Placed at the meeting of
Academic Council
held on 26.03.2018

APPENDIX - R

MADURAI KAMARAJ UNIVERSITY

(University with Potential for Excellence)

REBISED SYLLABUS FOR

M.Sc. Information Technology (Semester)

(From 2018-2019 onwards)

Choice Based Credit System

1. Introduction of the Programme:

Information Technology(IT) encompass the study and application of computers and any form of data communications that store, retrieve and send information. IT includes a combination of hardware and software used together to perform the essential functions people need and use everyday. In broad terms, IT also includes a set of tools, processes, and methodologies (such as coding/programming, data communications, data conversion, storage and retrieval, systems analysis and design, systems control) and associated equipment employed to collect, process, and present information.

2. Eligibility for Admission:

Candidate for admission to Master's degree course in Information Technology should have studied B.Sc.(Information Technology), B.Sc. (Computer Science) and BCA courses of Madurai Kamaraj University or any other University recognized by the Syndicate of Madurai Kamaraj University as equivalent thereto.

Candidate should have passed the Degree with a minimum of 55 % marks in Part-III. In case of SC/ST candidates, they should have passed the degree with a minimum of 50% marks in Part III.

2.1 Duration of the Programme : 2 Years

2.2. Medium of Instructions : English

3. Objectives of the Programme:

The Information Technology (IT) program will educate students to analyze, design, integrate, and manage information systems using information technology. The intent of the Information Technology program is to produce graduates who are able to achieve the following objectives:

- To develop a product or process by applying knowledge of programming, web, database, human computer interaction, networking and security tools

- To participate effectively as a member of a development team and undertaken leadership roles when appropriate
- To take graduate courses or continuing education classes to improve skills and abilities
- To make positive contributions to community and society by applying skills and abilities learned during undergraduate program in information technology
- To make decisions related to work that demonstrate understanding of the importance of being an ethical computing professional

4. Outcome of the Programme

Students graduating from this programme, able to choose many different roles; becoming IT consultants, project planners, project managers, information systems researchers, web developers, and systems analysts. Thus the students :

- able to implement computer skill in the areas related to multimedia and website design, Data base, Hardware and networking.
- able to demonstrate basic knowledge in the areas such as, Software Engineering, Data communication and Networking, Data base management, Web Technology and Operating Systems for building IT applications.

5. Duration of the Course:

The students shall undergo the prescribed course of study for a period of not less than Two academic year (Four semesters).

6. Medium of Instruction : English

7. Subjects/ Structure of Course Study : Appendix – PIT1

8. Scheme of Examinations/ Structure of Question Paper: : Appendix - PIT2

9. Detailed Syllabus: Appendix – PIT3

10. Eligibility for the Degree:

i) A Candidate shall be eligible for the award of the degree on completion of the prescribed course of study and passing all the prescribed external examinations.

ii) Attendance progress, internal examinations, conduct certificate from the Head of the Institution shall be required for taking the external examination.

iii) The passing minimum and the ranking are as per the existing rule of the Choice Based Credit System for the affiliated college of the University.

With effect from 2018-2019 and afterwards**.**

0	**Subjects**						**Total Hours**	**Total Credits**
I	CS11(5) [4]	CS12(5) [4]	CS13(5) [4]	CS14(5) [4]	CS15(5) [3]	CS16(5) [3]	30	22
II	CS21(5) [4]	CS22(5) [4]	CS23(5) [4]	ES1(5) [4]	CS24(5) [3]	CS25(5) [3]	30	22
III	CS31(5) [4]	CS32(4) [4]	CS33(5) [4]	ES2(5) [4]	CS34(5) [3]	CS35(5) [3]	30	22
IV	CS41(5) [4]	ES3(5) [4]	NME(4) [4]	CP(16) [12]			30	24
	Total						120	90

Abbreviations:

( )	–	Number of Hours	[ ]	–	Number of Credits
CS	–	Core Subject	NME	–	Non Major Elective
ES	–	Elective Subject	CP	–	Course Project

I SEMESTER

Subject No.	Title	Hours/ Week	Credits	Internal Marks	External Marks
CS11	Discrete Mathematical Structures	5	4	25	75
CS12	Advanced Data Structures using C++ and Algorithms	5	4	25	75
CS13	Distributed Systems	5	4	25	75
CS14	Advanced Java Programming	5	4	25	75
CS15	**Lab1:** Advanced Data Structures using C++ and Algorithms	5	3	40	60
CS16	**Lab2:** Advanced Java Programming Lab	5	3	40	60
	Total	30	22		

II SEMESTER

Subject No.	Title	Hours/ Week	Credits	Internal Marks	External Marks
CS21	Computer Graphics and Multimedia	5	4	25	75
CS22	Python Programming	5	4	25	75
CS23	Information Security	5	4	25	75
ES1	Elective 1	5	4	25	75
CS24	**Lab 3:** Computer Graphics and Multimedia	5	3	40	60
CS25	**Lab 4:** Python Programming	5	3	40	60
	Total	30	22		

ES11 - Embedded Systems
ES12 - Advanced Software Engineering
ES13 - Pattern Recognition

Subject No.	Title	Hours/ Week	Credits	Internal Marks	External Marks
CS31	Theory of Computation	5	4	25	75
CS32	Digital Image Processing	5	4	25	75
CS33	Data Mining and Data Warehousing	5	4	25	75
ES2	Elective 2	5	4	25	75
CS34	**Lab 5**: Data Mining	5	3	40	60
CS35	**Lab 6**:Image Processing	5	3	40	60
	Total	30	22		

III SEMESTER

ES21 - Information Retrieval

ES22 - Soft Computing

ES23 - Internet of Things

IV SEMESTER

Subject No.	Title	Hours/ Week	Credits	Internal Marks	External Marks
CS41	Cloud Computing	5	4	25	75
ES3	Elective 3	5	4	25	75
NME	Data Management Techniques	4	4	25	75
CP	Project Work & Viva voce	16	12	40	60
	Total	30	24		

ES31 – Big Data Analytics

ES32 – Wireless Sensor Networks

ES33 – Compiler Design

Non-Major Elective Courses to be offered by the Department of Information Technology to Other Departments

NME: Data Management Techniques

Appendix – PIT2

Pattern of Semester Exam
Internal Assessment
Internal Marks may be followed as

Test	: 10 marks (average of the best two tests)
Assignment	: 5 marks
Seminar/Group Discussion	: 5 marks
Peer-Team-Teaching	: 5 marks
Total	25 marks

Note: Peer-Team- Teaching shall conducted by forming a groups according the strength of the class with representation of both slow learners and fast learners. At least 10 % of the syllabus may be allocated with proportional allocation of teaching hours and be evaluated.

External Exam

Theory Subjects:

Question Paper Pattern:

Time: 3 Hours **Max. Marks: 75**

Part – A

Answer all the questions (10*1=10)

Ten Questions, two questions from every UNIT: *Multiple Choice Questions*

Part – B

Answer all the questions (5*7=35)

Five Questions, one question set from every UNIT: *Either …Or… type*

Part – C

Answer any three questions (3*10=30)

Five Questions, one question from every UNIT

The following list of parameters taken into account for the evaluation of the Practical examination and Project work.

Minimum of Two questions from Section A and Section B.

For Practical Subjects:

Parameters:

i.	Aim, Procedure / Algorithm and Program:	15
ii.	Coding and Compilation :	10
iii.	Debugging :	15
iv.	Results :	10
v.	Viva:	10
	Total	**60**

Note: The External Examiner can fix other exercises also other than those found in the list *(Syllabus)* in consultation with the Internal Examiner without violating the scope of the prescribed syllabus.

For Project Work:

Total Marks: 100 (Internal: 40 marks, External: 60 Marks)

Parameters:

For Internal Marks (40):

Start-up Review	: 5 Marks
Design Review	: 7.5 Marks
Implementation and Validation Review	:7.5 Marks
Final Review	: 10 Marks
Overall Performance	: 10 Marks

For External Marks (60):

Project Report	: 20 Marks
Project Work, Demo. & Presentation	: 30 Marks
Viva-Voce	:10 Marks

Appendix – PIT3
(Detailed Syllabus)
CS 11: DISCRETE MATHEMATICAL STRUCTURES
(5 Hours – 4 Credits)

UNIT I

Mathematical Logic: Statements and Notation – Connectives –Normal Forms – The Theory of Inference for the Statement Calculus – Inference Theory of the Predicate.

UNIT II

Set Theory: Basic Concepts of Set theory - Representation of Discrete Structures - Relations – Properties of Binary Relations in a Set – Relation Matrix and the Graph of a Relation – Partition and Covering of a Set – Equivalence Relations – Compatibility Relations – Composition of Binary Relations – Partial Ordering.

UNIT III

Algebraic Structures: Algebraic Systems – Semigroups and Moniods – Grammars and languages – Polish Expressions and their compilation – groups.

UNIT IV

Lattices and Boolean Algebra: Lattices as Partially Ordered Sets – Boolean Algebra – Boolean Functions – Representation and Minimization of Boolean Functions.

UNIT IV

Graph Theory: Basic Concepts of Graph Theory - Storage Representation and Manipulation of Graphs – Simple Precedence grammars.

Introduction to Computability Theory: Introduction – Finite-state Acceptors and Regular Grammars – Turing Machines and Partial Recursive Functions.

Text Book:

1. "Discrete Mathematical Structures with Applications to Computer Science"– J.P. Tremblay and R.Manohar, McGraw Hill Book Company, New York, 44th Reprint 2014.
   UNIT I – Chapter 1 : 1.1 - 1.6 (Exercises Excluded)
   UNIT II – Chapter 2 : 2.1 – 2.3 (Exercises Excluded)
   UNIT III - Chapter 3 : 3.1 – 3.5 (Exercises Excluded)
   UNIT IV –Chapter 4 : 4.1- 4.4 (Exercises Excluded)
   UNIT V –Chapter 5 : 5.1 – 5.3 (Exercises Excluded)
   Chapter 6 : 6.1 & 6.2 (Exercises Excluded)

Reference Books:

1. "Discrete Mathematics for Computer Scientists" – John Truss – II Edition Addison Wesley – 2000.
2. "Introduction to Automata Theory, Languages and Computation" – John E.HopCroftR.Motwani, Jeffery D.Ullman – III Edition Pearson Education – 2008.
3. "Discrete Mathematics with Graph Theory" – Goodaire Parmenter – Prentice Hall Inc., - 1998.

CS: 12 :ADVANCED DATA STRUCTURES USING C++ AND ALGORITHMS

(5 Hours – 4 Credits)

UNIT I

Trees: Heaps – Binary Search Trees – Selection Trees – Forests – Representation of Disjoint Sets – Counting Binary Trees.

Graphs: The Graph Abstract Data type – Elementary Graph Operations – Minimum Cost Spanning Trees – Shortest Paths and Transitive Closure – Activity Networks.

UNIT II

Hashing: Introduction – Static hashing – Dynamic hashing – Bloom filters.

Priority Queues: Single- and Double ended priority queues – Leftist Trees – Binomial Heaps – Fibonacci Heaps – Pairing Heaps – Symmetric Min-Max Heaps – Interval Heaps.

UNIT III

Efficient binary search trees: Optimal Binary Search Trees – AVL Trees – Red-Black Trees – Splay Trees.

Multiway Search Trees: m-way Search Trees – B-Trees – B^+-Trees.

UNIT IV

Dynamic Programming: The General Method – Multistage graphs – All-pairs shortest paths – Single-source shortest paths – Optimal binary search trees – string editing – 0/1 knapsack – reliability design – The Traveling Salesperson problem – flow shop scheduling.

Basic Traversal and Search Techniques: Techniques for Binary Trees – Techniques for Graphs – Connected Components and Spanning Trees – Biconnected Components and DFS.

UNIT V

Backtracking: The General Method – The 8-Queens Problem – Sum of subsets – Graph coloring – Hamiltonian cycles – Knapsack problem.

Branch and Bound: The Method – 0/1 Knapsack problem – Traveling Salesperson(*) – Efficiency considerations.

Text Books:

1. "Fundamentals of Data Structures in C++" – Ellis Horowitz, Sartaj Sahni, Dinesh Mehta – University Press(India) Private Limited, Second Edition, Reprinted 2017.

   UNIT I - Chapter 5.6 – 5.11 and 6

   UNIT II - Chapter 8 and 9

   UNIT III - Chapter 10 and 11

2. “Fundamentals of Computer Algorithms” - Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran – University Press(India) Private Limited, Second Edition, Reprinted 2017.

UNIT IV - Chapter 5 and 6

UNIT V - Chapter 7 and 8

Reference Books:

1. Data Structures, A. Chitra, P. T. Rajan, Vijay Nicol Imprints Pvt Ltd, McGrawHill Education of India Pvt Ltd.,2006.
2. Data Structures and Algorithms, Alfred V.Aho, John E.Hopcraft and Jeffrey D.Ullman, Pearson Education, Fourteenth Impression, 2013.
3. Classic Data Structures in C++, Timothy A. budd -, addition Wesley Publishing Co., First Edition.,1994.

CS: 13 :Advanced Java Programming

(5 Hours – 4 Credits)

UNIT I

JDBC Overview –Connection Class- Meta Data function- SQL Exception – SQL warning- Stataement – Resultset- Other JDBC Classes.

UNIT II

InetAddress - TCP/ IP client sockets - TCP/ IP server sockets - URL – URL Connection - Datagrams - Client/ Server application using RMI.

UNIT III

Bean Development Kit - Jar Files - Introspection - Design Pattern for properties, events and methods - Constrained Properties - Persistence – Customizers.

UNIT IV

Life Cycle of Servlet - Generic Servlet - HTTP Servlet - Reading Initialization Parameters - Reading Servlet Parameters - Cookies - Session Tracking.

UNI T V

JApplet - Button - Combo - Trees - Tables - Panes - AWT Classes – working with Graphics, Color and Font.

Text Books

1. The Complete Reference: Java 2, Patrick Naughton & Herbert Schildt, Tata McGraw Hill, 1999. (Chapter - 18, 21, 24, 25, 26, 27)
2. Using Java 2 Platform,Joseph Weber, , Prentice Hall of India, 2000. (Chapter - 39,40)

References

1. Deitel & Deitel, "Java How to Program", Prentice Hall, 5th Edition ,2002.
2. Peter Haggar, "Practical Java: Programming Language Guide", Addison-Wesley Pub Co, 1st Edition, 2000.
3. Bruce Eckel, "Thinking in Java", Pearson Education Asia, 2nd Edition, 2000.
4. Object oriented programming through Java, P.Radha Krishna, University Press, 2016.

CS: 14 :DISTRIBUTED SYSTEMS

(5 Hours – 4 Credits)

UNIT I

Introduction to Distributed System: Goals, Types of Distributed systems **Architecture:** System Architectures, Architectures vs Middle ware, Self Management in Distributed Systems.**Communication:** Layered protocols, Remote procedures call, Message-oriented communication, Stream-oriented communication.

UNIT II

Processes: Threads, Virtualization, Clients, Servers, Code Migration.**Naming:** Naming entities, Flat Naming, Structured Naming, Attribute-Based Naming.

UNIT III

Synchronization: Clock synchronization, Logical clocks, Mutual exclusion, Global Positioning, Election algorithms. **Consistency and Replication:** Introduction, Data centric consistency models, Client centric consistency models, Replica Management, Consistency protocols.

UNIT IV

Fault Tolerance: Introduction, Process resilience, Reliable client server communication, Reliable group communication. Distributed commit, Recovery. **Security:** Introduction, Secure channels, Access control, Security management.

UNIT V

Distributed File System: Architecture, Process, Communication, Naming, Synchronization, Consistency and Replication, Fault Tolerance, Security.

Text Book:

"Distributed Systems: Principles and Paradigms", A.S. Tanenbaum and M. Van Steen, Pearson/Prentice-Hall, 2nd Edition, 2007.

UNIT I	-	Chapters 1,2 and 4
UNIT II	-	Chapters 3 and 5
UNIT III	-	Chapters 6 and 7
UNIT IV	-	Chapters 8 and 9
UNIT V	-	Chapters 11

Reference Books:

1. "Distributed Systems: Concepts and Design", G. Coulouris, J. Dollimore, and T. Kindberg, , 5th edition, Addison-Wesley is an imprint of Pearson, 2017..
2. "Advanced Concepts in Operating Systems", M. Singhal, N. Shivaratri, , McGraw-Hill Education (India) Pvt Limited, 2001.
3. "Distributed Operating Systems: Concepts and Design", Pradeep K Sinha, Prentice Hall of India, 2007.

CS: 15 :LAB 1: ADVANCED DATA STRUCTURES USING C++ AND ALGORITHMS

(5 Hours – 3 Credits)

1. Implementation of Heap Tree.
2. Implementation of Tree Traversal.
3. Implementation Shortest Path in Tree.
4. Implementation of Minimum Spanning cost of a Tree.
5. Implementation of Hashing techniques.
6. Implement Binomial and Fibonacci Heap Trees.
7. Implementation of Binary Search Tree.
8. Implementation of AVL and Red Black Trees.
9. Implementation of Merge Sort using Divide and Conquer.
10. Implementation of Knapsack Problem using Dynamic Programming.
11. Implementation of Warshall's Algorithm using Dynamic Programming.
12. Implementation of Floyd's Algorithm using Dynamic Programming.
13. Implementation of Dijkstra's Algorithm using Greedy Technique.
14. Implementation of Prim's Algorithm using Greedy Technique.
15. Implementation of n-queens Problem using Backtracking.
16. Implementation of Assignment Problem using Branch and bound.

Note: The above are sample problems, Instructor can add more exercises on their requirements and to the technology

CS16 :LAB 2: ADVANCED JAVA PROGRAMMING

(5 Hours –3 Credits)

1. Write an Applet which will play two sound notes in a sequence continuously use the play () methods available in the applet class and the methods in the Audio clip interface.

2. Create a Japplet using swing control, which will create the layout shown below and handle necessary events.

FORMAT

Enter your Name: Enter your Age: Select your s/w: * Oracle *Visual Basic *Java Select your city : *Delhi *Mumbai *Chennai OK Cancel

1. Use JDBC connectivity and create Table, insert and update data.
2. Write a program in Java to implement a Client/Server application using RMI for Arithmetic operation.
3. Write a program in Java implement a Client/Server application using RMI for Banking operation.
4. Write a program in Java to create a Cookie and set the expiry time of the same.

5. Write a program in Java to create Servlet to count the number of visitors to a web page.
6. Write a program in Java to create a form and validate a password using Servlet.
7. Develop a Java Bean to demonstrate the use of the same.
8. Write a program in Java to convert an image in RGB to a Grayscale image.
9. Develop Chat Server using Java.

Note: The above are sample problems, Instructor can add more exercises on their requirements and to the technology

CS21 :COMPUTER GRAPHICS AND MULTIMEDIA

(5 Hours – 4 Credits)

UNIT I

Overview of Graphics Systems: Video Display Devices – Raster Scan Systems – Random Scan Systems – Input Devices. **Output Primitives:** Points and Lines – Line Drawing Algorithms – Circle Generating Algorithms – Ellipse Generating Algorithms – Filled Area primitives.

UNIT II

Attributes of Output Primitives: Line Attributes – Curve Attributes – Color and Gray Scale Levels – Area Fill Attributes –Antialiasing. **Two–Dimensional Geometric Transformations:** Basic Transformations – Matrix Representations – Composite Transformations – Other Transformations – Transformations Between Coordinate Systems.

UNIT III

Two –Dimensional Viewing : The Viewing Pipeline – Viewing Coordinate Reference Frame – Window –to- Viewport Coordinate Transformation – Two-Dimensional Viewing Functions – Clipping Operations – Point Clipping – Line Clipping – Polygon Clipping – Curve Clipping – Text Clipping – Exterior Clipping.

UNIT IV

Multimedia hardware & software - Components of multimedia – Text, Image – Graphics – Audio – Video – Animation – Authoring. Color models – XYZ-RGB-YIQ-CMY-HSV Models.

UNIT V

Multimedia communication systems – Multimedia Information Retrieval – Video conferencing – Virtual reality.

Text Books:

1. Hearn D and Baker M.P, “Computer graphics–C Version”, 2ndEdition, Pearson Education, 2004. (For Units 1to3)

2. Ralf Steinmetz, Klara Steinmetz, "Multimedia Computing, Communications and Applications", Pearson Education, 2004. (For Units 4 and 5)

Reference Books :

1. Computer Graphics, Multimedia and Animation – Malay K. Pakhira, Prentice Hall Of India Pvt. Ltd. , New Delhi – 2008.
2. Fundamentals Of Computer Graphics And Multimedia – D. P. Mukherjee, Prentice Hall Of India Pvt. Ltd. , New Delhi – 1999.
3. Multimedia programming, Siamon J. Gibbs ,Dionysios C. Tsichritzis, Addison Wesley,1995.
4. Multimedia Graphics, John Villamil, Casanova ,LeonyFernanadez, Eliar, PHI,1998.

CS22 :PYTHON PROGRAMMING

(5 Hours – 4 Credits)

UNIT I

Python Programming: An Introduction - IDLE an Interpreter for Python, Python Strings, Relational Operators, Logical Operators, Bitwise Operators, Variables and Assignment Statements, Keywords, Script Mode. **Functions -** Built-in Functions, Function Definition and Call, Importing User-defined Module**,** Assert Statement, Command Line Arguments. **Control Structures -** if Conditional Statement, Iteration (for and while Statements).

UNIT II

Scope - Objects and Object ids, Scope of Objects and Names. **Strings -** Strings, String Processing Examples, Pattern Matching. **Mutable and Immutable Objects –** Lists, Sets, Tuples, Dictionary.

UNIT III

Recursion - Recursive Solutions for Problems on Numeric Data, Recursive Solutions for Problems on Strings, Recursive Solutions for Problems on Lists, Problem of Tower of Hanoi. **Files and Exceptions -** File Handling, Writing Structures to a File, Errors and Exceptions, Handling Exceptions Using try…except, File Processing Example.

UNIT IV

Classes I - Classes and Objects, Person: An Example of Class, Class as Abstract Data Type, Date Class. **Classes II -** Polymorphism, Encapsulation, Data Hiding, and Data Abstraction, Modifier and Accessor Methods, Static Method, Adding Methods Dynamically, Composition, Inheritance, Built-in Functions for Classes.

UNIT V

Graphics - 2D Graphics, 3D Objects, Animation – Bouncing Ball. **Applications of Python -** Collecting Information from Twitter, Sharing Data Using Sockets, Managing Databases Using Structured Query Language (SQL), Developing Mobile Application for Android, Integrating Java with Python, Python Chat Application Using Kivy and Socket Programming.

Text Book:

Python Programming a Modular Approach with Graphics, Database, Mobile, and Web Applications – Sheetal Taneja, Naveen Kumar – Pearson Publication,2017.

Reference Books:

1.Python Programming,Reema Thareja – Oxford University Press, 2017

2.Fundamentals of Python Programming, Lambert – Cengage Publications, 2017

3. Problem Solving using python – E. Balagurswamy, MHI(India) Ltd., 2017

CS23 :INFORMATION SECURITY

(5 Hours – 4 Credits)

UNIT I:

Introduction: Security Goals – Attacks – Services and Mechanism – Techniques. **Mathematics of Cryptography:** Integer Arithmetic – Modular Arithmetic – Matrices – Linear Congruence - Traditional Symmetric Key Ciphers: Instruction – Substitution Ciphers – Transposition Ciphers – Stream and Block Ciphers. **Introduction to Modern Symmetric Key Ciphers:** Modern Block Ciphers – Modern Stream Ciphers.

UNIT II:

Data Encryption Standard (DES): Introduction – DES Structure – DES Analysis – Multiple DES – Security of DES. **Advanced Encryption Standard (AES):** Introduction – Transformations – Key Expansion – Ciphers – Examples – Analysis of AES.

UNIT III :

Asymmetric Key Cryptography: Introduction – RSA Crypto System. **Message Integrity and Message Authentication:** Message Integrity – Random Oracle Model – Message Authentication.

UNIT IV:

Cryptographic Hash Functions: Introduction – SHA – 512 – WHIRLPOOL. **Digital Signature:** Comparison – Process – Services – Attacks on Digital Signature – Digital Signature Schemes.

UNIT V:

Entity Authentication: Introduction – Passwords – Challenge Response – Zero Knowledge – Bio Metrics. **Key Management:** Symmetric Key Distribution – Kerberos – Symmetric Key Agreement – Public Key Distribution.

Text Book:

Cryptography and Network Security – Behrouz A. Forouzan, TheMcGraw Hill, 2011.

UNIT I – Chapter 1,2,3,5

UNIT II – Chapter 6, 7

UNIT III – Chapter 10, 11

UNIT IV – Chapter 12, 13

UNIT V – Chapter 14, 15

Reference Book:

1. "Internet Security: Cryptographic Principles", "Algorithms and Protocols", Man Young Rhee, Wiley Publications, 2003.
2. "Security in Computing", Charles Pfleeger, 4th Edition, Prentice Hall of India, 2006.
3. "Internet Security Protocols", Ulysess Black, Pearson Education Asia, 2000.

ES 11 :EMBEDDED SYSTEMS

(5 Hours – 4 Credits)

UNIT 1

Introduction to 8051 microcontroller: Comparison between micro controller and general purpose microprocessor; different types of microcontrollers; Architecture of 8051; key features of 8051; I/O ports; memory organization; counters and timers; serial I/O ports; interrupts of 8051.

UNIT II

8051 Instruction Set & Assembly Language programming: Addressing modes of 8051; instruction set; data move; arithmetic; logical; jump and call Instructions; Program for data transfer; Memory operations; arithmetic; logical; sorting.

UNIT III

Programming and Debugging Using Keil C: Different types of Header files, declaration of variables, operators, Macro declaration; inclusion of files; I/O functions; String functions;

Basic debugging concept; Logic analyzer programming; Timer simulation; I/O port simulation and debug; Program for RPM counting; Program for PWM.

UNIT IV

External Peripheral Interfacing: Interfacing switches; LEDs; Matrix Keyboard; Seven Segment Displays; 16 x 2 LCD; pulse measurement; analog to digital and digital to analog converters; interrupt programming; PC interfacing.

UNIT V

Real Time Software Development Architecture: Study of different architectures; simple Round Robin; Round Robin with Interrupt; Token passing method; Semaphores; Interrupt Latency; RTOS; RTOS applications; Vx Works RTOS study; RTC interfacing with RTOS; Selection procedure for Microcontrollers; SPI mode of operation.

Text Book:

The 8051 microcontroller Architecture programming and Applications ,Kenneth J AyalaPenram International Publishing Pvt. Ltd.,2005.

Reference Books:

1. Microprocessor and Interfacing. (3rded.), Douglas V Hall, Tata McGraw Hill. ,2000.
2. The 8051 Microcontroller and Embedded system,Muhammad Ali Mazidi and Mazidi&McKinlayR.D, 2006.
3. Microcontroller Architecture programming Interfacing and system design, Raj Kamal,Pearson Education,2005

ES 12 : ADVANCED SOFTWARE ENGINEERING

(5 Hours – 4 Credits)

UNIT I

Software and Software Engineering : Software - Characteristics - components - applications - Software Engineering - Classic Life Cycle Model - Prototyping - Spiral model.

UNIT II

Project Management : The Management spectrum - People – The Product – The Process – The Project.

Software Metrics: Measures – Metrics and Indicators – Software measurement – Metrics for Software Quality.

Estimation: Project planning objectives - Resources - S/W project estimation - Top down cost estimation - Bottom up cost estimation - Automated estimated tools.

Risk Analysis and Management: Software Risks – Risk Identification and Management.

Software project scheduling and Tracking : Scheduling – Earned value analysis.

UNIT III

System and S/W Requirement Analysis : Computer systems Engineering – Product Engineering - System specification review - Requirements Engineering – Requirements Analysis - Analysis principles - Specification Principles – Data modeling – Behavioural Modeling – The mechanics of structured Analysis.

UNIT IV

Software Design : Software design and Software Engineering – Design concepts - Effective Modular design.

Architectural Design : Data Design - Architectural Styles – Component level design – Structured programming comparison of design Notation.

Software Quality Assurance : Software Quality concepts and Software Quality Assurance – Software Reviews - Formal Technical reviews - Software reliability.

UNIT V

Software Testing Techniques : White Box Testing - Basis path testing - Control structure testing - Black Box testing - UNIT Testing - Integration Testing - validation testing - System testing.

Text Books:

1. Software Engineering - Roger. S.Pressman. McGraw Hill Publication, IV-Edn.
Chapters:
1 - 1.2.1, 1.2.2, 1.2.3
2 - 2.1, 2.4, 2.5, 2.7.2
3 - 3.1, 3.2, 3.3, 3.4, 3.5
4 – 4.1, 4.3, 4.5
5 - 5.2, 5.4, 5.5, 5.9
6 - 6.2, 6.3
7 - 7.7, 7.8
8 – 8.1, 8.3, 8.4, 8.5, 8.8
10 - 10.2,10.5
11 - 11.1,11.3,11,5
12 - 12.3,12.5,12.6
13 - 13.1,13.4,13.5
14 - 14.2,14.3.1,14.3.2
16 - 16.1,16.2
17 - 17.3,17.4,17.5,17.6
18 - 18.3,18.4,18.5,18.6

2.Software Engineering Principles - Richard Fairely McGraw Hill Publication ,1985.
Chapters: 3 - 3.2

Reference Books:

1. Richard E. Fairley, "Software Engineering – A practitioner's approach", McGraw Hill,1982
2. Martin L Shooman, "Software Engineering – Design, Reliability and Management" McGraw Hill,1983
3. Software Engineering - Ian Sommerville Addison Wesley Publishing company,1992.

ES 13 :PATTERN RECOGNITION

(5 Hours – 4 Credits)

UNIT I

Pattern Classifier : Introduction - Data Sets for Pattern Recognition - Different Paradigms for Pattern Recognition - Representation -Data Structures for Pattern Representation - Patterns as Vectors- Patterns as Strings -Logical Descriptions -Fuzzy and Rough Pattern Sets -Patterns as Trees and Graphs - Representation of Clusters - Proximity Measures - Distance Measure - Weighted Distance Measure - Non-Metric Similarity Function - Edit Distance - Mutual Neighbourhood Distance (MND) - Conceptual Cohesiveness - Kernel Functions - Size of Patterns - Normalization of Data -Use of Appropriate Similarity Measures - Abstractions of the Data Set

UNIT II

Clustering : Introduction to Clustering- Hierarchical Algorithms - Divisive Clustering - Agglomerative Clustering - Partitional Clustering - k-Means Algorithm - Soft Partitioning- Clustering Large Data Sets - Possible Solutions - Incremental Clustering - Divide-and-Conquer Approach

UNIT III

Linear Classifiers : Introduction - Linear Discriminant Functions and Decision Hyper planes - The Perceptron Algorithm - Least Squares Methods –STOCHASTIC Approximation and LMS algorithm-Mean Square Error Estimation - Mean Square Error Regression -The Bias-Variance Dilemma -Separable Classes –Non-separable Classes

UNIT IV

Hidden Markov Models And Support Vector Machine : Markov Models for Classification - Hidden Markov Models - HMM Parameters - Learning HMMs - Classification Using HMMs - Classification of Test Patterns-Linear Discriminant Functions- Learning the Linear Discriminant Function- Learning the Weight Vector - Multi-class Problems - Generality of

Linear Discriminants- SVM for Classification - Linearly Separable Case - Non-linearly Separable Case

UNIT V

Feature Selection and Extraction: Feature selection - Feature selection criteria - Search algorithms for feature selection -Suboptimal search algorithms - Linear feature extraction - Principal components analysis –Karhunen –Loeve transformation -Factor analysis- Multidimensional scaling - Classical scaling -Metric multidimensional scaling -Ordinal scaling-Algorithms -Multidimensional scaling for feature extraction

Text Book:

1. M. Narasimha Murthy and V. Susheela Devi, "Pattern Recognition", Springer 2011.
2. S.Theodoridis and K.Koutroumbas, "Pattern Recognition", 4th Ed., Academic Press, 2009
3. Andrew Webb, "Statically Pattern Recognition", Arnold publishers, London,1999.

UNIT I - Chapters 1,2 (Text Book 1)

UNIT II - Chapters 9 (Text Book 1)

UNIT III - Chapters 3 (Text Book 2)

UNIT IV - Chapter 5,7(Text Book 1)

UNIT V - Chapter 9 (Text Book 3)

Reference Books:

1. "Pattern Recognition Statistical, Structural and Neural Approaches" Robert J.Schalkoff, John Wiley & Sons Inc., New York, 1992.
2. Pattern Recognition and Machine Learning" C.M.Bishop, ", Springer, 2006.
3. "Pattern Classification" R.O.Duda, P.E.Hart and D.G.Stork, , John Wiley, 2001

CS24 :LAB 3:COMPUTER GRAPHICS AND MULTIMEDIA

(5 Hours – 3Credits)

(Implement in either C or C++ language)

SECTION – A

1. Using DDA Algorithm, Write a program to draw a line segment between two given points?
2. Write a program for determining pixel activation list between two given points in order to draw line segment using bresenham's Line drawing algorithm?

3. Using Midpoint ellipse generation algorithm which is a variant of Bresenham's line algorithm, write a Program to generate pixel activation list for drawing a ellipse?
4. Using different graphics functions available for text formatting, Write a program for
5. displaying text in different sizes, different colors, different font styles?
6. Using certain graphic functions available for drawing lines, rectangles & circles, Write a Program which generates pixel activation list for drawing the following simple two dimensional objects.
7. Write a program for performing the basic 2D transformations such as translation, Scaling, Rotation, shearing and reflection for a given 2D object?
8. By using the concept of Boundary fill algorithm, Write a program for filling a given rectangle object with color?
9. Different graphic Functions are available in C or C++ Language for filling a given object with colors. Using the graphic functions, Write a program for
    a. Filling a circle with any color?
    b. Filling a polygon with any color?
10. Write a program for performing the basic transformations such as translation, Scaling, Rotation for a given 3D object?
11. Write programs for designing simple animations using transformations?

SECTION - B

1. Design a ROBO using set of line segments generated by DDA Algorithm?
2. Design our national flag using set of lines generated by DDA or Bresenhams line drawing algorithm?
3. Design a solar planet system using a set of circles generated by midpoint circle generation algorithm?
4. Design a sky consisting of clouds using set of ellipses or circles generated by mid point ellipse generation algorithm?
5. Draw 3 clouds by using graphics functions and fill the 3 clouds with saphron, white and green colors by using flood fill Algorithm?
6. Draw our national flag by using graphics functions and fill appropriate colors by using boundary fill algorithm?
7. Draw a Mickey Mouse shape by using DDA, circle generation algorithm?
8. Design any cartoon animation which is sequence of at least 10-15 frames using adobe flash professional?
9. Using shape tweening and motion tweening, generate any animation sequence?
10. Using bone tool in adobe flash professional, generate an animation sequence of cartoon character walking?

Note: The above are sample problems, Instructor can add more exercises on their requirements and to the technology

CS25 :LAB 4: PYTHON PROGRAMMING

(5 Hours –3 Credits)

Section: A

1. Write a menu driven program to convert the given temperature from Fahrenheit to Celsius and vice versa depending upon user's choice.

2. Write a Python program to calculate total marks, percentage and grade of a student. Marks obtained in each of the three subjects are to be input by the user. Assign grades according to the following criteria:

Grade A: Percentage >=80

Grade B: Percentage>=70 and <80

Grade C: Percentage>=60 and <70

Grade D: Percentage>=40 and <60

Grade E: Percentage<40

3. Write a menu-driven program, using user-defined functions to find the area of rectangle, square, circle and triangle by accepting suitable input parameters from user.

4. Write a Python program to display the first 'n' terms of Fibonacci series.

5 Write a Python program to find factorial of the given number.

6. Write a Python program to find sum of the following series for n terms: 1 – 2/2! + 3/3! - - - - - n/n!

7. Write a Python program to calculate the sum and product of two compatible matrices.

Section: B

All the programs should be written using user defined functions, wherever possible.

1. Write a menu-driven program to create mathematical 3D objects

i. curve
ii. sphere
iii. cone
iv. arrow
v. ring
vi. cylinder

2. Write a Python program to read n integers and display them as a histogram.

3. Write a Python program to display sine, cosine, polynomial and exponential curves.

4. Write a Python program to plot a graph of people with pulse rate p vs. height h. The values of p and h are to be entered by the user.

5. Write a Python program to calculate the mass m in a chemical reaction. The mass m (in gms) disintegrates according to the formula m=60/(t+2), where t is the time in hours. Sketch a graph for t vs. m, where t>=0.

6. Input initial velocity and acceleration, and plot the following graphs depicting equations of motion:

i. velocity wrt time (v=u+at)

ii. distance wrt time (s=u*t+0.5*a*t*t)

iii. distance wrt velocity (s=(v*v-u*u)/2*a)

Note: The above are sample problems, Instructor can add more exercises on their requirements and to the technology

CS31 :THEORY OF COMPUTATION

(5 Hours – 4 Credits)

UNIT I

Finite Automata : Introduction – Finite State Machine – Acceptance of Strings and Languages – Deterministic Finite Automata – Non Deterministic Finite Automata – Significance of Non Deterministic Finite Automaton – NFA with ε-Transitions – Conversions and Equivalence – NFA to DFA Conversion – Minimization of FSM – Equivalence between Two FSM's – FA with Output – Equivalence of Moore and Mealy Machines.

UNIT II

Regular Expressions : Introduction – Regular Set – Regular Expressions – Finite Automata and Regular Expressions – Conversion of Finite Automata to Regular Expressions – Identity Rules – Proving Languages not to be Regular – Applications of Regular Expression – Closure Properties of Regular Languages.

UNIT III

Context Free Grammar : Introduction – Regular Grammar – Equivalence between Regular Grammar and FA – Context Free Grammar – Derivation and languages – Derivation Trees – Relationship between Derivation and Derivation Tree – Ambiguity – Simplification of CFG.

UNIT IV

Properties of Context Free Languages: Introduction – Normal Forms – Applications of Context free Grammar – Properties of Context Free Languages.

UNIT V

Turing Machines : Introduction – Model of Turing machine – Definition of Turing machine – Programming Techniques for Turing Machines – Computable Language and Functions – Two way infinite Tape – Power of Turing Machine – Comparison of FM, PDA and TM.

Text Book:

1. "Theory of Computation" – A.A.Puntambekar, Technical Publications, Pune, First Edition 2009

UNIT I	–	Chapter 2
UNIT II	–	Chapter 3
UNIT III	–	Chapter 4
UNIT IV	–	Chapter 5
UNIT V	–	Chapter 7.1 to 7.8

Reference Book:

1."Introduction to Automata Theory, Languages and Computation" – John E.Hopcroft, Rajeev Motwani, Jeffrey D.Ullman, Third Edition, Pearson, 2014.

2. "Theory of Computer Science - Automata, Languages and Computation", Mishra K L P and Chandrasekaran N, Third Edition, Prentice Hall of India, 2004.

3. "Elements of the Theory of Computation" Harry R Lewis and Christos H Papadimitriou, Second Edition, Prentice Hall of India, Pearson Education, New Delhi,

CS32 :DIGITAL IMAGE PROCESSING

(5 Hours – 4 Credits)

UNIT I

Digital Image Processing: Origins of Digital Image Processing, Steps in Digital Image Processing, Digital Image Fundamentals: Elements of Visual Perception, Light and the Electromagnetic Spectrum, Image Sensing and Acquisition, Image Sampling and Quantization, Basic Relationships between Pixels, Mathematical Tools used in Digital Image Processing.

UNIT II

Image Transformation & Filters: Basic Intensity Transformation Functions, Histogram Processing, Fundamentals of Spatial Filtering, Smoothing Spatial Filter, Sharpening Spatial Filters, Combining Spatial Enhancement methods, Fuzzy techniques for Intensity Transformation and Spatial Filtering. Filtering in the Frequency Domain: Preliminary Concepts, Sampling and the Fourier Transforms of Sampled Functions, The Discrete Fourier

Transform (DFT), Properties of the 2-D DFT, Filtering in the Frequency Domain, Image Smoothing and Sharpening using Frequency Domain Filters, Selective Filtering.

UNIT III

Image Restoration, Reconstruction and Image Segmentation: Image Degradation/Restoration process, Noise Models, Restoration in the presence of Noise only-Spatial Filtering, Periodic Noise Reduction by Frequency Domain Filtering, Linear, Position-Invariant Degradations, Estimating the Degradation Functions, Inverse Filtering, Wiener Square Error Filtering, Constrained Least Square Filtering, Geometric Mean Filter, Image Reconstruction from Projections. Image Segmentation: Point, Line and Edge Detection, Thresholding, Region-Based Segmentation, Segmentation Using Morphological Watersheds, Use of Motion in Segmentation.

UNIT IV

Color Image Processing: Color Fundamentals, Color Models, Pseudo color Image Processing, Full Color Image Processing, Color Transformation, Smoothing and Sharpening, Image Segmentation Based on Color, Noise in Color Images. Wavelets and Multi resolution Processing: Multi resolution Expansion, Wavelet Transforms in One Dimension, The Fast Wavelet Transforms, Wavelet Transforms in Two Dimensions, Wavelet Packets. Image Compression: Fundamentals, Basic Compression Methods, Digital Image Watermarking.

UNIT V

Morphological Image Processing: Erosion and Dilation, Opening and Closing, The Hit-Or-Miss Transformation, Basic Morphological Algorithms, Gray-Scale Morphology. Object Recognition: Patterns and Pattern Classes, Recognition Based on Decision-Theoretic Methods, Structural Methods.

Text Books:

1. Rafael C. Gonzalez, Richard E. Woods, "Digital Image Processing", 3rd Edition, Pearson Education, 2008.

UNIT I	-	chapter 1 and 2
UNIT II	-	chapter 3 and 4
UNIT III	-	chapter 5 and 10
UNIT 1V	-	chapter 6 and 7
UNIT V	-	chapter 9 and 12

Reference Books:

1. "Digital Image Processing using MATLAB" Rafael C. Gonzalez, Richard E. Woods,2nd Edition, Prentice Hall of India, 2011.

2. "Fundamentals of Digital Image Processing" A.Jain,", Prentice Hall of India.2011

3. "Digital Image Processing", Willliam K Pratt, John Willey, 2002.

CS33 :DATA MINING AND DATA WAREHOUSING

(5 Hours – 4 Credits)

UNIT I

Introduction – Data Mining – Data Mining on what kind of Data – Data Mining Functionalities – Classification of Data mining system – Major Issues.

UNIT II

Data warehouse and OLAP technology for data mining – Data warehouse – A multidimensional data model – Data Warehouse Architecture – Data Warehouse Implementation – Further development of data cube technology – From data warehousing to data mining.

UNIT III

Data preprocessing – Preprocess – Data cleaning – Data integration and transformation – Data reduction – Discretization and Concept Hierarchy Generation – Data Mining Primitives – Data Mining Query Language.

UNIT IV

Concept Description : Characterization and comparison – What is Concept description – Data generalization and Summarization – based Characterization – Analytical characterization – Mining class comparison mining descriptive statistical measures in large databases – Association Rule mining – Mining Single- Dimensional Boolean association rules from Transactional databases- Mining Multilevel Association rules from Transaction databases – Mining Multidimensional association rules from Relational databases and Data warehouses – From association mining to correlation analysis – Constraint based association mining.

UNIT V

Classification - Prediction – Issues Regarding Classification and Prediction – Classification by decision tree induction – Bayesian Classification – Classification by Back propagation – Classification Based on concepts from association Rule mining – Other Classification Methods – Prediction – Classifier Accuracy – What is Cluster analysis – Types of Data in Cluster Analysis - A categorization of Major Clustering Methods – Partitioning Methods – Hierarchical Methods – Density-Based Methods – Grid Based Methods – Model-Based Clustering Methods-Outlier Analysis.

Text Book:

1. "Data Mining Concepts and Techniques" Jiawei Han & Micheline Kamber, Morgan Kaufmann Publishers,2001.

   UNIT I - chapter 1
   UNIT II - chapter 3 and 4
   UNIT III - chapter 2
   UNIT 1V - chapter 5
   UNIT V - chapter 6

Reference Books:

1. "Advances in Knowledge Discovery and Data Mining" Usama M.Farrad, Geogory Piatetsky - Shapiro, Padhrai Smyth and Ramasamy Uthurusamy, The M.I.T. Press.

2. "The Data warehouse Life Cycle Toolhit", Ralph Kimball, John Wiley & Sons Inc.

3. "Data Warehousing in Action " Sean Kelly, John Wiley & Sons Inc.

4. "Insights into Data Mining" K.P. Soman, Shyam Diwakar, V. Ajay, Theory and Practice, PHI Publications Eastern Economy Edition 6th Printing, 2012.

ES 21 :INFORMATION RETRIEVAL

(5 Hours – 4 Credits)

UNIT I

Boolean retrieval: An example information retrieval problem- A first take at building an inverted index- Processing Boolean queries- The extended Boolean model versus ranked retrieval.

The term vocabulary and postings lists: Document delineation and character sequence decoding- Determining the vocabulary of terms- Faster postings list intersection via skip pointers- Positional postings and phrase queries. **Dictionaries and tolerant retrieval:** Search structures for dictionaries- Wildcard queries- Spelling correction- Phonetic correction.

UNIT II

Scoring, term weighting and the vector space model: Parametric and zone indexes- Term frequency and weighting- The vector space model for scoring- Variant tf-idf functions. **Computing scores in a complete search system:** Efficient scoring and ranking- Components of an information retrieval system- Vector space scoring and query operator interaction.

UNIT III

Text classification and Naive Bayes: The text classification problem- Naive Bayes text classification- The Bernoulli model- Feature selection- Evaluation of text classification.

Vector space classification: Document representations and measures of relatedness in vector spaces- Rocchio classification-k nearest neighbour- Classification with more than two classes- The bias-variance tradeoff.

UNIT IV:

Support vector machines and machine learning on documents: Support vector machines: The linearly separable case- Extensions to the SVM model- Issues in the classification of text documents- Machine learning methods in ad hoc information retrieval.

Flat clustering: Clustering in information retrieval- Problem statement- Evaluation of clustering- K-means.

UNIT V:

Hierarchical clustering: Hierarchical agglomerative clustering- Single-link and complete-link clustering- Group-average agglomerative clustering- Centroid clustering- Divisive clustering- Cluster labelling.

Text Book:

1. "Introduction to Information Retrieval" - Christopher D. Manning, PrabhakarRaghavan and HinrichSchutze, Cambridge University Press, 2014.

UNIT I - Chapters-1, 2, 3.
UNIT II - Chapters- 6, 7
UNIT III - Chapters-13, 14
UNIT IV - Chapters-15, 16
UNIT V - Chapters-17

Reference Books:

1. Information Retrieval: Implementing and Evaluating Search Engines,Stefan Buettcher, Charles L. A. Clarke, Gordon V. Cormack, The MIT Press, 2010.

2. "Information Retrieval: Algorithms and Heuristics: The Information Retrieval Series ",Ophir Frieder , 2nd Edition, Springer, 2004.

3. "Building Search Applications: Lucene, Ling Pipe", Manu Konchady, and First Edition, Gate Mustru Publishing, 2008.

ES 22 :SOFT COMPUTING

(5 Hours – 4 Credits)

UNIT I :

Introduction - Neural Networks – Application scope of Neural Networks – Fuzzy logic – Genetic Algorithm – Hybrid Systems – Soft Computing. Artificial Neural Network – An Introduction– Fundamental Concept – Evolution of Neural Networks – Basic models of Artificial Neural Network– Important terminologies of ANNs – McCulloch-Pitts Neuron – Linear Separability – Hebb Network.

UNIT II:

Supervised Learning Network – Introduction – Perceptron Networks – Adaptive Linear Neuron – Multiple Adaptive Linear Neurons – Back Propagation Network.

UNIT III:

Introduction to classical sets and Fuzzy Sets – Introduction – Classical sets (Crisp Sets) – Fuzzy Sets – Classical Relations and Fuzzy Relations – Introduction – Cartesian Product of Relation –Classical Relation – Fuzzy Relation.

UNIT IV:

Genetic Algorithm – Introduction – Basic Operators and Terminologies in Genetic Algorithms – Traditional Algorithm Vs Genetic Algorithm – Simple Genetic Algorithm – General Genetic Algorithm – The Schema Theorem – Classification of Genetic Algorithm – Holland Classifier Systems – Genetic Programming – Applications of Genetic Algorithm.

UNIT V:

Application of Soft Computing – Introduction – A fusion Approach of Multispectral Images with SAR (Synthetic Aperture Radar) Image for Flood Area Analysis – Optimization of Traveling Salesman Problem using Genetic Algorithm Approach – Genetic Algorithm based Internet Search Technique.

Text Book:

Principles of Soft Computing, S.N.Sivanadam & S.N.Deepa. First Edition , Wiley India, 2007.

UNIT I :Chapter 1, 2

UNIT II :Chapter 3

UNIT III :Chapter 7, 8

UNIT IV :Chapter 15

UNIT V :Chapter 16

Reference Book:

1. Soft Computing and Its Applications, R AAliev& R RAliev. Second Edition, world scientific, 2012.

2. "Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis & Applications", S.Rajasekaran and G.A.Vijayalakshmi Pai, Prentice-Hall of India Pvt. Ltd., 2006.

3. “Fuzzy Set Theory: Foundations and Applications”,George J. Klir, Ute St. Clair, Bo Yuan,

Prentice Hall, 1997.

ES 23 :INTERNET OF THINGS

(5 Hours – 4 Credits)

UNIT I

Introduction to Internet of Things: Introduction – Physical Design of IoT – Logical Design of IoT – IoT Enabling Technologies – IoT& Deployment Templates.

Domain Specific IoTs: Introduction – Home Automation – Cities – Environment – Energy – Retail – Logistics – Agriculture – Industry – Health & Lifestyle.

UNIT II

IoT and M2M : Introduction : M2M – Difference between IoT and M2M – SDN and NFV for IoT. **IoT System Management with NETCONF-YANG :** Need for IoT Systems Management – Simple Network Management Protocol (SNMP) – Network Operator Requirements – NETCONF- YANG – IoT Systems Management with NETCONF_YANG.

UNIT III

IoT Platforms Design Methodology: Introduction – IoT Design Methodology – Case Study on IoT System for Weather Monitoring – Motivation for using Python.

IoT Systems – Logical Design using Python: Introduction – Installing Python – Python Data types & Data Structures – Control Flow – Functions – Modules – Packages – File Handling – Date/Time Operations – Classes – Python packages of Interest for IoT.

UNIT IV

IoT Physical Devices & Endpoints: What is an IoT Device – Exemplary Device: Raspberry Pi – About the Board – Linux on Raspberry Pi – Raspberry Pi Interfaces – Programming Raspberry Pi with Python – Other IoT devices.

IoT Physical Servers & Cloud Offerings : Introduction to Cloud Storage Models & Communication APIs – WAMP-Auto Bahn for IoT – Xively Cloud for IoT – Python Web application Framework-Django – Designing a RESTful Web API – Amazon Web Services for IoT – SkynetIoT messaging platform.

UNIT V

Case Studies Illustrating IoT Design: Introduction – Home Automation – Cities – Environment – Agriculture – Productivity applications.

Data Analytics for IoT : Introduction – Apache Hadoop – Using HadoopMapReduce for Batch Data Analysis – Apache Oozier – Apache Spark – Apache Storm – Using Apache Storm for Real-time Data Analysis.

Text Book:

1. "Internet of Things" – ArshdeepBahga, Vijay Madisetti, Universities Press(INDIA) Private Ltd., 2015.

UNIT I	-	Chapters 1 &2
UNIT II	-	Chapters 3 & 4
UNIT III	-	Chapters 5 & 6
UNIT IV	-	Chapters 7 & 8
UNIT V	-	Chapters 9 & 10

Reference Books:

1. "Getting Started with the Internet of Things", CunoPfister, O'Relly, 2011
2. "Designing the Internet of Things",AdrianMcewen, HakinCassimally, Willey,2015
3. "The Internet of Things in the Cloud: A Middleware Perspective" ,Honbo Zhou, CRC Press, 2012
4. "Architecting the Internet of Things", Dieter Uckelmann; Mark Harrison; Florian Michahelles, (Eds.) Springer, 2011

CS34 :LAB 5: DATA MINING AND DATA WAREHOUSING

(5 Hours – 3 Credits)

Using weka tool

1. Demonstration of preprocessing on dataset student.arff
2. Demonstration of preprocessing on dataset labor.arff
3. Demonstration of Association rule process on dataset contactlenses.arff using apriori algorithm
4. Demonstration of Association rule process on dataset test.arff using apriori algorithm
5. Demonstration of classification rule process on dataset student.arff using j48 algorithm
6. Demonstration of classification rule process on dataset employee.arff using j48 algorithm
7. Demonstration of classification rule process on dataset employee.arff using id3 algorithm
8. Demonstration of classification rule process on dataset employee.arff using naïve bayes algorithm
9. Demonstration of clustering rule process on dataset iris.arff using simple k-means
10. Demonstration of clustering rule process on dataset student.arff using simple kmeans

Note: The above are sample problems, Instructor can add more exercises on their requirements and to the technology

CS35 :LAB 6: DIGITAL IMAGE PROCESSING

(5 Hours – 3 Credits)

1: Write a program for image enhancement
2: Write a program for image compression
3: Write a program for color image processing
4: Write a program for image segmentation
5: Write a program for image morphology
6: Write a Program for Image Restoration
7: Write a Program for Edge detection
8: Write a Program for Blurring 8 bit color versus monochrome
9. Write a Program to Display of Grayscale Images.
10. Write a Program for Histogram Equalization.

11. Write a Program for Non-linear Filtering.
12. Write a Program for Edge detection using Operators.
13. Write a Program for 2-D DFT and DCT.
14. Write a Program for Filtering in frequency domain.
15. Write a Program to Display of color images.
16. Write a Program for conversion between color spaces.
17. Write a Program for DWT of images.
18. Write a Program for Segmentation using watershed transform.

Note: The above are sample problems, Instructor can add more exercises on their requirements and to the technology

CS41 :CLOUD COMPUTING

(5 Hours – 4 Credits)

UNIT I

Systems Modeling, Clustering, and Virtualization: Introduction, Distributed System Models and Enabling Technologies, Scalable Computing Over the Internet, Technologies for Network-Based Systems, System Models for Distributed and Cloud Computing, Software Environments for Distributed Systems and Clouds, Performance, Security, and Energy Efficiency

Computer Clusters for Scalable Parallel Computing: Clustering for Massive Parallelism, Computer Clusters and MPP Architectures, Design Principles of Computer Clusters, Cluster Job and Resource Management

UNIT II

Virtual Machines and Virtualization of Clusters and Data Centers: Implementation Levels of Virtualization, Virtualization Structures/Tools and Mechanisms, Virtualization of CPU, Memory, and I/O Devices, Virtual Clusters and Resource Management, Virtualization for Data-Center Automation.

Cloud Platform Architecture over Virtualized Data Centers: Cloud Computing and Service Models, Data-Center Design and Interconnection Networks, Architectural Design of Compute and Storage Clouds, Public Cloud Platforms: GAE, AWS, and Azure, Inter-cloud Resource Management, Cloud Security and Trust Management

UNIT III

Service-Oriented Architectures for Distributed Computing: Services and Service-Oriented Architecture, Message-Oriented Middleware, Portals and Science Gateways, Discovery, Registries, Metadata, and Databases, Workflow in Service-Oriented Architectures

Cloud Programming and Software Environments: Features of Cloud and Grid Platforms, Parallel and Distributed Programming Paradigms, Programming Support of Google App Engine, Programming on Amazon AWS and Microsoft Azure, Emerging Cloud Software Environments

UNIT IV

Grid Computing Systems and Resource Management: Grid Architecture and Service Modeling, Grid Projects and Grid Systems Built, Grid Resource Management and Brokering, Software and Middleware for Grid Computing, Grid Application Trends and Security Measures

Peer-to-Peer Computing and Overlay Networks: Peer-to-Peer Computing Systems, P2P Overlay Networks and Properties, Routing, Proximity, and Fault Tolerance, Trust, Reputation, and Security Management.

UNIT V

Ubiquitous Clouds and the Internet of Things: Cloud Trends in Supporting Ubiquitous Computing, Performance of Distributed Systems and the Cloud, Enabling Technologies for the Internet of Things, Innovative Applications of the Internet of Things, Online Social and Professional Networking

Text Book:

Distributed and Cloud Computing, From Parallel Processing to the Internet of Things,Kai Hwang, Geoffrey C Fox, Jack G Dongarra, Morgan Kaufmann Publishers, 2012.

UNIT I	-	Chapters 1 and 2
UNIT II	-	Chapters 3 and 4
UNIT III	-	Chapters 5 and 6
UNIT IV	-	Chapters 7 and 8
UNIT V	-	Chapters 9

Reference Books:

1. "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Kai Hwang, Geoffrey C Fox, Jack G Dongarra, Morgan Kaufmann Publishers, 2012.
2. "Cloud Computing: Implementation, Management, and Security" John W.Rittinghouse and James F.Ransome, , CRC Press, 2010.
3. "Cloud Computing, A Practical Approach" Toby Velte, Anthony Velte, Robert Elsenpeter, , TMH, 2009.

ES 31 :BIG DATA ANALYTICS

(5 Hours – 4 Credits)

UNIT I

Introduction to Big Data: Types of Digital Data: Classification of Digital Data, Introduction to Big Data: Characteristics of data-Evolution of Big data-Challenges of Big data-Other Characteristics of Data Which are not Definitional Traits of Big Data-Why Big Data?-Are we Just an Information Consumer or Do we also produce Information?-Traditional Business Intelligence (BI) versus Big Data – A Typical Data Warehouse Environment – A Typical Hadoop Environment – What is New Today? – What is changing in the Realms of Big Data?

UNIT II

Analytics Basics: Big Data Analytics: Where do we Begin? – What is Big Data Analytics? – What Big Data Analytics Isn't? – Why this Sudden Hype Around Big Data Analytics? – Classification of Analytics – Greatest Challenges that Prevent Business from capitalizing on Big Data – Top Challenges Facing Big Data – why is Big Data Analytics Important? – What kind of Technologies are we looking Toward to Help Meet the Challenges Posed by Big Data? – Data Science – Data Scientist… Your New Best Friend – Terminologies Used in Big Data Environments – Basically Available Soft State Eventual Consistency (BASE) – Few Top Analytics Tools.

UNIT III

Big Data Technologies: The Big Data Technology Landscape: NoSQL (Not Only SQL) – Hadoop, Introduction to Hadoop: Introducing Hadoop – Why Hadoop? – Why not RDBMS? – RDBMS versus Hadoop – Distributed Computing Challenges – History of Hadoop – Hadoop Overview – Use Case of Hadoop – Hadoop Distributors – HDFS(Hadoop Distributed File System) – Processing Data with Hadoop – Managing Resources and Applications with Hadoop YARN(Yet another Resource Negotiator) – Interacting with Hadoop Ecosystem.

UNIT IV

Introduction to MAPREDUCE Programming: Introduction – Mapper – Reducer – Combiner – Partitioner – Searching – Sorting – Compression, Introduction to Hive: What is Hive? – Hive Architecture – Hive Data Types – Hive File Format – Hive Query Language (HQL) – RCFile Implementation – SerDe – User – Defined Function (UDF).

UNIT V

Analytical Algorithms: Introduction to Machine Learning: Introduction to Machine Learning – Machine Learning Algorithms.

Text Book:

Big Data and Analytics, SeemeAcharya, and Subhashini Chellappan, Wiley India Pvt.Ltd. First Edition-2015.

UNIT I : Chapters-1,2
UNIT II: Chapter 3
UNIT III: Chapter 4,5
UNIT IV: 8,9
UNIT V: 12

Reference Books:

1. Big Data – Principles and best practices of scalable real-time data systems, Nathan Marz, and James Warren, Manning Publication cp., USA-2015.
2. Analytics in a Big Data World: The Essential Guide to Data Science and its Applications, Bart Baesens, Wiley India Pvt.Ltd-2015.
3. Big Data, Data Mining and Machine Learning, Jared Deamn, Willey India Pvt.Ltd-2015.
4. The R Language-An Approach to Data Analytics, G. Sudhamathy,C.Jothi Venkateswaran, MJP Publishers,2018.

ES 32 :WIRELESS SENSOR NETWORK

(5 Hours – 4 Credits)

UNIT I

Introduction: the vision, Networked wireless sensor devices, Applications, Key design challenges. **Network deployment:** Structured versus randomized deployment, Network topology, Connectivity, Connectivity using power control, Coverage metrics, Mobile deployment.

UNIT II

Localization: issues & approaches, Coarse-grained & Fine-grained node localization, Network-wide localization, Theoretical analysis of localization techniques. **Synchronization:** Issues & Traditional approaches, Fine-grained clock synchronization, and Coarse-grained data synchronization.

UNIT III

Wireless characteristics: Basics, Wireless link quality, Radio energy considerations, SINR capture model for interference. **Medium-access and sleep scheduling:** Traditional MAC protocols, Energy efficiency in MAC protocols, Asynchronous sleep techniques, Sleep-scheduled techniques, and Contention-free protocols.

UNIT IV

Sleep-based topology control: Constructing topologies for connectivity, constructing topologies for coverage, Set K-cover algorithms. **Routing:** Metric-based approaches, Routing with diversity, Multi-path routing, Lifetime-maximizing energy-aware routing techniques, Geographic routing, Routing to mobile sinks.

UNIT V

Data-centric networking: Data-centric routing, Data-gathering with compression, Querying, Data-centric storage and retrieval, The database perspective on sensor networks. **Reliability and congestion control:** Basic mechanisms and tunable parameters, Reliability guarantees, Congestion Control, Real-time scheduling.

Text Book:

1. KazemSohraby, Daniel Minoli, TaiebZnati , Wireless Sensor Networks: Technology, Protocols, and Applications,Wiley Inter Science, 2007.

UNIT I	-	Chapters 1 and 2
UNIT II	-	Chapters 3, 4 and 5
UNIT III	-	Chapters 6 and 7
UNIT IV	-	Chapters 8 and 9
UNIT V	-	Chapters 10 & 11

Reference Books:

1. Wireless Sensor Networks: Technology, Protocols, and Applications: KazemSohraby, Daniel Minoli, TaiebZnati , Wiley Inter Science.
2. Wireless Sensor Networks: Architectures and Protocols: Edgar H. Callaway, Jr. Auerbach Publications, CRC Press.
3. Wireless Sensor Networks: Edited by C.S Raghavendra, Krishna M, Sivalingam, TaiebZnati , Springer.

ES 33 :COMPILER DESIGN

(5 Hours – 4 Credits)

UNIT I

Introduction to Compilers: Compilers and Translators – Why do we need translators – The structure of a compiler – Lexical Analysis – Syntax Analysis – Intermediate code generation – Optimization – Code generation – Book keeping – Error handling - Programming Languages: High-level programming languages – definitions of programming languages – The lexical and syntactic structure of a language – Data elements – Data structures – Operators – Assignment – Statements – Program units – Data environments – Parameter transmission – Storage management.

UNIT II

Finite Automata and Lexical Analysis: The role of the lexical analyzer – A simple approach to the design of lexical analyzers – Regular expressions – Finite automata – From regular expressions to finite automata – Minimizing the number of states of a DFA – A language for specifying lexical analyzers.

UNIT III

The Syntactic specification of Programming Languages: Context-free grammars – Derivations and parse trees – Capabilities of context-free grammars - Basic Parsing Techniques: Parsers – Shift-reduce parsing – Operator-precedence parsing – Top-down parsing – Predictive parsers.

UNIT IV

Syntax-Directed Translation: Syntax-directed translation schemes – Implementation of syntax-directed translators – Intermediate code – Postfix notation – Parse trees and syntax trees – Three-address code, quadruples, and triples – Translation of assignment statements – Boolean expressions – Statements that alter the flow of control – Postfix translations – Translation with top-down parser.

UNIT V

Symbol Tables: The contents of a symbol table – Data structures for symbol tables – Representing scope information - Introduction to Code Optimization: The principal sources of optimization – Loop optimization – The DAG representation of basic blocks.

Text Book:

1. Principles of Compiler Design by Alfred V.Aho Jeffrey D.Ullman, Narosa Publishing House, New Delhi.

UNIT-I	-	Chapter 1.1 to 1.10, Chapter 2.1 to 2.12
UNIT-II	-	Chapter 3.1 to 3.7
UNIT-III	-	Chapter 4.1 to 4.3, Chapter 5
UNIT-IV	-	Chapter 7
UNIT-V	-	Chapter 9, Chapter 12.1, 12.2, 12.3.

Reference Books

1. "Optimizing Compilers for Modern Architectures: A Dependence-based Approach", Randy Allen, Ken Kennedy, Morgan Kaufmann Publishers, 2002.
2. "Advanced Compiler Design and Implementation",Steven S. Muchnick, "Morgan Kaufmann Publishers - Elsevier Science, India, Indian Reprint 2003.
3. "Engineering a Compiler",Keith D Cooper and Linda Torczon, Morgan Kaufmann Publishers Elsevier Science, 2004.

NME 1 :DATA MANAGEMENT TECHNIQUES

(4 Hours – 4 Credits)

UNIT I

Database systems - Database – Database management system – Classical file based system – Modern DBMS approach – Significance of database systems-Modelling a database – Representation of data – Data models – Entity relationship model – Logical data models – Comparison of logical data models – Other data models-Modelling with ER diagram – ER based modeling – Symbolic representation of ER components – Mapping between entities – Use of entity sets and relationship sets – Modelling with ER diagram – Advantages and disadvantages of ER model-Principles of Relational Database Management Systems – Foundations of relational model – Application areas of RDBMS – Advantages of RDBMS – RDBMS packages and their developers – CODD's rule for RDBMS – Relational operations

UNIT II

Relational Database Design – Designing a database – Functional dependency – Relational decomposition – Normalization – Importance of Normalization – Limitations of Normal forms

Structured Query Language – SQL – Data sub languages – Single row functions used in SQL – SQL * Plus – Data Dictionary-Information Retrieval and Data Manipulation – Features of SQL – Sub query handling – Join operations – Data consistency and Integrity constraints – Transaction control statements – Views of tables – Embedded SQL -Programming with PL/SQL – Basics of PL/SQL Programming – PL/SQL programming – Exception handling in PL/SQL – SQL Cursor – SQL Trigger – Benefits of PL/SQL

UNIT III

What is Cloud Computing – Definition – What is driving IT and businesses to cloud - Introduction to cloud service models - Introduction to cloud delivery models - The IBM Cloud Computing Reference Architecture - Cloud enabled data center journey - Role of predefined IaaS offerings - Storage cloud components within overall cloud-What is a storage cloud -Storage cloud overview - Traditional storage versus storage cloud - Benefits and features of storage cloud - Storage classes for cloud - Storage cloud delivery models - The storage cloud journey

UNIT IV

What enables a smart storage cloud -Global collaboration for OpenStack storage components - Storage efficiency - Automation and management - Security and data protection

UNIT V

Introduction to ERP: Introduction-Evolution of ERP-what is ERP?-Reasons for growth of the ERP market-The advantages of ERP-Disadvantages of ERP-why do many ERP implementations Fail?-why are ERP packages being used now? Enterprise-An Overview: Introduction-Integrated management Information-Business modeling-Integrated Data Model.ERP and Related Technologies: Introduction-Business Process Reengineering(BPR)-Management Information Systems(MIS)-Decision Support System(DSS)-Executive Information System (EIS) - Data Warehousing-Data Mining-On-line Analytical Processing(OLAP)-Supply Chain Management.ERP Modules: Introduction-Finance-Plant Maintenance-Quality Management-Materials Management. Benefits of ERP: Introduction-Reduction of lead Time-On-time Shipment-Reduction in cycle time-improved resource

utilization-Better customer satisfaction-improved supplier performance-increased flexibility-Reduced quality costs-Improved information accuracy and decision making capability.

Text Book:

1. Database Management System, Malay K.Pakhira, PHI Learning Pvt.Ltd.
2. IBM Private, Public, and Hybrid CloudStorage Solutions, Larry Coyne, ShivaramakrishnanGopalakrishnan, John Sing

3. 3.Enterprise Resource Planning-Alexis Leon-Tata McGraw-Hill Publishing Company Limited New Delhi.

UNIT I, II	-	Text Book 1
UNIT III, IV	-	Text Book 2
UNIT V	-	Text Book 3

Reference Book:

1, Database Management System Concepts, Abraham Silberschatz, Hentry F.korth and S.Sudarshan, 5th Edition, McGraw hill International Edition.

2.An Introduction to Data Base Systems, C.J Date and Kannan, Eight Edition, Pearson Education,2006.