Semester I

Subject Code	Subject Name	Credits
ME-ITC101	**Data Science**	**04**

Course Objectives:

- Provide Insights about the Roles of a Data Scientist and enable to analyze the Big Data.
- Understand the principles of Data Science for the data analysis and learn cutting edge tools and techniques for data analysis.
- Figure Out Machine Learning Algorithms.
- Learn business decision making and Data Visualization

Course Outcomes:

The student should be able:

- Demonstrate knowledge of statistical and exploratory data analysis data analysis techniques utilized in decision making.
- Apply principles of Data Science to the analysis of business problems.
- To use Machine Learning Algorithms to solve real-world problems.
- To provide data science solution to business problems and visualization.

Prerequisite: fundamentals of data base, basic programming skills

Sr. No.	Module	Detailed Content	Hours
	Prerequisite	Relational database, KDD process, Introduction to BIG data, What is Hadoop, Core components of Hadoop, Hadoop ecosystem.	**3**
I	An Introduction to Data Science	Definition, working, benefits and uses of Data Science, Data science vs BI, The data science process, Role of a Data Scientist,	**4**
II	Statistical Data Analysis & Inference	Populations and samples, Statistical modeling, probability distributions, fittings a model, Statistical methods for evaluation, Exploratory Data Analysis, Getting started with R, Manipulating and Processing data in R , working with function in R , Working with descriptive Statistics, Working with graph plot in R.	**8**
III	Learning Algorithms	k-nearest neighbor, Simple and multiple Linear Regression, Logistic Regression, Support vector machine, Model-Based Clustering, Clustering High-Dimensional Data,	**12**
IV	Data Visualization	Data Visualization basics, techniques, types, applications, tools, Data Journalism, Interactive dashboards,	**8**
V	Advance Analytical Methods	Text Analysis- Text analysis steps, A text analysis example, Collecting raw text and representing text, TF and TFIDF, Categorizing documents by topics, determining	**8**

		sentiments, Time series analytics- overview, ARIMA model,	
VI	Business problems and data science solutions	Data Science and Business Strategy: Thinking Data-Analytically, Redux, Competitive Advantage with Data Science, Data Science Case Studies, Case Study: Global Innovation Network and Analysis.	**5**

Text Books:

1. Data science and big data analytics, EMC

2. Doing Data Science, *Rachel Schutt and Cathy O'Neil*

3. Introducing Data Science, Davy Cielen

4. Data Science for Business, Foster Provost and Tom Fawcett, O'Reilly. Copyright © 2013

References:

1. Regression Analysis by Example,

2. Data Mining Concepts and Techniques, Third Edition, Jiawei Han, Micheline Kamber, Jian Pei, Morgan Kaufmann

3. An Introduction to Statistical Learning with Applications in R , Gareth James • Daniela Witten • Trevor Hastie, Robert Tibshirani, Springer

List of Experiments : based on Laboratory Practical's/ Case studies

1. Exploratory Data Analysis and regression using R.

2. Text Analysis using R

3. Business problem : Data science solution.

Assessment:

Internal:	Assessment consists of two tests out of which; one should be compulsory class test (on minimum 02 Modules) and the other is either a class test or assignment on live problems or course project.
End Semester Examination:	Some guidelines for setting the question papers are as, six questions to be set each of 20 marks, out of these any four questions to be attempted by students. Minimum 80% syllabus should be covered in question papers of the end semester examination.

Subject Code	Subject Name	Credits
ME-ITDLOC-II2042	**AI and Machine Learning**	**04**

Course Objectives:

1 To learn the basic concepts and techniques of AI and machine learning
2. To explore the various mechanism of Knowledge and Reasoning used for building expert system.
3. To become familiar with supervised and unsupervised learning models
4. To design and develop AI and machine learning solution using modern tools.

Course Outcomes: Students will able to:

1. Explain the fundamentals of AI and machine learning.
2. Identify an appropriate AI problem solving method and knowledge representation technique.
3. Identify appropriate machine learning models for problem solving.
4. Design and develop the AI applications in real world scenario.

Prerequisite: Probability Theory and Statistics, PROLOG, R Programming

DETAILED SYLLABUS:

Sr. No.	Module	Detailed Content	Hours
	Prerequisite	Basics of AI, Need for AI Basics of ML, Types, need for ML	3
I	Introduction to AI	Definition, Problem, State space representation. Intelligent Systems: Categorization of Intelligent System, Components of AI Program, Foundations of AI, Applications of AI, Current trends in AI, Intelligent Agents: Anatomy, structure, Types	6
II	Problem solving	Solving problem by Searching: Problem Solving Agent, Formulating Problems. Uninformed Search Methods: Breadth First Search (BFS), Depth First Search (DFS), Depth Limited Search, Depth First Iterative Deepening (DFID), Informed Search Methods: Greedy best first Search, A* Search, Memory bounded heuristic Search. Local Search Algorithms and Optimization Problems: Hill climbing search Simulated annealing, Local beam search	8
III	Knowledge and Reasoning	Knowledge based Agents, The Wumpus World, and Propositional logic. First Order Logic: Syntax and Semantic, Inference in FOL, Forward chaining, backward Chaining, Knowledge Engineering in First-Order Logic, Unification, Resolution,	8
IV	Concepts of Machine learning	Supervised, unsupervised, semi-supervised, Rote learning, Reinforcement learning, Issues, steps and applications, Designing a learning System.	3

		Case study: hand written digit recognition, stock price prediction	
V	Learning Models	Decision tree learning. Probabilistic Models: Multivariate Bernoulli Naive Bayes Classifier, Linear and Logistic Regression. Deterministic Models: Support Vector Machine. Hidden Markov Model: Process, Model, Problems of HMM, Viterbi algorithm, Baum- welch algorithm. Reinforcement Learning: Model based learning, Temporal Difference Learning, Generalization, Partially Observable States.	12
VI	Artificial Neural Network	Introduction, neural network representation, Problems for neural network learning, perceptron, multilayer network & Back propagation Algorithm. Deep learning: Definition, relationship between AI, ML, and Deep Learning, Trends in Deep Learning.	8

Text Books:

1. Artificial Intelligence and Machine Learning By Vinod Chandra S.S., Anand Hareendran S

2. Stuart J. Russell and Peter Norvig, "Artificial Intelligence A Modern Approach "Second Edition" Pearson Education

3. Tom M. Mitchell. "Machine Learning" McGraw-Hill, 1997.
4. Ethem Alpaydin "Introduction to machine learning" 2nd ed. The MIT Press, 2010

References:

1. Ivan Bratko "PROLOG Programming for Artificial Intelligence", Pearson Education, Third Edition.
2. Elaine Rich and Kevin Knight "Artificial Intelligence "Third Edition
3. Davis E.Goldberg, "Genetic Algorithms: Search, Optimization and Machine Learning", Addison Wesley, N.Y., 1989.
4. Han Kamber, "Data Mining Concepts and Techniques", Morgann Kaufmann Publishers.

5. "Machine learning with R" by Brett Lantz

List of Experiments : based on Laboratory Practical's/ Case studies

1. Logic programming with **Prolog**

2. Machine Learning with **R**

3. Training and testing using Artificial Neural Network

Assessment:

Internal: Assessment consists of two tests out of which; one should be compulsory class test (on minimum 02 Modules) and the other is either a class test or assignment on live problems or course project.

End Semester Examination: Some guidelines for setting the question papers are as, six questions to be set each of 20 marks, out of these any four questions to be attempted by students. Minimum 80% syllabus should be covered in question papers of end semester examination.