SONA COLLEGE OF TECHNOLOGY, SALEM-5

(An Autonomous Institution)

M.Tech- Information Technology

(Dept of Information Technology)

CURRICULUM and SYLLABI

[For students admitted in 2025-2026]

PG Regulations 2023

Approved by BOS and Academic Council meetings

M.Tech-IT
I

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for M.E/M.Tech. Semester I under Regulations 2023 (CBCS)
Branch: Information Technology

S. No	Course Code	Course Title	L	T	P	J	C	Category	Total Contact Hours	Course Type
Theory Courses										
1	P23MAT101D	Mathematics for Data Analytics	3	1	0	0	4	FC	60	TT
2	P23MIT101	Full Stack Development	3	0	0	0	3	PC	45	T
3	P23MIT102	Advanced Data Structures	3	0	0	0	3	PC	45	T
4	P23GE101	Research Methodology and IPR	3	0	0	0	3	PC	45	T
5	P23MIT501	**Elective:** Internet of Things	3	0	0	0	3	PE	45	T
	P23MIT513	**Elective:** Natural Language Computing								
6	P23GE701	**Audit Course** – English for Research Paper Writing	2	0	0	0	0	AC	30	T
Practical Courses										
7	P23MIT103	Advanced Data Structures Laboratory	0	0	4	0	2	PC	60	L
8	P23MIT104	Full Stack Development Laboratory	0	0	4	2	3	PC	90	LP
						Total Credits	**21**			

*T- Theory, TT- Theory with Tutorial, TL- Theory with Laboratory, TP- Theory with Project, TLP- Theory with Laboratory and Project, L-Laboratory, LT- Laboratory with Theory, LP- Laboratory with Project

Approved By

J. Dilano	R.Shivakumar	J. Dilano	
Chairperson, Information Technology BoS	**Member Secretary, Academic Council**	**Dean-Academics**	**Chairperson, Academic Council & Principal**
Dr. J. Akilandeswari	**Dr. R. Shivakumar**	**Dr. J. Akilandeswari**	**Dr. S.R. R. Senthil Kumar**

Copy to:-
HOD/, First Semester M.E, M Tech Students and Staff, COE

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for M. Tech Semester II under Regulations 2023(CBCS)
Branch: M. Tech -Information Technology

S. No	Course Code	Course Title	L	T	P	J	C	Category	Total Contact Hours	Course Type
Theory Courses										
1	P23MIT201	Machine Learning	3	0	0	0	3	PC	45	T
2	P23MIT202	Cyber Security	3	0	0	0	3	PC	45	T
3	P23MIT203	Big Data Technologies	3	0	0	0	3	PC	45	T
4	P23MIT501	**Elective** Internet of Things	3	0	0	0	3	PE	45	T
	P23MIT507	Swarm Intelligence								
5	P23MIT502	Soft Computing	3	0	0	0	3	PE	45	T
6	P23GE702	**Audit Course** – Stress Management by Yoga	2	0	0	0	0	AC	30	T
Practical Courses										
7	P23MIT204	Machine Learning Laboratory	0	0	4	2	3	PC	90	LP
8	P23MIT205	Big Data Technologies Laboratory	0	0	4	0	2	PC	60	L
							Total Credits	**20**		

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Copy to:-
HOD/IT, Second Semester ,M. Tech Students, and Staff, COE

M.Tech-IT
I

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for M.E/M.Tech. Semester I under Regulations 2023 (CBCS)
Branch: Information Technology

S. No	Course Code	Course Title	L	T	P	J	C	Category	Total Contact Hours	Course Type
Theory Courses										
1	P23MAT101D	Mathematics for Data Analytics	3	1	0	0	4	FC	60	TT
2	P23MIT101	Full Stack Development	3	0	0	0	3	PC	45	T
3	P23MIT102	Advanced Data Structures	3	0	0	0	3	PC	45	T
4	P23GE101	Research Methodology and IPR	3	0	0	0	3	PC	45	T
5	P23MIT501	**Elective:** Internet of Things	3	0	0	0	3	PE	45	T
	P23MIT513	**Elective:** Natural Language Computing								
6	P23GE701	**Audit Course** – English for Research Paper Writing	2	0	0	0	0	AC	30	T
Practical Courses										
7	P23MIT103	Advanced Data Structures Laboratory	0	0	4	0	2	PC	60	L
8	P23MIT104	Full Stack Development Laboratory	0	0	4	2	3	PC	90	LP
						Total Credits	**21**			

*T- Theory, TT- Theory with Tutorial, TL- Theory with Laboratory, TP- Theory with Project, TLP- Theory with Laboratory and Project, L-Laboratory, LT- Laboratory with Theory, LP- Laboratory with Project

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INFORMATION TECHNOLOGY						
M. Tech. / INFORMATION TECHNOLOGY						
SEMESTER - I	MATHEMATICS FOR DATA ANALYTICS	L	T	P	J	C
P23MAT101D		3	1	0	0	4

Course Outcomes

At the end of the course, the student will be able to

CO1:	apply the concept of correlation, fit suitable curve to the given data and analyze the result.
CO2:	apply the concepts of probability, random variable, moments, moment generating function and their properties to solve the problems.
CO3:	analyze the characteristics of the estimators, find the estimate of the parameters using maximum likelihood estimation and method of moments.
CO4:	test the hypothesis about the population using Z, t, F and χ^2-test statistics.
CO5:	apply the multivariate analysis concept to analyze the given set of data which involves more than one variable.

Pre-requisites:

- Basics of elementary algebra
- Basics of calculus
- Basics of geometry
- Basics of statistics and probability

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5
CO1	3	3	2	3	3
CO2	3	3	2	3	3
CO3	3	3	2	3	3
CO4	3	3	2	3	3
CO5	3	3	2	3	3

Course assessment methods [Theory]

Direct		Indirect
CIE test I (10) (Theory) CIE test II (10) (Theory) CIE test III (10) (Theory) Assignment / Problem-solving / Seminar (10)	Total CIE: 40 marks Semester End Examination: 60 marks	Course end survey

Unit 01	CORRELATION, CURVE FITTING AND REGRESSION	12 Hours

Simple and rank correlations – multiple and partial correlations – curve fitting – principle of least squares – fitting a straight line – fitting a parabola – fitting an exponential curve – fitting a curve of the form $y = ax^b$ – linear regression – multiple and partial regressions.

Unit 02	PROBABILITY AND RANDOM VARIABLE	12 Hours

Axioms of probability – conditional probability – total probability – Baye's theorem – random variable – probability mass function, probability density function, moments, moment generating function and their properties.

Unit 03	ESTIMATION THEORY	12 Hours
Estimators – unbiasedness, consistency, efficiency and sufficiency (definitions and simple problems only) – maximum likelihood estimation – method of moments.		
Unit 04	**TESTING OF SIGNIFICANCE**	**12 Hours**
Parameter and statistic – null and alternative hypothesis – errors in sampling, critical region and level of significance – one tailed and two tailed tests – large sample tests for proportions, mean, difference between means, standard deviation – t-test for single mean, difference between means – Paired t-test – χ^2-test for independence of attributes, goodness of fit – F-test.		
Unit 05	**MULTIVARIATE ANALYSIS**	**12 Hours**
Random vectors and matrices – mean vectors and covariance matrices – multivariate normal density and its properties – principal components: population components from standardized variables.		

Theory: 45 Hrs	Tutorial: - 15 Hrs	Practical:	Project:–	Total Hours: 60 Hrs

TEXT BOOKS:

1. S. C. Gupta and V. K. Kapoor, "Fundamentals of Mathematical Statistics", Sultan Chand and Sons Publishers, 11th Edition (Reprint), 2019.
2. R. A. Johnson and D. W. Wichern, "Applied Multivariate Statistical Analysis", Pearson Publishers, 6th Edition, 2015.

REFERENCE BOOKS:

1. J. L. Devore, "Probability and Statistics for Engineering and the Sciences", Thomson and Duxbury Publishers, 9th Edition, 2015.
2. R. A. Johnson and C. B. Gupta, "Miller and Freund's, Probability and Statistics for Engineers", Pearson Publishers, 9th Edition, 2018.

M.E/M. TECH REGULATIONS 2023	HEAD OF THE DEPARTMENT OF MATHEMATICS
S&H BoS DATE:08-07-2023	

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P23MIT101	FULL STACK DEVELOPMENT	L	T	P	J	C
		3	0	0	0	3

Course Outcomes

At the end of the course, the student will be able to

CO1	Design a front end of web application using HTML and CSS.
CO2	Write a JavaScript code to validate the user data and asynchronously invoke backend application.
CO3	*Design a front end of web application using Bootstrap.*
CO4	Develop a front end of web application using a React JS library and make a call to server-side programs.
CO5	Develop a back end of web application using Node JS, Express framework, and Mongo DB with CRUD operations in MongoDB and deploy web application in Cloud.

Pre-requisite: HTML, CSS, and JavaScript

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5
CO1		2	2	3	2
CO2	2	3	3	3	
CO3		2	2	2	3
CO4		3	3	3	3
CO5	2	3	3	3	2

Course Assessment methods

Direct	Indirect
CIE test I (10) , CIE test II (10), CIE test III (10), Assignment/Problem-solving/seminar (10) , Total CIE : 40 Marks Semester End Examination: 60 Marks	Course end survey

UNIT I	HTML and CSS	9 Hours

Introduction to www, HTML: Tags, Lists, Images, Forms, Links, Tables, iframes, videos, anchors, HTML Divs – CSS: Inline, Internal, External, CSS Display, CSS Backgrounds, Borders, Margins, Padding, CSS Font Styling, Stylings Lists, Tables, Forms.

UNIT II	JAVA SCRIPT AND jQuery	9 Hours

Introduction to Javascript, Variables, scoping, Data type, Strings, Numbers, Operators, Loops, Functions, Objects, Events, Working with DOM, AJAX, ES5 vs ES6 Vs ES7, jQuery – Introduction to jQuery, Syntax, Selectors, Events, Effects, Traversing, and jQuery AJAX.

UNIT III	BOOTSTRAP	9 Hours

Introduction to Bootstrap, Bootstrap Basics – Container, Color, Table, Images, Alerts, Buttons, Badges, Bars, Spinner, Cards, Pagination, Drop down, Carousel, Bootstrap Grids, Bootstrap Themes, Bootstrap CSS, Bootstrap JS.

UNIT IV	REACT JS	9 Hours

Introduction to React, Install node, JSX, Virtual DOMs, Single Page Apps, React Lifecycle, States, Class Component Vs Function Component, Event Handling, Props, Routes, Hooks, Conditional rendering, Pure

Components, High order components, Controlled Vs uncontrolled components, Redux, Babel, webpack, Axios.		
UNIT V	**NODE.JS, EXPRESS, MONGO DB AND APPLICATION DEPLOYMENT IN CLOUD**	**9 Hours**
Introduction, Environmental setup, Simple Server, Response Type – HTML, JSON, Routing, Express Introduction, Express params and query string, Express Middleware, API Authentication, SQL Vs NO SQL, Mongo DB overview, Installation, connecting and performing CRUD operations - Introduction to Cloud – Deploy a web application using IBM Cloud and AWS cloud.		

Theory: 45 Hrs	***Tutorial: --***	***Practical: --***	***Project:--***	***Total Hours: 45 Hrs***

REFERENCES

1.	Eric Bush, "Node.Js, Mongodb,React, React native Full Stack Fundamentals and Beyond", Blue sky productions, 2019.
2.	B. Jakobus, J.Maraj, " Mastering Bootstrap 4", Packt publisher, 2016.
3.	Kirupa Chinnathambi, "Learning React", Addison-Wesley Professional, 2018.
4.	Marc Wandschneider, "Learning Node.js:A Hands-on guide to building web applications in javascript",2nd edition, 2018.

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P23MIT102	ADVANCED DATA STRUCTURES	L	T	P	J	C
		3	0	0	0	3

Course Outcomes

At the end of the course, the student will be able to

CO1	Design data structures and algorithms to solve computing problems.
CO2	Implement and analysis of hierarchical data structures and algorithms.
CO3	Design algorithms using graph structure and various string matching algorithms to solve real-life problems.
CO4	Apply suitable design strategy for problem solving.
CO5	Implement approximation algorithms.

Pre-requisite: NIL

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5
CO1	1		1	1	
CO2	2	1	1	2	
CO3	3	2	1	3	1
CO4	2	1	1	3	1
CO5	1	1	2	2	2

Course Assessment methods

Direct	Indirect
CIE test I (10) , CIE test II (10), CIE test III (10) Assignment/Problem-solving/seminar (10) Total CIE : 40 Marks Semester End Examination : 60 Marks	Course end survey

UNIT I	ROLE OF ALGORITHMS IN COMPUTING	9 Hours

Algorithms – Algorithms as a Technology- Insertion Sort – Analyzing Algorithms – Designing Algorithms- Growth of Functions: Asymptotic Notation – Standard Notations –Divide and Conquer- Maximum-subarray problem- Strassen's algorithm- Common Functions- Recurrences: The Substitution Method – The Recursion-Tree Method-The Master method.

UNIT II	HIERARCHICAL DATA STRUCTURES	9 Hours

Binary Search Trees: Basics – Querying a Binary search tree – Insertion and Deletion- Red-Black trees: Properties of Red-Black Trees – Rotations – Insertion – Deletion- B-Trees: Definition of B trees – Basic operations on B-Trees – Deleting a key from a B-Tree- Fibonacci Heaps: Structure – Heap operations – Decreasing a key and deleting a node – Bounding the maximum degree.

UNIT III	GRAPHS	9 Hours

Elementary Graph Algorithms: Representations of Graphs – Breadth-First Search – Depth-First Search – Topological Sort – Strongly Connected Components- Minimum Spanning Trees: Growing a Minimum Spanning Tree – Kruskal and Prim- Single-Source Shortest Paths: The Bellman-Ford algorithm – Single-Source Shortest paths in Directed Acyclic Graphs – Dijkstra's Algorithm; All Pairs Shortest Paths: Shortest Paths and Matrix Multiplication – The Floyd-Warshall Algorithm.

UNIT IV	ALGORITHM DESIGN TECHNIQUES	9 Hours
Dynamic Programming: Matrix-Chain Multiplication – Elements of Dynamic Programming – Longest Common Subsequence- Greedy Algorithms: An Activity-Selection Problem – Elements of the Greedy Strategy – Huffman Codes		
UNIT V	**NP COMPLETENESS AND APPROXIMATION ALGORITHMS**	**9 Hours**
NP-Completeness: Polynomial Time – Polynomial-Time Verification – NP-Completeness and Reducability – NP-Completeness Proofs – NP-Complete Problems- Approximation Algorithms: Vertex-Cover problem- Travelling-Salesman problem – Subset-sum problem.		

Theory: 45 Hrs	Tutorial: --	Practical: --	Project:--	Total Hours: 45 Hrs

REFERENCES

1.	Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, "Introduction to Algorithms", 4th Edition, MIT Press, 2022.
2.	Robert Sedgewick and Kevin Wayne, "Algorithms", 4th Edition, Pearson Education, 2011. .
3.	Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman, "Data Structures and Algorithms", 1st edition, Pearson Education.
4.	Donald E Knuth, "Art of Computer Programming-Volume I- Fundamental Algorithms", 3rd edition, Addison Wesley, 2022.

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P23MIT103	ADVANCED DATA STRUCTURES LABORATORY	L	T	P	J	C
		0	0	4	0	2

Course Outcomes

At the end of the course, the student will be able to

CO1	Implement the tree data structure
CO2	Implement graph algorithms
CO3	Implement problems in greedy and approximation approach

Pre-requisite: NIL

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5
CO1	3	1	1	1	2
CO2	3	2	1	1	3
CO3	3	1	3	2	1

Course Assessment methods

Direct	Indirect
CIE test I (20) ,Quiz I- (5) , CIE test II (20),Quiz II- (5), RTPS (10) Total CIE: 60 marks , Semester End Examination :40 marks	Course end survey

LIST OF EXPERIMENTS

1. Implementation of Binary Search Tree
2. Implementation of Fibonacci Heaps
3. Implementation of Red-Black tree
4. Implementation of Spanning Tree
5. Implementation of Shortest Path Algorithms
6. Implementation of Graph Traversals
7. Implementation of Greedy Algorithms
8. Implementation of Approximation Algorithms

Theory: --	Tutorial: --	Practical: 60 Hrs	Project: --	Total Hours: 60 Hrs

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14/6/25

P23MIT104	FULL STACK DEVELOPMENT LABORATORY	L	T	P	J	C
		0	0	4	2	3

Course Outcomes

At the end of the course, the student will be able to

CO1	Design a Front End of application using HTML, CSS, BOOTSTRAP.
CO2	Write programs to validate data and initiate a call to backend using JavaScript code and jQuery.
CO3	Develop a Full Stack application using React JS, Node JS and Mongo DB and Deploy it in Cloud.

Pre-requisite: HTML, CSS, and JavaScript

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5
CO1		2	2	2	2
CO2	2	3	3	2	3
CO3	2	3	3	3	2

Course Assessment methods

Direct	Indirect
CIE test I (10) - Laboratory,*Quiz 1 (5)*, CIE test II (10)- Laboratory,Quiz 2 (5), CIE test III (10) -Project, Record (10) Total CIE: 50 marks Semester End Examination :50 marks ,SEE: Laboratory	Course end survey

LIST OF EXPERIMENTS

1. Study of most popular full stack such as MEAN, PERN, LAMP and MERN.
2. Create your own Blog page using HTML/CSS.
3. Create a home page of your website using Bootstrap.
4. Add a functionality to your Blog using JavaScript and jQuery.
5. *Create a front end of online assessment pages using React JS.*
6. Build a Node.js server to say a given string is palindrome or not (Explore a node server with only API).
   input: localhost:8080/is_palindrome?text=madam
   output: true/false
7. Node.js with MONGO DB (NodeJS with DB access).

   a) Create a database and insert the given data into the table.

   b) Fetch the record based by

   - joining the tables
   - Search criteria
   - recent data order
   - Limit first 5 records

7. a) Whenever a user is logged in set the email in the MongoDB.

   b) Write a NodeJS script to pull the MongoDB email value which is set and provide as an API end point.

8. Email

a) Build a script in NodeJS to send an email with a default content.

b) Use task '7-b' and integrate the task '8-a' to send an email to the user that they have logged in from this IP.

9. Create a back end of backend of online assessment using Node JS and Mongo DB.

10. Create a full stack application comprising React JS, Node JS, and Mongo DB to manage information of employees working in the organization. Admin of the application should able to perform CRUD operation on the employee database.

11. Deploy a Full Stack based web application into IBM Cloud.

12. Deploy a Full Stack based web application into AWS Cloud.

Theory: --	Tutorial: --	Practical: 60Hrs		Project: 30Hrs	Total Hours: 90 Hrs

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P23MIT501	INTERNET OF THINGS	L	T	P	J	C
		3	0	0	0	3

Course Outcomes

At the end of the course, the student will be able to

CO1	Explain the concept of IoT and identify the functions of different actuators and sensors.
CO2	Analyze various protocols for IoT
CO3	Design an IoT system using Rasperry Pi/Arduino
CO4	Implement web based services on IoT devices
CO5	Analyze applications of IoT in real time scenario

Pre-requisite: No

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)					
	PO1	PO2	PO3	PO4	PO5	
CO1	2	2	2	2	2	
CO2	3	3	3	3	3	
CO3	3	3	3	3	3	
CO4	3	3	3	3	3	
CO5	3	3	3	3	3	

Course Assessment methods

Direct	Indirect
CIE test I (10), CIE test II (10), CIE test III (10), Assignment/Problem-solving/seminar (10), Total CIE Marks: 40 Semester End Examination Marks: 60	Course end survey

UNIT I	FUNDAMENTALS OF IoT	9 Hours

Evolution of Internet of Things – Enabling Technologies – IoT Architectures: oneM2M, IoT World Forum (IoTWF) and Alternative IoT models – Simplified IoT Architecture and Core IoT Functional Stack – Fog, Edge and Cloud in IoT – Functional blocks of an IoT ecosystem – Sensors, Actuators, Smart Objects and Connecting Smart Objects

UNIT II	IoT PROTOCOLS	9 Hours

IoT Access Technologies: Physical and MAC layers, topology and Security of IEEE 802.15.4, 802.15.4g, 802.15.4e, 1901.2a, 802.11ah and LoRaWAN – Network Layer: IP versions, Constrained Nodes and Constrained Networks – Optimizing IP for IoT: From 6LoWPAN to 6Lo, Routing over Low Power and Lossy Networks – Application Transport Methods: Supervisory Control and Data Acquisition – Application Layer Protocols: CoAP and MQTT

UNIT III	DESIGN AND DEVELOPMENT	9 Hours

Design Methodology – Embedded computing logic – Microcontroller, System on Chips – IoT system building blocks – Arduino – Board details, IDE programming – Raspberry Pi – Interfaces and Raspberry Pi with Python Programming

UNIT IV	IoT PHYSICAL SERVERS AND CLOUD OFFERINGS	9 Hours
Introduction to Cloud Storage models and communication APIs Webserver – Web server for IoT, Cloud for IoT, Python web application framework designing a RESTful web API		
UNIT V	**CASE STUDIES/INDUSTRIAL APPLICATIONS**	**9 Hours**
Cisco IoT system – IBM Watson IoT platform – Manufacturing – Converged Plantwide Ethernet Model (CPwE) – Power Utility Industry – GridBlocks Reference Model – Smart and Connected Cities: Layered architecture, Smart Lighting, Smart Parking Architecture and Smart Traffic Control		

Theory: 45 Hrs	Tutorial: --	Practical: --	Project:--	Total Hours: 45 Hrs

REFERENCES

1.	Arshdeep Bahga, Vijay Madisetti, —Internet of Things – A hands-on approach, Universities Press, 2015
2.	David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, —IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things, Cisco Press, 2017
3.	Olivier Hersent, David Boswarthick, Omar Elloumi , —The Internet of Things – Key applications and *Protocols, Wiley, 2012 (for Unit 2).*
4.	Jan Ho¨ ller, Vlasios Tsiatsis , Catherine Mulligan, Stamatis , Karnouskos, Stefan Avesand. David Boyle, "From Machine-to-Machine to the Internet of Things – Introduction to a New Age of Intelligence", Elsevier, 2014.
5.	Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), —Architecting the Internet of Things, Springer, 2011.
6.	Michael Margolis, Arduino Cookbook, Recipes to Begin, Expand, and Enhance Your Projects, 2nd Edition, O'Reilly Media, 2011.

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P23MIT513	NATURAL LANGUAGE COMPUTING	L	T	P	J	C
		3	0	0	0	3

Course Outcomes

At the end of the course, the student will be able to

CO1	Identify the Process of text data at syntactic and semantic level.
CO2	Explain and apply the operations of text such as Wordnet and POS.
CO3	Explore the methods and techniques to retrieve the key information from text data.
CO4	Analyze the text content to provide predictions related to a specific domain using language models.
CO5	Discuss the tools and applications related to NLP and Text.

Pre-requisite: Machine learning

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)					
	PO1	PO2	PO3	PO4	PO5	
CO1	1					
CO2	1	1		1		
CO3	2	1	1	2		
CO4	3		2	2		
CO5	1		3		1	

Course Assessment methods

Direct	Indirect
CIE test I (10), CIE test II (10), CIE test III (10), Assignment/Problem-solving/seminar (10), Total CIE Marks: 40 Semester End Examination Marks: 60	Course end survey

UNIT I	INTRODUCTION	9 Hours

Natural Language Processing – Linguistic Background – Mathematical Foundations - Morphological Analysis -Tokenization -Stemming- Lemmatization - Boundary Determination.

UNIT II	DATA REPRESENATATION	9 Hours

Reading unstructured data – Representing text data - Part of speech tagging - Syntactic representation - Text similarity - WordNet based similarity- Shallow parsing - Semantic representation.

UNIT III	INFORMATION RETRIEVAL & EXTRACTION	9 Hours

Information retrieval and Information extraction - Named Entity Recognition - Relation Identification- Template filling.

UNIT IV	LANGUAGE MODEL FOR TEXT DATA	9 Hours

Language model - Probabilistic Models - n-gram language models- Hidden Markov Model- Topic Modeling - Graph Models -Feature Selection and classifiers -Rule-based Classifiers - Maximum entropy classifier – Clustering-Word and Phrase-based Clustering.

UNIT V	TOOLS AND APPLICATIONS		9 Hours

Tools – Natural Language Tool kit, Apache OpenNLP. Applications of Text Analytics – Applications in Social media - Life science - Legal Text–Visualization -Case studies.				
Theory: 45 Hrs	**Tutorial: --**	**Practical: --**	**Project:--**	**Total Hours: 45 Hrs**

REFERENCES

1.	Christoper D.Manning and Hinrich Schutze,"Foundation of statistical Natural Lanuage Processing",MIT Press 2019.
2.	Steven Struhl, "Practical Text Analytics: Interpreting Text and Unstructured Data for Business Intelligence", Kogan Page, 2015.
3.	Matthew A. Russell, "Mining the Social Web", O'Reilly Media, 2013.
4.	Steven Bird,Ewan Kien and Edward Loper,"Natural Language Processing with python",1st Edision,O'Reilly Media,2009.

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P23GE101 **RESEARCH METHODOLOGY AND IPR** 3 0 0 0 3

(Common to all M.E /M.Tech Programmes)

COURSE OUTCOMES:

At the end of the course, the student will be able to

1. Review the literature of the research problem
2. Choose appropriate data collection and sampling method according to the research problem.
3. Interpret the results of research and communicate effectively with their peers
4. Explain the Importance of intellectual property rights
5. Evaluate trade mark, develop and register patents.

CO/PO, PSO Mapping (3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak COs Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)					
COs	PO1	PO2	PO3	PO4	PO5
CO1	2	3	3	3	3
CO2	2	3	3	3	3
CO3	2	3	3	3	3
CO4	2	3	3	3	3
CO5	3	3	3	3	3

Course Assessment methods

Direct		Indirect
CIE test I (10) (Theory) CIE test II (10) (Theory) CIE test III (10) (Theory)	Assignment / Problem –Solving /Seminar (10) Total CIE: **40 Marks** Semester End Examination : **60 Marks**	Course end survey

UNIT I INTRODUCTION TO RESEARCH METHODS 9

Definition and Objective of Research, Various steps in Scientific Research, Types of Research, Criteria for Good Research, Defining Research Problem, Research Design , Case Study Collection of Primary and Secondary Data, Collection Methods: Observation, Interview, Questionnaires, Schedules,

UNIT II SAMPLING DESIGN AND HYPOTHESIS TESTING 9

steps in Sampling Design, Types of Sample Designs, Measurements and Scaling Techniques -Testing of hypotheses concerning means (one mean and difference between two means -one tailed and two tailed tests), concerning variance — one tailed Chi-square test.

UNIT II INTERPRETATION AND REPORT WRITING 9

Techniques of Interpretation, Precaution in Interpretation, Layout of Research Report, Types of Reports, Oral Presentation, Mechanics of Writing Research Report

UNIT IV INTRODUCTION TO INTELLECTUAL PROPERTY 9

Introduction, types of intellectual property, international organizations, agencies and treaties, importance of intellectual property rights, Innovations and Inventions trade related intellectual property rights.

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UNIT V TRADE MARKS, COPY RIGHTS AND PATENTS 9

Purpose and function of trade marks, acquisition of trade mark rights, trade mark registration processes, trademark claims —trademark Litigations- International trademark law Fundamental of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership issues, copy right registration, notice of copy right, international copy right law. Law of patents: Foundation of patent law, patent searching process, ownership rights and transfer

Lecture: 45, Tutorial: 0, Total: 45 Hours

TEXT BOOKS

1. C.R. Kothari, Gaurav Garg, Research Methodology Methods and Techniques An Edition, New Age International Publishers, 2019.
2. Deborah E. Bouchoux, "Intellectual Property: The Law of Trademarks, Copyrights, Patents, and Trade Secrets", Delmar Cengage Learning, 4" Edition, 2012.
3. Prabuddha Ganguli, "Intellectual Property Rights: Unleashing the Knowledge Economy", Tata Mc Graw Hill Education, 1" Edition, 2008.

REFERENCE BOOKS

1. Panneerselvam, R., Research Methodology, Second Edition, Prentice-Hall of India, New Delhi, 2013.
2. Ranjith Kumar, Research Methodology — A step by step Guide for Begineers, 4" edition, Sage publisher, 2014.
3. D Llewelyn & T Aplin W Cornish, "Intellectual Property: Patents, Copyright, Trade Marks and Allied Rights", Sweet and Maxwell, 1" Edition, 2016.
4. Ananth Padmanabhan, "Intellectual Property Rights-Infringement and Remedies", Lexis Nexis, 1" Edition, 2012.
5. Ramakrishna B and Anil Kumar H.S, "Fundamentals of Intellectual Property Rights: For Students, Industrialist and Patent Lawyers", Notion Press, 1" Edition, 2017.
6. M.Ashok Kumar and Mohd. Iqbal Ali :"Intellectual Property Rights" Serials Pub

S. Padma 4.8.23

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P23GE701	English for Research Paper Writing	L	T	P	J	C
		2	0	0	0	0

Course Outcomes

At the end of the course, the student will be able to

CO1:	Demonstrate research writing skills both for research articles and thesis
CO2:	Frame suitable title and captions as sub-headings for articles and thesis
CO3:	Write each section in a research paper and thesis coherently
CO4:	Use language appropriately and proficiently for effective written communication
CO5:	Exhibit professional proof-reading skills to make the writing error free

Course Assessment methods

Direct		Indirect
CIE test I (30) CIE test II (30) CIE test III (40)	Total CIE: 100 marks Semester End Examination: NIL	Course end survey

Unit 01:	**6 Hours**
Planning and preparation, word order, breaking up long sentences, organising ideas into paragraphs and sentences, being concise and avoiding redundancy, ambiguity and vagueness	
Unit 02:	**6 Hours**
Interpreting research findings, understanding and avoiding plagiarism, paraphrasing sections of a paper/ abstract.	
Unit 03:	**6 Hours**
Key skills to frame a title, to draft an abstract, to give an introduction	
Unit 04:	**6 Hours**
Skills required to organise review of literature, methods, results, discussion and conclusions	
Unit 05:	**6 Hours**
Usage of appropriate phrases and key terms to make the writing effective - proof-reading to ensure error-free writing	

Theory: 30 Hrs	Tutorial: --	Practical: --	Project:--	Total Hours: 30 Hrs

TEXT BOOKS

1. Adrian Wallwork , English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011
2. Highman N , Handbook of Writing for the Mathematical Sciences, SIAM. Highman's book, 1998
3. Day R, How to Write and Publish a Scientific Paper, Cambridge University Press, 2006.
4. Goldbort R, Writing for Science, Yale University Press, 2006. (available on Google Books)

REFERENCES

1. Martin Cutts, Oxford Guide to Plain English, Oxford University Press, Second Edition, 2006

HOD

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SALEM - 6

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for M. Tech Semester II under Regulations 2023(CBCS)
Branch: M. Tech -Information Technology

S. No	Course Code	Course Title	L	T	P	J	C	Category	Total Contact Hours	Course Type
Theory Courses										
1	P23MIT201	Machine Learning	3	0	0	0	3	PC	45	T
2	P23MIT202	Cyber Security	3	0	0	0	3	PC	45	T
3	P23MIT203	Big Data Technologies	3	0	0	0	3	PC	45	T
4	P23MIT501	**Elective** Internet of Things	3	0	0	0	3	PE	45	T
	P23MIT507	Swarm Intelligence								
5	P23MIT502	Soft Computing	3	0	0	0	3	PE	45	T
6	P23GE702	**Audit Course** – Stress Management by Yoga	2	0	0	0	0	AC	30	T
Practical Courses										
7	P23MIT204	Machine Learning Laboratory	0	0	4	2	3	PC	90	LP
8	P23MIT205	Big Data Technologies Laboratory	0	0	4	0	2	PC	60	L
							Total Credits	**20**		

*T- Theory, TT- Theory with Tutorial, TL- Theory with Laboratory, TP- Theory with Project, TLP- Theory with Laboratory and Project, L-Laboratory, LT- Laboratory with Theory, LP- Laboratory with Project

Approved By

J. Akilandeswari	R.Shivakumar	J. Akilandeswari	J. Akilandeswari
Chairperson, Information Technology BoS	**Member Secretary, Academic Council**	**Dean-Academics**	**Chairperson, Academic Council & Principal**
Dr.J.Akilandeswari	**Dr.R.Shivakumar**	**Dr.J.Akilandeswari**	**Dr.S.R.R.Senthil Kumar**

Copy to:-
HOD/IT, Second Semester ,M. Tech Students, and Staff, COE

P23MIT201	MACHINE LEARNING	L	T	P	J	C
		3	0	0	0	3

Course Outcomes

At the end of the course, the student will be able to

CO1	Describe the concepts of different types of learning and apply linear regression for appropriate real world problems
CO2	Demonstrate the concepts of logistic regression and implement the same.
CO3	Explain and apply the concepts of Neural networks and support vector machines
CO4	Evaluate the hypothesis based on factors like bias and variance
CO5	Analyze the concepts of clustering, dimensionality reduction and anomaly detection.

Pre-requisite: -

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)					
	PO1	PO2	PO3	PSO1	PSO2	
CO1	3	1	3	2	3	
CO2	3	1	3	3	3	
CO3	3	1	3	3	3	
CO4	3	1	3	2	3	
CO5	3	1	3	3	3	

Course Assessment methods

Direct	Indirect
CIE test I (10), CIE test II (10), CIE test III (10), Assignment/Problem-solving/seminar (10), Total CIE Marks: 40 Semester End Examination Marks: 60	Course end survey

UNIT I: INTRODUCTION AND LINEAR REGRESSION — **9 Hours**

What is machine learning? — Supervised Learning — unsupervised learning — Linear Regression — cost function — gradient descent algorithm — implementation - Gradient descent for multiple variables — feature scaling — learning rate — polynomial regression

UNIT II : LOGISTIC REGRESSION — **9 Hours**

Hypothesis representation — decision boundary — nonlinear decision boundaries — cost function — gradient descent — advanced optimizations — multi class classification problems— Regularization - Problem of overfitting — cost function optimization for regularization — regularized linear regression — regularized logistic regression

UNIT III : NEURAL NETWORKS AND SUPPORT VECTOR MACHINES — **9 Hours**

Overview and summary — neurons and brain — model representation — artificial neural networks representation — example — multiclass classification — cost function — back propagation algorithm — gradient checking — random initialization — Support vector machines — optimization objective — cost function — large margin intuition — decision boundary — kernels — adapting to nonlinear classifiers

UNIT IV: ADVICE FOR APPLYING MACHINE LEARNING — **9 Hours**

Debugging a learning algorithm — evaluating a hypothesis — model selection and training, validation test sets — bias Vs variance — regularization and bias/variance — learning curves machine learning system design

UNIT V : UNSUPERVISED ALGORITHMS				9 Hours
Unsupervised learning — k-means algorithm — optimization objective — choosing number of clusters - Dimensionality reduction — principle component analysis - Anomaly detection — algorithm — developing and evaluating the algorithm — anomaly detection Vs supervised algorithm -Case study — recommender system — collaborative filtering - Large scale machine learning — online learning — map reduce and parallelism.				
Theory: 45 Hrs	**Tutorial: --**	**Practical: --**	**Project:--**	**Total Hours: 45 Hrs**

REFERENCES

1.	Stanford's machine learning course presented by Professor Andrew Ng — online resource - http://www.holehouse.org/mlclass/
2.	James, G., Witten, D., Hastie, T., Tibshirani, R, "An Introduction to Statistical Learning with Applications in R", Springer, 2013.
3.	Ethem Alpaydin, "Introduction to Machine Learning", The MIT Press, 4th edition, 2020.
4.	Christopher M. Bishop, "Pattern Recognition and Machine Learning", Springer, 2016.
5.	Sebastianraschka, "Python Machine Learning", Packt Publishing Ltd., 3rd Edition, 2019.

J. Dilond

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P23MIT202	CYBER SECURITY	L	T	P	J	C
		3	0	0	0	3

Course Outcomes

At the end of the course, the student will be able to

CO1	Describe the importance of cyber security and its essentials through various examples of cybercrimes in the world.
CO2	Analyse possible vulnerablites in e mail, web applications and operating ssytems the
CO3	Describe spoofing and hijacking methods used in cybersecurity and its prevention.
CO4	Apply the tools and methods used by cyber criminals and various techniques to protect against the cyber-attack.
CO5	Apply the suitable tools and techniques for analysing and validating forensics data .

Pre-requisite: -

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)					
	PO1	PO2	PO3	PSO1	PSO2	
CO1	1	2	1	3	3	
CO2	3	3	3	3	3	
CO3	2	3	2	3	2	
CO4	3	2	1	3	2	
CO5	3	1	3	3	3	

Course Assessment methods

Direct	Indirect
CIE test I (10) , CIE test II (10), CIE test III (10), Assignment/Problem-solving/seminar (10) , Total CIE Marks: 40 Semester End Examination Marks: 60	Course end survey

UNIT I : INTRODUCTION — **9 Hours**

Cyber Security Concepts- layers of security, Vulnerability, threat, Harmful acts, Internet Governance – Challenges and Constraints, Computer Criminals, CIA Triad, Assets and Threat, motive of attackers, active attacks, passive attacks, Software attacks, hardware attacks, Cyber Threats-Cyber Warfare, Cyber Crime, Cyber terrorism, Cyber Espionage, etc., Comprehensive Cyber Security Policy.

UNIT II: VULNERABILITIES IN EMAIL AND WEB APPLICATIONS — **9 Hours**

Mail Vulnerabilities – Major Mail Protocols: SMTP, POP, IMAP- Email attacks: List linking ,Email Bombing, Email Spamming, Email sniffing and Spoofing , 419s, phishing- Browser Based Vulnerabilities- Email security countermeasures. Web application vulnerabilities-Webserver Vulnerabilities- Weakness in administration tools, Weakness in application or Protocol design, Protection against web application Vulnerabilities.

UNIT III: SPOOFING AND HIJACKING — **9 Hours**

Spoofing –Process of IP Spoofing attack –Types of Spoofing : Blind Spoofing, Active Spoofing, IP Spoofing, ARP Spoofing, Web Spoofing, DNS Spoofing – Spoofing Tools : Mausezahn, Ettercap, ARPspoof – Prevention and Mitigation. Session Hijacking – TCP Session Hijacking –Session Hijacking Tool: Hunt- UDP Hijacking - Prevention and Mitigation

UNIT IV: NETWORK SCANNING TOOLS — **9 Hours**

Introduction- Types of scanning- TCP connect scanning, Half open scanning, UDP scanning, IP scanning, Ping scanning, Stealth scanning – Scanning phases and Tools. Sniffers – Sniffers Types – Sniffer operation- Sniffer

Programs: Wireshark, tcpdump, Snort, Network monitor, Cain and Abel- Detecting a sniffer- Protection against Sniffer.				
UNIT V: COMPUTER FORENSICS				**9 Hours**
Need for Computer Forensics - Cyberforensics and Digital Evidence - Forensics Analysis of E-Mail - Digital Forensics Life Cycle - Chain of Custody Concept - Network Forensics - Approaching a Computer Forensics Investigation - Setting up a Computer Forensics Laboratory: Understanding the Requirements - Computer Forensics and Steganography - Forensics and Social Networking Sites: The Security/Privacy Threats - Computer Forensics from Compliance Perspective - Challenges in Computer Forensics.				
Theory: 45 Hrs	**Tutorial: --**	**Practical: --**	**Project:--**	**Total Hours: 45 Hrs**

REFERENCES

1.	Cyber Security and Cyber Laws- Alfred Basta, Nadine Basta, Mary Brown, Ravinderkumar Cengage Publishers,2018
2.	MarjieT.Britz, —"Computer Forensics and Cyber Crime: An Introduction", 3rd Edition, Prentice Hall, 2015.
3.	Sagar Rahalkar, "Network Vulnerability Assessment", Birmingham, UK : Packt Publishing, 2018
4.	Charles J. Brooks, Christopher Grow, Philip Craig, Donald Short "Cyber Security Essentials" Wiley India Publications, Oct 2019.
5.	Nina Godbole, Sunit Belapur "Cyber Security"- Understanding Cyber Crimes, Computer Forensics and Legal Perspectives –, Wiley India Publications Released: April 2015

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P23MIT203	BIG DATA TECHNOLOGIES	L	T	P	J	C
		3	0	0	0	3

Course Outcomes

At the end of the course, the student will be able to

CO1	Explain the need and challenges of Big data and analytics.
CO2	Apply and write jobs in Hadoop and map reduce framework and configure Hadoop eco systems and work with tools that are handling big data.
CO3	Create NoSQL database and apply CRUD operations in MongoDB.
CO4	Create database and apply CRUD operations in Cassandra and Hive.
CO5	Write PigLatin scripts for database maintenance and Perform statistical based analysis and describe the data using various graphical methods.

Pre-requisite: -

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)					
	PO1	PO2	PO3	PSO1	PSO2	
CO1	1	2	2	1	1	
CO2	3	3	3	2	2	
CO3	2	2	2	3	1	
CO4	2	3	3	1	2	
CO5	2	3	3	1	2	

Course Assessment methods

Direct	Indirect
CIE test I (10), CIE test II (10), CIE test III (10), Assignment/Problem-solving/seminar (10), Total CIE Marks: 40 Semester End Examination Marks: 60	Course end survey

UNIT I : INTRODUCTION — **9 Hours**

Types of Digital Data – Introduction to Big Data - Big Data Analytics - classification of Analytics - Greatest Challenges that Prevent Businesses from Capitalizing on Big Data - Top Challenges Facing Big Data - Why is Big Data Analytics Important? - Data Science - Terminologies Used in Big Data Environment - Few Top Analytics Tools

UNIT II: TECHNOLOGIES, HADOOP AND MAP REDUCE — **9 Hours**

The big data technology landscape – NoSQL – Hadoop - Introduction to Hadoop - RDBMS versus Hadoop - RDBMS versus Hadoop - Hadoop Overview - Hadoop Distributed File System - Processing Data with Hadoop - Managing Resources and Application with Hadoop YARN - Hadoop Ecosystem – Introduction to Map reduce Programming

UNIT III: MONGODB — **9 Hours**

Introduction to MongoDB - What is MongoDB? - Why MongoDB? - RDBMS and MongoDB - Data Types in MongoDB – MongoDB Query Language.

UNIT IV: CASSANDRA AND HIVE — **9 Hours**

Introduction to Cassandra - Features of Cassandra - CQL Data Types – CQLSH – Keyspaces - CRUD – Collections – Alter - Import and Export – querying system tables Hive Architecture - Hive Data Types - Hive File Format - Hive Query Language- RCFile Implementation – SerDe – User Defined Functions

UNIT V: PIG AND RECENT TRENDS				9 Hours
Introduction to Pig -_The Anatomy of Pig - Pig on Hadoop - Pig Latin Overview - Data Types - Running Pig - Execution Modes of Pig - HDFS Commands - Relational operators - Eval Function - Complex Data Type - User Defined Function - parameter Substitution - Diagnostic Operator - Word Count Example - When to use Pig? - When NOT to use Pig? - Pig versus Hive - Reporting tool – Trends – Case study				
Theory: 45 Hrs	**Tutorial: --**	**Practical: --**	**Project:--**	**Total Hours: 45 Hrs**

REFERENCES

1.	Seema Acharya, Subhashini Chellappan, "Big Data and Analytics", Wiley Publication, first edition. Reprint in 2016.
2.	DT Editorial Services, "Black Book- Big Data (Covers Hadoop 2, MapReduce, Hive, Yarn, PIG, R, Data visualization)", Dream tech Press edition 2016.
3.	Radha Shankarmani, M Vijayalakshmi, "Big Data Analytics", Wiley Publications, First Edition 2016.
4.	Chuck lam, "Hadoop in action", Dream tech Press-2016 reprint edition.
5.	O'Reilly Media, Big Data now: Current Perspective from O'Reilly Media, 2013 Edition.

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P23MIT204	MACHINE LEARNING LABORATORY	L	T	P	J	C
		0	0	4	2	3

Course Outcomes

At the end of the course, the student will be able to

CO1	Apply data preprocessing and visualization techniques required for implementing ML algorithms
CO2	Make use of Data sets in implementing machine learning algorithms
CO3	Implement the machine learning concepts and algorithms

Pre-requisite: NIL

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)					
	PO1	PO2	PO3	PSO1	PSO2	
CO1		2	2		2	
CO2	2	3	3		3	
CO3	2	3	3		3	

Course Assessment methods

Direct	Indirect
CIE test I (10) Laboratory, Quiz-1 (5) CIE test II (10) – Laboratory ,Quiz-2 (5),CIE test III (10) Project, Record (10) Total CIE: 50 marks , Semester End Examination (50 Marks),SEE:Laboratory	Course end survey

LIST OF EXPERIMENTS

1. Write a program to perform simple computations on the given dataset using numpy and pandas.

   Sample Exercises:

   Write a Python program to load the data from a given csv file into a dataframe and print the shape of the data, type of the data, first 3 rows, number of rows-columns, feature names and missing values.

   Write a Python program to view basic statistical details like percentile, mean, std etc. of given dataset.

   Write a Python program to access first four cells from a given Dataframe using the index and column labels.

2. Write a program to visualize the data and features in the given dataset using matplotlib and pyplot.

   Sample Exercise:

   Write a Python program to create a plot to get a general Statistics of the given dataset. Draw box plot, joinplot, scatterplot, pairplot, kernel density estimate plot(using seaborn) to explore the frequency of data in the dataset.

3. Write a program to implement simple linear regression to minimize the cost function.

   Sample Exercise: In AB Company, there is a salary distribution table based on Year of experience. You are a HR officer and you got a candidate with 5 years of experience. Plot the given data. and find the best salary to offer the candidate.

4. Write a program to implement multivariate linear regression.

   Sample Exercise:
   Consider a housing price data set with 2 variables (size of the house in square feet and number of bedrooms) and a target (price of the house). Write a program to normalize the features and predict the price of a new house (given the size and the number of bedrooms) by minimizing the cost function.

5. Build a logistic regression model to classify the data in the given dataset.

Sample Exercise: Suppose that you are the administrator of a university department and you want to determine each applicant's chance of admission based on their results on two exams. You have historical data from previous applicants that you can use as a training set. For each training example, you have the applicant's scores on two exams and the admissions decision. Write a program to build a classification model (logistic regression) that estimates the probability of admission based on the exam scores.

6. Write a program to fit a logistic regression model with regularization to avoid overfitting of the given dataset.
7. Write a program to implement a Neural Network model to classify the data in the given dataset.
8. Implement a ML model for the given datasets using Support Vector Machines(SVM).

Sample Exercise: Classify emails as spam or not spam using SVM classifier.

9. Load the given dataset, split it into train and test sets, then estimate the mean squared error (MSE) for a linear regression as well as the bias and variance for the model error over 100 bootstrap samples.
10. Apply K means algorithm to cluster a set of data stored in a .CSV file and plot the clusters.

Project:

Real time use cases will be provided to the students and students will carry out the project based on the use cases.

Theory: --	Tutorial: --	Practical: 60 Hrs	Project: -30	Total Hours: 90 Hrs

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P23MIT205	BIG DATA TECHNOLOGIES LABORATORY	L	T	P	J	C
		0	0	4	0	2

Course Outcomes

At the end of the course, the student will be able to

CO1:	Create applications for Big Data analytics.
CO2:	Apply data modelling techniques to large data sets.
CO3:	Prepare for data summarization, query, and analysis.

Pre-requisite: NIL

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)					
	PO1	PO2	PO3	PSO1	PSO2	
CO1		2	2	2	1	
CO2	2	3	3	1	2	
CO3	2	3	3	1	2	

Course Assessment methods

Direct	Indirect
CIE test I (20), Quiz-1 (5) CIE test II (20) ,Quiz-2 (5),RTPS (10) Total CIE: 60 marks , Semester End Examination: 40 Marks	Course end survey

LIST OF EXPERIMENTS

1. (i) Perform setting up and Installing Hadoop in its two operating modes:
   - Pseudo distributed,
   - Fully distributed.

   (ii) Use web based tools to monitor your Hadoop setup.
2. (i) Implement the following file management tasks in Hadoop:
   - Adding files and directories • Retrieving files • Deleting files

   ii) Benchmark and stress test an Apache Hadoop cluster
3. Run a basic Word Count Map Reduce program to understand Map Reduce Paradigm.
   - Find the number of occurrence of each word appearing in the input file(s)
   - Performing a MapReduce Job for word search count (look for specific keywords in a file)
4. Stop word elimination problem:
   - Input: A large textual file containing one sentence per line

     A small file containing a set of stop words (One stop word per line)
   - Output:

     A textual file containing the same sentences of the large input file without the words appearing in the small file.
5. Write a Map Reduce program that mines weather data.

   Data available at: https://github.com/tomwhite/hadoopbook/tree/master/input/ncdc/all.

- Find average, max and min temperature for each year in NCDC data set?
- Filter the readings of a set based on value of the measurement, Output the line of input files associated with a temperature value greater than 30.0 and store it in a separate file.

6. Purchases.txt Dataset
    a. Instead of breaking the sales down by store, give us a sales breakdown by product category across all of our stores
    b. What is the value of total sales for the following categories? ♣ Toys ♣ Consumer Electronics
    c. Find the monetary value for the highest individual sale for each separate store
    d. What are the values for the following stores? ♣ Reno ♣ Toledo ♣ Chandler
    e. Find the total sales value across all the stores, and the total number of sales.
7. Install and Run MongoDB then use MongoDB to create, alter, and drop databases, tables, views, functions, and indexes
8. Install and Run Pig then write Pig Latin scripts to sort, group, join, project, and filter your data.
9. Write a Pig Latin scripts for finding TF-IDF value for book dataset (A corpus of eBooks available at: Project Gutenberg)
10. Install and Run Hive then use Hive to create, alter, and drop databases, tables, views, functions, and indexes

Theory: --	Tutorial: --	Practical: 60 Hrs	Project: --	Total Hours: 60 Hrs

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P23MIT501	INTERNET OF THINGS	L	T	P	J	C
		3	0	0	0	3

Course Outcomes

At the end of the course, the student will be able to

CO1	Explain the concept of IoT and identify the functions of different actuators and sensors.
CO2	Analyze various protocols for IoT
CO3	Design an IoT system using Rasperry Pi/Arduino
CO4	Implement web based services on IoT devices
CO5	Analyze applications of IoT in real time scenario

Pre-requisite: No

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)					
	PO1	PO2	PO3	PSO1	PSO2	
CO1	2	2	2	2	2	
CO2	3	3	3	3	3	
CO3	3	3	3	3	3	
CO4	3	3	3	3	3	
CO5	3	3	3	3	3	

Course Assessment methods

Direct	Indirect
CIE test I (10) , CIE test II (10), CIE test III (10), Assignment/Problem-solving/seminar (10) , Total CIE Marks: 40 Semester End Examination Marks: 60	Course end survey

UNIT I: FUNDAMENTALS OF IoT — **9 Hours**

Evolution of Internet of Things – Enabling Technologies – IoT Architectures: oneM2M, IoT World Forum (IoTWF) and Alternative IoT models – Simplified IoT Architecture and Core IoT Functional Stack – Fog, Edge and Cloud in IoT – Functional blocks of an IoT ecosystem – Sensors, Actuators, Smart Objects and Connecting Smart Objects

UNIT II: IoT PROTOCOLS — **9 Hours**

IoT Access Technologies: Physical and MAC layers, topology and Security of IEEE 802.15.4, 802.15.4g, 802.15.4e, 1901.2a, 802.11ah and LoRaWAN – Network Layer: IP versions, Constrained Nodes and Constrained Networks – Optimizing IP for IoT: From 6LoWPAN to 6Lo, Routing over Low Power and Lossy Networks – Application Transport Methods: Supervisory Control and Data Acquisition – Application Layer Protocols: CoAP and MQTT

UNIT III: DESIGN AND DEVELOPMENT — **9 Hours**

Design Methodology – Embedded computing logic – Microcontroller, System on Chips – IoT system building blocks – Arduino – Board details, IDE programming – Raspberry Pi – Interfaces and Raspberry Pi with Python Programming

UNIT IV: IoT PHYSICAL SERVERS AND CLOUD OFFERINGS — **9 Hours**

Introduction to Cloud Storage models and communication APIs Webserver – Web server for IoT, Cloud for IoT, Python web application framework designing a RESTful web API

UNIT V: CASE STUDIES/INDUSTRIAL APPLICATIONS				9 Hours
Cisco IoT system – IBM Watson IoT platform – Manufacturing – Converged Plantwide Ethernet Model (CPwE) – Power Utility Industry – GridBlocks Reference Model – Smart and Connected Cities: Layered architecture, Smart Lighting, Smart Parking Architecture and Smart Traffic Control				
Theory: 45 Hrs	**Tutorial: --**	**Practical: --**	**Project:--**	**Total Hours: 45 Hrs**

REFERENCES

1.	Arshdeep Bahga, Vijay Madisetti, —Internet of Things – A hands-on approach, Universities Press, 2015
2.	David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, —IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things, Cisco Press, 2017
3.	Olivier Hersent, David Boswarthick, Omar Elloumi , —The Internet of Things – Key applications and Protocols, Wiley, 2012 (for Unit 2).
4.	Jan Ho" ller, Vlasios Tsiatsis , Catherine Mulligan, Stamatis , Karnouskos, Stefan Avesand. David Boyle, "From Machine-to-Machine to the Internet of Things – Introduction to a New Age of Intelligence", Elsevier, 2014.
5.	Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), —Architecting the Internet of Things, Springer, 2011.
6.	Michael Margolis, Arduino Cookbook, Recipes to Begin, Expand, and Enhance Your Projects, 2nd Edition, O'Reilly Media, 2011.

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P23MIT502	SOFT COMPUTING	L	T	P	J	C
		3	0	0	0	3

Course Outcomes

At the end of the course, the student will be able to

CO1	Design an efficient Fuzzy inference system and choose a fuzzy model specific to the problem
CO2	Apply the different derivative based optimization techniques to solve optimization problem.
CO3	Design a supervised and unsupervised learning system.
CO4	Design a different type of neuro fuzzy system models.
CO5	Apply the computation intelligence for printed character recognition and Color Recipe Prediction.

Pre-requisite: Machine learningz

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)					
	PO1	PO2	PO3	PSO1	PSO2	
CO1	1		3		3	
CO2	1		3	3	1	
CO3	2	2	3			
CO4	1	2	3		2	
CO5	2	2		2	3	

Course Assessment methods

Direct	Indirect
CIE test I (10) , CIE test II (10), CIE test III (10), Assignment/Problem-solving/seminar (10) , Total CIE Marks: 40 Semester End Examination Marks: 60	Course end survey

UNIT I FUZZY SET THEORY — **9 Hours**

Introduction to Neuro – Fuzzy and Soft Computing – Fuzzy Sets – Basic Definition and Terminology – Set-theoretic Operations – Member Function Formulation and Parameterization – Fuzzy Rules and Fuzzy Reasoning – Extension Principle and Fuzzy Relations – Fuzzy If-Then Rules – Fuzzy Reasoning – Fuzzy Inference Systems – Mamdani Fuzzy Models – Sugeno Fuzzy Models – Tsukamoto Fuzzy Models – Input Space Partitioning and Fuzzy Modeling.

UNIT II OPTIMIZATION — **9 Hours**

Derivative-based Optimization – Descent Methods – The Method of Steepest Descent – Classical Newton's Method – Step Size Determination – Derivative-free Optimization – Genetic Algorithms – Simulated Annealing – Random Search – Downhill Simplex Search.

UNIT III NEURAL NETWORKS — **9 Hours**

Supervised Learning Neural Networks – Perceptrons - Adaline – Backpropagation Mutilayer Perceptrons – Radial Basis Function Networks – Unsupervised Learning Neural Networks – Competitive Learning Networks – Kohonen Self-Organizing Networks – Learning Vector Quantization – Hebbian Learning.

UNIT IV NEURO FUZZY MODELING — **9 Hours**

Adaptive Neuro-Fuzzy Inference Systems – Architecture – Hybrid Learning Algorithm – Learning Methods that Cross-fertilize ANFIS and RBFN – Coactive Neuro Fuzzy Modeling – Framework Neuron Functions for Adaptive Networks – Neuro Fuzzy Spectrum.

UNIT V	**APPLICATIONS OF COMPUTATIONAL INTELLIGENCE**	**9 Hours**

Printed Character Recognition – Inverse Kinematics Problems – Automobile Fuel Efficiency Prediction – Soft Computing for Color Recipe Prediction.

Theory: 45 Hrs	**Tutorial: –**	**Practical: –**	**Project:–**	**Total Hours: 45 Hrs**

REFERENCES

1.	J.S.R.Jang, C.T.Sun and E.Mizutani, "Neuro-Fuzzy and Soft Computing", PHI, 2015.
2.	Timothy J.Ross, "Fuzzy Logic with Engineering Applications", McGraw-Hill, 2011.
3.	James A. Freeman and David M. Skapura, "Neural Networks Algorithms, Applications, and Programming Techniques", Pearson Edn., 2007.
4.	S. Rajasekaran and G.A.V. Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithms", PHI, 2003. Emereo Pty Limited, July 2008.
5.	R.Eberhart, P.Simpson and R.Dobbins, "Computational Intelligence - PC Tools", AP Professional, Boston, 2006.
6.	S. N. Sivanandam, S. Sumathi and S. N. Deepa, "Introduction to Fuzzy Logic using MATLAB", Springer, 2016.
7.	S.N.Sivanandam, S.N.Deepa, " Introduction to Genetic Algorithms", Springer, 2017.

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P23MIT507	SWARM INTELLIGENCE	L	T	P	J	C
		3	0	0	0	3

Course Outcomes

At the end of the course, the student will be able to

CO1	Explain the concept of swarm intelligence and optimization techniques.
CO2	Apply the Evolutionary Programming steps to the various optimization problems
CO3	Explain Bee's foraging and Mating approach.
CO4	Apply the Bee's Foraging and Mating intelligence to wired and wireless networks
CO5	Analyze ACO applications in real time scenario.

Pre-requisite: Machine learningz

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PSO1	PSO2
CO1	2	2	2	2	2
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3

Course Assessment methods

Direct	Indirect
CIE test I (10) , CIE test II (10), CIE test III (10), Assignment/Problem-solving/seminar (10) , Total CIE Marks: 40 Semester End Examination Marks: 60	Course end survey

UNIT I: FUNDAMENTALS — **9 Hours**

Swarm Intelligence Vs Artificial Intelligence, Cellular Automata and the edge of chaos, artificial life in computer programs –Intelligence in people –Intelligence in Machines, Binary optimization.

UNIT II: EVOLUTIONARY COMPUTATION THEORY AND PARADIGMS — **9 Hours**

Evolutionary Computation History, Genetic Algorithms: An Overview -A Simple GA Example Problem –Schemata and the Schema Theorem, Evolutionary Programming, Evolution Strategies.

UNIT III: PATICLE SWARM AND BEE INTELLIGENCE — **9 Hours**

Particle Swarm and Particle Swarm Intelligence –Honeybee's Intelligence: Bee's Mating Intelligence – Bee's Foraging Intelligence.

UNIT IV: APPLICATIONS OF BEE'S INTELLIGENCE — **9 Hours**

Energy minimization in wireless Sensor Networks using Bee's Mating Intelligence, Band width estimation using Bee's Foraging Intelligence, Online recommendation system using Bee's Foraging Intelligence, Determination of traverse path of Mobile sink node in WSN using Bee's Foraging Intelligence.

UNIT V: ANT COLONY OPTIMIZATION				9 Hours
Introduction to Ant Systems, Ant Colony Optimization Technique, Pheromones and its Density as Deciding Factor, Applications of Ant Colony Optimization in Travelling Salesman Problem and Routing. Comparison between ACO and PSO swarm intelligence models.				
Theory: 45 Hrs	**Tutorial: --**	**Practical: --**	**Project:--**	**Total Hours: 45 Hrs**

REFERENCES

1.	Andries P. Engelbrecht, "Fundamentals of Computational Swarm Intelligence", Wiley, 2008.
2.	James Kennedy, Russell C. Eberhart, with Yuhui Shi, "Swarm Intelligence", Morgan Kaufmann, 2010.
3.	Andries P. Engelbrecht, "Computational Swarm Intelligence ", John Wiley, & Sons, 2017
4.	Eric Bonabeau, Marco Dorigo, and Guy Theraulaz, "Swarm Intelligence: From Natural to Artificial Systems", Oxford University Press, 2009.

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P23GE702	Stress Management by Yoga	L	T	P	J	C
		2	0	0	0	0

Course Outcomes

At the end of the course, the student will be able to

CO1:	Develop physical and mental health thus improving social health
CO2:	Increase immunity power of the body and prevent diseases
CO3:	Accelerate memory power
CO4:	Achieve the set goal with confidence and determination
CO5:	Improve stability of mind, pleasing personality and work with awakened wisdom

Course Assessment methods

Direct		Indirect
CIE test I (30) CIE test II (30) CIE test III (40)	Total CIE: 100 marks Semester End Examination: NIL	Course end survey

Unit 01: **6 Hours**

Yoga-Introduction - Astanga Yoga- 8 parts-Yam and Niyam etc.- Do's and Don'ts in life-Benefits of Yoga and Asana- Yoga Exercise- and benefits- Pranayam Yoga- Nadi suthi, Practice and Spinal Sclearance Practice-Regularization of breathing techniques and its effects-Practice and kapalapathy practice.

Unit 02: **6 Hours**

Neuromuscular breathing exercise and Practice- Magarasa Yoga, 14 points Acupressure techniques and practice-Body relaxation practice and its benefits- Raja Yoga- 1.Agna –explanation and practice- Activation of Pituitary- Raja Yoga- 2. Santhi Yoga-Practice-Balancing of physical and mental power.

Unit 03: **6 Hours**

Raja Yoga- 3. Sagasrathara yoga –practice- Activation of dormant brain cells-Kayakalpa-theory- Kayakalpa –practice-Yogic exercise to improve physical and mental health and practice-Asanas –explanation-Practice-benefits

Unit 04: **6 Hours**

Sun namaskar- 12 poses-explanation and practice-Yoga –Asana-Padmasana, vajrasana,chakrasana, viruchasana etc-Stress management with Yoga-Role of women and Yoga Equality, nonviolence, Humanity, Self- control- Food and yoga Aware of self-destructive habits Avoid fault thinking (thought analysis-Practice)-Yoga Free from ANGER (Neutralization of anger)& practice

Unit 05: **6 Hours**

Moralisation of Desire & practice- Punctuality-Love-Kindness-Compassion Eradication of worries-Practice - Personality development, positive thinking-Good characters to lead a moral life How to clear the polluted mind- Benefits of blessing- Five- fold culture –explanation- Karma Yoga Practice In Geetha- Sense of duty-Devotion, self- reliance, confidence, concentration, truthfulness, cleanliness.

Theory: 30 Hrs	Tutorial: --	Practical: --	Project:--	Total Hours: 30 Hrs

REFERENCES

1. 'Yogic Asanas for Group Tarining-Part-I" Janardan Swami Yogabhyasi Mandal, Nagpur
2. "Rajayoga or conquering the Internal Nature" by Swami Vivekananda, AdvaitaAshrama (Publication Department), Kolkata

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