GURU KASHI UNIVERSITY

M. Tech Computer Science & Engineering

Session: 2024-25

Department of Computer Science & Engineering

GRADUATE OUTCOME OF THE PROGRAMME

The programme focuses on higher education and research activities, with the aim of emerging as leaders in engineering, management, applied research.

PROGRAMME LEARNING OUTCOMES

After completing the programme, the Learner will be able to:

1. Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. Identify, formulate, review research literature, and analysis complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
6. Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
7. Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
8. Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
9. Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

Programme Structure

Semester: I						
Course Code	**Course Title**	**Type of Course**	**L**	**T**	**P**	**Credits**
MCS118	Advanced Data Structures	Program core Course	4	0	0	4
MCS102	Advanced Database Management Systems	Program core Course	3	0	0	3
MCS111	Machine Learning	Program core Course	3	0	0	3
MCS119	Advanced Computer Vision	Program core Course	3	0	0	3
MCS112	Advanced Database Management System Lab	Program core Course	0	0	4	2
MCS120	Entrepreneurship Development	Audit Course	2	0	0	2
Program Elective-I (Any one of the following)						
MCS113	Soft Computing	Discipline Elective	3	0	0	3
MCS114	Cyber Security					
Total			**18**	**0**	**4**	**20**

Semester: II						
Course Code	**Course Title**	**Type of Course**	**L**	**T**	**P**	**Credits**
MCS222	Big Data Analytics	Program core Course	3	0	0	3
MCS210	Design and Analysis of Advanced Algorithms	Program core Course	4	0	0	4
MCS223	Internet of Things	Program core Course	3	0	0	3
MCS203	Mini Project	Project Based	0	0	4	2
MCS220	English for Research Paper Writing	Audit Course	2	0	0	2
MCS227	Human Value & Ethics	Value added	2	0	0	NC
Program Elective-II (Any one of the following)						
MCS225	Distributed System.	Discipline Elective	3	0	0	3
MCS226	Cognitive Robotics					
Program Elective-III (Any one of the following)						
MCS212	Wireless and Mobile Networks	Discipline Elective	3	0	0	3
MCS216	Security Engineering					
Total			**18**	**0**	**4**	**20**

Semester: III						
Course Code	**Course Title**	**Type of Course**	**L**	**T**	**P**	**Credits**
MCS309	Research Methodology	Research Based	4	0	0	4
MCS313	Cyber Law & Ethics	Professional core	4	0	0	4
MCS302	Seminar	Project based	0	0	4	2
MCS398	Research Proposal	Research Based	0	0	8	4
MCS314	Organizational Behavior	VAC	2	0	0	NC
Program Elective -IV (Any one of the following)						
MCS315	Biometric Security	Discipline Elective	3	0	0	3
MCS311	Data Visualization					
Open Elective Course-I(Any One of the following)						
OEC091	Value Education	Open Elective-I	3	0	0	3
OEC092	Constitution of India					
Total			**14**	**0**	**12**	**20**

Semester: 4th						
Course Code	**Course Title**	**Type of Course**	**L**	**T**	**P**	**Credits**
MCS403	Dissertation	Research Based	-	-	-	20
Total			0	0	0	20
Grand Total			**50**	**0**	**20**	**80**

Evaluation Criteria for Theory Courses

A. Continuous Assessment: [25 Marks]
   CA1-Surprise Test (Two best out of Three) - (10 Marks)
   CA2-Assignment(s) (10 Marks)
   CA3-Term Paper/Quiz/Presentations (05 Marks)
B. Attendance: [05 marks]
C. Mid Semester Test: [30 Marks]
D. End-Term Exam: [40 Marks]

Evaluation Criteria for Practical Courses

Performance of each practical-(10 Marks)
Report- (5 Marks)
Practical Viva – (5 Marks)
Total - (20 Marks) (Each Practical)

SEMESTER-I

Course Title: Advanced Data Structures
Course Code: MCS118

L	T	P	Credits
4	0	0	4

Total hours: 60

Learning Outcomes: After completion of this course, the learner will be able to:

1. Design and implement an appropriate hashing function for an application.
2. Demonstrate different methods for traversing trees.
3. Describe common applications for arrays, records, linked structures, Stacks, queues, trees, and graphs
4. Compare and contrast the benefits of dynamic and static data Structures implementations

Course Content

UNIT-I **15 Hours**

Complexity Analysis: Asymptotic notations, Properties of big oh notation, asymptotic notation with several parameters, conditional asymptotic notation, amortized analysis, NP completeness, NP-hard, recurrence equations, solving recurrence equations.

UNIT-II **15 Hours**

Elementary Data Structures& Basics Applications: Arrays, linked lists, trees and sparse matrices. Heap Structures Min-max heaps, Heaps, Leftist heaps, Binomial heaps, Fibonacci heaps, skew heaps, Lazy-binomial heaps.

UNIT-III **15 Hours**

Search Structures: Binary search trees, AVL trees, 2-3 trees, 2-3-4 trees, Red-black trees, B trees. Multimedia Structures Segment trees, k-d trees, Point Quad trees, MX-Quad trees, R-trees, Trees. Graph Algorithms, Topological sort, minimum Spanning tree, single-source shortest paths, all-pairs shortest paths, bi-connected components, strongly connected components, cycles, articulation points, bridges.

UNIT-IV **15 Hours**

Applications: Huffman coding, Garbage collection and compaction, Topological sort, Min cut max flow algorithm, Activity networks, set representation, set union and find operations, counting binary trees.

Transaction Modes

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Suggested Readings

- *Horowitz, S.Sahni and Dinesh Mehta. (2008). Fundamentals of Data structures in C++, universities*
- *Adam Drozdex. (1993). Data Structures and algorithms in C++.Thomson learning, Vikas publishing house.*
- *Lipschutz Seymour. (2014). Theory and Problems of Data Structures, Schaum's series.*
- *BalujaG.S. (2016). Data structures through C++, PHI.*
- *T. H. CORMEN, C. E. LEISERSON, R. L. RIVEST, AND C. STEIN. Introduction to Algorithms, MIT Press, New York, 3rd edition, 2009*
- *S. DASGUPTA, C. PAPADIMITRIOU, AND U. VAZIRANI. Algorithms, McGraw-Hill, New York, 2008*

Course Title: Advanced Database Management System
Course Code:MCS102

L	T	P	Credits
3	0	0	3

Total hours: 45

Learning Outcomes: After completion of this course, the learner will be able to:

1. Acquire the knowledge of Query optimization, Parallel and distributed database systems, new database architectures and query operators.
2. Develop new methods in databases based on knowledge of existing techniques.
3. Apply acquired knowledge for developing holistic solutions based on database systems/database techniques.
4. Explain the principles of concurrency control.

Course Content

UNIT-1 **15 Hours**

Distributed DBMS: Transaction Processing, Concurrency & Recovery Management in Centralized DBMS. Concept of Transaction and its properties, scheduling of transactions, Conflict operations, Two Phase Locking protocol, Recovery management in Centralized DBMS.

Concepts and Design: Introduction, functions and architecture of a DDBMS, distributed relational database design, Transparencies in DDBMS, Date's twelve rules for a DDBMS. Advanced Concepts. Distributed transaction management, distributed concurrency control, distributed deadlock management, distributed database recovery, Replication servers, and Distributed query optimization, Mobile databases.

UNIT-II **10 Hours**

Object-Oriented DBMS: Introduction, advanced database applications, weakness of RDBMS, storing objects in a relational database, next-generation database systems. Concepts and Design. OODBMS perspectives, persistence, issues in OODBMS, advantages and disadvantages of OODBMS, Object-oriented database design. Object Relational DBMS Introduction, third generation database manifestos, SQL8, Object oriented extensions in Oracle, Comparison of ORDBMS and OODBMS.

UNIT-III **10 Hours**

Web Technology and DBMS: Web as a database Application Platform, Requirements for web-DBMS integration, web-DBMS architecture, advantages and disadvantages of web-DBMS approach, approaches to integrating the web and DBMS, Oracle Internet Application Server (IAS).

UNIT-IV **10 Hours**

Data Warehousing Concepts, OLAP and Data mining: Evolution of data warehousing, data warehousing concepts, benefits and problems of data warehousing, comparison of OLTP systems and data warehousing, On-Line Analytical Processing, Introduction to data mining.

Transaction Modes

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning.

Suggested Readings

- *Thomas Connolly, Carolyn Begg. (1996). Database Systems, Dorling Kingsley.*
- *H. F. Korth, A. Silverschatz. (1997). Database Concepts, Tat Hill.*
- *Hoofer, Prescott, McFadden. (2007). Modern Database Management, Pearson education.*
- *C.S.R. Prabhu. (2005). Object-oriented Database Systems, Eastern Economy Edition.*
- *Peter Rob and Carlos Coronel, Database Systems Design, Implementation and Management, Thomson Learning-Course Technology, Seventh Edition, 2007.*
- *Peter Rob and Carlos Coronel, Database Systems Design, Implementation and Management, Thomson Learning-Course Technology, Seventh Edition, 2007.*
- *Shio Kumar Singh, Database Systems Concepts, Designs and Application, Pearson Education, Second Edition, 2011.*

Course Title: Machine Learning
Course Code: MCS111

L	T	P	Credits
3	0	0	3

Total hours: 45

Learning Outcomes: After completion of this course, the learner will be able to:

1. Develop mathematical thinking and problem-solving skills associated with research and writing proofs.
2. Examine an exposure to a wide variety of mathematical concepts used in computer science discipline like probability.
3. Use Graph Theory for solving problems.
4. Acquire basic knowledge of sampling and estimation.

COURSE CONTENT

UNIT-I **15 Hours**

Introduction: Introduction to machine learning, use of machine learning, type of machine

Learning: supervised, unsupervised and reinforcement learning, Main challenges in machine learning

Preparation of Model: Introduction to Statistical Learning, Significance of Mean, Mode, Median, variance, standard deviation, Basic types of data in machine learning, exploring structure of data, Data quality and remediation, Data pre-processing.

Modeling and evaluation: Model Selection, Training, Model representation and Interpretability, evaluating performance of a model.

UNIT-II **10 Hours**

Supervised Learning (Regression/Classification):

Basic methods: Distance-based methods, Decision Trees, random forest model, Naive Bayes Linear models: Simple Linear Regression, Multiple linear regression, Polynomial regression, Logistic Regression.

UNIT-III **10 Hours**

Unsupervised Learning (Clustering): Different types of clustering techniques, k-medoids clustering, K-means/Kernel K-means, Hierarchical clustering

Dimensionality Reduction: Principal Component Analysis (PCA) and Linear Discriminant Analysis (LDA), Introduction to Matrix Factorization and Matrix Completion.

UNIT-IV **10 Hours**

Support Vector Machines (SVM): Linear learning machines and Kernel space, Making Kernels and working in feature space, SVM for classification and regression problems. Recent trends in machine learning.

Transaction Modes

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Suggested Readings

- *Saikat Dutt, Subramanian Chandra mouli and Amit Kumar Das, Machine Learning", Pearson, 2019.*
- *Oliver Theobald, Machine Learning for Absolute Beginners: A Plain English Introduction (Second Edition, 2017.*
- *Tamodt, Agnar, and Enric Plaza. "Case-based reasoning: Foundational issues, methodological variations, and system approaches." AI communications*

Course Title: Advance Computer Vision
Course Code: MCS119

L	T	P	Credits
3	0	0	3

Total hours: 45

Learning Outcomes: After completion of this course, the learner will be able to:

COURSE CONTENT

Unit-I **15 Hours**

Implementation Image Classification using Computer vision and Deep learning techniques like Convolutional Neural Networks and segmentation.
Object Segmentation and Detection: Object Segmentation and detection using Python deep learning libraries like PyTorch.

Unit: II **10 Hours**

Introduction to Transfer Learning: What is Transfer Learning, How Transfer Works, and Why Should You Use Transfer Learning? Steps to Use Transfer Learning, Model Building in Transfer Learning, Code Implementation of Transfer Learning.

Unit-III **10 Hours**

Introduction to AI Backend Frameworks: What is AI Backend Framework, Model building with Tensor flow & Pytorch, Other Framework comparison & Use cases. Fine-tuning pre-trained models: Implement the advanced Deep learning concept of Fine-tuning on pre-trained models such as YOLO.

Unit-IV **10 Hours**

Domain adaptation & anomaly detection: Perform the anomaly detection using Transfer Learning algorithms

Course Title: Advanced Database Management System Lab
Course Code: MCS112

L	T	P	Credits
0	0	4	2

Total hours: 30

Learning Outcomes: After completion of this course, the learner will be able to:

1. Interpret practical knowledge in designing and creating relational database systems.
2. Understand various advanced queries execution such as relational constraints, joins, set operations, aggregate functions, trigger, views and embedded SQL.
3. Use of various software to design and build ER Diagrams, UML, Flow chart for related database systems.
4. Design and implement database applications using Server-side.

Course Content

List of Programs:

1. Familiarization of the MySQL database – creation and manipulation of tables.
2. Analyze a given situation, develop an ER model and convert the ER model to Relational model.
3. Implement the database using MySQL and manipulate the tables using SQL commands.
4. Course project topic selection, developing an ER model and converting ER model to a Scheme
5. Developing a data flow diagram for the problem specification
6. Implementation of front-end pages
7. Implementation of server-side pages and verifying the normalization Testing the constraints and project Submission and evaluation of project

Transaction Modes

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning.

Course Title: Entrepreneurship Development
Course Code: MCS120

L	T	P	Credits
2	0	0	2

Total Hours:30

Course Learning Outcome: On successful completion of this course, the students will be able to:

1. Assess the commercial viability of new technologies, business opportunities and existing companies
2. Plan, organize, and execute a project or new venture with the goal of bringing new products and service to the market
3. Carry out scientific research in the field of entrepreneurship
4. Improved your interpersonal and collaborative skills

Course Content

UNIT-I **10 Hours**

Introduction to Generic Skills: Importance of Generic Skill Development (GSD), Global and Local Scenario of GSD, Life Long Learning (LLL) and associated importance of GSD.

Managing Self: Knowing Self for Self Development- Self-concept, personality, traits, multiple intelligence such as language intelligence, numerical intelligence, psychological intelligence etc., Managing Self – Physical- Personal grooming, Health, Hygiene, Time Management, Managing Self – Intellectual development -Information Search: Sources of information, Reading: Purpose of reading, different styles of reading, techniques of systematic reading, Note Taking: Importance of note taking, techniques of note taking, Writing: Writing a rough draft, review and final draft. Managing Self – Psychological, Stress, Emotions, Anxiety-concepts and significance, Techniques to manage the above.

UNIT-II **5 Hours**

Managing in Team: Team - definition, hierarchy, team dynamics, Team related skills- sympathy, empathy, co-operation, concern, lead and negotiate, work well with people from culturally diverse background, Communication in group - conversation and listening skills.

UNIT-III **10 Hours**

Task Management: Task Initiation, Task Planning, Task execution, Task close out, Exercises/case studies on task planning towards development of skills for task management

Problem Solving: Prerequisites of problem solving- meaningful learning, ability to apply knowledge in problem solving, Different approaches for problem solving. Steps followed in problem solving. Exercises/case studies on problem solving.

UNIT-IV **5 Hours**

Entrepreneurship: Introduction, Concept/Meaning and its need, Competencies/qualities of an entrepreneur, Entrepreneurial Support System e.g., District Industry Centres (DICs), Commercial Banks, State Financial Corporations, Small Industries Service Institute (SISIs), Small Industries Development Bank of India (SIDBI), National Bank of Agriculture and Rural Development (NABARD), National Small Industries Corporation (NSIC) and other relevant institutions/organizations at State/National level. Market Survey and Opportunity Identification (Business Planning)- How to start a small scale industry, Procedures for registration of small-scale industry, List of items reserved for exclusive manufacture in small-scale industry, Assessment of demand and supply in potential areas of growth, understanding business opportunity, Considerations in product selection, Data collection for setting up small ventures. Project Report Preparation- Preliminary Project Report, Techno-Economic Feasibility Report, Exercises regarding "Project Report Writing" for small projects.

Course Title: Soft Computing
Course Code: MCS113

L	T	P	Credits
3	0	0	3

Total hours: 45

Learning Outcomes: After completion of this course, the learner will be able to: to:

1. Classify the basic concepts and the terminology of the soft computing techniques.
2. Understand and appreciate the soft computing techniques and to identify the situations where soft computing techniques are applicable.
3. Apply Soft Computing techniques as computational tools to solve a variety of problems related to optimization and machine learning.
4. Design and experiment with variations of Genetic Algorithms.

Course Content

UNIT-I **10 Hours**

Working of a simple Genetic Algorithm and the related definitions: Representation/Encoding Schemes, initializing a GA population, evaluation function, genetic operators, study of parameters of genetic algorithms and its performance, sampling and selection mechanisms, mathematical foundations of genetic algorithms, schemata theorem and building block hypothesis, optimizing numerical functions using GA. 19

UNIT-II **10 Hours**

Genetic Algorithm variations: Scaling fitness, Niching and speciation, Crowding Technique for Multimodal Problems, Multi-Objective Genetic Algorithms, Master Slave and Distributed Genetic Algorithms, Designing GAs for numerical optimization, knapsack problem, travelling salesperson and other similar problems.

UNIT-III **15 Hours**

Neural networks: Basic terminology and definitions, Model of an artificial neuron, Sigmoid function, Neural Network Architectures, Characteristics of neural networks, Learning methods, Rosenblatt's Perceptron, Fixed increment perceptron learning algorithm for a classification problem, Examples of learning of AND/OR gate by perceptron, XOR problem. Back Propagation Neural Networks: Architecture of a backpropagation network, Model for multi-layer perceptron, Back propagation learning, Delta or gradient descent learning rule and effect of learning rate, Back propagation learning algorithm.

UNIT-IV **10 Hours**

Fuzzy sets: Basic terminology and definitions, Operations on Fuzzy sets, MF formulations and parameterization, Derivatives of parameterized MFs, Fuzzy

numbers, Extension principal and fuzzy relations, Linguistic variables, Fuzzy If-Then Rules, Fuzzy reasoning and compositional rule of inference.

Transaction Modes

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Suggested Readings

- *David.E. Goldberg, Genetic Algorithms in Search, Optimization and machine learning, Addison Wesley, 1999.*
- *ZbigniewMichalewicz, Genetic algorithms +Data Structures = Evolution Programs, Springers-Verlag, 1999.*
- *M. Mitchell, An Introduction to Genetic Algorithms, Prentice-Hall, 1998.*
- *S. Rajasekaran& G. A. VijayalakshmiPai, Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis & Applications, PHI, 2003.*
- *S. N. Sivanandam& S. N. Deepa, Principles of Soft Computing, Wiley - India, 2007.*
- *J-S. R. Jang, C.-T. Sun, E. Mizutani, Neuro-Fuzzy and Soft Computing, PHI, 1997.*
- *Simon O. Haykin, Neural Networks, A Comprehensive Foundation, PHI, 1994*

Course Title: Cyber Security
Course Code:MCS114

L	T	P	Credits
3	0	0	3

Total hours: 45

Learning Outcomes: After completion of this course, the learner will be able to:

1. Analyse the concept of cybercrimes.
2. Classify about the regulation of cyber space at national and international level.
3. Learn the international legal regime related to cyber-Crime.
4. Discuss the offences and penalties under it act 2000.

Course Content

UNIT – I **15 Hours**

General introduction and Cyber space regulations: Cyber Space-Meaning and characteristics Need for regulation of cyber space, Cyber-libertarianism, Cyber-paternalism, Lessing's model of regulation, Regulators in cyberspace, Introduction to Internet, ACLU v Reno, Digitization and Society, Legal Challenges of the Information Society, Information Technology Act, 2000

UNIT – II **10 Hours**

Cyber law and IPR issues: Digital Copyrights, Open Source, Linking and caching, Digital Rights Management, DMCA, - Patents, Software Patents Trademarks and domain names, Brand identities, search engines and secondary market, ICANN, Database Right.

UNIT- III **10 Hours**

Cyber law and privacy and taxations issues: Digitization, personal data and data industry, Data protection principles, Conditions for processing of personal data, CCTV, RFID tracking, Data retention and identity - Taxation issues of e-commerce

UNIT – IV **10 Hours**

Cyber Crimes: Computer misuse - identity theft, grooming and harassment, Hacking, Viruses, Criminal damage and mail bombing, Denial of service attack, Obscenity, child abuse, Stalking. Morphing, web jacking, phishing etc., Cyber terrorism, Bandwidth theft, Convention on cyber-Crime

Transactional Modes

Video based Teaching, Collaborative Teaching, Cooperative Teaching, Case based Teaching, Case Analysis, and Group Discussion

Suggested Readings

- *Senthil, Surya and Devi Lakshmi (2010). Manual of Cyber Laws. New Delhi: Aditya Book Company.*
- *Singh, Ranbir and Singh Ghanshyam (2004). Cyber Space and the Law: Issues and Challenges, Hyderabad: Nalsar University.*
- *Maras, Marie-Helen. (2016). Cyber criminology. Oxford University Press.*
- *Maras, Marie-Helen. Cyber law and Cyber liberties. Oxford University Press, forthcoming, 2020*

SEMESTER-II

Course Title: Big Data Analytics
Course Code:MCS222

L	T	P	Credits
3	0	0	3

Total hours: 45

Learning Outcomes: After completion of this course, the learner will be able to:

1. Describe big data and use cases from selected business domains
2. Explain NoSQL big data management
3. Understand the concept of Installing, configuring, and run Hadoop and HDFS
4. Perform map-reduce analytics using Hadoop

Course Content

UNIT-I **15 Hours**

What is big data, why big data, convergence of key trends, unstructured data, industry examples of big data, web analytics, big data and marketing, fraud and big data, risk and big data, credit risk management, big data and algorithmic trading, big data and healthcare, big data in medicine, advertising and big data, big data technologies, introduction to Hadoop, open source technologies, cloud and big data, mobile business intelligence, Crowd sourcing analytics, inter and trans firewall analytics.

UNIT-II **10 Hours**

Introduction to NoSQL, aggregate data models, aggregates, key-value and document data models, relationships, graph databases, schemaless databases, materialized views, distribution models, sharding, master-slave replication, peerpeer replication, sharding and replication, consistency, relaxing consistency, version stamps, map-reduce, partitioning and combining, composing map-reduce calculations.

UNIT-III **10 Hours**

Data format, analyzing data with Hadoop, scaling out, Hadoop streaming, Hadoop pipes, design of Hadoop distributed file system (HDFS), HDFS concepts, Java interface, data flow, Hadoop I/O, data integrity, compression, serialization, Avro, file-based data structures.

UNIT-IV **10 Hours**

Map Reduce workflows, unit tests with MR Unit, test data and local tests, anatomy of Map Reduce job run, classic Map-reduce, YARN, failures in classic

Map-reduce and YARN, job scheduling, shuffle and sort, task execution, Map Reduce types, input formats, output formats.

Transaction Modes

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning.

Suggested Readings

- *Michael Minelli, Michelle Chambers, and AmbigaDhiraj, "Big Data, Big Analytics: Emerging, 2013.*
- *Business Intelligence and Analytic Trends for Today's Businesses", Wiley, 2013.*
- *P. J. Sadalage and M. Fowler, "NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence", Addison-Wesley Professional, 2012.*
- *Tom White, "Hadoop: The Definitive Guide", Third Edition, O'Reilley, 2012.*
- *Eric Sammer, "Hadoop Operations", O'Reilley, 2012.*
- *Capriolo, D. Wampler, and J. Rutherglen, "Programming Hive", O'Reilley, 2012.*
- *Lars George, "HBase: The Definitive Guide", O'Reilley, 2011.*
- *Eben Hewitt, "Cassandra: The Definitive Guide", O'Reilley, 2010.*
- *Alan Gates, "Programming Pig", O'Reilley, 2011*

Course Title: Design and analysis of advanced algorithms
Course Code: MCS210

L	T	P	Credits
4	0	0	4

Total hours: 60

Learning Outcomes: After completion of this course, the learner will be able to:

1. Define the basic concepts of algorithms and analyze the performance of algorithms.
2. Discuss various algorithm design techniques for developing algorithms.
3. Apply the algorithms and design techniques to solve problems, and mathematically evaluate the quality of the solutions, typically using the following algorithms.
4. Use of various searching, sorting and graph traversal algorithms.

Course Content

UNIT-I **15 Hours**

Analysis of algorithms: Notation for Algorithms, Complexity of Algorithm, Growth of functions, Models of computation, Algorithm control structures, Performance analysis

UNIT-II **15 Hours**

Elementary Data Structures: Stacks and Queues, Lists, Trees, Dictionaries, Set and graphs. Basic design methodologies, In Credential& Divide and conquer Approach, Dynamic Programming, Backtracking, Greedy algorithms, Branch and Bound.

UNIT-III **15 Hours**

Particular Algorithms: Disjoint set manipulation, Matrix multiplication, Pattern matching, Sorting and Searching algorithms, combinatorial algorithms, String processing algorithms, Algebraic algorithms.

UNIT-IV **15 Hours**

Graph Algorithms: Problem classes, NP-completeness, Deterministic and Nondeterministic, polynomial time algorithms, theory of lower bounds, Approximation algorithms.

Transaction Modes

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Suggested Readings

- *Aho. (2002). Design & Analysis of Computer Algorithms, Pearson Education.*
- *Horowitz, S. Sahni. (1984). Fundamentals of Computer Algorithms, Galgotia Publishers.*
- *Knuth. (1968). The Art of Programming, Pearson Education.*
- *Nitin Upadhyay. (2004). The Design & Analysis of Algorithms. K. Kataria publication.*

Course Title: INTERNET OF THINGS
Course Code: MCS223

L	T	P	Credits
3	0	0	3

Total Hours-45

Learning Outcome: After completion of this course, the learner will be able to:
1. Understand the application areas of IOT.
2. Realize the revolution of Internet in Mobile Devices, Cloud & Sensor Networks.
3. Examine the blocks of Internet of Things and characteristics.
4. Use IOT in real world applications.

Course Content

UNIT1 **10 Hours**

Introduction & Concepts: Introduction to Internet of Things, Physical Design of IOT, Logical Design of IOT, IOT Enabling Technologies, IOT Levels.

UNIT II **10 Hours**

Domain Specific IOTs: Home Automation, Cities, Environment, Energy, Retail, Logistics, Agriculture, Industry, Health & Life Style.
Sensors: Sensors in Internet of Things (IoT), **Sensor's characteristics, Dynamic Characteristics,** Types of sensors.

UNIT III **15 Hours**

M2M & System Management with NETCONF-YANG: M2M, Difference between IOT and M2M, SDN and NFV for IOT, Software defined Networking, Network Function Virtualization, Need for IOT Systems Management, Simple Network Management Protocol, Limitations of SNMP, Network Operator Requirements, NETCONF, YANG, IOT Systems management with NETCONF-YANG.

UNIT IV **10 Hours**

Developing Internet of Things & Logical Design using Python: Introduction, IOT Design Methodology, Installing Python, Python Data Types & Data Structures, Control Flow, Functions, Modules, Packages, File Handling, Date/ Time Operations, Classes, Python Packages.
IOT Physical Devices & Endpoints: Introduction to IOT Device, Exemplary Device, Board, Linux on Raspberry Pi, Interfaces, and Programming & IOT Devices.

Transaction Modes

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning.

Suggested Readings

- *Vijay Madisetti, Arshdeep Bahga," Internet of Things a Hands-On-Approach",2014, ISBN:978 0996025515*
- *Adrian McEwen, "Designing the Internet of Things", Wiley Publishers, 2013, ISBN: 978-1-118-43062-0*
- *Daniel Kellmereit, "The Silent Intelligence: The Internet of Things". 2013, ISBN 0989973700*
- *Manoel Carlos Ramon, "Intel® Galileo and Intel® Galileo Gen 2: API Features and Arduino Projects for Linux Programmers", Apress, 2014. 2. Marco Schwartz, "Internet of Things with the Arduino Yun", Pack Publishing, 2014.*

Course Title: Mini Project
Course Code: MCS203

L	T	P	Credits
0	0	4	2

Total hours: 30

Learning Outcomes: After completion of this course, the learner will be able to:

1. Engage in independent study to research literature in the identified domain
2. Consolidate the literature search to identify and formulate the engineering problem
3. Identify the community that shall benefit through the solution to the identified engineering problem and also demonstrate concern for environment
4. Demonstrate compliance to the press Cribbed standards/ safety norms through implementation of the identified engineering problem

Course Content

To achieve a desired outcome at a specific end date employing a specific number of resources.

Transaction Modes

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

SEMESTER: II

Course Title: English for Research Paper Writing
Course Code: MCS220

L	T	P	Credits
2	0	0	2

Total Hours: 30

Learning Outcomes: After completion of this course, the learner will be able to:

1. Define the planning and preparation, Word Order, breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness.
2. Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticizing, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts.
3. Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.
4. Understand the key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature.

Course Content

UNIT-I **10 Hours**

Planning and Preparation: Word Order, breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness.

Plagiarism: Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticizing, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts. Introduction

UNIT-II **5 Hours**

Review of the Literature, Methods, Results, Discussion, Conclusions, the Final Check.

UNIT-III **15 Hours**

Key skills: key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature,

UNIT-IV **15 Hours**

Writing the Methods: Skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, and skills are needed when writing the Conclusions.

Implementation Process: Useful phrases, how to ensure paper is as good as it could possibly be the first- time submission.

Transaction Modes

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Suggested Readings

- *Goldbort R. (2006). Writing for Science, Yale University Press. (Available on Google Books)*
- *Day R. (2006). How to Write and Publish a Scientific Paper, Cambridge University Press.*
- *HighmanN. (1998). Handbook of Writing for the Mathematical Sciences, SIAM. Highman'sbook*
- *Ackers, J., & Hardman, F. (2001). Classroom interaction in Kenyan primary schools. Compare: a journal of comparative and international education, 31(2), 245-261.*
- *2.Agrawal, M. (2004). Curricular reform in schools: the importance of evaluation. Journal of curriculum studies, 36(3), 361-379.*
- *Akyeampong, K. (2003). Teacher Training in Ghana-Does it Count? Multi-Site Teacher Education Research Project (MUSTER), Country Report One (No. 666-2016-45498).*

Course Title: Human Value & Ethics
Course Code: BCS227

L	T	P	Credits
2	0	0	NC

Total Hours-45

Learning Outcomes: After completion of this course, the learner will be able to:

1. Develop the ability to distinguish between Value and ethics.
2. Construct the ability to face difficult situations in life boldly and resolve them confidently.
3. Implement the code of ethics in professional life.
4. Create Ethical reason and achieve harmony in life
5. Formulate moral responsibility and could themselves as good professionals

Course Content

UNIT I **10 Hours**

Human Values: Morals, Values and Ethics - Integrity - Work Ethic - Service Learning - Civic Virtue - Respect for Others - Living Peacefully - caring - Sharing - Honesty - Courage - Valuing Time - Co-operation - Commitment - Empathy - Self-Confidence - Character – Spirituality.

UNIT II **15 Hours**

Engineering Ethics: Senses of 'Engineering Ethics' - variety of moral issued - types of inquiry- moral dilemmas - moral autonomy - Kohlberg's theory - Gilligan's theory - consensus and controversy - Models of Professional Roles - theories about right action - Self-interest - customs and religion - uses of ethical theories.

UNIT III **10 Hours**

Engineering as Social Experimentation: Engineering as experimentation - engineers as responsible experimenters - codes of ethics - a balanced outlook on law - the challenger case study.

UNIT IV **10 Hours**

Safety, Responsibilities and Rights: Safety and risk - assessment of safety and risk - risk benefit analysis and reducing risk - the three-mile island and chernobyl case studies. Collegiality and loyalty - respect for authority - collective bargaining - confidentiality - conflicts of interest - occupational crime - professional rights - employee rights - Intellectual Property Rights (IPR) - discrimination.

Transaction Modes

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Suggested Readings

1. "***Ethics in Engineering",*** *Mike Martin and Roland Schinzinger, McGraw-Hill, New York, 1996.*
2. ***"Engineering Ethics",*** *Govinda rajan M, Natarajan S, Senthil Kumar V. S, Prentice Hall of India, New Delhi, 2004.*

Course Title: Distributed System
Course Code: MCS225

L	T	P	Credits
3	0	0	3

Total hours-45

Course learning outcomes: On successful completion of this course, students will be able to:

1. Understand the hardware and software issues in modern distributed systems
2. Get knowledge in distributed architecture, naming, synchronization, consistency and replication, fault tolerance, security, and distributed file systems.
3. Analyze the current popular distributed systems such as peer-to-peer (P2P) systems will also be analyzed.
4. Get knowledge about Shared Memory Techniques.

Course Content

UNIT-I **10 Hours**

Introduction: Distributed data processing; What is a DDBS; Advantages and disadvantages of DDBS; Problem areas; Overview of database and computer network concepts Distributed Database Management System Architecture Transparencies in a distributed DBMS; Distributed DBMS architecture; Global directory issues.

UNIT-II **10 Hours**

Distributed Database: Design Alternative design strategies; Distributed design issues; Fragmentation; Data allocation. Basics of semantic data control, query processing issues Objectives of query processing; Characterization of query processors; Layers of query processing; Query decomposition; Localization of distributed data.

UNIT-III **15 Hours**

Distributed Query Optimization: Factors governing query optimization; Centralized query optimization; Ordering of fragment queries; Transaction Management The transaction concept; Goals of transaction management; Characteristics of transactions; Taxonomy of transaction models. Concurrency Control Concurrency control in centralized database systems; Concurrency control in DDBSs; Distributed concurrency control algorithms; Deadlock management.

UNIT-IV **10 Hours**

Reliability: Reliability issues in DDBSs; Types of failures; Reliability techniques; Commit protocols; Recovery protocols. Parallel Database Systems,

Parallel architectures; parallel query processing and optimization; load balancing. Advanced Topics, Mobile Databases, Multi-databases.

Suggested Reading

1. George Coulouris, Jean Dollimore, Tim Kindberg(1996).Distributed Systems*: Concepts and Design,* Addison-Wesley.

2**.** pradeep k. sinha**(**1998).Distributed Operating Systems*:* Concepts and Design, PHI Learning Pvt. Ltd.

Course: Cognitive Robotics
Course Code: MCS226

L	T	P	Credits
3	0	0	3

Total hours-45

Course learning outcomes: On successful completion of this course, students will be able to:

1. Create a tight coupling between object perception and manipulation
2. Implement and experiment several methods for object grasping.
3. hands-on experience working on a research project.
4. human robot interaction and their application in robotics.

Course Content

UNIT:1 Introduction

Module 1: Introduction to Cognitive robotics and Human Robot Interaction
Module 2: Smart materials-I
Module 3: Smart materials-II
Module 4: Smart materials-III

UNIT:2 Brain physiology and neural signal transmission

Module 1: Architecture of the Brain
Module 2: Architecture of the Brain (Contd.)
Module 3: Nerve cells

UNIT:3 Neural modeling

Module 1: Introduction to Synchronization Models
Module 2: Synchronization Models (Contd.)
Module 3: Electroencephalography (EEG)

UNIT:4 Intelligence architecture

Module 1: Theories of Intelligence-I
Module 2: Theories of Intelligence-II
Module 3: Kura moto Model
Module 4: Child-Robot Interaction

Suggested Readings

- *Neuroscience, edited by Dale Purves, et al., published by Sinauer Associates.*
- *How the body shapes the way we think-A New View of Intelligence, by Rolf Pfeifer and Josh Bongard, MIT Press.*
- *Control Systems: Classical, Modern, and AI-Based Approaches, by Jitendra R. Raol, Ramakalyan Ayyagari, CRC Press.*

Course Title: Wireless and Mobile Networks
Course Code: MCS212

L	T	P	Credits
3	0	0	3

Total hours: 45

Learning Outcomes: After completion of this course, the learner will be able to:

1. Conversant with the latest 3G/4G and Wi-MAX networks and its architecture.
2. Design and implement wireless network environment for any application using latest wireless protocols and standards.
3. Implement different type of applications for smart phones and mobile devices with latest network strategies
4. Compare and contrast multiple division techniques, mobile communication systems, and existing wireless networks.

Course Content

UNIT-I **10 Hours**

Overview of wireless sensor networks: Challenges for Wireless Sensor Networks, Single Node Architecture - Hardware Components, Energy Consumption of Sensor Nodes- Radio Energy Consumption Model, Operating Systems and Execution Environments, Applications of WSN, Computational models, Performance metrics

UNIT II **15 Hours**

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-III **10 Hours**

Infrastructure establishment: Sensor deployment mechanisms- uniform random deployment, grid deployment, Time Synchronization- Introduction, Protocol based on sender- receiver synchronization, Issues of coverage, Node discovery protocols, Localization Schemes, Network clustering, Topology Control.

UNIT IV **10 Hours**

Wireless Networks: Introduction to wireless Networks, Advantages and disadvantages of Wireless Local Area Networks, WLAN Topologies, WLAN Standard IEEE 802.11, IEEE 802.11 Medium Access Control, Comparison of IEEE 802.11 a,b,g and n standards, IEEE 802.16 and its enhancements, Wireless PANs, Hiper Lan, WLL.

Transaction Modes

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Suggested Readings

- *Holger Karl & Andreas Willig, 'Protocols and Architectures for Wireless Sensor Networks', John Wiley, 2005.*
- *Feng Zhao & Leonidas J. Guibas, 'Wireless Sensor Networks- An Information ProcessingApproach', Elsevier, 2007.*
- *KazemSohraby, Daniel Minoli, &TaiebZnati, 'Wireless Sensor NetworksTechnology, Protocols, And Applications', John Wiley, 2007.*
- *Anna Hac, 'Wireless Sensor Network Designs', John Wiley, 2003*

Course Title: Security Engineering
Course Code:MCS216

L	T	P	Credits
3	0	0	3

Total hours: 45

Learning Outcomes: After completion of this course, the learner will be able to:

1. Use of various concepts related to engineering secure systems by keeping various threats in mind.
2. Understand the principles related to use of authentication mechanism, their form, security analysis, overhead, use of security standards related to cryptography and physical security.
3. Examine the building systems using passwords, biometrics, CAPTCHA's, secure programming techniques, trusted computing, Crypto APIs and physical security.
4. Understand a variety of security attacks, their sophistication, and defense mechanisms.

Course Content

UNIT-I **10 Hours**

Introduction to Security Engineering: Passwords and their limitations, attacks on passwords, CAPTCHA, Biometrics. Access Control, ACL, sandboxing, virtualization, trusted computing. Multi-level and multi-lateral security.

UNIT-II **10 Hours**

Securing services: Security in Metered Services, pre-payment meters, secure printing and seals. Tamper resistance mechanisms. Secure systems: hardware, software and communication systems – design issues and analysis.

UNIT-III **15 Hours**

Secure software architecture: Models and principles, hardware design related security – smart cards and other security solutions, communication protocols and application systems associated with security.

UNIT-IV **10 Hours**

Attacks and defenses: Phishing, social networking attacks, Denial of service, API attacks, network attacks and countermeasures, side-channel attack, advanced persistent Threats (APTs), copyright and DRM.

Transaction Modes

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Suggested Readings

- *Ramesh s. Gaonkar. (2013) Microprocessor Architecture, Programming and Application with 8085, Penram International publishing India Pvt. Ltd.*
- *Douglas. V Hall. (2006). Microprocessor andinterfacing, Tata Mc-GrawHill Publication.*

Semester III

Course Title: Research Methodology
Course Code: MCS309

L	T	P	Credits
4	0	0	4

Total hours: 60

Learning Outcomes: After completion of this course, the learner will be able to: to:

1. Identify and discuss the role and importance of research in the social sciences.
2. Discuss the issues and concepts salient to the research process.
3. Choose the appropriate research design and develop appropriate research hypothesis for a research project
4. Discuss the complex issues inherent in selecting a research problem, selecting an appropriate research design, and implementing a research project.

Course Content

Unit-I **15 Hours**

Research: its concept, nature, scope, need and Objectives of Research, Research types, Research methodology, Research process – Flow chart, description of various steps, Selection of research problem.

Unit-II **15 Hours**

Research Design: Meaning, Objectives and Strategies of research, different research designs, important experimental designs

Methods of Data Collection and Presentation: Types of data collection and classification, Observation method, Interview Method, Collection of data through Questionnaires, Schedules, data analysis and interpretation, editing, coding, content analysis and tabulation.

Unit-III **15 Hours**

Sampling Methods: Different methods of Sampling: Probability Sampling methods, Random Sampling, Systematic Sampling, Stratified Sampling, Cluster Sampling and Multistage Sampling. Non probability Sampling methods, Sample size.

Unit-IV **15 Hours**

Report writing and Presentation: Types of reports, Report Format – Cover page, Introductory page, Text, Bibliography, Appendices, Typing instructions, Oral Presentation.

Transaction Modes

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Suggested Readings

- Panneerselvam, R, 'Research Methodology', PHI, New Delhi.
- Cooper, D.R Schindler,P.S., 'Business Research Methods,' Tata McGraw Hill
- Gupta S P,' Statistical Methods', Sultan Chand & Sons, Delhi
- Ronald E Walpole, 'Probability and Statistics for Engineers and Scientists' (International Edition), Pearson Education.
- Geode, Millian J. & Paul K. Hatl, "Methods in Research", McGraw Hills, New Delhi

Reference Books

- *Kothari C.R., "Research Methodology", New AgePublisher*
- *Nargundkar R, Marketing Research, Tata McGraw Hill, New Delhi,2002.*
- *Sekran, Uma, "Business Research Method", Miley Education,Singapore*

Website/Links/Online Portal/ICT

- https://www.academia.edu/
- https://www.studeersnel.nl
- https://www.scribd.com

Course Title: Cyber Law & Ethics
Course Code: MCS313

L	T	P	Credits
4	0	0	4

Total hours: 60

Learning Outcomes: After completion of this course, the learner will be able to:

1. Analyses the concept of cybercrimes.
2. Learn about the regulation of cyber space at national and international level.
3. Understand the international legal regime related to cybercrimes.
4. Discuss the offences and penalties under it act 2000.

Course Content

UNIT – I **10 Hours**

General introduction and Cyber space regulations: Cyber Space-Meaning and characteristics Need for regulation of cyber space, Cyber-libertarianism, Cyber-paternalism, Lessing's model of regulation, Regulators in cyberspace, Introduction to Internet, ACLU v Reno, Digitization and Society, Legal Challenges of the Information Society, Information Technology Act, 2000.

UNIT – II **10 Hours**

Cyber law and IPR issues: Digital Copyrights, Open Source, Linking and caching, Digital Rights Management, DMCA, - Patents, Software Patents Trademarks and domain names, Brand identities, search engines and secondary market, ICANN, Database Right

UNIT III **10 Hours**

Cyber law and privacy and taxations issues: Digitization, personal data and data industry, Data protection principles, Conditions for processing of personal data, CCTV, RFID tracking, Data retention and identity - Taxation issues of e-commerce.

UNIT – IV **15 Hours**

Cyber Crimes: Computer misuse - identity theft, grooming and harassment, Hacking, Viruses, criminal damage and mail bombing, Denial of service attack, Obscenity, child abuse, Stalking. Morphing, web jacking, phishing etc., Cyber terrorism, Bandwidth theft, Convention on cybercrime.

Transactional Modes

Video based Teaching, Collaborative Teaching, Cooperative Teaching; Case based Teaching, Case Analysis, and Group Discussion.

Suggested Readings

- *Senthil, Surya and Devi Lakshmi (2010). Manual of Cyber Laws. New Delhi: Aditya Book Company.*
- *Singh, Ranbir and Singh Ghanshyam (2004). Cyber Space and the Law: Issues and Challenges, Hyderabad: Nalsar University.*

Course Title: Seminar
Course Code: MCS302

L	T	P	Credits
0	0	0	2

Total hours-30

Learning Outcomes: After completion of this course, the learner will be able to:

1. Engage in independent study to research literature in the identified domain
2. Consolidate the literature search to identify and formulate the engineering problem
3. Identify the community that shall benefit through the solution to the identified engineering problem and also demonstrate concern for environment
4. Demonstrate compliance to the press Cribbed standards/ safety norms through implementation of the identified engineering problem

Course Content

Each student shall present a seminar on any topic of interest related to the core / elective courses offered in the first semester of the M. Tech. Programme. He / she shall select the topic based on the References: from reputed International Journals, preferably IEEE journals. They should get the paper approved by the Programme Coordinator / Faculty member in charge of the seminar and shall present it in the class. Every student shall participate in the seminar. The students should undertake a detailed study on the topic and submit a report at the end of the semester. Marks will be awarded based on the topic, presentation, participation in the seminar and the report submitted.

Course Title: Research Proposal
Course Code:MCS398

L	T	P	Credits
0	0	8	4

Learning Outcomes

After completion of the course, the learner willbe able to

1. Get deep insights to collect, review and analyze the related literature.
2. To apply the knowledge to formulate hypothesis & design research process.
3. Find the research titles which are significant, applicable and researchable.
4. Interpret the findings to design statistical strategies & write references, bibliography and webliography.

Course Content

A research proposal contains all the key elements involved in the research process and proposes a detailed information to conduct the research.
The students are supposed to prepare the research proposal of any research area of their choice following these steps:

1. Selection of topic
2. Significance of the research area
3. Formulation of hypothesis/Research questions
4. Review of related literature
5. Method & Procedure (Includes sampling & design)
6. Data collection and proposed statistical analysis
7. Delimitations
8. Reference/Bibliography

Evaluation

The students will have to complete the writing process of each topic given above within one week, which will be evaluated at the end of every week. It will consist of 8 marks each. The final proposal shall be of 15 marks, Viva 16 marks and attendance 5 marks.

Transaction Mode

Collaborative learning, Group Discussion, E team Teaching, Activities, Assessments, Collaborative teaching, Peer Teaching, Video Based Teaching, Quiz, Open talk, E team Teaching, Case analysis, Flipped Teaching

SEMESTER-III

Course Title: Organizational Behavior
Course Code:MCS314

L	T	P	Credits
2	0	0	NC

Total Hours:30

Course Learning Outcomes: On successful completion of this course, the students will be able to:

1. Understand the conceptual framework of the discipline of OB and its practical applications in the organizational set up.
2. To deeply understand the role of individual, groups and structure in achieving organizational goals effectively and efficiently.
3. To critically evaluate and analyse various theories and models that contributes in the overall understanding of the discipline.
4. To develop creative and innovative ideas that could positively shape the organizations.
5. To accept and embrace in working with different people from different cultural and diverse background in the workplace.

Course Content

UNIT-I **10 Hours**

Organizational Behavior: What managers do, Definition of OB, contributing disciplines to OB, challenges and opportunities for OB. Foundations of Individual behavior- biographical characteristics, ability, and learning? Values, Attitudes, Personality and Emotions, Perception

UNIT-II **10 Hours**

Motivation: Concept, Theories of Maslow, Herzberg, mcclelland, Porter & Lawler Model, Application of Motivation Concept. Job Satisfaction Foundations of Group Behavior: Group formation, development and structure, Group Processes, Group Decision- making Techniques, Work Teams.

UNIT –III **5 Hours**

Interpersonal Skill-Transactional analysis, Life Positions, Johari Window. Leadership: Concept, theories, styles and their application. Power and Politics in Organization.

UNIT –IV **5 Hours**

Conflict Management, Stress Management, Crisis Management, Organizational Change & Development, Innovation, Creating a learning Organization, Organizational Culture, Organizational Effectiveness.

Suggested Readings

1. Nelson, Debra L and James C Quick. (2009). *Organizational Behavior*. Thomson Learning
2. Pareek, Udai. (2007). *Understanding Organizational Behavior*. Oxford University Press, New Delhi.
3. Robbins, S.P. (2012). *Organizational Behavior.* Prentice Hall of India, New Delhi.
4. Hellgiegel, D & J.W. Slocum. (2009). *Organizational Behavior*. Thomson Learning
5. Mcschane. (2014). Organization Behavior. TMH, New Delhi.
6. Luthans, Fred. (2010). *Organizational Behavior.* Mcgraw Hill, New York.

Course Title: Biometric Security
Course Code:MCS315

L	T	P	Credits
3	0	0	3

Total hours-45

Learning Outcomes: After completion of this course, the learner will be able to:

1. Examine the Mathematical Foundations for Data Security
2. Classify Biometric tool.
3. Analysis the data using data tools
4. Understand the concept of filtering process.

Course Content

UNIT-I **15 Hours**

Biometrics- Introduction- benefits of biometrics over traditional authentication systems –benefits of biometrics in identification systems-selecting a biometric for a system –Applications – Key biometric terms and processes - biometric matching methods –Accuracy in biometric systems.

UNIT-II **15 Hours**

Physiological Biometric Technologies: Fingerprints – Technical description – characteristics - Competing technologies - strengths – weaknesses – deployment - Facial scan - Technical description - characteristics - weaknesses-deployment - Iris scan – Technical description – characteristics - strengths – weaknesses – deployment- Retina vascular pattern

UNIT-III **10 Hours**

Technical description – characteristics - strengths – weaknesses –deployment - Hand scan - Technical description-characteristics - strengths – weaknesses deployment – DNA biometrics. Behavioral Biometric Technologies: Handprint Biometrics – DNA Biometrics.

UNIT-IV **15 Hours**

signature and handwriting technology - Technical description – classification – keyboard / keystroke dynamics- Voice – data acquisition - feature extraction - characteristics - strengths – weaknesses-deployment.

Transaction Modes

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Suggested Readings

- *P. J. Sadalage and M. Fowler, "NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence", Addison-Wesley Professional, 2012.*
- *Tom White, "Hadoop: The Definitive Guide", Third Edition, O'Reilley, 2012.*
- *Eric Sammer, "Hadoop Operations", O'Reilley, 2012.*
- *Capriolo, D. Wampler, and J. Rutherglen, "Programming Hive", O'Reilley, 2012.*
- *Lars George, "HBase: The Definitive Guide", O'Reilley, 2011.*
- *Eben Hewitt, "Cassandra: The Definitive Guide", O'Reilley, 2010.*

Course Title: Data Visualization
Course Code: MCS311

L	T	P	Credits
3	0	0	3

Total hours: 45

Learning Outcomes: After completion of this course, the learner will be able to:

1. Examine the Mathematical Foundations for Data Science
2. Classify Data collections and APIs
3. Analysis the data using data tools
4. Understand the concept of Data visualization

Course Content

UNIT-I **15 Hours**

Introduction to core concepts and technologies: Introduction, Terminology, data science process, data science toolkit, Types of data, Example applications, Mathematical Foundations for Data Science: linear algebra; Analytical and numerical solutions of linear equations; Mathematical structures, concepts and notations used in discrete mathematics. Introduction to Statistical Methods: basic and some advanced concepts of probability and statistics; Concepts of statistics in solving problems arising in data science.

UNIT-II **15 Hours**

Data collection and management: Introduction, Sources of data, Data collection and APIs, Exploring and fixing data, Data storage and management, using multiple data sources

UNIT-III **15 Hours**

Data analysis: Introduction, Terminology and concepts, Introduction to statistics, Central tendencies and distributions, Variance, Distribution properties and arithmetic, Samples/CLT, Basic machine learning algorithms, Linear regression, SVM, Naive Bayes.

UNIT-IV **15 Hours**

Data visualization: Introduction, Types of data visualization, Data for visualization: Data types, Data encodings, Retinal variables, mapping variables to encodings, Visual encodings.

Transaction Modes

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Suggested Readings

- *Andy Kirk, Data Visualization A Handbook for Data Driven Design, Sage Publications, 2016*
- *Philipp K. Janert, Gnuplot in Action, Understanding Data with Graphs, Manning Publications, 2010.*
- *Alberto Cordoba, "Understanding the Predictive Analytics Lifecycle", Wiley, 2014.*
- *Eric Siegel, Thomas H. Davenport, "Predictive Analytics: The Power to Predict Who Will Click, Buy, Lie, or Die", Wiley, 2013.*
- *James R Evans, "Business Analytics – Methods, Models and Decisions", Pearson 2013.*
- *R. N. Prasad, Seema Acharya, "Fundamentals of Business Analytics", Wiley, 2015.*

Course Title: Value Education
Course Code: OEC091

L	T	P	Credits
3	0	0	3

Total hours: 45

Learning Outcomes: After completion of this course, the learner will be able to:

1. Understand value of education and self- development
2. Predict the good values in students
3. Examine about the importance of character
4. Comprehend the essential steps to become good leaders

Course Content

UNIT-I **10 Hours**

Values and Self-Development: Social Values and Individual Attitudes. Work Ethics, Indian Vision of Humanism. Moral and Non- Moral Valuation. Standards and Principles. Value Judgements.

UNIT-II **10 Hours**

Importance of Cultivation of Values: Sense of Duty. Devotion, Self-Reliance. Confidence, Concentration. Truthfulness, Cleanliness. Honesty, Humanity. Power of Faith, National Unity. Patriotism, Love for Nature, Discipline.

UNIT-III **15 Hours**

Personality and Behavior Development: Soul and Scientific Attitude. Doing Best for Saving Nature Association and Cooperation. Aware of Self-Destructive Habits. Happiness Vs Suffering, Love for Truth. True Friendship. Universal Brotherhood and Religious Tolerance. Free from Anger, Dignity of Labor. Avoid Fault Thinking. Punctuality, Love and Kindness. Positive Thinking. Integrity and Discipline.

UNIT-IV **10 Hours**

Character and Competence: Holy Books vs. Blind Faith. Honesty, Studying Effectively. Mind Your Mind, Self-Control. All Religions and Same Message. Equality, Nonviolence, Humility, Role of Women. Science of Reincarnation. Self-Management and Good Health.

Transaction Modes

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Suggested Readings

- *Chakraborty, S.K. (2000). Values and Ethics for organizations Theory and practice, Oxford University Press, New Delhi*

Course Title: Constitution of India
Course Code: OEC092

L	T	P	Credits
3	0	0	3

Total hours: 45

Learning Outcomes: After completion of this course, the learner will be able to: to:

1. Understand the meaning and importance of Constitution
2. Examine about making of Indian Constitution-contribution of Constituent assembly on it.
3. Comprehend the salient features of Indian Constitution
4. Predict the importance of Preamble of the Indian Constitution and its significance.

Course Content

UNIT-I **5 Hours**

History of Making of the Indian Constitution: History Drafting Committee, (Composition & working)

Philosophy of the Indian Constitution: Preamble Salient Features.

UNIT-II **15 Hours**

Contours of Constitutional Rights & Duties: Fundamental Rights, Right to Equality, Right to Freedom, right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles of State Policy, Fundamental Duties Panchayat raj. Introduction, PRI.Zila Panchayat. Elected officials and their roles, CEO Zila Panchayat, Position and role. Block level. Organizational Hierarchy (Different departments), Village level, Role of Elected and Appointed officials.

UNIT-III **15 Hours**

Organs of Governance: Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions.

Local Administration: District's Administration head: Role and Importance, Municipalities, Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation.

UNIT-IV **10 Hours**

Election Commission: Election Commission, Role and Functioning. Chief Election Commissioner and Election Commissioners. State Election Commission, Role and Functioning. Institute and Bodies for the welfare of SC/ST/OBC and women.

Transaction Modes

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning.

Suggested Readings

- *M P Jain Indian Constitutional Law: by M.P. Jain (Author), Justice JastiChelameswar (Editor)*
- *Constitution of India for Children: Written by Subhadra Sen Gupta*
- *Introduction to the Constitution of India by DD Basu*

Course Title: Dissertation
Course Code: MCS403

L	T	P	Credits
0	0	0	20

Learning Outcomes: After completion of this course, the learner will be able to:

1. Create, analyze and critically evaluate different technical/architectural solutions.
2. Analyze the consciousness critically of the ethical aspects of research and development work.
3. Analyze and evaluate different technical/architectural solutions.
4. Explain the capability of critically and systematically integrate knowledge.

Course Content

The dissertation will normally contain:

1. A clear indication, at appropriate stages, of original and critically elements. The level of originality expected is likely to include the application of existing techniques to new environments, the use of original materials, the re-working of existing materials, and the Use of comparative approaches to the provision of information technology;
2. A discussion of its scope and aims, and its theoretical and professional significance, including discussion of the context in which the problem is seen as important;
3. An analysis of the topic within a critically review of the relevant literature;
4. An evaluation of methods used in the dissertation, their reliability, validity, and a comparison with alternative methods;
5. An account of the process of obtaining the data required for the dissertation and the results obtained;
6. An analysis of the results of the dissertation to include a discussion of their significance, their relationship to other research, and any methodological or theoretical implications;
7. The relationship of the findings to existing professional understanding and, where Appropriate, potential implementation difficulties. It is not intended to restrict students to a precisely defined format for the dissertation but it should follow the standard practices of dissertation writing. Although a written report will normally be expected, it should be accompanied by soft copy on CD.

Transaction Modes

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning.