SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE
(AUTONOMOUS)

(*Affiliated to Bharathidasan University*)

(Accredited by NAAC; An ISO 9001:2015 Certified Institution)

SUNDARAKKOTTAI, MANNARGUDI – 614016.

TAMILNADU, INDIA.

M.Sc., COMPUTER SCIENCE

LEARNING OUTCOMES BASED CURRICULUM FRAMEWORK(CBCS-LOCF)

(*For the candidates admitted in the academic year 2022–2023*)

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CHOICE BASED CREDDIT SYSTEM – LEARNING OUTCOMES BASED CURRICULUM FRAMEWORK (CBCS – LOCF)

(For the Candidates admitted in the academic year 2022 – 2023)

Eligibility : Candidates who have passed B.Sc. Computer Science/ B.Sc. Information Technology/ B.C.A/B.Sc. Software Development of this University or from a recognized University or an examination accepted by the Syndicate equivalent there to

Sem	Course	Course Code	Title of the Paper	Ins. Hours/ Week	Credit	Exam Hours	Marks		Total
							CIA	ESE	
I	Core Course – I (CC)	22PCS101	Open Source Technologies	6	5	3	25	75	100
	Core Course – II (CC)	22PCS102	Web Technologies	6	5	3	25	75	100
	Core Course – III (CC)	22PCS103	Design and Analysis of Algorithms	6	5	3	25	75	100
	Core Practical – I (CP)	22PCS104P	Web Technologies Lab	6	3	3	40	60	100
	Elective Course-I (EC)	22PCSE1A/ 22PCSE1B/ 22PCSE1C	Mobile Computing/Digital Marketing/Human Computer Interaction	6	4	3	25	75	100
	Value added course I	22PCSVA11	Organizational Behaviour		2*	3	25	75	100*
			TOTAL	**30**	**22**	-	-	-	**500**
II	Core Course – IV (CC)	22PCS205	Programming in Python	6	5	3	25	75	100
	Core Course – V (CC)	22PCS206	Distributed Technologies using ASP.Net	5	5	3	25	75	100
	Core Course – VI (CC)	22PCS207	Cloud Computing	5	5	3	25	75	100
	Core Practical – II (CP)	22PCS208P	Distributed Technologies Lab	6	3	3	40	60	100
	Elective Course – II (EC)	22PCSE2A/ 22PCSE2B/ 22PCSE2C	Embedded Systems / Digital Image Processing/Advanced Computer Architecture	5	4	3	25	75	100
	Extra Disciplinary Course-I(EDC)	22PCSED1A/ 22PCSED1B	Basics of Computer Programming /Fundamentals of Web Technology	3	2	3	25	75	100
			TOTAL	**30**	**24**	-	-	-	**600**
III	Core Course – VII (CC)	23PCS309	Data Mining and Data Warehousing	6	5	3	25	75	100
	Core Course – VIII(CC)	23PCS310	Complier Design	5	5	3	25	75	100
	Core Course – IX (CC)	23PCS311	Research Methodology	5	5	3	25	75	100
	Core practical -III	23PCS312P	Data Mining and Data Warehousing Lab	6	3	3	25	75	100
	Elective Course III (EC-III)	23PCSE3A/ 23PCSE3B/ 23PCSE3C	Cryptography and Network Security/ Advanced DBMS /Software Project Management	5	4	3	25	75	100

Sem	Course	Course Code	Title of the Paper	Ins. Hours/ Week	Credit	Exam Hours	Marks		Total
							CIA	ESE	
	Extra Disciplinary Course-II(EDC)	23PCSED2A/ 23PCSED2B	Enterprise Resource Planning/Green Computing	3	2	3	25	75	100
			TOTAL	**30**	**24**	**-**	**-**	-	**600**
IV	Core Course -X	23PCS413	Distributed Operating Systems	6	5	3	25	75	100
	Core Course -XI	23PCS414	Machine Learning	6	5	3	25	75	100
	Entrepreneurship / Industry Based course	23PCSI41	Data Science and Data Analytics	6	5	3	25	75	100
	Project	23PCSPW	Project Work	12	5	-	25	75	100
	Value added course II	23PCSVA42	Fundamentals of Cyber Crime and Security		2*	3	25	75	100
			TOTAL	**30**	**20**	-	-	-	**400**
			G. TOTAL	**120**	**90**				**2100**

CURRICULAM DESIGN

Courses	No. of Courses	Total Credits
Core course	11	55
Core Practical	3	9
Elective Course	3	12
Extra Disciplinary Course	2	4
Entrepreneurship/ Industry Based Course	1	5
Project	1	5
Total	**21**	**90**

Note:

1. Theory — Internal 25 marks — External 75 marks
2. Practical — Internal 25 marks — External 75 marks
3. Separate passing minimum is prescribed for Internal and External

a) The passing minimum for CIA shall be 40% out of 25 marks (i.e. 10marks)
b) The passing minimum for University Examinations shall be 40% out of 75marks (i.e. 30marks)
c) The passing minimum not less than 50% in the aggregate.

ELECTIVE COURSES (EC) OFFERED BY THE DEPARTMENT

S.No.	Semester	Elective Courses (EC)(Any one from the list)
1.	I	Mobile Computing
2.	I	Digital Marketing
3.	I	Human Computer Interaction
4.	II	Embedded Systems
5.	II	Digital Image Processing
6.	II	Advanced Computer Architecture

EXTRA DISCIPLINARY COURSES (EDC) OFFERED BY THEDEPARTMENT

S.No.	Semester	Extra Disciplinary Courses (EDC)(Any one from the list)
1.	II	Basics of Computer Programming
2.	II	Fundamentals of Web Technology
3.	III	Enterprise Resource Planning
4.	III	Green Computing

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PG AND RESEARCH DEPARTMENT OF COMPUTER SCIENCE
M.Sc., COMPUTER SCIENCE

(For the Candidates admitted in the academic year 2022 – 2023)

Question Paper Pattern-(Theory)

Max time: 3 Hours **Max Marks: 75**

Section – A (10 x 2 = 20)
Answer all the questions
Answer in One or Two sentences each

1. 2.	Unit I
3. 4.	Unit II
5. 6.	Unit III
7. 8.	Unit IV
9. 10.	Unit V

Section – B (5 x 5 = 25)
Answer all the questions
Each answer should not exceed 500 words

11. a (or) b	Unit I
12. a (or) b	Unit II
13. a (or) b	Unit III
14. a (or) b	Unit IV
15. a (or) b	Unit V

Section – C (3 x 10 = 30)
Answer any <u>THREE questions</u> in 1200 words

16 Unit I
17 Unit II
18 Unit III
19 Unit IV
20 Unit V

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SEMESTER III

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PG AND RESEARCH DEPARTMENT OF COMPUTER SCIENCE
M.Sc., COMPUTER SCIENCE

Semester: III - CC-VII: DATA MINING AND DATA WAREHOUSING

Ins. Hrs./Week:6 **Course Credit:5** **Course Code: 23PCS309**

OBJECTIVES:

- To understand the overview of an growing field of data mining
- To understand the fundamental techniques and algorithms of data mining
- To solve complex real-world problems in data mining

UNIT-I: Introduction to Data mining **(20 Hours)**

Overview of Data mining–Relational Databases-Data Warehouses–Transactional Databases-KDD vs Data Mining – Data Mining Functionalities–Classification of Data mining System-Basic Data mining tasks–Data Mining Issues. **Applications and Trends in Data Mining:** Data Mining Applications – Data Mining System Products and Research Prototypes – Additional Themes on Data mining – Social Implications of Data Mining.

UNIT-II: Data Preprocessing **(19 Hours)**

Need to preprocess the Data–Descriptive Data Summarization-Data Cleaning- Data Integration and Transformation – Data Reduction – Data cube Aggregation – Attribute Subset Selection-Data Discretization and Concept Hierarchy Generation. **Classification**: Introduction–statistical based algorithms – Bayesian Classification-Distance Based Algorithms–Decision Tree Based algorithms–ID3.

UNIT-III: Clustering **(18 Hours)**

Introduction – A Categorization of Major Clustering Methods – Hierarchical algorithms – Partitional algorithms – Minimum spanning Tree – K Means Clustering - Nearest Neighbour algorithm. **Association Rules:** Definition of Association rule–Methods to discover an association rule – Mining Various kinds of Association Rules-APRIORI algorithm–Partitioning algorithm.

UNIT-IV: Data Warehouse and OLAP Technology **(17 Hours)**

An Overview - Definition of Data Warehouse - A Multidimensional Data Model - Schemas for Multidimensional databases – OLAP Operations in the Multidimensional Data Model-Data Warehouse Architecture – Metadata Repository – Types of OLAP Servers - Data Warehouse Implementation – Efficient Computation of Data Cubes - Indexing OLAP Data-Efficient Processing of OLAP Queries – From Data Warehousing to Data Mining – Data Warehouse Usage.

UNIT-V: Web Mining and Text Mining: **(16 Hours)**

Web Mining: Mining the Web Page Layout Services – Mining the Web's Linking Structures to identify Authoritative Web pages –Mining Multimedia Data on the Web –Automatic Classification of Web Documents- Web usage mining. **Text Mining:** Text Data Analysis and Information Retrieval – Dimensionality Reduction for Text – Text Mining Approaches.

Total Lecture Hours - 90

COURSE OUTCOME

The Students will be able to,

1. Understand the various techniques of Data Mining
2. Apply the usage of data preprocessing techniques
3. Implement the Concept of Clustering Algorithm in the real world problems
4. Apply the Association rule and APRIORI algorithm for mining frequent item sets
5. Interpret the concept of data warehouse Architecture and its Environment
6. Identify the different types of OLAP servers
7. Apply the concepts of Web Mining and Text Mining in the real world scenario

TEXT BOOK(S)

1. Jiawei Hanand Miceline Kamber,2006,"DataMining Concepts and Techniques", Morgan Kaulmann Publishers, Massachusetts, USA.x
2. Margaret Dunham.H,2003,"Data mining Introductory & Advanced Topics", Pearson Education, India.

REFERENCE BOOK(S)

1. Arun Pujari.K, 2003, "Data mining Techniques", Universities Press(India) Pvt, Hyderabad
2. MaxBramer,2020,"Principles of data mining", Springer 4thEdition,NewYork,USA
3. Pieter Adriaans, Dolf Zantinge,1998,"DataMining"PearsonEducation,India.

E-RESOURCES

1. https://hanj.cs.illinois.edu/bk3/bk3_slidesindex.html
2. https://www.slideshare.net/2cdude/data-warehousing-3292359

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PG AND RESEARCH DEPARTMENT OF COMPUTER SCIENCE
M.Sc., COMPUTER SCIENCE

Semester: III - CC-VIII: COMPILER DESIGN

Ins. Hrs./Week:5 **Course Credit:5** **Course Code:23PCS310**

OBJECTIVES:

- To understand the different phases of compiler
- To study about needs of the compiler
- To learn the working of each phase of compiler

Unit I: **Compiler Introduction** **(15 Hours)**

Introduction-Language processors-The structure of a Compiler: Lexical analysis – syntax analysis –semantic analysis-intermediate code generation –code optimization –code generation. Symbol table management – The grouping of phases into passes- Compiler construction tools. **A simple syntax directed translator**: Introduction –syntax definition– derivations –parse trees -ambiguity-Associativity of operators-precedence of operators-Syntax directed translation: postfix notation – synthesized attributes-tree traversals-translation schemes.

Unit II: Parsing **(15 Hours)**

Parsing: Top-Down parsing-predictive parsing –when to use £ productions-designing a predictive parser-left recursion. Lexical analysis: removal of white space and comments- Reading Ahead – Recognizing keywords and identifiers-A Lexical Analyzer. Symbol Tables- Symbol table per scope-the use of symbol tables. Intermediate code generation: Two kinds of intermediate representations – Construction of syntax tree-static checking-Three Address code.

Unit III: Lexical analysis: **(15 Hours)**

Lexical analysis: The Role of the Lexical Analyser-Lexical analysis versus parsing –Tokens, patterns lexemes –Attributes for tokens-lexical Errors. Input Buffering –Buffer pairs- sentinels**.** **Specification of Tokens**: String and Languages operations on languages – Regular Expressions-Regular Definitions-Extension of regular Expressions. Recognition of Tokens: Transition diagrams-Recognition of served words and identifiers –Completion of the Running Example.

Unit IV: Finite Automata **(15 Hours)**

Finite Automata: Nondeterministic Finite Automata – Transition Tables- Deterministic Finite Automata-From Regular Expressions to Automata –Conversion of an NFA to a DFA Simulation of an NFA-Efficiency of NFA Simulation-Construction of an NFA from a Regular Expression – Efficiency of string processing algorithms-Construction of an NFA from a regular Expression. **Syntax Analysis**: Introduction-The role of the parser- Representative grammars-syntax error handling-Error Recovery strategies. Context free grammar:-The formal definition of a context free grammar-National conventions-Derivations- parse trees and derivations- Ambiguity-Verifying the Language generated by a grammar- context free grammars versus regular expression. Writing a grammar: - Lexical versus syntactic analysis-Eliminating ambiguity-Elimination of left recursion – Left factoring-Non- Context free language constructs

Unit V: Top-down parsing **(15 Hours)**

Recursive Descent Parsing –FIRST and FLLOW-LL(1) Grammars-Non recursive parsing-Error recovery in predictive Parsing –Bottom Up parsing: Reductions-Handle Handle pruning-Shift reduced parsing. **Syntax directed translation** :- Syntax directed definition-Evaluation order for SDD's-Ordering the evaluation attributes –S-attribute definitions-L-attributes definitions-Intermediate **code generation**: Variants of syntax trees – Three address code-Types and declarations –Type checking .Run time Environments:-Storage organization-Stack allocation of space.

Total Lecture Hours- 75

COURSE OUTCOME

The students will be able to,

1. Understand about the different phases of compiler
2. Explain about parsing and symbol table entry
3. Analyze the storage and organization of storage allocation strategies
4. Apply the concept of finite automata
5. Illustrate the use of top down parsing and code generation
6. Summarize the concept of Recursive decent parsing and syntax directed translation
7. Examine the runtime environment and storage organization

TEXT BOOK(S)

1. Aho, Ullman,2001, "Compilers, Principles and Techniques and Tools", – 6th edition, Pearson Education, India.
2. Tremblay.J.PandSorrenson.P.G,1985, "The Theory and Practice of Compiler Writing", McGraw Hill.

REFERENCE BOOK(S)

1. Andrew Appel.N, "Modern Complier Implementation in C", Cambridge University Press, United Kingdom.
2. Kakde Charles.O.G,2011,"Algorithms for Compiler Design" River Media.
3. Seidl, Hack Sebastian.H, and Reinhard Wilhelm, "Compiler Design: Syntactic and Semantic Analysis Book".

E-RESOURCES

1. https://www.youtube.com/watch?v=Qkwj65l_96I
2. https://www.slideshare.net/naparnanayak/code-generation-15188739

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PG AND RESEARCH DEPARTMENT OF COMPUTER SCIENCE

M.Sc., COMPUTER SCIENCE

Semester: III - CC-IX: RESEARCH METHODOLOGY

Ins. Hrs./Week:5 **Course Credit:5** **Course Code:23PCS311**

OBJECTIVES:

- To understand the types of research and research problems
- To learn the art of thesis writing
- To understand Research ethics and ethics in Information technology

UNIT-I: Research Fundamentals **(14 Hours)**

Motivation and Objectives – Research Methods and Methodology - Research types – Descriptive Vs Analytical, Applied Vs Fundamental, Quantitative Vs Qualitative, Conceptual Vs Empirical, concept of applied and Basic research process – Criteria of good Research.

UNIT-II: Research Formulation and Problems **(16 Hours)**

Defining and formulating the Research problem – Selecting the problem – Necessity of defining the problem – Importance of Literature review in defining a problem – Literature collection - Literature review – Primary and secondary sources – Reviews – Monograph – Patents – Research Databases – Web as a source – Searching the web – Critical literature review – Identifying gap areas from literature and research database, Development of working hypothesis.

UNIT-III: Thesis Writing **(14 Hours)**

Writing review and journal articles – manuscript publication - **Thesis Writing**: Planning a thesis – general format – page and chapter format – footnotes – tables and figures–references and appendices. Research Tools in Computer Science: LaTex, R, WEKA, MATLAB, NS2.

UNIT-IV: Research Ethics **(16 Hours)**

Philosophy - Definition, nature, scope and concept - Ethics – definition, moral philosophy, nature of moral judgments and reactions - Ethics with respect to science and research- Scientific misconducts– falsification, fabrication and plagiarism software – Turnitin, Urkund and other open source software tools - Redundant publications-duplicate and overlapping publications - Publication ethics- definition and importance. Publication miscount-definition, concept, problems that lead to unethical behavior, types, Violation of publication ethics, authorship and contributor ship - Software tool to identify predatory publications developed by SPPU - Subject specific ethical issues-authorship, Conflicts of interest.

UNIT-V: Ethics in Information Technology **(15 Hours)**

Overview of Ethics: Definition of Ethics - The Importance of Integrity - The Difference Between Morals, Ethics, and Laws - Ethics in the Business World - Corporate Social - Improving Corporate Ethics Creating an Ethical Work Environment - Ethics in Information

Technology – **Ethics for IT Workers and IT users**: IT Professionals - Professional Relationships - Professional Codes of Ethics - Professional Organizations –- **Ethics of IT organization:** Key Ethical Issues for Organizations - The Need for Nontraditional Workers

Total Lecture Hours - 75

COURSE OUTCOME

The students will be able to,

1. Understand the basic concepts of research and its types
2. Analyze the research problems in the real world scenario
3. Understand scholarly writing and development of the skills to write the same
4. Use tools related to research in Computer Science
5. Describe the art of thesis writing
6. Apply the research ethics and publication ethics
7. Apply the ethics in Information technology to justify the morals of professional ethics

TEXT BOOK(S)

1. Garg B.L.Karadia, R.Agarwal, F and Agarwal, "An Introduction to Research Methodology" RBSA Publishers, U.K., 2002
2. Kothari C.R. Research Methodology – methods and techniques, 2nd Edition,Wishwa Prakashjan NewDelhi 1999
3. Sinha.S.C, and Dhiman A.K, 2002, " Research Methodology", Ess Ess Publications- Second Volume
4. Trochim W.M.K, "Research Methods: the concise knowledgebase", 2005, Atomic Dog Publishing.
5. George Reynolds, "Ehics in Information Technology" Thompson Course Technology, 2007 ISBN 13:978-1-4188-3631-3(Chapter:1,2,10)

REFERENCE BOOK(S)

1. Anderson, Durston and Poole, 'Thesis and Assignment writing', Wiley Eastern Ltd.ND1970
2. Misra R.P. Research Methodology–A Hand Book, Concept publishing Company, NewDelhi1988

E_RESOURCES

1. https://ccsuniversity.ac.in/bridge-library/pdf/Research-Methodology-CR-Kothari.pdf
2. https://repository.dinus.ac.id/docs/ajar/ethics_in_information_technology2c_5th_ed._0
3. _.pdf

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Semester: III – CP-III: DATA MINING AND DATA WAREHOUSING LAB

Ins. Hrs./Week: 6 **Course Credit: 3** **Course Code:23PCS312P**

OBJECTIVES

- To provide a practical introduction to the R programming language
- To understand to navigate and optimize the R integrated development environment(IDE) R Studio
- To learn to import external data, manipulate data for specific needs, and running summary statistics and visualizations

EXERCISE

1. Write a R program using Simple Commands.
2. Write a R program using Control Structures.
3. Write a calculator program using R.
4. Write a R Program to perform Data Preprocessing:
   a. Data type Conversion
   b. Data Transformation
5. Write a R Program to apply Filters:
   a. Replace Missing Values
   b. Add Expression
6. Regression: Perform Simple Regression using R Package
7. Classification: Apply Naïve Bayes Rule by using R Package.
8. Clustering: Apply Partitioned Algorithm by using R Package.
9. Clustering: Apply Hierarchical Algorithm by using R Package.
10. Association Rule Mining: A-Priori Algorithm by using R Package.

Total Lecture Hours - 90

COURSE OUTCOME

The students will be able to,

1. Understand to import external data into R for data processing and statistical analysis
2. Implement the R data structures –vector and data frame
3. Understand to compute basic summary statistics
4. Implement the data visualizations in the ggplot package
5. Evaluate the fundamental error problems in R Studio.

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Semester: III - EC-III(a) - CRYPTOGRAPHY AND NETWORK SECURITY

Ins.Hrs./Week: 5 **Course Credit:4** **Course Code: 23PCSE3A**

OBJECTIVES

- To provide knowledge for establishing secured network-based computing and information systems
- To learn about how to maintain the Confidentiality, Integrity and Availability of data
- To understand various protocols for network security to protect against the threats in the networks

UNIT I:Computer and Network Security Concepts (14 Hours)
Introduction: The OSI Security Architecture-Security attacks-Security Services- Security mechanisms - A model for network Security - **Classical Encryption Techniques:** Symmetric Cipher model: Cryptography – Cryptanalysis and Brute-Force Attack. **Substitution Techniques**: Caesar Cipher – Monoalphabetic Ciphers – Playfair Cipher – Hill Cipher – Polyalphabetic Ciphers – One Time Pad. Transposition Techniques–Rotor Machines– Steganography.

UNIT II : Block ciphers and the Data Encryption Standards (16 Hours)
Traditional Block Cipher Structure-Stream Ciphers and block Ciphers – Motivation for the Feistel Cipher Structure – The Fiestel Cipher- **The Data Encryption Standard:** DES Encryption – DES Decryption. **The Strength of DES:** The use of 56-Bit Keys – The Nature of the DES Algorithm Timing Attacks. **Block Cipher Design Principles:** Number of Rounds – Design of function F Key Schedule Algorithm. **Public-Key Cryptography and RSA:** Public Key Cryptosystems- Applications for Public-Key Cryptosystems – Requirements for public-Key Cryptography – Public Key Cryptanalysis-The RSA Algorithm. **Cryptographic Hash Functions:** Applications of Cryptographic Hash Functions –Secure Hash Algorithm.

UNIT III: Transport level Security (15 Hours)
Web Security Considerations- Web Security Threats- Web Traffic Security Approaches. **Secure Socket Layer :** SSL Architecture – SSL Record Protocol – Change Cipher Spec Protocol – Alert Protocol – Handshake Protocol- Cryptographic Computations. **Transport Layer Security**: Version Number- Message Authentication Code – Pseudorandom Function –Alert Codes – Cipher Suites – Client Certificate types – Certificate-Verify and Finished Messages – Cryptographic Computations- Padding. HTTPS – Secure Shell(SSH) - secure electronic transaction (SET)

UNIT IV : Wireless Network Security and IP Security (15 Hours)
Wireless Security - Wireless Network Threats – Wireless Security Measures. **Mobile Device Security:** Security Threats – **Mobile Device Security Strategy. IEEE 802.11.**

Wireless LAN Overview: The Wi-Fi Alliance – IEEE 802 Protocol Architecture – IEEE 802.11 Network Components and Architectural Model – IEEE 802.11 Services. **IEEE 802.11i Wireless LAN Security:** IEEE 802.11i Services – IEEE 802.11i Phases of Operations – Discovery Phase –Authentication Phase – Key Management Phase – Protected data Transfer Phase – The IEEE Pseudo random Function. **IP Security:** Overview-IP Security policy – Encapsulating Security Payload – Combining Security Associations – Internet Key Exchange.

UNIT V : System Security **(15 Hours)**

System Security: Intruders-Intrusion Detection-Password Management- Malicious Software: Types of Malicious Software(Malware)-Advanced Persistent Threat-Viruses- Worms-Spam E-mail, Trojans-System Corruption-Zombie, Bots - Information Theft - Keyloggers, Phishing, Spyware-Countermeasures-Distributed Denial of Service attacks- Firewalls: The Need for Firewalls-Firewall characteristics and Access Policy- Types of Firewalls-Firewall basing-Firewall Location and Configurations

Total Lecture Hours-75

COURSE OUTCOME

The Students will be able to,

1. Understand the concepts, methods of Network Security using cryptography basics.
2. Analyze and design classical encryption techniques and block ciphers.
3. Acquire knowledge about Public Key cryptography.
4. Evaluate Hash Functions in network security.
5. Analyze about IP security, Wireless Network security.
6. Understand about Web security.
7. Understand about intruders, malicious software and Firewalls.

TEXT BOOK(S)

1. William Stallings, 2017, "Cryptography and Network Security"-Principles and Practices,Prentice-Hall, Seventh edition, **ISBN:**10:1-292-15858-1, India.
2. Behrouz A. Ferouzan, 2015, "Cryptography & Network Security", Tata Mc Graw Hill, India.
3. Neal Krawetz, 2007, "Intoduction to Network Security", Charles River media Publications.

REFERENCE BOOK(S)

1. Johannes A. Buchaman, 2004, "Introduction to cryptography" (2nd edition), 2004. ISBN 0387207562, Springer Publications, United States.
2. Robert Collins,2017, "Network Security Monitoring: Basics for Beginners".
3. William Stalings, 2016, "Network Security Essentials-Applications and Standards",Sixth Edition, Pearson Publications, India.

E_RESOURCES

1.http://www.cs.vsb.cz/ochodkova/courses/kpb/cryptography-and-network- security_-principles-and-practice-7th-global-edition.pdf

2. http://uru.ac.in/uruonlinelibrary/Cyber_Security/Cryptography_and_Network_Security. pdf

3. https://youtu.be/2Z3toEiY5ll

Semester: III - EC-III(b) – ADVANCED DBMS

Ins.Hrs./Week: 5 **Course Credit:4** **Course Code: 23PCSE3B**

OBJECTIVES:

- To understand the foundations of Database Design
- To introduce the idea of Distributed and Object based Database
- To understand the advanced features for the different types of Database

Unit-I **(15 Hours)**

Relational and parallel Database Design: Basics, Entity Types, Relationship Types, ER Model, ER-to-Relational Mapping algorithm. Normalization: Functional Dependency, 1NF, 2NF, 3NF, BCNF,4NF and 5NF. Architecture, I/O Parallelism, Interquery Parallelism, Intraquery Parallelism, Intraoperation Parallelism, Interoperation Parallelism.

Unit-II **(15 Hours)**

Distributed and Object based Databases: Architecture, Distributed data storage, Distributed transactions, Commit protocols, Concurrency control, Query Processing. Complex Data Types, Structured Types and Inheritance, Table Inheritance, array and Multiset, Object Identity and Reference Types, Object Oriented versus Object Relational.

Unit-III **(15 Hours)**

Spatial Database: Spatial Database Characteristics, Spatial Data Model, Spatial Database Queries, Techniques of Spatial Database Query, Logic based Databases: Introduction, Overview, Propositional Calculus, Predicate Calculus, Deductive Database Systems, Recursive Query Processing.

Unit-IV **(15 Hours)**

XML Databases: XML Hierarchical data model, XML Documents, DTD, XML Schema, XML Querying, XHTML, Illustrative Experiments.

Unit-V **(15 Hours)**

Temporal Databases: Introduction, Intervals, Packing and Unpacking Relations, Generalizing the relational Operators, Database Design, Integrity Constraints, Multimedia Databases: Multimedia Sources, Multimedia Database Queries, Multimedia Database Applications.

Total Lecture Hours- 75

COURSE OUTCOME

The students will be able to,

1. Understand the basics of Database Concepts.
2. Apply the basics concepts of Object Oriented Database System.
3. Understand the controls and features of Spatial Data models.
4. Summarize the advanced features of XML data models.
5. Interprets the concepts of Temporal database design.

TEXT BOOK(S)

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

REFERENCE BOOK(S)

1. Ramez Elmasri, Shamkant B Navathe, "Fundamental of Database Systems", Pearson, 7th edition 2016.
2. Thomas Connolly, Carolyn Begg., "Database Systems a practical approach to Design , Implementation and Management ", Pearson Education, 2014.

E_RESOURCES

1. https://tinyurl.com/bdh96w3v
2. https://tinyurl.com/bdft5nrj
3. https://tinyurl.com/2s39s883

Semester: III - EC-III(C) – SOFTWARE PROJECT MANAGEMENT

Ins.Hrs./Week: 5 **Course Credit:4** **Course Code: 23PCSE3C**

OBJECTIVES

- To Understand the framework of project management
- To Learn to monitor and control the project
- To Know the sound knowledge in Agile method

UNIT- I: PROJECT MANAGEMENT FRAMEWORK (20 Hours)

Introduction: Project - Project management - Relationship among Project, Program and Portfolio management - Project and operations management- Role of project manager - Project management body of knowledge - Enterprise Environmental factors. Project life cycle and Organization: Overview of project life cycle - Projects vs Operational Work - Stakeholders - Organizational influences on project management. **The Standard for Project Management of a Project**: Project management processes for a project: Common project management process interactions - Projects management process groups - Initiating process group - planning process group - Executing process group - Monitoring and controlling process group - Closing process group.

Unit- II: METHODOLOGIES AND TERMINOLOGIES (15 Hours)

Choosing Methodologies and Technologies – Software Processes and Process Models – Choice of Process Models – The Waterfall Model– Prototyping – other ways of categorizing prototype - **Agile Methods** – Extreme Programming Selecting the Most Appropriate Process Model- Need of Agile - Iterative vs Incremental-Agile Manifesto and Mindset – Lean, Scrum and Kanban methods-uncertainty, Risk, and lifecycle selection-Scrum Elements overview-5 levels of planning-Scrum Process overview-Agile Team-roles and responsibilities- Epic-feature- User Stories-PBI-The Sprint.

Unit-III: THE PROJECT MANAGEMENT KNOWLEDGE AREAS (15 Hours)

Project integration management: Develop project charter - Develop project management plan - Direct and manage project execution - Monitor and control project work - Perform integrated change control - Close project or phase. Project scope management: Collect requirements - Define Scope - Create WBS - Verify Scope - Control Scope. Project team management: Define activities - Sequence activities - Estimate activity resources - Estimate Activity Durations - Develop Schedule - Control Schedule.

Unit IV: PROJECT COST MANAGEMENT (15 Hours)

Estimate costs - Determine budget - Control costs. Project Quality Management: Plan quality - perform quality assurance - Perform quality control. Project Human Resource Management: Develop human resource plan - Acquire project team - Develop project team - Manage project team. Project Communications Management:

Identify stakeholders - Plan communications - Distribute information - Manage stakeholder expectations - report performance.

Unit V: PROJECT RISK MANAGEMENT (10 Hours)

Plan risk management - Identify risks - Perform qualitative risk analysis - Perform quantitative risk analysis - plan risk responses - Monitor and control risks. Project Procurement Management: Plan - Conduct - Administer - Close procurements.

Total Lecture Hours- 75

COURSE OUTCOME:

The Students will be able to,

1. Analyze the scope, cost, timing, and quality of the project, at all times focused on project success as defined by project stakeholders.
2. Align the project to the organization's strategic plans and business justification throughout its lifecycle.
3. Identify project goals, constraints, deliverables, performance criteria, control needs, and resource requirements in consultationwith stakeholders.
4. Implement project management knowledge, processes, lifecycle and the embodied concepts, tools and techniques in order to achieve project success.
5. Adapt projects in response to issues that arise internally and externally.

TEXT BOOK(S)

1. "A guide to the Project management Body of Knowledge (PMBOK Guide)" Fouth Edition, Project Management Institute, Pennsylvania, 2008
2. BOB Huges, Mike Cotterell, Rajib Mall “Software Project Management”, McGraw Hill, Fifth Edition,2011.
3. Emerson, "Agile Handbook," Philosophie

REFERENCE BOOK(S)

1. Futrell, “Quality Software Project Management”, Pearson Education India.
2. Royce, “Software Project Management”, Pearson Education India.
3. C.Ravindranath Pandian, “Applied Software Risk Management-A Guide for Software Project Managers”, Auerbach Publications, 2015.
4. Benjamin A. Lieberman, “The Art of Software Modeling”, Auerbach Publications, 2010.

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1. https://www.srividyaengg.ac.in/coursematerial/CSE/104831.pdf
2. https://archive.mu.ac.in/myweb_test/MCA%20study%20material/M.C.A%20(Sem%20-%20IV)%20Paper%20-%20Software%20Project%20Management.pdf

Semester: III - EDC-II (a) –ENTERPRISE RESOURCE PLANNING

Ins.Hrs./Week: 3 **Course Credit: 2** **Course Code: 23PCSED2A**

OBJECTIVES:

- To explain the role of Enterprise Systems Requirements.
- To describe the basic methodology concepts, including the ERP Systems and ERP Modules.
- To understand the overview of ERP Software

UNIT-I: INTRODUCTION **(9 Hours)**

Overview of Enterprise System: Introduction-Need for Enterprise-Definition of ERP. Overview of ERP: Material Requirements Planning-MRP-II, ERP, Extended ERP. Benefits of ERP: Advantages to Business Functions and Manufacturing Sector. Related Technologies of ERP: BPR-OLAP-Data Warehouse-Data Mining-Application of ERP.

UNIT -II: ERP IMPLEMENTATION **(9 Hours)**

Implementation and Product Life cycle- Implementation Methodology- Planning Evaluation & selection of ERP systems- Organizing the Project Management and Monitoring- Case Study on Manufacturing.

UNIT -III: ERP MODULES **(9 Hours)**

Business modules in an ERP Package- Manufacturing- Human Resources- Plant Maintenance-Materials Management- Supply chain Management (SCM) - Sales and Distribution- Case Study in Banking Sector.

UNIT -IV: POST IMPLEMENTATION **(9 Hours)**

Overview of ERP software solution- Maintenance of ERP - Organizational and Industrial impact - Success and Failure factors of ERP Implementation -Case Study of Success Story and Failure of Processing Sector.

UNIT V: EMERGING TRENDS ON ERP **(9 Hours)**

Extended ERP systems and ERP add-ons-Customer Relationship Management: Customer Satisfaction - Business analytics & Intelligence - Future trends in ERP system - Web enabled-Wireless Technology used in ERP - Case Study in Service Sector.

Total Lecture Hours- 45

COURSE OUTCOME:

The Students will be able to,

1. Understand the basics of Enterprise Systems.
2. Implement the real time methodology for ERP.
3. Design Business modules in an ERP Package.
4. Understand the Overview of ERP software solution.
5. Analyze the concept of Emerging trends on ERP.

TEXT BOOK(S):

1. Mahadeo Jaiswal & Ganesh Vanapalli 2014,"Textbook of Enterprice Resouce Planning"-Published in India by TRINITY Press-113,New Delhi.

2. Vinod Kumar Garg & N.K Venkitakirshnan,2003 "Enterprise Resource Planning: Concepts and Practice", Prentice Hall India Learning Private Limited; 2nd edition (1 January 2003)

REFERENCE BOOK(S):

1. Alexis Leon, "Enterprise Resource Planning" Third Edition, McGraw Hill Education; Third edition (1 July 2017).

2. Jack G.Nestell,"Successful ERP Systems" A Guide for Business and Executives, Business Expert Press (21 November 2017).

E-RESOURSE:

1. https://mrcet.com/downloads/digital_notes/CSE/III%20Year/ERP%20Digital%20notes.pdf
2. https://www.mbaknol.com/management-information-systems/enterprise-resource-planning-erp-definition

Semester: III - EDC-II (b) – GREEN COMPUTING

Ins.Hrs./Week: 3 **Course Credit: 2** **Course Code: 23PCSED2B**

OBJECTIVES:

- To explain the role of issues in Green Computing.
- To describe the basic methodology concepts, Reengineering with Green Computing.
- To understand the overview of Green supply chain.

UNIT-I: OVERVIEW AND ISSUES: **(9 Hours)**

Introduction- An overview and Issues related to it: Problems- Toxins- Power Consumption- Equipment Disposal- Company's Carbon Footprint- Measuring and Exercising projects- Define your Borders- Set a Baseline- How to track and analyze data- Other ways to reduce the occurring issues- Hardware- Power. Current Initiatives and Standards: Global Initiatives- Task Forces.

UNIT -II: MINIMIZING POWER USAGE **(9 Hours)**

Objectives- Introduction- Power Problems- Monitoring Power Usage- Servers- Low-Cost Options- Reducing Power Use- Data De-duplication- Virtualization- Management- Bigger Drives- Involving the Utility Company- Low-Power Computers- PCs, Linux- Components- Servers- Computer Settings- Storage- Monitors- Power Supplies- Wireless Devices- Software.

UNIT -III: CHANGING THE WAY OF WORK **(9 Hours)**

Objectives-Old Behaviors- Starting at the Top-Process Reengineering with Green in Mind-Analyzing the Global Impact of Local Action-. Steps: Water- Recycling-Energy-Pollutants-Teleworkers and Outsourcing: Telecommuting-Outsourcing-How to Outsource.

UNIT -IV: GOING PAPERLESS **(9 Hours)**

Objectives-Paper Problems-Paper and Office- Going Paperless-Organizational Realities-Changing Over-Paperless Billing-Handheld Computers vs. the Clipboard-Unified Communications-Intranets-Building an Intranet-Microsoft Office SharePoint Server 2007-Electronic Data Interchange (EDI)-Nuts and Bolts- Value Added Networks-Advantages-Obstacles.

UNIT V: GREENING YOUR INFORMATION SYSTEMS (9 Hours)

Introduction-Initial Improvement Calculations-Selecting Metrics- Tracking Progress-Change Business Processes- Paper Reduction- Green Supply Chain-Improve Technology Infrastructure-. Reduce PCs and Servers-Shared Services-Hardware Costs-Cooling.

Total Lecture Hours- 45

COURSE OUTCOME:

The Students will be able to,

1. Understand the overview and Issues in Green Computing
2. Implement the Virtualization using minimize the duplication.
3. Understand the Process Reengineering with Green Computing.
4. Implement methodology for Going Paperless
5. Analyze the Green supply chain technology.

TEXT BOOK(S):

1. Toby Velte,Anthony Velte,Robert Elsenpeter,"Green IT",McGraw Hill,2008.
2. Alvin Galea,Michael,Mike Ebbers "Green Data Center: Steps for Journey"Shroff Publishers and Distributers,2011.

REFERENCE BOOK(S):

1. Bud E.Smith,"Greeen Computing Tools and Techniques for Saving Energy",Money and Resources,CRC Press 2014.
2. Salahudin S.Sajan,"Introduction to Green Computing",Published by:NIRALI PRAKASHAN,Feb 2019.

E-RESOURSE:

1. https://old.mu.ac.in/wp-content/uploads/2021/06/USIT205-Green-Computing.pdf
2. https://www.himpub.com/documents/Chapter1765.pdf

SEMESTER IV

Semester: IV -CC-X: Distributed Operating Systems

Ins.Hrs./Week:6 **Course Credit:5** **Course Code:23PCS413**

OBJECTIVES:

- To examine hardware and software issues in modern distributed systems
- To describe about distributed architecture, naming, synchronization, consistency and replication, fault tolerance, security, and distributed file systems
- To analyze the current popular distributed systems such as peer-to-peer(P2P) systems will also be analyzed

UNIT-I: Fundamentals **(15 Hours)**

Introduction to Distributed Computing System – Evolution of Distributed Computing Systems –Distributed Computing System Models – Importance of Distributed Computing Systems – Introduction to Distributed Computing System– Issues in Designing Distributed Computing System – Introduction to Distributed Computing Environment**-** Comparison of DOS, UNIX Operating System and Windows Operating System.

UNIT-II: Message Passing **(19 Hours)**

Introduction – Desirable features–Issues in PC Message Passing Synchronization– Buffering – Multi-datagram Messages – Encoding and Decoding– Process Addressing – Failure Handling – Group Communication.

UNIT-III: Distributed Shared Memory **(18 Hours)**

Introduction – General Architecture of DSM system – Design and Implementation Issues of DSM – Granularity – Structure of Shared Memory – Replacement Strategy – Thrashing– Heterogeneous DSM – Advantages - **Synchronization:** Introduction – Clock Synchronization –Event Ordering–Mutual Exclusion–Deadlock–Election Algorithm.

UNIT-IV: Resource Management **(19 Hours)**

Desirable Features of a Good Scheduling Algorithm – Task Assignment Approach – Load-Balancing Approach – Load - Sharing Approach. **Distributed File System:** Introduction – Desirable features – File Models – File Accessing Models – File Sharing Semantics – File Caching Schemes – File Replication – Fault Tolerance – Atomic Transactions – Design Principles.

UNIT-V: Security **(19 Hours)**

Introduction – **Potential Attacks to Computer System:** Passive Attacks – Active Attacks – Confinement Problem - **Cryptography:** Basic Concepts and Terminologies – Basic Requirements – Symmetric and Asymmetric Cryptosystems - Key Distribution Problem. **Authentication:** Approaches to Authentication – User Login Authentication–One Way Authentication of Communicating Entities - Two Way Authentication of Communicating Entities. **Access Control:** Protection Domains – Access Matrix – Implementation of Access Matrix - Digital Signatures – Design Principles - Cipher Block Chaining.

Total Lecture Hours-90

COURSE OUTCOME

The students will be able to,

1. Gain knowledge about hardware and software issues in distributed systems
2. Illustrate Message Passing Synchronization
3. Learn the concept of distributed shared memory techniques and peer-to-peer(P2P) Systems will also be analyzed
4. Demonstrate about file access models
5. Understand about security and cryptography

TEXT BOOK(S)

1. Mukesh Singhal, Niranjan G Shivratri, 2017, "Advanced Concepts in Operating Systems Distributed", Database and Multiprocessor Operating systems, Tata Mc-Graw-Hill, Indian Edition.
2. Pradeep Sinha.K, 2012, "Distributed Operating Systems", Concepts and Design, PHI Learning Private Limited, New Delhi, India.

REFERENCE BOOK(S)

1. Maarten Van Steen, Andrew Tanenbaum.S, 2017, "Distributed Operating Systems Principles and Paradigms", Distributed Systems.net.
2. Mukesh Singhal, Niranjan Shivratri.G, 2011, "Advanced concepts in Operating Systems", Mc-Graw Hill International, New York, USA.
3. Stallings William, 2017, "Cryptography and Network Security", 2017, Principles and Practice, Seventh Edition, Pearson Education, India

E_RESOURCES

1.https://bit.ly/3kYYGeh
2.https://bit.ly/3pWfvtV
3.https://bit.ly/339vtH

Semester: IV -CC-XI: Machine Learning

Ins.Hrs./Week:6 **Course Credit:5** **Course Code:23PCS414**

OBJECTIVES:

- To understand the concepts of Machine Learning.
- To understand the concepts of Supervised and Unsupervised Learning.
- To understand the concepts of Artificial Neural Networks.

Unit-I: Introduction to Machine Learning **(20 Hours)**

Introduction to Machine Learning-Origins of Machine Learning-Uses of Machine Learning-Machine Learning Ethics-How Machine Learn-Data Storage- Abstraction-Generalization-Evaluation-Types of Input Data-**Managing and Understanding Data:** R Data Structures-Vectors-Factors-Lists-Data Frames-Matrices and arrays-**Exploring and Understanding Data:** Exploring the structure of data-Exploring Numeric Variables-Exploring Categorial Variables-Exploring relationship between variables.

UNIT-II: Supervised and Unsupervised Learning **(20 Hours)**

Supervised machine learning-Working and steps of supervised learning-Regression analysis-Simple and Multiple linear regression-Classification algorithms in machine learning**- Linear Models:** Logistic Regression-Support Vector Machines-Naïve Bayes Classifier-**Non-Linear Models:** K-Nearest Neighbours- Naïve Bayes- Random Forest Classification-Working of Unsupervised Learning-K-means Clustering-Apriori algorithm-Hierarchical Clustering.

UNIT-III: Artificial Neural Networks **(20 Hours)**

Introduction to Artificial Neural Networks-Understanding neural networks from Biological to Artificial Neurons-Architecture of Artificial Neural Network-Working of artificial neural networks-**Convolutional Neural Networks(CNN):** Structure of Convolutional Neural Network-Components of CNN Architecture-Convolutional Layer-Pooling Layer-**Recurrent Neural Network:** Fully Recurrent Network-Elman Neural Networks-Training RNNs with Back-Propagation Through Time (BPPT)- Deep Belief Networks.

UNIT-IV: Introduction to Deep Learning **(15 Hours)**

Introduction to Deep Learning-Deep Learning Models-Single Layer Perceptron Model (SLP)-Multilayer Perceptron Model(MLP)- Restricted Boltzmann Machines (RBMs)-Genetic Algorithm in machine learning-Working of Genetic Algorithm-Difference between Traditional algorithm and genetic algorithm-**Other Local Search Methods:** Hill Climbing search methods-Stimulated Annealing(SA)-Steepest Ascent Hill Climbing.

UNIT-V: Problems in Machine Learning **(15 Hours)**

Apply KNN Algorithm for Diagnosing Breast Cancer- Apply Naïve Bayes Algorithm for filtering Mobile Phone Spam-Apply Classification Rules for Identifying Poisonous Mushrooms with Rule

Learners-Finding Groups of Data and Clustering with K-Means Algorithm for clustering finding teen market segments using k-means Clustering.

Total Lecture Hours- 90

Course Outcome:

The Students will be able to,

1. Understand the knowledge about basic concepts of machine learning techniques.
2. Understand the supervised and unsupervised learning algorithms.
3. Understand the basic concepts of Artificial Neural Networks.
4. Understand the basic concepts of Deep Learning and local search methods.
5. Understand the machine learning algorithm and apply the algorithm to a problem and make a prediction.

TEXT BOOK(S)

1. Brett Lantz, "Machine Learning with R: Expert techniques for predictive modeling", 3rd Edition, April 15, 2019.
2. Taweh Beysolow, "Introduction to Deep Learning Using R: A Step-by-Step Guide to Learning and Implementing Deep Learning Models Using R", San Francisco, California, USA, 2017.

REFERENCE BOOK(S)

1. Daniel T. Larose, Chantal D. Larose, "Data mining and Predictive analytics", Second Ed., Wiley Publication, 2015.
2. Jason Bell, "Machine Learning: Hands-On for Developers and Technical Professionals", Wiley Publication,2015.
3. Christopher M. Bishop, "Pattern Recognition and Machine Learning", Springer, 2006.

E_RESOURCES

1. https://rb.gy/2x75x
2. https://rb.gy/xpd7p
3. https://rb.gy/m7rcf

Semester: IV –Entrepreneurship / Industry Based Course: Data Science and Data Analytics

Ins.Hrs./Week:6 Course Credit:5 Course Code:23PCSI41

OBJECTIVES:

- To introduce Data Science, Big data tools and Information Standard formats
- To understand the basic concepts of Data Science and perform data analysis, Datamining tasks & techniques
- To learn Hadoop, HDFS, MapReduce concepts and the importance of NoSQL

Unit I : Introduction to Data Science (18 Hours)

Data Mining – Kinds of Data and Patterns to be Mined – Technologies used – Kinds of Applications are Targeted - Major Issues –Data objects and Attribute types – Basic statistical Descriptions of Data – Data Visualization - **Data Preprocessing:** Data Cleaning – Data Integration - Data Reduction - Data Transformation.

Unit II: Classification, Association Analysis and Web Data Mining (18 Hours)

Classification: Basic concepts - Decision Tree Induction: Working of Decision Tree - Building Decision Tree. **Association Analysis**: Basic Concepts - Frequent Itemset Generation - Rule Generation - Compact Representation of Frequent Item sets –FP Growth Algorithm. **Cluster Analysis:** Introduction-Desired Features of Cluster Analysis -Types of Data- ComputingDistance - Types of Cluster Analysis Methods. **Web Data Mining**: Introduction - Web terminology and characteristics.

Unit III: Big Data and Analytics (18 Hours)

Classification of Digital Data: Structured Data- Semi Structured Data and Unstructured Data. Introduction to Big Data: Characteristics – Evolution – Definition - Challenges with Big Data - Other Characteristics of Data - Big Data - Traditional Business Intelligence versus Big Data - Data Warehouse and Hadoop. Environment Big Data Analytics: Classification of Analytics – Challenges - Big Data Analytics important - Data Science - Data Scientist - Terminologies used in Big Data Environments – Basically Available Soft State Eventual Consistency - Top Analytics Tools

Unit IV: Technology Landscape (18 Hours)

NoSQL, Comparison of SQL and NoSQL, Hadoop -RDBMS Versus Hadoop - Distributed Computing Challenges – Hadoop Overview - Hadoop Distributed File System - Processing Data with Hadoop - Managing Resources and Applications with Hadoop YARN - Interacting with Hadoop Ecosystem

Unit V: MongoDB and Mapreduce Programming (18 Hours)

MongoDB: Mongo DB - Terms used in RDBMS and Mongo DB - Data Types - MongoDB Query Language. MapReduce: Mapper – Reducer – Combiner – Partitioner – Searching – Sorting – Compression. **Hive:** Introduction – Architecture - Data Types - File Formats - Hive Query Language Statements. **Pig:** Introduction - Anatomy – Pig Primitive Data Types - Running Pig - Execution Modes of Pig - HDFS Commands

Total Lecture Hours- 90

COURSE OUTCOME

The students will be able to,

1. Outline the basics in data science
2. Interpret and demonstrate the knowledge of data analysis techniques in decision making
3. To understand, illustrate and evaluate the concepts and techniques of Data Science, Big Data Analytics and its tools
4. To collaborate, apply and review the computing for big data in Hadoop, and NoSQL environment
5. To comprehend, implement and review the concepts of data science and big data analytics projects using MapReduce, MongoDB, HIVE and PIG

TEXT BOOKS:

1. Vipin Kumar - Michael Steinbach - Pang - Ning Tan - (2006) - Introduction to Data Mining - Pearson Education.
2. Jiawei Han and Micheline Kamber - (2012) - Data Mining Concepts and Techniques - Third Edition - Morgan Kaufmann.
3. Seema Acharya, Subhashini Chellappan, "Big Data and Analytics", Wiley Publications, First Edition, 2015

REFERENCE BOOKS:

1. Bhavani M. Thuraisingham - Data Mining: Technologies - techniques - tools and trends - CRC Press
2. Yanchang Zhao (2012 - 2013) - R and Data Mining: Examples and Case Studies - Elsevier.
3. Samir Madhavan, "Mastering Python for Data Science", Packet Publishing, 2015.
4. Judith Huruwitz, Alan Nugent, Fern Halper, Marcia Kaufman, "Big data for dummies", John Wiley & Sons, Inc. (2013)
5. Tom White, "Hadoop The Definitive Guide", O'Reilly Publications, Fourth Edition, 2015
6. Dirk Deroos, Paul C.Zikopoulos, Roman B.Melnky, Bruce Brown, Rafael Coss, "Hadoop For Dummies", Wiley Publications, 2014
7. G.K. Gupta, "Introduction to Data mining with case studies", 2nd Edition, PHI Privatelimited, New Delhi, 2011.

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2. http://oai.dtic.mil/oai/oai?verb=getRecord&metadataPrefix=html&identifier=AD0770256
3. https://www.datamentor.io/r - programming#tutorial
4. http://www.csis.pace.edu/~ctappert/cs816-15fall/books/2015DataScience&BigDataAnalytics.pdf
5. http://www.rdatamining.com/
6. https://www.analyticsvidhya.com/blog/2016/02/complete - tutorial - learn - data - science - scratch/
7. https://www.tutorialspoint.com/data_mining/dm_classification_prediction.htm (Classification)

Semester: IV – VAC-II: Fundamentals of Cyber Crime and Security

Ins.Hrs./Week:- **Course Credit:2** **Course Code:23PCSVA42**

OBJECTIVES

- To acquire knowledge on the criminal offences
- To understand the judicial procedures and punishments in the Computer
- To analyze the Internet based illegal activities

Unit I: Introduction

Cyber Crime- Overview, Internal and External Attacks, Attack Vectors. Cybercrimes against Individuals – E-mail spoofing and online frauds, Phishing and its forms, Spamming, Cyber-defamation, Cyberstalking, Cyber Bullying and harassment, Computer Sabotage, Pornographic offenses, Password Sniffing. Keyloggers and Screenloggers

Unit II: Cybercrime in Organization

Cybercrime against organization – Unauthorized access of computer, Password Sniffing, Denial-of-service (DOS) attack, Backdoors and Malwares and its types, E-mail Bombing, Salami Attack, Software Piracy, Industrial Espionage, Intruder attacks.

Unit III: Security Policies

Security policies violations, Crimes related to Social Media, ATM, Online and Banking Frauds - Intellectual Property Frauds - Cyber Crimes against Women and Children.

Unit IV: Attacks on Cybercrime

A global perspective on cybercrimes, Phases of cyber attack – Reconnaissance, Passive Attacks, Active Attacks, Scanning, Gaining Access, Maintaining Access, Lateral movement and Covering Tracks. Detection Avoidance, Types of Attack vectors, Zero-day attack, Overview of Network based attacks.

Unit V: Tools in Cybercrime

Cybercrime and cloud computing, Different types of tools used in cybercrime, Password Cracking – Online attacks, Offline attacks, Remote attacks, Random Passwords, Strong and weak passwords - Viruses and its types - Ransomware and Cryptocurrencies.

COURSE OUTCOME

The students will be able to,

1. Understanding the foundations and importance of Cybercrime.
2. Analyze the cybercrime against organization.
3. Describe the security policies.
4. Assess the various attacks on Cybercrime.
5. Understand the tools used in Cybercrime.

TEXT BOOKS:

1. Nina Godbole and Sunit Belapore; "Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives", Wiley Publications, 2011.
2. Shon Harris, "All in One CISSP, Exam Guide Sixth Edition", McGraw Hill, 2013.

REFERENCE BOOKS:

1. Bill Nelson, Amelia Phillips and Christopher Steuart; "Guide to Computer Forensics and Investigations"3 rd Edition, Cengage, 2010 BBS.
2. William Stallings; "Cryptography and Network Security: Principles and Practices", Fifth Edition, Prentice Hall Publication Inc., 2007.
3. Atul Jain; "Cyber Crime: Issues, Threats and Management", 2004.
4. Majid Yar; "Cybercrime and Society", Sage Publications, 2006.
5. Michael E Whiteman and Herbert J Mattord; "Principles of Information Security", Vikas Publishing House, New Delhi, 2003. 8. Matt Bishop, "Computer Security Art and Science", Pearson/PHI, 2002.

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2. https://www.educba.com/cyber-law/
3. https://www.geeksforgeeks.org/cyber-law-it-law-in-india/