OP JINDAL UNIVERSITY

Raigarh-Chhattisgarh

Scheme and Syllabus

Of

M. Tech.(01PG021)

Department of

Computer Science and Engineering

School of Engineering

SESSION: 2023- 2025

Approved scheme of teaching and syllabus for M. Tech. (Department of Computer Science and Engineering) by the members of the Board of Studies

Scheme & Syllabus of M. Tech (CSE) Programme

Semester II

S. No	Subject Code	Subject	Periods Per Week			Scheme of Examination and Marks				Credit L+[T+P]/2
						PRE**		ESE*	Total Marks	
			L	T	P	Mid Sem	TA			
1.	SOE-M-CSE201	Next Generation Databases	3	0	0	30	20	50	100	3
2.	SOE-M-CSE202	Business Intelligent & Machine learning	3	0	0	30	20	50	100	3
3.	SOE-M-CSE211(X)	Elective II	3	0	0	30	20	50	100	3
4.	SOE-M-CSE213(X)	Elective III	3	0	0	30	20	50	100	3
5.	SOE-M-CSE210	Research Methodology	3	0	0	30	20	50	100	3
6.	SOE-M-CSE212(X)	Elective Lab II	0	0	4	0	30	20	50	2
7.	SOE-M-CSE207	Next Generation Databases Lab	0	0	4	0	30	20	50	2
8.	SOE-M-CSE208	Business Intelligent & Machine learning Lab	0	0	4	0	30	20	50	2
9.	SOE-M-CSE214(X)	Elective Lab III	0	0	4	0	30	20	50	2
Total			15	0	16	150	220	330	700	23

L: Lecture, **T:** Tutorial, **P:** Practical, **ESE:** End Semester Examination, **T.A:** Teacher's Assessment.

Elective-II

Sl. No	Subject Code	Subject Name
1.	SOE-M-CSE211(1)	Signal Processing and Data Analytics
2.	SOE-M-CSE211(2)	Digital Image Processing
3.	SOE-M-CSE211(3)	Blockchain Fundamentals and Applications

Elective-III

Sl. No	Subject Code	Subject Name
1.	SOE-M-CSE213(1)	Indexing and Retrieval in Big Data
2.	SOE-M-CSE213(2)	Soft Computing
3.	SOE-M-CSE213(3)	Wireless Sensor Network and IoT

Elective Lab - II

Sl. No	Subject Code	Subject Name
1.	SOE-M-CSE212(1)	Signal Processing and Data Analytics Lab
2.	SOE-M-CSE212(2)	Digital Image Processing Lab
3.	SOE-M-CSE212(3)	Blockchain Fundamentals and Applications Lab

Elective Lab - III

Sl. No	Subject Code	Subject Name
1.	SOE-M-CSE214(1)	Indexing and Retrieval in Big Data Lab
2.	SOE-M-CSE214(2)	Soft Computing Lab
3.	SOE-M-CSE214(3)	Wireless Sensor Network and IoT Lab

Programme	:	**M. Tech.**	**Semester**	:	**II**
Name of the Course	:	**Next Generation Databases**	**Course Code:**		**SOE-M-CSE201**
Credits	:	**3**	**No of Hours**	:	**3 Hrs./week**
Max Marks	:	**100**			

Course Description:

This course offers lecture, laboratory, and online interaction to provide a foundation in next generation data management concepts and database systems. It includes key concepts on parallel, distributed, NoSQL, Blockchain and Quantum Databases. It also convers next generation database query languages like GenoMetric Query Language (GMQL), NOSQL Query Language, xQuery, GraphQL, PartiQL, N1QL. This further explains concepts of advance database administration tools and security threats and strategies to protect data and database systems.

Course Outcomes:

After Completion of the course Students will be able to:

CO Number	Course Outcome
CO1	Explain about Database Revolutions.
CO2	Explain about various Document database, its types and features.
CO3	Work with various next generation database query languages.
CO4	Get familiar with Distributed Database Patterns. It's consistency model, Data Model and storage.

Syllabus:

UNIT-I: Introduction to Parallel and Distributed databases

Limitations of Traditional Databases, Tradition Databases vs Next Generation Databases, Parallel databases: key concepts, Architecture, Parallelizing Individual operations, Parallel query Evaluation, Distributed Databases: key concepts, Architecture, Distributed Data storage, Distributed catalog, Distributed query processing Distributed concurrency control and recovery, Transaction Processing.

UNIT-II: NoSQL Databases

Introduction to NoSQL, Object database, Key–value database, Document-oriented database and XML database, Graph database, Multivalue databases, Multimodal database

UNIT-III: Next Generation Query Languages

Introduction to Advance and Next Generation Query Languages, SQL/JRT, SQL CLR, GenoMetric Query Language (GMQL), NOSQL Query Language, xQuery, GraphQL, PartiQL, N1QL

UNIT-IV: Blockchain and Quantum Ledger Database (QLDB)

Blockchain: Introduction, key concepts, Ledger structure, Blockchain-based databases, Quantum: Introduction, key concepts, Quantum Databases, Quantum Ledger Database

UNIT-V: Next Generation Database Administration and Security Issues

Next Generation Database Administration: Key Concepts, Administration Tools, PaaS and IaaS database administrations, next generation security issues and trends, attack vectors and database security approaches.

Text Books:

- Distributed Databases, Stefano Ceri, McGraw-Hill Education, 2017.
- NoSQL for Dummies, Adam Fowler, Wiley, 2015.
- Christopher D. Manning, Prabhakar Raghavan and Hinrich Schütze, Introduction to Information Retrieval, Cambridge University Press. 2008
- Chellammal Surianarayanan, Kavita Saini, Pethuru Raj, Blockchain Technology and Applications, CRC Press, 2020
- Joseph Steinberg, Cybersecurity for Dummies, Wiley, 2019

References Books:

- Principles of Distributed Database Systems by Ozsu, Ozsu M. Tamer, Pearson Education, 2006.
- NoSQL Database for Storage and Retrieval of Data in Cloud, Ganesh Chandra Deka, CRC Press, 2017
- Tiana Laurence, Introduction to Blockchain Technology the Many Faces of Blockchain Technology in the 21st Century, Van Haren Publishing
- Mayank Bhushan, Rajkumar Singh Rathore, Aatif Jamshed, Fundamentals of Cyber Security, BPB Publications, 2017.

CO-PO&PSO Correlation

Course Name: Next Generation Databases								
	Program Outcomes					PSOs		
Course Outcomes	**1**	**2**	**3**	**4**	**5**	**1**	**2**	**3**
CO1:	**2**	**2**				**1**	2	1
CO2:		**3**					1	1
CO3:	**1**	**2**	**2**				2	
CO4:	**2**	**2**				**1**	1	1

Note: 1: Low 2.: Moderate 3: High

Programme	**:**	**M. Tech.**	**Semester**	**:**	**II**
Name of the Course:		**Business Intelligent & Machine Learning**	**Course Code:**		**SOE-M-CSE202**
Credits	**:**	**3**	**No of Hours**	**:**	**3 Hrs./week**
Max Marks	**:**	**100**			

Course Descriptions:

This course gives the fundamental description about Business Intelligence and technique for gathering, storing, analyzing, sharing and providing access to data, to help University Enterprise or any other organization to make a better decision. Also understand the fundamental concepts in machine learning and popular machine learning algorithms.

Course Outcomes:

After Completion of the course Students will be able to:

CO Number	Course Outcome
CO1	Learn concept, process, and practice of the data science and how methodologies are applied to visualize information from raw data.
CO2	Learn BI involving predictive and statistical approach.
CO3	Implement BI techniques by using various tools and Create data visualization.
CO4	Implement and apply machine learning algorithms.
CO5	Select appropriate algorithms for solving a particular group of real-world problems.
CO6	Select real-world applications that needs machine learning based solutions.

Syllabus:

UNIT-I: Introduction to Business Intelligence (BI)

(BI concept, BI architecture, BI in today's perspective, BI Process, Applications of BI like Financial analysis, statistical analysis, sales analysis, CRM, result pattern and ranking analysis, Balanced Scorecard, BI in Decision Modelling: Optimization, Decision making under uncertainty. Ethics and business intelligence).

Data Visualization and Dashboard Design: (Responsibilities of BI analysts by focusing on creating data visualizations and dashboards, Importance of data visualization, types of basic and composite charts).

UNIT-II: Performance Dashboard:

(Measuring, Monitoring and management of Business, KPIs and dashboard, the types of dashboards, the common characteristics of Enterprise dashboard, design of enterprise dashboards, and the common pitfalls of dashboard design).

Modelling and Analysis: (Exploring Excel Modeling capabilities to solve business problems, summarize and present selected data, introduction to business metrics and KPIs, creating cubes using Microsoft Excel).

Future of Business Intelligence: (Emerging Technologies, Predicting the Future with the help of Data Analysis, BI Search & Text Analytics – Advanced Visualization – Rich Report, Future beyond Technology).

UNIT-III:

Foundations for Machine Learning (ML), Supervised Learning: Classification (Artificial Neural Network, classifying with K-Nearest Neighbors, splitting datasets one feature at a time: Decision Trees, classifying with probability theory: Naive Bayes, Support Vector Machines, Improving classification with the AdaBoost meta algorithm), Regression (Linear Regression, Logistic Regression).

UNIT-IV: Unsupervised Learning

Clustering (Grouping unlabeled items using k-means clustering, Hierarchical Clustering, Density based Clustering - DBScan), Association (Association analysis with the Apriori algorithm), Efficiently finding frequent item sets with FP-growth. Reinforcement learning: Markov decision process (MDP), Bellman equations, Linear quadratic regulation (LQR), Linear Quadratic Gaussian (LQG), Dimensionality reduction.

UNIT-V: Case study:

BI (curriculum data extraction lattes for the institution of higher education, Creating a BI Strategy for an Emergency Healthcare Company). ML (Scaling image processing used in roof inspections, Digitizing information on business cards, Building an automated category tree).

Text Books:

- Efraim Turban, Ramesh Sharda, Dursun Delen, “Decision Support and Business Intelligence Systems”, Pearson.
- Tom Mitchel, Machine Learning, McGraw Hill.

Reference Books:

- Hans-Georg Kemper and Henning Baars “Business Intelligence – Grundlagen und praktische Anwendungen: Eine Einführung in die IT”.
- David Loshin Morgan, Kaufman, “Business Intelligence: The Savvy Manager‟s Guide”, Second Edition.
- Harrington, Peter. Machine learning in action. Manning Publications Co.

- Bishop, C. M., "Pattern recognition and machine learning", New York: springer.

CO-PO&PSO Correlation

Course Name: Business Intelligent & Machine Learning								
	Program Outcomes					PSOs		
Course Outcomes	**1**	**2**	**3**	**4**	**5**	**1**	**2**	**3**
CO1:	**1**					**1**	**2**	**1**
CO2:	**2**		**2**				**1**	**1**
CO3:	**2**	**2**					**2**	
CO4:		**2**				**1**	**1**	**1**
CO5:	**2**	**2**				**1**	**2**	**1**
CO6:	**2**	**1**				**2**	**1**	**1**

Note: 1: Low 2.: Moderate 3: High

Programme	:	**M. Tech.**	**Semester**	:	**II**
Name of the Course	:	**Signal Processing and Data Analytics**	**Course Code:**		**SOE-M-CSE211(1)**
Credits	:	**3**	**No of Hours**	:	**3 Hrs./week**
Max Marks	:	**100**			

Course Description:

The course will provide foundational knowledge of digital signal processing and data analytics and get practical experience in building projects in analyzing signals. It does not require an extensive math background to signals and data analytics. It introduces basic concepts of signal processing and data analytics.

Course Outcomes:

After Completion of the course Students will be able to:

CO Number	Course Outcome
CO1	Learn concept, process, and practice of the digital signal processing and data analytics.
CO2	Learn digital signal processing to analyze signals.
CO3	Learn data analytics techniques to deep understand of signals
CO4	Learn techniques to detect and classify digital signals.
CO5	Design and analyze data using different statistical tools

Syllabus:

UNIT-I: Introduction to Signal Processing

Signals, systems and signal processing, classification of signals, elements of digital signal processing system, concept of frequency in continuous and discrete time signals, Periodic Sampling, Frequency domain representation of sampling, Reconstructions of band limited signals from its samples.

UNIT-II: Introduction to Fourier Domain

Representation of Periodic sequences: The discrete Fourier Series and its Properties Fourier Transform of Periodic Signals, Sampling the Fourier Transform, The Discrete-Fourier Transform, Properties of DFT, Linear Convolution using DFT.

UNIT-III: Introduction to data analytics

Need for data science – benefits and uses – facets of data – data science process – setting the research goal – retrieving data – cleansing, integrating, and transforming data – exploratory data analysis – build the models – presenting and building applications.

UNIT-IV: Data analytics techniques

Frequency distributions – Outliers – relative frequency distributions – cumulative frequency distributions – frequency distributions for nominal data – interpreting distributions – graphs – averages – mode – median – mean – averages for qualitative and ranked data – describing variability – range – variance – standard deviation – degrees of freedom – interquartile range – variability for qualitative and ranked data

UNIT-V: Data analytics tools to analyze data

Normal distributions – z scores – normal curve problems – finding proportions – finding scores – more about z scores – correlation – scatter plots – correlation coefficient for quantitative data – computational formula for correlation coefficient – regression – regression line – least squares regression line – standard error of estimate – interpretation of r2 – multiple regression equations – regression toward the mean

Text Books:

- David Cielen, Arno D. B. Meysman, and Mohamed Ali, "Introducing Data Science", Manning Publications, 2016.
- Digital Signal Processing: A Computer-Based Approach, S. K. Mitra, McGraw-Hill, Third edition, 2006.

Reference Books:

- Allen B. Downey, "Think Stats: Exploratory Data Analysis in Python", Green Tea Press, 2014.
- Digital Signal Processing fundamentals and Applications, Li Tan, Jean Jiang, Academic Press,2nd edition,2013

CO-PO&PSO Correlation

Course Name: Signal Processing and Data Analytics								
	Program Outcomes					PSOs		
Course Outcomes	1	2	3	4	5	1	2	3
CO1:	2	1				1	2	1
CO2:	2						1	1
CO3:	2	2					2	
CO4:	2	2				1	1	1
CO5:	1	2				1	2	1

Note: 1: Low 2.: Moderate 3: High

Programme	**:**	**M. Tech.**	**Semester**	**:**	**II**
Name of the Course:		**Digital Image Processing**	**Course Code:**		**SOE-M-CSE211(2)**
Credits	**:**	**3**	**No of Hours**	**:**	**3 Hrs./week**
Max Marks	**:**	**100**			

Course Description:

The objective of this course to equip the students with the techniques & tools for digital image processing, & image analysis in the form of image segmentation, image enhancement, image filters, image transforms, Fourier transforms & fast Fourier transforms, edge detection, image segmentation & colour imaging.

Course Outcomes:

Upon successful completion of this course, the student will be able to:

CO Number	Course Outcome
CO1	Describe the theory and algorithms that are widely used in digital image processing
CO2	Apply a proper image enhancement technique for given a set of noisy images
CO3	Compare different image segmentation and compression techniques
CO4	Formulate solutions using morphological concepts
CO5	Develop any application using different image processing techniques

Syllabus:

Unit 1: Digital Image Fundamental

Introduction – Steps in Digital Image Processing, Components, Elements of Visual Perception, Light and Electromagnetic Spectrum, Image Sensing and Acquisition, Image Sampling and Quantization, Relationships between pixels.

Unit 2: Image Enhancement

Spatial Domain, Gray level transformations, Histogram processing, Basics of Spatial Filtering, Smoothing and Sharpening Spatial Filtering, Frequency Domain, Introduction to Fourier Transform, Smoothing and Sharpening frequency domain filters, Ideal, Butterworth and Gaussian filters.

Unit 3: Image Restoration

Noise models, Mean filters, Order Statistics, Adaptive filters, Band reject, Band pass, Notch – Optimum notch filtering, Inverse Filtering, Constrained Least Square Filtering, Wiener filtering.

Unit 4: Image Compression

Fundamentals – Image Compression models, Error Free Compression, Variable Length Coding – Bit, Plane Coding, Lossless Predictive Coding, Lossy Compression, Lossy Predictive Coding, Wavelet Coding, and Compression Standards – JPEG2000.

Unit 5: Image Segmentation & Representation

Segmentation – Detection of Discontinuities, Edge Linking and Boundary detection, Region based segmentation, Representation – Boundary descriptors, Simple Descriptors, Shape numbers, Regional descriptors, Simple and Topological Descriptors, Introduction to Image Processing Toolbox, Practice of Image Processing Toolbox, and Case studies–Various Image Processing Techniques.

Text Books:

- Digital Image Processing. Gonzales R. C. & Woods R. E. 3rd Ed., Pearson Education.2010.
- Fundamentals of Digital Image Processing. Jain A. PHI Learning Pvt. Ltd., 2011.
- Digital Image Processing. Jayaraman S., Esaki R. S., Kumar T. V., 2nd Ed., Tata McGraw Hill Pvt. Ltd, 2010.
- Digital Image Processing Using MATLAB. Gonzalez R. C., Woods R. E., Eddins S. L., 3rd Ed. Tata McGraw Hill Pvt. Ltd, 2011.

Reference Books:

- Digital Image Processing and analysis, Chanda B., Majumder D. D. PHI Learning Pvt. Ltd., 2011.
- Digital Image Processing and Pattern Recognition, Pakhira M. K., 2nd Ed., Tata McGraw Hill Pvt. Ltd, 2010.
- Fundamentals of Digital Image Processing, Annadurai S., Shanmugalakshmi R., 1st Ed. Pearson Education, 2007.

CO-PO&PSO Correlation

Course Name: Digital Image Processing								
	Program Outcomes					PSOs		
Course Outcomes	1	2	3	4	5	1	2	3
CO1:	2	2				1		
CO2:	3	1					1	
CO3:	2	2	2			1		1
CO4:	2	2	3				1	
CO5	2	2	3					

Note: 1.: Low 2.: Moderate 3.: High

Programme	**:**	**M. Tech.**	**Semester**	**:**	**II**
Name of the Course:		**Blockchain Fundamentals and Applications**	**Course Code:**		**SOE-M-CSE211(3)**
Credits	**:**	**3**	**No of Hours**	**:**	**3 Hrs./week**
Max Marks	**:**	**100**			

Course Description

Explore the core concepts of blockchain technology, including distributed ledger, consensus mechanisms, and smart contracts. Discover real-world applications in finance, supply chain, healthcare, and more. Address regulatory considerations and challenges. Gain the knowledge to identify use cases and contribute to blockchain projects. Suitable for professionals seeking to leverage the transformative potential of blockchain.

Course Outcomes:

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

CO Number	Course Outcome
CO1	have knowledge about the design principles of blockchain and smart contracts.
CO2	be able to program and demonstrate the working of different consensus mechanisms.
CO3	be able to deploy and interact with blockchain systems by setting up a system and sending and reading the transactions.
CO4	be able to design, build, and deploy distributed applications and smart contracts by identifying the need of blockchains to find the solution to the real-world problems.
CO5	be able to evaluate security, privacy, and efficiency of a given blockchain use case.

Syllabus:

Unit-I: Introduction

Introduction to Blockchain and Digital Currency, Evolution, Blockchain as Public ledger, Structure of a Block, Transactions, Merkel Trees, Peer-to-Peer Networks, Timestamp, Double Spend Problem, Decentralization Applications, Characteristics, Benefits and Challenges.

Unit-II: Cryptography In Blockchain

Hash Functions, Public Key Cryptosystem, Public Key Generation, Digital Signature, Zero-Knowledge Proof, k-Anonymity.

Unit-III: Smart Contracts And Consensus Algorithms

Smart Contract, Applications of Smart Contracts, Mining, Hardness of Mining, Incentive, Consensus, Paxos, Consensus Algorithms - PBFT, PoW, PoS, etc.

Unit-IV: Ethereum And Hyperledger

Ethereum, Trustlessness and Immutability of Blockchain Technology, Proof of Work (PoW) and Proof of Stake (PoS), Ethereum Virtual Machine (EVM), Wallets for Ethereum, Solidity, Hyperledger, Corda, Hyperledger Fabric, Hyperledger Composer, Permissioned vs Permissionless Blockchain.

Unit-V: Blockchain For Real-World Applications

Cryptocurrencies, Banking, Supply Chain, Healthcare, Real-Estate, Judiciary, IoT, Insurance, etc.

Text Books:

- Arvind Narayanan, Joseph Bonneau, Edward Felten, andrew Miller, Steven Goldfeder, “Bitcoin and Cryptocurrency Technologies: A Comprehensive introduction”, Princeton University Press, 2016.
- Roger Wattenhofer, “Blockchain Science: Distributed Ledger Technology”, independently Published, ISBN-10 : 1793471738, 2019.
- Andreas M. Antonopoulos, “Mastering Bitcoin: Programming the Open Blockchain”, Shroff/O'Reilly, 2017.

Reference Books:

- Elaine Shi, “Foundations of Distributed Consensus and Blockchains”, (URL: http://elaineshi.com/docs/blockchain-book.pdf), 2020.
- Alan T. Norman, “Blockchain Technology Explained: the Ultimate Beginner s Guide About Blockchain Wallet, Mining, Bitcoin, Ethereum, Litecoin, Zcash, Monero, Ripple, Dash, IOTA and Smart Contracts”, Amazon Digital Services, 2017.
- Bahga, Arshdeep, and Vijay Madisetti. "Blockchain applications: a hands-on approach", VPT, 2017.

CO-PO & PSO Correlation

Course Name: Blockchain Fundamentals and Applications												
	Program Outcomes								PSOs			
Course Outcomes	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**1**	**2**	**3**	**4**
CO1:	3	3	2	1	3				1	2		
CO2:	2	2	2	1	3				1	2		
CO3:	3	3	2	2	3				1	3		
CO4:	2	2	1	1	3				1	2		
CO5:	3	3	2	2	3				1	3		

Note: 1.: Low 2.: Moderate 3.: High

Programme	**:**	**M. Tech.**	**Semester**	**:**	**II**
Name of the Course:		**Indexing and Retrieval in Big Data**	**Course Code:**		**SOE-B-CSE213(1)**
Credits	**:**	**3**	**No of Hours**	**:**	**3 Hrs./week**
Max Marks	**:**	**100**			

Course Description:

This course introduces the concepts of big data analytics and the analytical tools like Hadoop, PIG, HIVE, Spark, R etc.

Course Outcomes:

After Completion of the course Students will be able to:

CO Number	Course Outcome
CO1	Understand the fundamentals of various big data analytics techniques.
CO2	Design efficient algorithms for mining the data from large volumes.
CO3	Analyze the HADOOP and Map Reduce technologies associated with big data Analytics
CO4	Understand the fundamentals of various big data analytics techniques .
CO5	Build a complete business data analytics solution.

Syllabus:

UNIT-I: Introduction

Introduction to Big Data Platform – Challenges of Conventional Systems - Intelligent data analysis – Nature of Data - Analytic Processes and Tools - Analysis vs Reporting.

UNIT-II: Mining data streams

Streams Concepts – Stream Data Model and Architecture - Stream Computing - Sampling Data in a Stream – Filtering Streams – Counting Distinct Elements in a Stream – Estimating Moments – Counting Oneness in a Window – Decaying Window - Real Time Analytics Platform(RTAP) Applications - Case Studies - Real Time Sentiment Analysis- Stock Market Predictions

UNIT-III: Hadoop

Hadoop Distributed File System – Components of Hadoop Analysing the Data with Hadoop- Scaling Out- Hadoop Streaming- Design of HDFS-Java interfaces to HDFS Basics- Developing a Map Reduce Application-How Map Reduce Works-Anatomy of a Map Reduce Job Run-Failures-Job Scheduling-Shuffle and Sort – Task execution - Map Reduce Types and Formats- Map Reduce Features in Hadoop environment.

UNIT-IV: Frameworks

Applications on Big Data Using Pig and Hive – Data processing operators in Pig – Hive services – HiveQL – Querying Data in Hive - fundamentals of HBase and ZooKeeper - IBM InfoSphereBigInsights and Streams. Predictive Analytics- Simple linear regression- Multiple linear regression- Interpretation 5 of regression coefficients. Visualizations - Visual data analysis techniques- interaction techniques - Systems and applications.

UNIT-V: Data Analytics with Machine Learning

Supervised Learning, Unsupervised Learning, Collaborative Filtering. Big Data Analytics with BigR

Text Books:

1. Tom White "Hadoop: The Definitive Guide" Third Edit on, O'reily Media, 2012.
2. Seema Acharya, Subhasini Chellappan, "Big Data Analytics" Wiley 2015.

Reference Book:

1. Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer, 2007.
2. Jay Liebowitz, "Big Data and Business Analytics" Auerbach Publications, CRC press (2013)
3. Tom Plunkett, Mark Hornick, "Using R to Unlock the Value of Big Data: Big Data Analytics with Oracle R Enterprise and Oracle R Connector for Hadoop", McGraw-Hill/Osborne Media (2013), Oracle press.

CO-PO&PSO Correlation

Course Name : Indexing and Retrieval in Big Data								
	Program Outcomes					PSOs		
Course Outcomes	**1**	**2**	**3**	**4**	**5**	**1**	**2**	**3**
CO1:	**1**	**2**	**3**	**4**	**5**	**1**	**2**	**3**
CO2:	**2**	**2**	**3**	**1**		**1**	**2**	**3**
CO3:	**3**	**1**				**1**	**2**	**1**
CO4:	**2**			**1**	**1**		**1**	**1**
CO5:	**2**	**2**					**2**	

Note: 1: Low 2.: Moderate 3: High

Programme	**:**	**M. Tech.**	**Semester**	**:**	**II**
Name of the Course:		**Soft Computing**	**Course Code:**		**SOE-B-CSE213(2)**
Credits	**:**	**3**	**No of Hours**	**:**	**3 Hrs./week**
Max Marks	**:**	**100**			

Course Description:

A unified and unique mathematical treatment of various soft computing techniques for constructing intelligent systems, in modelling, optimization and control. The course covers the theory and applications of neural networks, fuzzy logic, evolutionary strategies and genetic algorithms in developing intelligent systems with examples and practical applications.

Course Outcomes:

Keeping in view the philosophy experiential learning this courses should aim to: -

CO Number	Course Outcome
CO1	Recognize the feasibility of applying a soft computing methodology for a particular problem.
CO2	Recognize Develop intelligent machines to provide solutions to real world problems, which are not modelled or too difficult to model mathematically.
CO3	Exploit the tolerance for Approximation, Uncertainty, Imprecision, and Partial Truth in order to achieve close resemblance with human like decision making.

Syllabus:

UNIT-I: Neural Networks-1 (Introduction & Architecture)

Neuron, Artificial Neuron and its model, activation functions, Neural network architecture: single layer and multilayer feed forward networks, recurrent networks. Various learning techniques; perception and convergence rule, Auto- associative and hetro-associative memory.

UNIT-II: Neural Networks-II (Back Propagation Networks)

Architecture: perception model, solution, single layer artificial neural network, multilayer perception model; back propagation learning methods, effect of learning rule co-efficient; back propagation algorithm, factors affecting back propagation training, applications.

UNIT-III: Fuzzy Logic-I (Introduction)

Basic concepts of fuzzy logic, Fuzzy sets and Crisp sets, Fuzzy set theory and operations, Properties of fuzzy sets, Fuzzy and Crisp relations, Fuzzy to Crisp conversion.

UNIT-IV: Fuzzy Logic –II (Fuzzy Membership, Rules)

Membership functions, interference in fuzzy logic, fuzzy if-then rules, Fuzzy implications and Fuzzy algorithms, Fuzzyfications & Defuzzificataions, Fuzzy Controller, Industrial applications.

UNIT-5: Genetic Algorithm (GA)

Basic concepts, working principle, procedures of GA, flow chart of GA, Genetic representations, (encoding) Initialization and selection, Genetic operators: Crossover, Mutation, Generational Cycle, GA optimization problem, applications.

Text Books:

- "Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis and Applications" by S. Rajsekaran & G.A. Vijayalakshmi Pai, Prentice Hall of India.
- "Artificial Intelligence and Intelligent Systems" by N.P.Padhy, Oxford University Press.

Reference Books:

- Siman Haykin "Neural Netowrks", Prentice Hall of India.
- Timothy J. Ross "Fuzzy Logic with Engineering Applications", Wiley India.
- Kumar Satish "Neural Networks", Tata Mc Graw Hill.

CO-PO&PSO Correlation

Course Name: Soft Computing								
	Program Outcomes					PSOs		
Course Outcomes	1	2	3	4	5	1	2	3
CO1:	2		2	1		1		
CO2:	2	2	2		1		1	
CO3:	1	1						1

Note: 1.: Low 2.: Moderate 3.: High

Programme	**:**	**M. Tech.**	**Semester**	**:**	**II**
Name of the Course:		**Wireless Sensor Network and IoT**	**Course Code:**		**SOE-B-CSE213(3)**
Credits	**:**	**3**	**No of Hours**	**:**	**3 Hrs./week**
Max Marks	**:**	**100**			

Course Description:

This course covers fundamentals of wireless network technology and distributed sensor networks. It also covers various WSN applications in areas of environmental monitoring, smart energy systems, battle field surveillance, home automation, medical monitoring, mobile computing, etc. Course touches upon integrated network engineering, embedded system engineering and sensor technology in the context of WSN.

Course Outcomes:

Upon successful completion of this course, the student will be able:

CO Number	Course Outcome
CO1	Implement the WSN routing protocols.
CO2	Identify medium access control protocols and address physical layer issues.
CO3	Implement the transport layer protocols for sensor networks.
CO4	Identify the WSN design requirements.
CO5	Identify the WSN software level platform.

Syllabus:

UNIT–I: Overview of Wireless Sensor Networks

Challenges for Wireless Sensor Networks, Enabling Technologies for Wireless Sensor Networks.

UNIT–II: Architectures

Single Node Architecture, Hardware Components, Energy Consumption of Sensor Nodes, Operating Systems and Execution Environments, Network Architecture, Sensor Network Scenarios, Optimization Goals and Figures of Merit, Gateway Concepts.

UNIT-III: Networking Sensors

Physical Layer and Transceiver Design Considerations, MAC Protocols for Wireless Sensor Networks, Low Duty Cycle Protocols and Wakeup Concepts, S, MAC, The Mediation Device Protocol, Wakeup Radio Concepts, Address and Name Management, Assignment of MAC Addresses, Routing Protocols, Energy, Efficient Routing, Geographic Routing.

UNIT-IV: Infrastructure Establishment

Topology Control, Clustering, Time Synchronization, Localization and Positioning, Sensor Tasking and Control.

UNIT-V: Sensor Network Platforms and Tools

Sensor Node Hardware, Berkeley Motes, Programming Challenges, Node level software platforms, Node level Simulators, State centric programming.

Text Books:

- Holger Karl & Andreas Willig, "Protocols and Architectures for Wireless Sensor Networks", John Wiley, 2005.
- Feng Zhao & Leonidas J. Guibas, "Wireless Sensor Networks, An Information Processing Approach", Elsevier, 2007.

Reference Books:

- Kazem Sohraby, Daniel Minoli, & Taieb Znati, "Wireless Sensor Networks,Technology, Protocols, And Applications", John Wiley, 2007.
- Anna Hac, "Wireless Sensor Network Designs", John Wiley, 2003.

CO-PO&PSO Correlation

Course Name: Wireless Sensor Network and IoT								
	Program Outcomes					PSOs		
Course Outcomes	1	2	3	4	5	1	2	3
CO1:	2					3		
CO2:	3	2	1		1			2
CO3:	3	2			1		1	2
CO4:	1	2			1		1	1
CO5:	1					3		

Note: 1.: Low 2.: Moderate 3.: High

Programme	:	**M. Tech.**	**Semester**	:	**II**
Name of the Course	:	**Research Methodology**	**Course Code:**		**SOE-B-CSE210**
Credits	:	**3**	**No of Hours**	:	**3 Hrs./week**
Max Marks	:	**100**			

Course Description:

The course is designed to provide in-depth knowledge of research methodology in all fields of computer science and engineering and other disciplines. This course thoroughly covers the topic of research methodology to enhance the quality of the research. Research methodology provides vital information regarding thorough literature review, critical thinking and logical reasoning, problem formulation, designing of experiments, data analysis, and interpretation, thesis writing, scientific writing, and presentation skills. This subject will provide an appropriate platform for postgraduate students and doctoral research scholars for high-quality research in a scientific manner.

Course Outcomes:

After Completion of the course Students will be able to:

CO Number	Course Outcome
CO1	Explain the basic concepts of research and its methodologies.
CO2	Identify appropriate research topics, select and define appropriate research problems and parameters
CO3	Organize and research more appropriately by using various research techniques.
CO4	Write research report and thesis.
CO5	Justify the need for intellectual property rights and patent laws.

Syllabus:

UNIT-I: Foundation of Research

Definitions and objectives of the research, types of research, research approaches, the significance of research, main components of research process; Defining a research problem: reviewing the literature, framing the research problem, hypotheses, Qualities of a Good Hypothesis, Hypothesis Testing – Logic & Importance. Research Paradigms in CSE, Grand Challenges for CSE Research.

UNIT-II: Data Source, Measurement, and Sampling

Data Source: Meaning and Importance of Data, Sources of Data, Use of Secondary Data, Methods of Collecting Primary Data, Observation Method, Experimentation, Simulation, Interviewing, Panel Method, Mail Survey, Projective Technique

Measurement: Concept of measurement, Problems in measurement in research – Validity, and Reliability. Levels of measurement – Nominal, Ordinal, Interval, Ratio. External and Internal Validity, Levels of Measurement, Scaling, and Qualitative Measures.

Sampling: Concepts of Statistical Population, Sample, Sampling Frame, Sampling Error, Sample Size, Non-Response. Characteristics of a good sample. Probability Sample – Simple Random Sample, Systematic Sample, Stratified Random Sample & Multi-stage sampling. Determining the size of the sample– Practical considerations in sampling and sample size.

UNIT-III: Research Design

Research Design: Elements and Characteristics, Quantitative and Qualitative Research Design, Quantitative vs. Qualitative Research Design, Fixed vs. Flexible Research Design, the 5 Types of Research Designs: Descriptive, Experimental, Correlational, Diagnostic, and Explanatory Research Design. Research Design Types by Grouping: Cohort, Cross-sectional, Longitudinal and Cross-sequential study, Probabilistic Equivalence, Hybrid Experimental Designs and Quasi-Experimental Design, Research design case studies for CSE.

UNIT-IV: Data Interpretation and Analysis

Data Preparation, data processing, data analysis: Correlation and Regression, Discriminant & Logit Analysis, Factor Analysis, Cluster Analysis, Multidimensional Scaling, and Conjoint Analysis, Structural Equation Modeling and Path Analysis, hypothesis testing, Strategies and tools, data analysis with statistical packages, Descriptive Statistics and Correlation; and Inferential Statistics, Generalization and Interpretation.

UNIT-V: Research Report and Ethics

Report Writing: Structure and components of scientific reports, types of reports, technical reports, and thesis. Thesis writing – different steps and software tools (Word processing, etc) in the design and preparation of the thesis, layout, structure (chapter plan) and language of typical reports, Illustrations and tables, bibliography, referencing, and footnotes. Oral presentation, planning, software tools, creating and making an effective presentation, use of visual aids, the importance of effective communication.

Research Ethics: ethical issues, ethical committees (human & animal); IPR- intellectual property rights and patent law, commercialization, copyright, royalty, trade-related aspects of intellectual property rights (TRIPS); scholarly publishing- IMRAD concept and design of research paper, citation and acknowledgment, plagiarism, reproducibility, and accountability.

Text Books:

- Graeme Johanson, Kirsty Williamson, "Research Methods: Information, Systems, and Contexts", Elsevier Science, 2017
- Monique Hennink, Inge Hutter, Ajay Bailey "Qualitative Research Methods", SAGE Publications, 2020

References Books:

- David Manz "Research Methods for Cyber Security by Thomas Edgar", Elsevier Science, 2017.
- Ryhan Ebad "Research Methodology in Computer Science", Centrum Press, 2013.
- Jonathan Lazar, Jinjuan Heidi Feng, Harry Hochheiser "Research Methods in Human-Computer Interaction", Elsevier Science, 2017.

CO-PO & PSO Correlation

Course Name: Research Methodology								
	Program Outcomes					PSOs		
Course Outcomes	1	2	3	4	5	1	2	3
CO1:	1	3	3	4	5	1	2	3
CO2:	2	3	1			1	2	1
CO3:	2	2	3	1	1		1	1
CO4:	2	3	1				2	
CO5:	2	3				1	1	1

Note: 1: Low 2.: Moderate 3: High

Programme	**:**	**M. Tech**	**Semester**	**:**	**II**
Name of the Course:		**Signal Processing and Data Analytics Lab**	**Course Code:**		**SOE-M-CSE212(1)**
Credits	**:**	**2**	**No of Hours**	**:**	**4 Hrs. / Week**
Max Marks	**:**	**50**			

Course Descriptions:

The laboratory augments the lecture course in Signal Processing and Data Analytics by programming signal processing and classification techniques. The laboratory introduces programming concepts of signal analysis and signal classification.

Course Outcomes:

After Completion of the course Students will be able to:

CO Number	Course Outcome
CO1	2D signal analysis using Fourier transform
CO2	2D signal analysis using Fourier transform
CO3	Analysis of signals using machine learning techniques
CO4	Signal classification using machine learning techniques
CO5	2D signal classification using CNN

The following concepts will be covered in the lab:

- Forward and Inverse Fourier transform of 1-Dimensional Signal.
- Forward and Inverse Fourier transform of 2-Dimensional Signal.
- Analysis 1D and 2D signal spectrum using machine learning techniques.
- Classification of different signals using SVM classifer.
- Classification of 2D signal using CNN.

Text Books:

- David Cielen, Arno D. B. Meysman, and Mohamed Ali, “Introducing Data Science”, Manning Publications, 2016
- S. K. Mitra, “Digital Signal Processing: A Computer-Based Approach”, 3rd edition, McGraw-Hill, 2006
- Allen B. Downey, “Think Stats: Exploratory Data Analysis in Python”, Green Tea Press, 2014.
- Li Tan , Jean Jiang, “Digital Signal Processing fundamentals and Applications”, 2nd edition, Academic Press,2013

CO-PO & PSO Correlation

Course Name: Signal Processing and Data Analytics Lab								
	Program Outcomes					PSOs		
Course Outcomes	1	2	3	4	5	1	2	3
CO1:	2	2				3		
CO2:	2			1				2
CO3:	2	2					1	2
CO4:	2	1					2	1
CO5:	1	2		1		2		

Note: 1.: Low 2.: Moderate 3.: High

Programme	**:**	**M.Tech.**	**Semester :**	**II**
Name of the Course:		**Digital Image Processing Lab**	**Course Code:**	**SOE-M-CSE212(2)**
Credits	**:**	**2**	**No of Hours :**	**4 Hrs. / Week**
Max Marks	**:**	**50**		

Course Descriptions:
This course is an introduction to image processing, image analysis techniques and concepts. Areas include: Imaging sensors and their principles; Image representation and storage, coding and compression techniques, lossy versus lossless; techniques for noise reduction.

Course Outcomes:
At the end of the course, students should be able to:

CO Number	Course Outcome
CO1	Learn concepts, process and practice DIP methodologies
CO2	Learn image processing in spatial and frequency domain
CO3	Learn image restoration and segmentation
CO4	Learn image compression using various techniques

Following concepts will be covered in the lab

- Implement Low Pass Filters – Gaussian, Butterworth, Ideal.
- Implement High Pass Filters – Gaussian, Butterworth, Ideal.
- Perform Image Enhancement in Spatial Domain through Gray Level
- Image filtering in Frequency Domain
- Wavelet transforms
- Transformation Function. Histogram Equalization
- Histogram Specification.
- Image compression
- Image restoration
- Implementation of Morphological Operations, image processing, image segmentation and for Edge detection.

Software Requirements:

- Scientific computing tool.

Text Books:

- John H Davies, "MSP430 Microcontrollers Basics", 1st edition, Newnes Publishers, 2008
- C P Ravikumar, "MSP430 Microcontrollers in Embedded Sys-tem Projects", 1st edition, Elite Publishing House, 2012.

CO-PO & PSO Correlation

Course Name: Digital Image Processing Lab								
	POs					PSOs		
Course Outcomes	**1**	**2**	**3**	**4**	**5**	**1**	**2**	**3**
CO1:	**2**	**2**	**1**			**1**	**2**	
CO2:	**1**	**2**	**2**			**1**	**2**	**2**
CO3:	**1**	**2**	**1**			**1**	**2**	
CO4:		2	1			1		

Programme	**:**	**M.Tech.**	**Semester : II**	
Name of the Course:		**Blockchain Fundamentals and Applications Lab**	**Course Code:**	**SOE-M-CSE212(3)**
Credits	**:**	**2**	**No of Hours :**	**4 Hrs / Week**
Max Marks	**:**	**50**		

Course Descriptions:
Explore the core principles of blockchain technology and its diverse applications. Understand distributed ledger, consensus algorithms, cryptography, and smart contracts. Examine real-world use cases in finance, supply chain, healthcare, and more. Gain hands-on experience in developing and deploying smart contracts. Address regulatory considerations and challenges. Suitable for professionals interested in leveraging blockchain's transformative potential.

Course Outcomes:
At the end of the course, a student will be able to:

CO Number	Course Outcome
CO1	Understand and explain blockchain fundamentals, including distributed ledger, consensus mechanisms, and smart contracts.
CO2	Identify and assess appropriate use cases for implementing blockchain solutions in various industries.
CO3	Develop and interact with smart contracts on popular blockchain platforms.
CO4	Evaluate challenges and propose solutions for implementing blockchain projects.

The following concepts will be covered in the lab:

- Setting up a Blockchain Development Environment
- Creating and Managing Blockchain Wallets
- Implementing a Basic Blockchain Network
- Developing and Deploying Smart Contracts
- Interacting with Smart Contracts using Web3.js or similar libraries
- Mining and Proof-of-Work (PoW) Consensus Simulation
- Implementing Proof-of-Stake (PoS) Consensus Algorithm
- Building Decentralized Applications (DApps) on Ethereum

- Exploring Hyperledger Fabric for Enterprise Blockchain Solutions
- Testing and Debugging Blockchain Applications

Text Books:

- Arvind Narayanan, Joseph Bonneau, Edward Felten, andrew Miller, Steven Goldfeder, "Bitcoin and Cryptocurrency Technologies: A Comprehensive introduction", Princeton University Press, 2016.
- Roger Wattenhofer, "Blockchain Science: Distributed Ledger Technology", independently Published, ISBN-10 : 1793471738, 2019.
- Andreas M. Antonopoulos, "Mastering Bitcoin: Programming the Open Blockchain", Shroff/O'Reilly, 2017.
- Elaine Shi, "Foundations of Distributed Consensus and Blockchains", (URL: http://elaineshi.com/docs/blockchain-book.pdf), 2020.

CO-PO & PSO Correlation

Course Name: Blockchain Fundamentals and Applications Lab												
	Program Outcomes								PSOs			
Course Outcomes	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**1**	**2**	**3**	**4**
CO1:	3	3	2	1					1	2		
CO2:	2	2	2	1					1	2		
CO3:	3	3	2	2					1	3		
CO4:	2	2	1	1					1	2		

Note: 1.: Low 2.: Moderate 3.: High

Programme	:	**M. Tech.**	**Semester**	:	**II**
Name of the Course	:	**Next Generation Database Lab**	**Course Code:**		**SOE-M-CSE207**
Credits	:	**2**	**No of Hours**	:	**4 Hrs./week**
Max Marks	:	**50**			

Course Description:
In this course students will learn to implement the concepts of NoSQL database.

Course Outcomes:
After Completion of the course Students will be able to:

CO Number	Course Outcome
CO1	Understand the implementation procedures to create NoSQL Database.
CO2	Understand the implementation queries for NoSQL Database.
CO3	Understand different Cloud platform and their installation

The following concepts will be covered in the lab:

- Implementation of DDL commands - overview of using sql tool, data types in sql, creating tables (along with primary and foreign keys), altering tables and dropping tables.
- Implementation of DML commands- insert, select, update, delete etc.
- Implementation of queries using any, all, in, exists, not exists, union, intersect, constraints etc.
- Implementation of sub queries (nested, correlated) and joins (inner, outer and equi).
- Implementation of queries using count, sum, avg, max, min, group by, having, views creation and dropping.
- Implementation of triggers - creation of trigger, insertion using trigger, deletion using trigger, updating using trigger.
- Implementation of procedures- creation of stored procedures, execution of procedure, and modification of procedure.
- Implementation of cursors- declaring cursor, opening cursor, fetching the data, closing the cursor.

Text Books:

- Rajiv Chopra, S. Chand, “Database Management System (DBMS): A Practical Approach” .
- Sharad Maheshwari, Ruchin Jain, “DBMS – Complete Practical Approach”, Firewall Media.

CO-PO & PSO Correlation

Course Name: Next Generation Database Lab								
	Program Outcomes					PSOs		
Course Outcomes	**1**	**2**	**3**	**4**	**5**	**1**	**2**	**3**
CO1:	**1**	**2**				**1**	**1**	**1**
CO2:	**3**	**2**					**1**	**1**
CO3:	**2**	**2**					**2**	

Note: 1: Low 2.: Moderate 3: High

Programme	:	**M. Tech.**	**Semester**	:	**II**
Name of the Course	:	**Business Intelligent & Machine learning Lab**	**Course Code:**		**SOE-M-CSE208**
Credits	:	**2**	**No of Hours**	:	**4 Hrs./week**
Max Marks	:	**50**			

Course Description:

This course is about the implementation of basic machine learning algorithms. Students will learn to create machine learning models.

Course Outcomes:

After Completion of the course Students will be able to:

CO Number	Course Outcome
CO1	Understand the implementation procedures for the machine learning algorithms
CO2	Construct machine learning models based on the attributes of applications and datasets
CO3	Understand different metrics for evaluation of machine learning models
CO4	Identify and apply Machine Learning algorithms to solve real world problems

The following concepts will be covered in the lab:

- Implementation of DFS for water jug problem
- Implementation of BFS for tic-tac-toe problem using
- Implementation of TSP using heuristic approach
- Implementation of Simulated Annealing Algorithm
- Implementation of Hill-climbing to solve 8- Puzzle Problem
- Implementation of Data classification using Naïve Bayes classifier
- Implementation of Data classification using K-Nearest Neighbor classifier
- Implementation of K-Means Clustering Algorithm
- Implementation of Hierarchical Clustering Algorithm
- Implementation of Linear Regression

Text Books:

- David Poole, Alan Mackworth, Randy Goebel, “Computational Intelligence: a logical approach”, Oxford University Press.
- Saikat Dull, S. Chjandramouli, Das, “Machine Learning”, Pearson
- R. O. Duda, P. E. Hart and D.G. Stork, “Pattern Classification”, John Wiley, 2001.
- G. Luger, “Artificial Intelligence: Structures and Strategies for complex problem-solving”, Fourth Edition, Pearson Education.

CO-PO&PSO Correlation

Course Name: Business Intelligent & Machine learning Lab								
	Program Outcomes					PSOs		
Course Outcomes	1	2	3	4	5	1	2	3
CO1:	3	2	1			1	1	1
CO2:	2	3					1	1
CO3:	2	3	1				2	
CO4:	1	1	1			1	1	1

Note: 1: Low 2.: Moderate 3: High

Programme	**:**	**M. Tech**	**Semester**	**:**	**II**
Name of the Course:		**Soft Computing Lab**	**Course Code:**		**SOE-M-CSE214(2)**
Credits	**:**	**2**	**No of Hours**	**:**	**4 Hrs. / Week**
Max Marks	**:**	**50**			

Course Descriptions:

This course will cover fundamental concepts used in Soft computing. The concepts of Fuzzy logic (FL) will be covered first, followed by Artificial Neural Networks (ANNs) and optimization techniques using Genetic Algorithm (GA). Applications of Soft Computing techniques to solve a number of real life problems will be covered to have hands on practices. In summary, this course will provide exposure to theory as well as practical systems and software used in soft computing.

Course Outcomes:

After Completion of the course Students will be able to:

CO Number	Course Outcome
CO1	Explore methods that implements neural network techniques.
CO2	Practice the fuzzy set relations using different operations.
CO3	Design Regression techniques for a set of data points.
CO4	Capture an appropriate classification model for analytical tasks.

The following concepts will be covered in the lab:

- Introduction to Soft Computing
  - Concept of computing systems.
  - "Soft" computing versus "Hard" computing
  - Characteristics of Soft computing
  - Some applications of Soft computing techniques
  - Solving single-objective optimization problems using Gas
- Program to implement logic gates.
- Implement Union, Intersection, Complement and Difference operations on fuzzy sets. Also create fuzzy relation by Cartesian product of any two fuzzy sets and perform max-min composition on any two fuzzy relations.
- Implement svm classification by fuzzy concepts.
- Implementation of Genetic Application
- Implementation of Perceptron Learning Algorithm
- Implementation of Unsupervised Learning Algorithm
- Write a program to implement artificial neural network without back propagation.
- Implement travelling sales person problem (tsp) using genetic algorithms.
- Implement crisp partitions for real-life iris dataset
- Implement linear regression and multi-regression for a set of data points

- Perceptron net for an AND function with bipolar inputs and targets.
- Program for Pattern storage of 10 digits with Discrete Hopfield Network

Text Books:

- G. A. Vijayalakshami, "Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis & Applications, S.Rajasekaran", PHI.
- E. Goldberg, "Genetic Algorithms: Search and Optimization".
- Chin Teng Lin, "Neuro-Fuzzy Systems", C. S. George Lee, PHI.
- Joe choong, "Build_Neural_Network_With_MS_Excel_sample".

CO-PO & PSO Correlation

Course Name: Soft Computing Lab								
	Program Outcomes					PSOs		
Course Outcomes	**1**	**2**	**3**	**4**	**5**	**1**	**2**	**3**
CO1:	1	1	2	2		1	2	2
CO2:	3	3	2	2		2	2	2
CO3:			3			1		3
CO4:	1						1	2

Note: 1.: Low 2.: Moderate 3.: High

Programme	**:**	**M.Tech.**	**Semester :**	**II**
Name of the Course:		**Wireless Sensor Networks and IoT Lab**	**Course Code:**	**SOE-M-CSE214(3)**
Credits	**:**	**2**	**No of Hours :**	**4 Hrs / Week**
Max Marks	**:**	**50**		

Course Descriptions

In this course, introduction of evolution of Wireless sensor networks with internet technology and need for IoT. Discusson on IoT reference layer and various protocols and software. Train the students to build IoT systems using sensors, single board computers and open source IoT platforms. Make the students to apply IoT data for business solution in various domain in secured manner. To understand the functionalities of various layers of OSI model. To demonstrate the working of network components such as switch, router, gateways, etc. To inculcate the use of tools in network topology design. To understand the distributed sensing capabilities and the ease of deployment provided by a wireless communication paradigm. To efficiently design WSN communication system for a given set of parameters and constraints.

Course Outcomes

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

CO Number	Course Outcome
CO1	Design the network for different applications, configure and manage the network components
CO2	Analyze the different types of sensors to be used based on the problem definition.
CO3	Design and develop the WSN communication system for the given parameters and constraints in real
CO4	Select protocols for a specific IoT application Utilize the cloud platform and APIs for IoT application
CO5	Choose the sensors and actuators for an IoT application Experiment with embedded boards for creating IoT prototypes

The following concepts will be covered in the lab:

Experiments will be completed by students based on various wireless sensors and actuators with the real life application like door automation, light automation using boards like aurdino UNO and RaspberryPi. Under this lab they will learn to connect boards, supply data, connection with cloud etc.

Text Books :

- Alessandro Bassi, Martin Bauer, Martin Fiedler, Thorsten Kramp, Rob van Kranenburg, Sebastian Lange, Stefan Meissner, "Enabling things to talk – Designing IoT solutions with the IoT Architecture Reference Model", Springer Open, 2016
- Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stamatis Karnouskos, Stefan Avesand, David Boyle, "From Machine to Machine to Internet of Things", Elsevier Publications, 2014.
- "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", by Pethuru Raj and Anupama C. Raman (CRC Press).
- "Internet of Things: A Hands-on Approach", by Arshdeep Bahga and Vijay Madisetti (Universities Press).
- C. Siva Ram Murthy and B. S. Manoj, "Ad Hoc Wireless Networks Architectures and Protocols", Second Edition, Pearson Publication, 2015.
- Holger Karl and Andreas Willig, "Protocol and Architecture for Wireless Sensor Networks", First Edition, John wiley publication, 2011

CO-PO & PSO Correlation

Course Name: Wireless Sensor Networks and IoT Lab												
	Program Outcomes								PSOs			
Course Outcomes	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**1**	**2**	**3**	**4**
CO1:	**2**		**3**		**1**		**3**	**2**	**2**			3
CO2:		**1**	**2**	**3**	**1**	**3**	**2**			**3**		
CO3:	**3**		**1**	**2**						**2**	**1**	
CO4:					**3**		**2**	**1**	**1**			

Note: 1.: Low 2.: Moderate 3.: High