamic pipelining – principles of designing static pipeline processors – Instruction prefetch and branch handling – data buffering and busing structures – Internal forwarding and register tagging – vector processing – requirements and characteristics of pipelined vector processing methods.

Unit IV: Array Processors – Single Instruction stream – Multiple data stream – SIMD processors – Types of SIMD computer organization – Array process or organization and associative processors – Array processor computer organization – SIMD interconnection networks – Static and Dynamic networks – Linear array, mesh, ring, star, tree, systolic, completely connected, chordalring and cube networks – Parallel algorithms for array processors – SIMD matrix multiplication – Parallel sorting on array processors.

Unit V: Multiprocessor architecture – Functional structures of a multiprocessor system loosely and tightly coupled multiprocessor – Processor characteristics of multiprocessing – Inter processor communication mechanism – Instruction set – Interconnection networks – Time shared or common bus – cross bar switch and multi p ort memories and multistage networks for multiprocessor – Parallel memory organization – Interleaved memory configurations – classification of multiprocessor operating system.

Reference books:

1. Kai Hwang, Faye A.Briggs, “Computer Architecture and Parallel Processing , Prentice

Hall of India, 1985.

E-Resources

- shodhganga.inflibnet.ac.in/bitstream/10603/3398/7/07_chapter%201.pdf
- brahms.emu.edu.tr/rza/chapter1.pdf
- https://www.ida.liu.se/~TDTS08/lectures/12/lec8.pdf
- https://engineering.ucsb.edu/~hpscicom/p1.pdf
- https://engineering.ucsb.edu/~hpscicom/p1.pdf

Course content and lecture schedule:

Module no	Topic	No of Lectures
1	**Introduction to parallel processing**	
1.1	Definition and functions of parallel processing	2
1.2	Uni-processor and parallel processing system	2
1.3	Parallel computers, pipeline computers, array processor	2
1.4	Multi-processor system	2
1.5	Performance of parallel computers, application of parallel processor	2
2	**Memory and I/O system**	
2.1	Memory system for parallel processor computers and hierarchical memory structures	2
2.2	Virtual memory system, paged system, segmented system with paged segments	2
2.3	Memory management policies, fixed partitioning and variable partitioning, cache memories and management.	2
2.4	Characteristics of cache memories, cache memory organization, input/output subsystem – characteristics of I/O subsystem	2
2.5	Interrupt Mechanism and special hardware, I/O processor and channel architecture	2
3	**Pipeline Computers**	
3.1	principles of linear pipelining, pipelined structures of a typical central processing unit	2
3.2	classification of pipeline processors, interleaved memory organization, S access memory organization	2
3.3	C access memory organization, C & S access memory organization	2
3.4	Static & dynamic pipelining, principles of designing static pipeline processors, Instruction prefetch and branch handling	2
3.5	Data buffering and busing structures, Internal forwarding and register tagging – vector processing	2
3.6	requirements and characteristics of pipelined vector processing methods	2
4	**Array processors**	
4.1	Single Instruction stream, Multiple data stream,	1

4.2	SIMD processors, Types of SIMD computer organization,	3
4.3	Array process or organization and associative processors	2
4.4	Array processor computer organization, SIMD interconnection networks	2
4.5	Static and Dynamic networks, Linear array, mesh, ring, star, tree, systolic, completely connected, chordalring and cube networks	3
4.6	Parallel algorithms for array processors, SIMD matrix multiplication, Parallel sorting on array processors.	2
5	**Multiprocessor architecture**	
5.1	Functional structures of a multiprocessor system loosely and tightly coupled multiprocessor	2
5.2	Processor characteristics of multiprocessing, Inter processor communication mechanism	2
5.3	Instruction set, Interconnection networks, Time shared or common bus	2
5.4	cross bar switch and multi-port memories and multistage networks for multiprocessor, Parallel memory organization	3
5.5	Interleaved memory configurations, classification of multiprocessor operating system	2
	Total	**56**

Course Prepared by: Dr. R. Porkodi

Course Verified by: Dr.E.Chandra

SOFTWARE RELIABILITY

Subject Code: 18CS1E03 **No. of Credits L P T**
4 0 4

Preamble

The aim of the course is to enrich the student knowledge in estimating the software reliability by giving exposure to the Software Life Cycle Models, Quality Modeling, SQA, TQA Software Reliability Models, Testing, Maintenance, Reusability of software and exercise on Case Studies.

Prerequisite:

Degree level knowledge in software development.

Course outcomes:

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

CO1	To explain how system reliability can be measured and how reliability growth models can be used for reliability prediction	Understand
CO2	To study Software Life Cycle Models and fault tolerance	Understand
CO3	To understand Quality Modeling, SQA, TQA	Understand
C04	To study Software Reliability Models	Understand/Apply/Analyse
C05	Understand Testing, Maintenance, Reusability of software's and case studies	Understand/Apply/Analyse

Mapping with programme outcomes:

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

S- Strong; M-Medium; L-Low

Assessment pattern:

Bloom's Category	**Continuous Assessment Test (%)**			**Terminal Examination**
	1	**2**	**3**	
Remember	20	20	20	20
Understand	40	40	40	40
Apply	20	20	20	20
Analyse	20	20	20	20
Evaluate	0	0	0	0
Create	0	0	0	0

Course level assessment questions:

Introduction (CO1):

1. Discuss the primary and secondary objectives to improve the reliability of software.
2. Discuss the reasons for software failures
3. What is Mean time to failure?

Software Life Cycle Models(CO2):

1. What Are The Models In SDLC?
2. Discuss about fault tolerance.

Quality Modeling, SQA, TQA (CO3):

1. Classify SQA system components.
2. List out the activities needed for SQA
3. What are the components of TQM

Software Reliability Models (CO4):

1. Discuss the characteristics of reliability models.
2. Explain how will estimate model accuracy

Testing, Maintenance, Reusability and case studies (CO5):

1. Difference between strategic test plan & test plan?
2. What is change management?
3. What Is Agile Testing?
4. What will be the Test case for ATM Machine

Syllabus:

Unit - I Software Reliability Definitions - software disasters - Errors - faults - failures - different views of software reliability – software requirements specification - Causes of unreliability in software - Dependable systems: reliable, safe, secure, maintainable, and available - Software maintenance.

Unit - II The phases of a Software Project - Monitoring the development process – The software life cycle models - software engineering - Structured Analysis and structured Design - Fault tolerance - Inspection - Software cost and schedule

Unit - III Software quality modeling - Diverse approaches and sources of information - Fault avoidance, removal and tolerance - Process maturity levels (CMM) - Software quality assurance (SQA) - Monitoring the quality of software - Total quality management (TQA) - Measuring Software Reliability - The statistical approach - Software reliability metrics.

Unit - IV Data Trends - Complete prediction Systems - overview of some software reliability models - The recalibration of the models - Analysis of model accuracy - Reliability growth models and trend analysis - Software Costs Models - Super models.

Unit -V Testing and maintaining more reliable software –logical testing – functional testing – algorithm testing – regression testing - fault tree analysis – failure mode effects and critical analysis – reusability - case studies.

Reference books:

1. J.D. Musa, A. Iannino and K.Okumoto, Software Reliability, Measurement, Prediction, Application, McGraw Hill, 1990.
2. J.D. Musa, Software Reliability Engineering, McGraw Hill, 1998.
3. Michael R. Lyer, Handbook of Software Reliability Engineering, McGraw Hill, 1995.
4. M., Software Reliability Modelling, World Scientific, London, 1991.

Course content and lecture schedule:

Module no	Topic	No of Lectures
1	**Introduction**	
1.1	Software Reliability Definitions, software disasters	2
1.2	Errors, faults, failures, different views of software reliability	3
1.3	Software requirements specification, Causes of unreliability in software	2

1.4	Dependable systems: reliable, safe, secure, maintainable, and available	2
1.5	Software maintenance	2
2	**Software Life Cycle Models**	
2.1	The phases of a Software Project	2
2.2	Monitoring the development process, The software life cycle models	2
2.3	Software engineering, Structured Analysis and structured Design	3
2.4	Fault tolerance, Inspection	2
	Software cost and schedule	
3	**Quality Modeling, SQA, TQA**	
3.1	Software quality modeling - Diverse approaches and sources of information	2
3.2	Fault avoidance, removal and tolerance	2
3.3	Process maturity levels (CMM)	2
3.4	Software quality assurance (SQA) - Monitoring the quality of software	2
3.5	Total quality management (TQA), Measuring Software Reliability ,The statistical approach	2
3.6	Software reliability metrics	2
4	**Software Reliability Models**	
4.1	Data Trends, Complete prediction Systems	2
4.2	Overview of some software reliability models, The recalibration of the models	2
4.3	Analysis of model accuracy	2
4.4	Reliability growth models and trend analysis	2
4.5	Software costs models	2
4.6	Super models	2
5	**Testing, Maintenance, Reusability and Case Studies**	
5.1	Testing and maintaining more reliable software, logical testing, functional testing	2
5.2	Algorithm testing , regression testing	2
5.3	Fault tree analysis, failure mode effects and critical analysis	2
5.4	Reusability	2
5.5	Case studies.	3
	Total	**55**

Course Prepared by: Mrs.K. Geetha

Course Verified by: Dr.E.Chandra

WEB SERVICES

Subject Code: 18CS1E04 No. of Credits LP T

4 0 4

Preamble:

The main objective of this courseis to provide the strong foundation to students to be familiar with distributed services, XML and web services. The course covers the Overview of the distributed computing, introduction to web services, technologies and concepts underlying web services, XML, SOAP, WSDL, UDDI specification, static and interactive aspects of system interface and its implementation, work flow, orchestration and refinement, transactions, security issues, the common attacks, security attacks facilitated within web services quality of services, QOS metrics, mobile and wireless service, building real world web service applications, Deployment of Web services and applications onto Tomcat application server.

Prerequisite:

Fundamentals of mark-up language, basic knowledge on distributed services.

Course outcomes:

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

CO1:	Understand about the distributed computing, web services, technologies and concepts underlying webservices and applications that consumes the web services.	Remember/Understand
CO2:	Understand the basic concepts of XML, XML document (WSDL) and the concepts of XML protocol (SOAP), locating the remote web services.	Understand
CO3:	Understand the concepts of UDDI and its specifications.	Understand

CO4:	Understand the concepts of system interface and its workflow, the common attacks.	Understand/Analyse
CO5:	Examining the concepts of architecture of system to meet the user requirements and analyse the concepts of mobile and wireless services.	Understand/Analyse
CO6:	Design and develop the real-world enterprise applications using web services.	Understand/Analyse/Apply
CO7:	Analysing the steps necessary to build and deploy the web services.	Analyse
CO8:	Applying the applications created based on the web services on different web servers like TOMCAT, axis SOAP server.	Understand/Apply

Mapping with programme outcomes:

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**S**	**S**	**M**									
CO2	**S**				**M**			**S**				
CO3	**M**			**S**		**M**						
CO4	**S**	**L**		**M**					**S**			
CO5	**M**	**S**	**M**									
CO6	**M**	**M**	**S**	**M**								
CO7	**M**	**S**	**M**									
CO8	**S**				**M**			**S**				

S- Strong; M-Medium; L-Low

Assessment pattern:

Bloom's Category	Continuous Assessment Test (%)			Terminal Examination
	1	2	3	
Remember	20	20	20	20

Understand	30	30	30	30
Apply	40	40	40	40
Analyse	10	10	10	10
Evaluate	0	0	0	0
Create	0	0	0	0

Course level assessment questions:

BasicsDistributed computing and web services (CO1):

1. What is distributed computing?
2. Brief about web services?
3. How to consume a web service?
4. What is support to web services?
5. Explain web service technology?

Basic concepts of XML (CO2):

1. Explain fundamentals of XML?
2. Explain (i) SOAP message (ii) SOAP encoding
3. What is the difference between WSDL and SOAP?
4. Explain structure of WSDL?
5. What is remote web service?

UDDI specifications (CO3):

1. Describe elements of UDDI?
2. What is UDDI web service?
3. Explain specification of UDDI?
4. Explain Life cycle management and UDDI?
5. Describe UDDI Core Data Structures

Static and interactive aspects of system interface (CO4):

1. What is system interface in web service?
2. Explain workflow management system?
3. Describe BPEL for web services?
4. Write about Types of Security Attacks and Threats?
5. What is WS security?

Mobile and wireless services (CO5):

1. Define QOS metrics?
2. Explain performance and reliability?
3. Describe challenges with mobile?

4. Explain Proxy-Based Mobile Systems?
5. Write about J2ME web service?

Real-world enterprise applications (CO6):

1. Describe HTTP security?
2. Write note on programming for mobility?
3. Explain Building Evolvable and Composable Workflows?
4. Write sample source codes to develop web services?
5. Write real time use of web service?

Build and deploy the web service (CO7):

1. Write short notes on (i)customization (ii)maintenance
2. Write Steps necessary to build and deploy web services?
3. Write notes on mobility?
4. Describe multiple device and platform?
5. What is build of web server?

Deployment of web services on different servers (CO8):

1. What is Tomcat application server?
2. What is axis SOAP server?
3. What is deployment of web service?
4. What is the platform element in web service?
5. What is developing and deploying web services?

Syllabus:

Unit I: Overview of Distributed Computing. Introduction to web services – Industry standards, Technologies and concepts underlying web services – their support to web services. Applications that consume web services.

Unit II: XML– its choice for web services – network protocols to back end databases-technologies – SOAP, WSDL – exchange of information between applications in distributed environment – locating remote web services – its access and usage. **UDDI** specification – an introduction.

Unit III: A brief outline of web services – conversation – static and interactive aspects of system interface and its implementation, work flow – orchestration and refinement, transactions, security issues – the common attacks – security attacks facilitated within web services quality of services – Architecting of systems to meet users requirement with respect to latency, performance, reliability, QOS metrics, Mobile and wireless services – energy consumption, network bandwidth utilization, portals and services management.

Unit IV: Building real world enterprise applications using web services – sample source codes to develop web services – steps necessary to build and deploy web services and client applications to meet customer s requirement – Easier development, customization, maintenance, transactional

requirements, seamless porting to multiple devices and platforms.

Unit V: Deployment of Web services and applications onto Tomcat application server and axis SOAP server (both are free wares) – Web services platform as a set of enabling technologies for XML based distributed computing.

Reference books:

1. SandeepChatterjee, James Webber, "Developing Enterprise Web Services: An Architects Guide, Prentice Hall, Nov 2003

E-Resources

- https://www.tutorialspoint.com/webservices/webservices_tutorial.pdf
- https://www.tutorialspoint.com/webservices/webservices_tutorial.pdf
- https://www.w3.org/TR/ws-arch/wsa.pdf

Course content and lecture schedule:

Module no	Topic	No of Lectures
1	**Overview of Distributed computing**	
1.1	Introduction to web services	2
1.2	Industry standards, technologies and concepts underlying web services	3
1.3	Industry standards, technologies, concepts: their support to web services	3
1.4	Application that consume web services	2
2	**XML**	
2.1	XML choice for web services, network protocols to back end databases, technologies	3
2.2	SOAP, WSDL	3
2.3	Exchange of information between applications in distributed environment	2
2.4	Locating remote web services and its access, usage	2
2.5	UDDI specification – an introduction	3
3	**A brief outline of web services**	
3.1	Conversation, static and interactive aspects of system interface and its implementation, work flow	2
3.2	Orchestration and refinement, transactions, security issues	2
3.3	The common attacks, security attacks facilitated within web services quality of service	2
3.4	Architecting of systems to meet user's requirement with respect to latency, performance, reliability, QOS metrics	2
3.5	Mobile and wireless services: An introduction	2

3.6	Energy consumption, network bandwidth utilization, portals and service management.	3
4	**Building real world enterprise applications using web services**	
4.1	Sample source code to develop web service	3
4.2	Steps necessary to build and deploy web services	2
4.3	Client applications to meet customers requirements	3
4.4	Easier development, customization, maintenance, transactional requirements, seamless, porting to multiple devices and platforms.	3
5	**Deployment of Web services**	
5.1	Deployment of web services and applications on to Tomcat application server and axis SOAP server	5
5.2	Web services platform as a set of enabling technologies for XML based distributed computing.	5
	Total	**57**

Course Prepared by:Dr. R. Porkodi

Course Verified by: Dr.E.Chandra

BIOINFORMATICS

Subject Code: 18CS1E05 **No. of Credits** L P T
4 0 4

Preamble

The objective of this course is to furnish an interdisciplinary knowledge for the students understand Bioinformatics and Computational Biology. Emphasis will be given to the basics of bioinformatics, biological databases, and sequence analysis and to solve real research problems. At the end of this course, the students will become familiar with the use of a wide variety of biological database and will be able to apply these datasets to research problems. Also, the students will be able to use computational tools and approaches to extract information from different types of
bioinformatics data such as gene, protein, etc. and to analyse them in their area of research work. It helps the students to analyze the techniques involved in protein sequence analysis.

Prerequisite

Basic knowledge in computer, mathematics and molecular biology would be valuable.

Course Outcomes

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

CO1:	Explain the biological concepts in terms of structures and functions for DNA & Protein	Remember/Understand
CO2:	Describe about the various genome projects carried out in several model organisms.	Understand/Apply
CO3:	Estimate the difference between various biological databases such as sequence, structural and pathway	Analyse
CO4:	Identify the various methods involved in gene identification	Understand
CO5:	Distinguish between pairwise and multiple sequence alignment methods	Apply/Analyse/Evaluate
CO6:	Explain about the various elements involved in PERL Programming	Remember/Understand
CO7:	Illustrate about the concepts involved in structural biology and molecular modelling	Understand
CO8:	Identify the different methods involved in protein sequence analysis	Evaluate/Create

Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**M**	**S**	**S**	**S**	**S**	**M**	**S**		**L**	**S**		
CO2	**M**	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**L**		
CO3	**S**	**M**	**S**		**S**				**S**	**S**		**S**
CO4	**S**	**M**	**L**	**M**	**M**							
CO5	**S**	**S**	**S**	**M**	**M**							
CO6	**S**	**M**										
CO7	**S**	**M**	**L**	**M**	**M**							
CO8	**S**	**S**	**S**	**M**	**M**							

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's Category	Continuous Assessment Tests			Terminal Examination
	1	2	3	
Remember	**10**	**10**	**10**	**10**
Understand	**25**	**25**	**25**	**25**
Apply	**20**	**20**	**20**	**20**
Analyse	**20**	**20**	**20**	**20**
Evaluate	**15**	**15**	**15**	**15**
Create	**10**	**10**	**10**	**10**

Course Level Assessment Questions

Explain the biological concepts in terms of structures and functions for DNA & Protein (CO1):

1. Explain the steps involved in conversion of DNA to Protein.
2. Discuss about the applications of bioinformatics.
3. Describe about the various types of protein structures.
4. List out the importance of identifying the protein function.

Describe about the various genome projects carried out in several model organisms (CO2):

1. List out the various genome projects.
2. Define model organisms.

Estimate the difference between various biological databases such as sequence, structural and pathway (CO3):

1. Discuss about the various sequence databases.
2. Elaborate the various structural databases.
3. Mention the use of pathway databases.

Identify the various methods involved in gene identification (CO4):

1. Explain in detail about the gene identification methods.
2. Discuss about the computational methods involved in gene identification.
3. Differentiate between prokaryotic and eukaryotic organisms.

Distinguish between pairwise and multiple sequence alignment methods (CO5):

1. Describe about the various techniques involved in pairwise alignment.
2. Explain in detail about the multiple sequence alignment methods.
3. Discuss about the computational methods involved in multiple sequence alignment.

Explain about the various elements involved in PERL Programming (CO6):

1. List out various data types in perl programming
2. Distinguish between various loops in perl.
3. Describe in detail about the inputs and outputs in perl programming.

Illustrate about the concepts involved in structural biology and molecular modelling (CO7):

1. List out the application insights in structural biology and molecular modelling.
2. Discuss about the structural biology and molecular modelling in detail.

Identify the different methods involved in protein sequence analysis (CO8):

1. Define Blocks and motif
2. What is meant by protein domains?
3. Explain about the molecular visualization tools.
4. Describe in detail about the comparative modelling.

Syllabus

Unit - I Introduction – importance of bioinformatics – biological concepts – DNA & protein (Structure and functions).

Unit – II Model organisms and genome projects, Biological Databases, Sequence databases, Primary, secondary, composite databases, Nucleotide sequence databases (NCBI, EBI, DDBJ), Protein sequence databases (SwissPROT, TrEMBL, PIR, Expasy), Structural

databases, DNA structure databases, Protein structure database (PDB, SCOP, CATH), Genome databases, NCBI genome, Pathway database, KEGG.

Unit – III Sequence analysis – gene identification methods (Prokaryotic and eukaryotic), Needleman and Wunsch algorithm, Smith and Waterman algorithm, pairwise sequence alignment (local and global alignment), scoring a matrix (Pam and Blosum), Multiple sequence alignment, sequence motif analysis.

Unit – IV Elements of PERL Programming – Data types, syntax, loops, input and outputs.

Unit – V Structural biology and molecular modeling - Molecular visualization, RasMol, ViewerPro, Swiss PDB Viewer, Protein conformational analysis, Ramachandran plot, Secondary structure prediction, 3DPSSM, Protein Domains, Blocks and Motifs, CD Search, PDB Search, PDB Format, Comparative Modelling.

Reference books

1. T.K. Attwood, D.J. Parry-Smith, "Introduction to Bioinformatics", Pearson Education, Asia, 2003.
2. Dan E.Krane, Michael L.Raymer, "Fundamental concepts of Bioinformatics", Pearson Education, Asia, 2003.
3. Dr. K.Mani and N. Vijayaraj, "Bioinformatics for beginners", KalaikathirAchchagam, 2002.

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures
1	**UNIT-I**	
1.1	Introduction	2
1.2	Importance of bioinformatics	2
1.3	Biological concepts	3
1.4	DNA &protein	3
2	**UNIT-II**	
2.1	Model organisms and genome projects	3
2.2	Sequence databases	4
2.3	Structuredatabases	4
2.4	Pathwaydatabases	4
3	**UNIT-III**	
3.1	Sequenceanalysis	3
3.2	Pairwisesequencealignment	3
3.3	Multiplesequencealignment& motif analysis	4
4	**UNIT-IV**	
4.1	ElementsofPERLProgramming	3
4.2	Datatypes&syntax	3
4.3	Loops, input and outputs	3
5	**UNIT-V**	

5.1	Structuralbiology andmolecularmodelling	3
5.2	Proteinconformational analysis	4
5.3	Blocks and Motifs	4
	Total	**55**

Course Prepared by: Dr.D.Ramyachitra

Course Verified by: Dr.E.Chandra

OPERATION RESEARCH

Subject Code: 18CS1E06 **No. of Credits** **L P T**
4 0 4

Preamble The main objective of this course is to provide knowledge on Operation Research procedures and practices. This course covers the fundamentals of operation research where the objective of Operations Research, as a mathematical discipline, is to establish theories and algorithms to model and solve mathematical optimization problems that translate to real life decision making problems.

This course focuses on area of mathematics relevant to the field of operations research such as continuous optimization, discrete optimization, game theory, and stochastic models. At the end of this course the students will be able to understand the key concepts of optimization which estimates the operations research problems which are broken down into basic components and then solved in defined steps by mathematical analysis. Accordingly, operations research exercises are included at the end of each chapter.

Prerequisite

Understanding operation research techniques and approaches.

Course Outcomes

On the successful achievement of the course, students will able to

CO1	Understand about the fundamentals of Operations Research, Linear Programming Problem	Understand / Apply
CO2	Understand about simplex methods Big-M method	Understand / Apply

CO3	Understand about Transportation Problem and basic feasible solutions	Understand / Apply
CO4	Understand about Optimality test and Dual problem	Understand / Apply
CO5	Understand about Dual simplex Problem and Transportation algorithms.	Understand / Apply
CO6	Understand about Shortest route and Project network	Understand / Apply
CO7	Understand the concepts of Games Theory	Understand / Apply

Mapping with Programme Outcomes

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	S	S	M									
CO2	S	S	M									
CO3	S	M	S									
CO4	S	S	M									
CO5	S	S	S									
CO6	S	S	M									
CO7	S	S	S									

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's Category	**Continuous Assessment Tests**			**Terminal Examination**
	1	**2**	**3**	
Remember	10	10	10	20
Understand	30	30	30	30
Apply	30	30	30	30
Analyse	30	30	30	30
Evaluate	0	0	0	0
Create	0	0	0	0

Course Level Assessment Questions

Acquire knowledge about Operations research and linear programming (CO1):

1. Define Operations Research.
2. Discuss the limitation of Operations research.
3. What is linear programming?
4. What are the characteristics of linear programming problem?
5. What are the limitations for operation research?

Understand about simplex methods, Big-M method (CO2):

1. What is Big-M method?
2. Define Simplex method.
3. What is Two-phase method?
4. What is unbounded solution of a linear programming problem?
5. What is Gauss-Jordan reduction process?

Understand about Transportation Problem and basic feasible solutions (CO3):

1. What do you understand by Transportation problem?
2. Write the mathematical form of Transportation Problem.
3. What is an unbalanced transportation problem?
4. What is North-west corner method?
5. What is feasible solution?

Understand about Optimality test and Dual problem (CO4):

1. What is dual problem in linear programming?
2. What is Test for Optimality in Transportation Problem?
3. What is Stepping Stone Method?
4. What is the maximization problem?
5. How can we estimate the degradation function?

Understand about Dual simplex Problem and Transportation algorithms(CO5):

1. What is Dual simplex problem?
2. What is sensitivity analysis in transportation problem?
3. Explain sensitivity analysis.
4. What is Assignment problem?
5. What is branch and bound technique?

Understand about Shortest route and Project network (CO6):

1. What is Spanning Tree with example?
2. What do you mean by spanning tree?
3. What is the maximum spanning tree?
4. What is Project network analysis?
5. What is the use of critical path method?

Understand the concepts of Games Theory (CO7):

1. What is game theory?
2. What are some of the applications in game theory?
3. What are the problem solving methods in game theory?
4. What are the terminologies commonly used in Game theory?
5. What is called mixed strategies?

Syllabus

Unit – I: Introduction to Operations Research: Basics definition, scope, objectives, phases, models and limitations of Operations Research. Linear Programming Problem – Formulation of

LPP, Graphical solution of LPP. Simplex Method, artificial variables, simplex Gauss-Jordan reduction process in simplex methods, Big-M method, two-phase method, degeneracy and unbound solutions.

Unit - II :Transportation Problem. Formulation, solution, unbalanced Transportation problem. Finding basic feasible solutions – Northwest corner rule, least cost method and Vogel's approximation method. Optimality test: the stepping stone method and MODI method, Minimization and Maximization problem.

Unit - III : Dual Problem: Relation between primal and dual problems, Dual simplex method, Sensitivity analysis Transportation algorithms –Assignment problem –Hungarian Method (Minimization and Maximization), Branch & Bound technique.

Unit - IV :Shortest route – minimal spanning tree - maximum flow models – project network-CPM and PERT network-critical path scheduling.

Unit - V :Games Theory. Competitive games, rectangular game, saddle point, minimum (maximum) method of optimal strategies, value of the game. Solution of games with saddle points, dominance principle. Rectangular games without saddle point – mixed strategy for 2 X 2 games.

Reference Books:

1. Handy A Taha, Operations Research – An Introduction, Pearson Education
2. P. SankaraIyer, "Operations Research", Tata McGraw-Hill, 2008.
3. A.M. Natarajan, P. Balasubramani, A. Tamilarasi, "Operations Research", Pearson Education
4. J K Sharma., "Operations Research Theory & Applications , 3e", Macmillan India Ltd, 2007.
5. P. K. Gupta and D. S. Hira, "Operations Research", S. Chand & co., 2007.

Course Contents and Lecture Schedule

Module No.	Topic	No.of lectures
1	**UNIT-I**	
1.1	Introduction to Operations Research	1
1.2	Models and limitations of Operations Research	2
1.3	Linear Programming Problem	2
1.4	Graphical solution of LPP	2
1.5	Simplex Method	2
1.6	Simplex Gauss-Jordan reduction process in simplex methods	2

1.7	Big-M method	2
1.8	Two-phase method	2
1.9	Degeneracy and unbound solutions	2
2	**UNIT-II**	
2.1	Transportation Problem. Formulation, solution	2
2.2	Unbalanced Transportation problem	2
2.3	Finding basic feasible solutions – Northwest corner rule	2
2.4	Least cost method and Vogel‟s approximation method	2
2.5	Optimality test: the stepping stone method and MODI method	1
2.6	Minimization and Maximization problem	2
3	**UNIT-III**	
3.1	Dual Problem : Relation between primal and dual problems	2
3.2	Dual simplex method	2
3.3	Sensitivity analysis Transportation algorithms	2
3.4	Assignment problem	2
3.5	Hungarian Method	2
3.6	Branch & Bound technique	2
4	**UNIT-IV**	
4.1	Shortest route – minimal spanning tree	2
4.2	Maximum flow models	2
4.3	Project network- CPM and PERT	2
4.4	Network-critical path scheduling.	2
5	**UNIT-V**	
5.1	Games Theory. Competitive games, rectangular game	2
5.2	Saddle point, minimum method of optimal strategies	2
5.3	Solution of games with saddle points	2
5.4	Dominance principle, Rectangular games without saddle point	2
5.5	Mixed strategy for 2 X 2 games	2
	Total	58

Course Prepared by: Dr.D.Napoleon

Course Verified by: Dr.E.Chandra

MOBILE COMMUNICATIONS

Subject Code: 18CS1E07 **No. of Credits: L PT**
4 0 4

Preamble:

The main objective of this course is to provide the strong foundation to the students on Mobile Communications and its generations, basic architecture of cellular devices, digital cellular infrastructure, GSM, principles of synchronous digital hierarchy, Pleisosynchronous digital hierarchy and fiber optics communications. This course also focuses on Mobile switching systems, Base station sub systems and Network management systems.

Prerequisite:

Fundamentals of Mobile Communications and Telecommunication Architecture.

Course outcomes:

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

CO1:	Understand the basic principles of mobile communications and its generations along with basic cellular architecture.	Remember/Understand
CO2:	Learn the concept of GSM and its architecture.	Remember/Understand
CO3:	Analyze about the principles of synchronous digital hierarchy, Pleisosynchronous digital hierarchy and fiber optics communications.	Understand/Analyze
CO4:	Understand about Mobile service switching centre and inter working functions (IWF) and Gateway MSC.	Remember/Understand
CO5:	Exploring the concepts of home location register (HLR) and Vister Location register (VLR), Signaling Transfer Point (STP)	Understand/Analyze

CO6:	Examine the use Base station controller, base transceiver station and transcoder rate adaptation unit and promote the use of open system interconnection and frequency management.	Understand/Analyse
CO7:	Recognize the Network Management systems operations, maintenance and administration, subscription management, charging and mobile equipment management.	Understand/Analyse

Mapping with programme outcomes:

Cos	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**S**	**L**	**L**									
CO2	**S**	**M**	**L**									
CO3	**M**	**M**	**L**									
CO4	**S**	**S**	**L**									
CO5	**M**	**S**	**L**									
CO6	**S**	**S**										
CO7	**S**	**S**										

S- Strong; M-Medium; L-Low

Assessment pattern:

Bloom's Category	**Continuous Assessment Test (%)**			**Terminal Examination**
	1	**2**	**3**	
Remember	20	20	10	20
Understand	40	40	40	40
Apply	0	0	0	0
Analyse	40	40	40	40

Evaluate	0	0	0	0
Create	0	0	0	0

Course level assessment questions:

Introduction to mobile communications (CO1):

1. Define mobile Communications?
2. Explain in detail about TDMA?
3. Write a short note on CDMA?
4. Compare and contrast CDMA, TDMA and FDMA?
5. Write a detailed note on basic cellular architecture?

Digital cellular system infrastructure(CO2):

1. Write a note on mobile services in GSM?
2. Discuss in detail about the various handover scenarios?
3. Illustrate about the architecture of GSM?
4. Explain in brief about the localization and calling in GSM?
5. Describe the various security services offered by GSM?

Principles of Digital Hierarchy (CO3):

1. Explain in detail about the principle of synchronous digital hierarchy?
2. List out the advantages and disadvantages of synchronous digital hierarchy?
3. What are the principles of Pleisosynchronous digital hierarchy?
4. Define Fibre optics communications and its principles?
5. Differentiate between synchronous digital hierarchy and Pleisosynchronous digital hierarchy?

Mobile switching systems (CO4):

1. Define Mobile service switching centre (MSC)?
2. Briefly discuss about the inter working functions (IWF)?
3. Write about gateway of MSC?
4. Describe about the advantages and disadvantages of MSC?

Location Registers and Signals Transfer Point (CO5):

1. Explain in detail about home location register (HLR)?
2. Elaborate the Vister Location register (VLR)?
3. Distinguish between HLR and VLR?
4. Write the advantages and disadvantages of HLR?
5. Write a brief note on Signaling transfer point?

Base station sub systems(CO6):

1. Write an introduction about Base station sub systems?
2. Define the Base station controller (BSC).
3. Elaborate the base transceiver station (BTS).
4. Write in detail about transcoder rate adaptation unit?
5. Define Open System interconnection.
6. Explain in detail about the frequency management?

Network Management Systems (CO7):

1. Write in detail about Operating sub systems?
2. Briefly discuss network operations, maintenance and administration.
3. Explain in details about subscription management and charging.
4. Write a note on mobile equipment management.

Syllabus:

Unit - I Introduction: Introduction to mobile communications – generation of mobile communication FM, TDMA, CDMA – basic cellular architecture.

Unit - II Digital cellular system infrastructure: global system for mobile communication (GSM) – GSM architecture – principles of synchronous digital hierarchy – principles of Pleisosynchronous digital hierarchy – principles of fiber optics communications.

Unit - III Mobile switching systems: Mobile service switching centre (MSC) – inter working functions (IWF) – home location register (HLR) and Vister Location register (VLR) – Gateway MSC – Signaling transfer point (STP)

Unit - IV Base station sub systems: Base station controller (BSC) – base transceiver station (BTS) – transcoder rate adaptation unit (TRAU) – open system interconnection – frequency management.

Unit - V Network management systems: Operating sub systems – network operation, maintenance and administration – subscription management and charging – mobile equipment management.

Reference books:

1. Jochen Schiller, "Mobile Communications", Second Edition, Pearson Education, 2003.
2. William Stallings, "Wireless Communications and Networks", Pearson Education, 2002.

E-Resources:

1. Systems & Network - https://www.snt.co.uk/training_courses/Telecommunications/Mobile_communications_overview_course.htm
2. https://www.coursera.org/learn/wireless-communication-technologies

Course content and lecture schedule:

Module No.	Topic	No of Lectures
1	**Introduction**	
1.1	Introduction to mobile communications	2
1.2	Generation of mobile communication FM	2
1.3	TDMA	2
1.4	CDMA	2
1.5	Basic cellular architecture	2
2	**Digital cellular system infrastructure**	
2.1	Global system for mobile communication (GSM)	2
2.2	GSM architecture	2
2.3	Principles of synchronous digital hierarchy	2
2.4	Principles of Pleisosynchronous digital hierarchy	2
2.5	Principles of fiberoptics communications	1
3	**Mobile switching systems**	

3.1	Mobile service switching centre (MSC)	2
3.2	Inter working functions (IWF)	2
3.3	Home location register (HLR) and Vister Location register (VLR)	2
3.4	Gateway MSC	2
3.5	Signaling transfer point (STP)	1
4	**Base station sub systems**	
4.1	Base station controller (BSC)	2
4.2	Base transceiver station (BTS)	2
4.3	Transcoder rate adaptation unit (TRAU)	2
4.4	Open system interconnection	2
4.5	Frequency management	1
5	**Network management systems**	
5.1	Operating sub systems	2
5.2	Network operation, maintenance and administration	2
5.3	Subscription management and charging	2
5.4	Mobile equipment management	2
	Total	**45**

Course Prepared by: Dr.P.B.Pankajavalli

Course Verified by: Dr.E.Chandra

IMAGE PROCESSING

Subject Code: 18CS1E08 **No. of Credits** **L P T**
4 0 4

Preamble The main aim of this course is to provide strong foundation to student bring Image processing procedures and practices for the post graduate students in the second semester. The course covers the fundamentals of image processing and its relationship between pixels. This course also focuses on different logical operators which help students to enhance images. This course covers different filtering and transformation techniques for image restoration where the operation of taking a corrupt or noisy image and estimating the clean, original image. At the end of this course the students will be able to understand the key concepts of image compression which estimates the degradation function. Also, the course covers segmentation and classifiers at the end of the course. Accordingly, image processing exercises are included at the end of each chapter.

Prerequisite

Understanding Image processing techniques and approaches.

Course Outcomes

On the successful achievement of the course, students will able to

CO1	Understand about the fundamentals of digital image processing, Sampling and quantization	Understand / Remember
CO2	Understand about image enhancement, histogram processing and Filtering techniques	Understand / Apply
CO3	Explain about image restoration and transformations	Understand / Analyse
CO4	Understand the concepts of color fundamentals and models.	Understand / Analyse
CO5	Understand the importance of image compression	Understand / Apply
CO6	Understand about morphological issues in image processing	Understand / Apply
CO7	Exploring the concepts of Image segmentation	Understand / Analyse / Apply
CO8	Examine the use of classifiers and neural networks.	Understand / Analyse / Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**S**	**M**	**M**									
CO2	**S**	**S**	**M**									
CO3	**M**	**L**	**L**									
CO4	**S**	**L**	**M**									
CO5	**S**	**M**	**L**									
CO6	**S**	**M**	**L**									
CO7	**M**	**L**	**L**									
CO8	**S**	**M**	**M**									

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's Category	Continuous Assessment Tests			Terminal Examination
	1	2	3	
Remember	20	20	20	20
Understand	30	30	30	30
Apply	20	20	20	20
Analyse	30	30	30	30
Evaluate	0	0	0	0
Create	0	0	0	0

Course Level Assessment Questions

Acquire knowledge about image processing and pixels (CO1):

1. What is digital image processing?
2. Define pixel.
3. Explain the formation of an image.
4. What is sampling?
5. What is the purpose of using quantization in image processing?

Explain about image enhancement and filtering (CO2):

1. Explain about image enhancement?
2. What is grey-level transformation?
3. What is histogram?
4. In what way arithmetic and logical operators are used in enhancement?
5. Describe about smoothing and sharpening spatial filters.

Understand image restoration and transformation (CO3):

1. What is image restoration?
2. Describe image degradation and restoration process.
3. Explain the role of filtering in image restoration.
4. Explain fourier transform.
5. How can we estimate the degradation function?

Learn about color image processing (CO4):

1. Explain about color fundamentals.
2. What is pseudo color image processing?
3. Define Noise.
4. What is weiner filtering?
5. Explain in details about constrained least square filtering.

Explain image compression (CO5):

1. What is image compression?
2. What are image compression models?
3. Define access control?
4. Describe security for internet applications?
5. What are the issues related to security?

Syllabus

Unit I: Introduction: Digital image processing - Fundamental steps in digital image processing - components of image processing system. Digital Image Fundamentals: A simple image formation model -image sampling and quantization - basic relationships between pixels.

Unit II: Image enhancement in the spatial domain**:** Basic gray-level transformation - histogram processing, enhancement using arithmetic and logic operators - basic spatial filtering - smoothing and sharpening spatial filters - combining the spatial enhancement.

Unit III: Image restoration: A model of the image degradation/restoration process - noise models - restoration in the presence of noise–only spatial filtering - Weiner filtering - constrained least squares filtering - geometric transforms; Introduction to the Fourier transform and the frequency domain - estimating the degradation function.

Unit IV: Color Image Processing: Color fundamentals - color models - pseudo color image processing - basics of full– color image processing - color transforms - smoothing and sharpening - color segmentation. Image Compression: Fundamentals - image compression models - error-free compression -lossypredictive coding - image compression standards.

Unit V: Morphological Image Processing**:** Preliminaries - dilation, erosion, open and closing, hit or miss transformation, basic morphologic algorithms. Image Segmentation: Detection of discontinuous - edge linking and boundary detection –thresholding - region–based segmentation. Object Recognition: Patterns and patterns classes - recognition based on decision– theoretic

methods – matching - optimum statistical classifiers - neural networks - structural methods – matching shape numbers - string matching.

Reference books

1. RafealC.Gonzalez, Richard E.Woods, Digital Image Processing, Second Edition, Pearson Education/PHI.
2. Milan Sonka, Vaclav Hlavac and Roger Boyle, Image Processing, Analysis, and Machine Vision, Second Edition, Thomson Learning.
3. Alasdair McAndrew, Introduction to Digital Image Processing with Matlab, Thomson Course Technology
4. Adrian Low, Computer Vision and Image Processing, Second Edition, B.S.Publications
5. RafealC.Gonzalez, Richard E.Woods, Steven L. Eddins, Digital Image Processing using Matlab, Pearson Education.

Course Contents and Lecture Schedule

Module No.	Topic	No.of lectures
1	**UNIT-I**	
1.1	Introduction to database system	1
1.2	Database Languages	1
1.3	Data storage and querying	1
1.4	Transaction and Storage management	2
1.5	Data mining and information retrieval	1
1.6	Databases users and administrators	1
1.7	Relational databases: Introduction to the relational model	1
1.8	Structural of relational databases and database schema	1
1.9	Relational query languages and Relational operations	2
2	**UNIT-II**	
2.1	Advanced sql	2
2.2	Constraints sql create index	2
2.3	Sql functions	3
2.4	Data control language	2
2.5	PL/SQL- a basic introduction	2
2.6	Triggers	2
3	**UNIT-III**	

3.1	Advanced transaction processing and recovery	2
3.2	Defining a concurrent transactions in DBMS	2
3.3	Optimistic concurrency control techniques	3
3.4	Deadlock handling	3
3.5	Recovery in DBMS	2
3.6	Data security and Access control	3
4	**UNIT-IV**	
4.1	Distributed database management system	1
4.2	DDBMS components	2
4.3	Distributed database design	2
4.4	Client/server vs DDBMS	2
5	**UNIT-V**	
5.1	Business intelligence and data warehouses	2
5.2	OLAP & Star schema	2
5.3	Database connectivity	3
5.4	Security and authorization	2
5.5	Security for internet application	2
	Total	57

Course Prepared by: Dr.D.Napoleon

Course Verified by: Dr.E.Chandra

ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS

Subject Code: 18CS1E09 **Number of Credits: L P T**
4 0 4

Preamble:

The main objective of this course is to inculcate the problem solving and AI, search methods and expert systems. This course presents the problem states and AI, state space methods, problem reduction search methods, predicate calculus, and knowledge engineering in expert systems. This course also examines the ideas and techniques underlying the design of intelligent computer systems.

Prerequisite:

Programming, Data structures, Algorithms

Course Outcomes:

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

CO1:	Learn about AI Problems	Remember/Understand
CO2:	Understanding of Heuristic search techniques, Knowledge representation issues	Understand/Analyze
CO3:	Understanding the usage ofproblem reduction methods	Understand/Analyze
CO4:	Demonstrate how predicate calculus used in problem solving	Remember/Understand
CO5:	Analyze Expert Systems	Analyze/Apply

Mapping with Programme Outcomes:

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

S- Strong; M-Medium; L-Low

Assessment pattern:

Bloom's Category	**Continuous Assessment Test (%)**			**Terminal Examination**
	1	**2**	**3**	
Remember	40	40	20	20
Understand	40	30	20	30
Apply	0	0	30	20
Analyze	20	30	30	30
Evaluate	0	0	0	0
Create	0	0	0	0

Course level assessment questions:

Learn about AI Problems (CO1):

1. What is Intelligence?
2. List the fields that form the basis for AI.
3. How to define a problem as state space search?
4. Describe the four categories under which AI is classified with examples.

Understanding of Heuristic search techniques, Knowledge representation issues (CO2):

1. Define state-space search technique.
2. State the advantages of heuristic search.
3. Deduce the difference between breadth first and depth first search.
4. How an algorithm's performance is evaluated?

Understanding the usage of problem reduction methods (CO3):

1. How would the minimax procedure have to be modified to be used by a program playing a three or four-person game rather than two –person one?
2. Infer the definition of unification.
3. Discover the operation of the unification algorithm on each of the following pairs of

literals:

A. f(Marcus)and f(Caesar)

B. f(x) and f(g(y))

C. f(Marcus,g(x,y))and f(x,g(Caesar,Marcus))

4.Give algorithm for propositional resolution and Unification.

Demonstrate how predicate calculus used in problem solving (CO4):

1. Compare and contrast predicate logic and propositional logic.
2. Give resolution proof for example problem statement: "West is a criminal"
3. Analyze clausal form and its usefulness.
4. How will you represent facts in propositional and predicate logic?

Analyze Expert Systems (CO5):

1. List the characteristic features of a expert system.
2. Explain the process ofKnowledge Acquisition.
3. Infer the difficulties in developing Expert Systems.
4. Mention some of the key applications of Expert Systems.

Syllabus:

Unit- I: Problem solving and AI – Puzzles and Games – Problem States and operators – Heuristic programming – state space representations – state descriptions – graph notations – non-deterministic programs

Unit – II: State space search methods – breadth first and depth first search – heuristic – admissibility –optimality of algorithms – performance measures – problem reduction representations – AND/OR graphs and higher level state space

Unit – III : Problem reduction search methods – cost of solution trees – ordered search – alpha beta and minimum procedure – theorem proving in predicate calculus – syntax, semantics, Herbranduniverse: variables, qualifiers, unification, resolvents

Unit – IV: Predicate calculus in problem solving – answer extraction process –resolution – Automatic **program** writing – predicate calculus – proof finding methods

Unit – V : Expert systems: Expert systems and conventional programs – expert system organization –Knowledge engineering: knowledge representation techniques – knowledge acquisition – acquiring knowledge from experts – automating knowledge acquisition –Building an expert system –difficulties in developing an expert system

References:

1. Elaine Rich and Kevin Knight, "Artificial Intelligence", Tata McGraw Hill Publication, 2nd Edition, 2001
2. Donald A.Waterman, 'A Guide to Expert Systems', Pearson Education, 2009.
3. George F Luger," Artificial Intelligence", 4th Edition, Pearson Education Publications 2002.

E-Resources:

NPTEL - http://nptel.ac.in/courses/106105079/

Course content and lecture schedule:

Module no	Topic	No of Lectures
1	**Unit I**	
1.1	Problem solving and AI	1
1.2	Puzzles and Games	1
1.3	Problem States and operators	1
1.4	Heuristic programming	2
1.5	State space representations	1
1.6	State descriptions	1
1.7	Graph notations	1
1.8	Non-deterministic programs	1
2	**Unit II**	
2.1	State space search methods	1
2.2	Breadth first and depth first search	2
2.3	Heuristic – Admissibility	1
2.4	Optimality of algorithms	2
2.5	Performance measures	1
2.6	Problem reduction representations	1

2.7	AND/OR graphs and higher level state space	1
3	**Unit III**	
3.1	Problem reduction search methods	2
3.2	Cost of solution trees	1
3.3	Ordered search	1
3.4	Alpha beta procedure	1
3.5	Minimum procedure	1
3.6	Theorem proving in predicate calculus – syntax, semantics	2
3.7	Herbranduniverse: variables, qualifiers, unification, resolvents	1
4	**Unit IV**	
4.1	Predicate calculus in problem solving	2
4.2	Answer extraction process	2
4.3	Resolution	1
4.4	Automatic program writing	1
4.5	Predicate calculus	1
4.6	Proof finding methods	2
5	**Unit V**	
5.1	Expert systems: Expert systems and conventional programs	1
5.2	Expert system organization	1
5.3	Environment- Energy	1
5.4	Knowledge engineering: knowledge representation techniques	1
5.5	Knowledge acquisition –	1

5.6	Acquiring knowledge from experts	1
5.7	Automating knowledge acquisition	1
5.8	Building an expert system	1
5.9	Difficulties in developing an expert system	1
	Total	**45**

Course Prepared by: Dr.P.B.Pankajavalli

Course Verified by: Dr.E.Chandra

SOFTWARE QUALITY ASSURANCE

Subject Code: 18CS1E010 **No. of Credits L P T**
4 0 4

Preamble

This course presents the essentials of Software Quality, Plan for Software Quality Assurance and Standards. This course enables the students to learn the Concepts and Principles of Software Quality Assurance. It also focuses on tools, techniques and methodologies in software quality management. This will enable the students to judge the quality of software.

Prerequisite:

Fundamentals of Software engineering.

Course outcomes:

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

C01	Understand the basic concepts and the processes that lead to software quality.	Understand
C02	Understand Purpose and Scope of Software quality assurance management.	Understand/Analyse
C03	Understand the conventions and metrics in software inspection process. Describe about Audit processes in software quality.	Understand/Analyse
C04	Understand about Tools, Techniques and methodologies in software quality.	Understand/Analyse

C05 Understand various models in software quality. Understand/Analyse

Mapping with programme outcomes:

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

S- Strong; M-Medium; L-Low

Assessment pattern:

Bloom's Category	Continuous Assessment Test (%)			Terminal Examination
	1	2	3	
Remember	20	20	20	20
Understand	30	30	30	30
Apply	20	20	20	20
Analyse	30	30	30	30
Evaluate	0	0	0	0
Create	0	0	0	0

Course level assessment questions:

Basic concepts in Software quality (CO1):

1. Define: Software Quality.
2. Define: Error, Defect and Failure.
3. What is the scope of software quality program?
4. Explain how to establish software quality goals.
5. Brief the software modelling.

Software Quality Assurance Management (CO2):

1. Brief the need for Software quality assurance plan.
2. What is a Software quality assurance management?

3. List out the tasks in software quality.
4. What are the responsibilities of software quality tasks?
5. How documentations are prepared in software quality assurance management?

Software Inspection (CO3):

1. Illustrate the standard practices in Software Inspection.
2. Explain about walkthrough process in Software Inspection.
3. Elaborate: ISO testing process.
4. Describe audit process in Software Inspection.
5. What are the corrective actions to be taken in Software Inspection?

Software Quality Techniques (CO4):

1. Define: Records collections in Software quality assurance.
2. Briefly discuss the various techniques of Software quality assurance.
3. Write a note about code control in Software quality assurance.
4. Explain risk management in Software quality assurance.
5. List out the methodologies in Software quality assurance.

Software Quality Models (CO5):

1. Describe about ISO 9000 model.
2. Elaborate the weaknesses of ISO 9000 model.
3. Compare ISO 9000 and CMM Model.
4. List out the advantages and disadvantages of CMM model.
5. Write a brief note on SPICE determination in software quality.

Syllabus:

Unit I: Introduction to Software quality: Software modeling – Scope of the software quality program – Establishing quality goals – purpose, quality, goals – SQA Planning software of productivity and documentation.
Unit II: Software quality assurance plan: Purpose and Scope, Software quality assurance management - Organization – Quality tasks – Responsibilities – Documentation.
Unit III: Software inspection process:Standards, Practices, Conventions and Metrics, Reviews and Audits – Management, Technical review – Software inspection process – Walk through process – Audit process – Test processes – ISO, cmm compatibility – Problem r eporting and corrective action.
Unit IV: Software Quality process: Tools, Techniques and methodologies, Code control, Media control, Supplier control, Records collection, Maintenance and retention, Training and risk management.

Unit V: Models:ISO 9000 model, cmm model, Comparisons, ISO 9000 weaknesses, cmm weaknesses, SPICE – Software process improvement and capability determination.

Reference books:

1. Mordechai Ben – Meachem and Garry S.Marliss, "Software Quality – Producing Practical, Consistent Software", International Thompson Computer Press, 2014
2. Watt. S. Humphrey, "Managing Software Process", Addison – Wesley, 2016.
3. Philip.B.Crosby, "Quality is Free: The Art of making quality certain", Mass Market,1992.

E-Resources

1. www.aptest.com/resources.html
2. https://www.softwaretestinghelp.com/resources/
3. www.softwareqatest.com/
4. https://www.computersciencezone.org/software-quality-assurance
5. https://www.stickyminds.com/book-topic/software-quality-assurance

Course content and lecture schedule:

Module no	Topic	No of Lectures
1	**Introduction to Software quality**	
1.1	Software modeling – Scope of the software quality program	2
1.2	Establishing quality goals – purpose	3
1.3	Quality – goals	2
1.4	SQA Planning software of productivity and documentation.	3
2	**Software quality assurance plan**	
2.1	Purpose and Scope, Software quality assurance management	2
2.2	Organization – Quality tasks –	2
2.3	Responsibilities – Documentation.	3
3	**Software inspection process**	
3.1	Standards and Practices	3
3.2	Conventions and Metrics	2
3.3	Reviews and Audits – Management	2
3.4	Technical review – Software inspection process – Walk through process – Audit process – Test processes – ISO cmm compatibility	3
3.5	Problem reporting and corrective action.	2
4	**Software Quality process**	

4.1	Tools , Techniques and methodologies	2
4.2	Code control Media control	2
4.3	Supplier control	2
4.4	Records collection	3
4.5	Maintenance and retention	2
4.6	Training and risk management.	2
5	**Models**	
5.1	ISO 9000 model	2
5.2	CMM model	2
5.3	ISO 9000 weaknesses	3
5.4	CMM weaknesses	3
5.5	SPICE – Software process improvement and capability determination.	3
	Total	**55**

Course Prepared by: Dr.S.Vijayarani

Course Verified by: Dr.E.Chandra

General Papers

Semester - I

Industry Literacy

Sub. Code: 18CS1G1 **Number of Credits: 1**

Goals and Objective:

Industry literacy course has been designed to help the students to do complete analysis of the Industrial companies. The complete analysis of the industry includes the history, stock, design and development, growth, market value, employee facilities, administration and their future directions. This analysis helps the students to get improve themselves "what they have to be?" once they step out of their college/university. They will be gaining more knowledge on the present industry status which helps to get employment.

Semester - II

Literature Survey

Sub. Code: 18CS2G1 **Number of Credits: 1**

Goals and Objective:

This course has been designed to enhance the research knowledge for each and every individual student. Research is one of the best ways to inculcate the recent trends and techniques developed around the world. Students have to choose the particular topic and identify the research problems, challenges and opportunities and techniques by finding in journals which will develop their technical writing skills.

Professional Development Courses (PDC)

Semester - I

PC Troubleshooting and Installation

Sub. Code: 18CS1PDC1 **Number of Credits: 1**

Goals and Objective:

This course wrapped up with the fundamentals of the PC troubleshooting and Installation. The main focus of this course is to impart useful skills on the students in order to enhance the ability to install, troubleshoot, repair and maintain computer systems. The outcome of the course is to upgrade the knowledge of students towards installation, configuration, optimization and upgrading of computer systems and also make the students to understand diagnostic procedures and troubleshooting techniques to personal computers, portable devices, operating systems and computer peripherals.

Semester - II

Network Administration and Maintenance

Sub. Code: 18CS2PDC1 **Number of Credits: 1**

Goals and Objective:

This course covers topics related to network architectures, heterogeneous systems, network services, management and configuration of services and system resources, system initialization, drivers, cross platforms services, policies and procedures. The outcome of the course is to enable the student to have knowledge in essential networking skills including installing, configuring, securing and troubleshooting the devices, protocols and services within a network infrastructure and also provide the ability to diagnose and solve network problems.