Course Code: ITC604	Course Title: AI and DS - 1	Credit
Currently same	**AI and DS - 1**	3

1) Prerequisite:
Engineering Mathematics III (ITC301)
Data Structures and Analysis (ITC302)
Engineering Mathematics IV (ITC401)

2) Course Objectives:

1	To introduce the students' with different issues involved in trying to define and simulate intelligence.
2	To familiarize the students' with specific, well known Artificial Intelligence methods, algorithms and knowledge representation schemes.
3	To introduce students' different techniques which will help them build simple intelligent systems based on AI/IA concepts.
4	To introduce students to data science and problem solving with data science and statistics.
5	To enable students to choose appropriately from a wider range of exploratory and inferential methods for analyzing data, and interpret the results contextually.
6	To enable students to apply types of machine learning methods for real world problems.

3) Course Outcomes:

1	Develop a basic understanding of the building blocks of AI as presented in terms of intelligent agents.
2	Apply an appropriate problem-solving method and knowledge-representation scheme.
3	Apply an appropriate problem-solving method and knowledge-representation scheme.
4	Apply problem solving concepts with data science and will be able to tackle them from a statistical perspective.
5	Choose and apply appropriately from a wider range of exploratory and inferential methods for analyzing data and will be able to evaluate and interpret the results contextually
6	Understand and apply types of machine learning methods for real world problems.

4) syllabus

Module		Content	Hrs
0	Prerequisite	Nil	1
I	Introduction to AI I	Introduction: Introduction to AI, AI techniques, Problem Formulation. Intelligent Agents: Structure of Intelligent agents, Types of Agents, Agent Environments PEAS representation for an Agent. Self-Learning Topics : Identify application areas of AI	4
II	Search Techniques	Uninformed Search Techniques: Uniform cost search, Depth Limited Search, Iterative Deepening, Bidirectional search. Informed Search Methods: Heuristic functions, Best First Search, A*, Hill Climbing, Simulated Annealing. Constraint Satisfaction Problem Solving: Crypto-Arithmetic Problem, Water Jug, Graph Coloring. Adversarial Search: Game Playing, Min-Max Search, Alpha Beta Pruning. Comparing Different Techniques. Self-Learning Topics : IDA*, SMA*	9
III	Knowledge Representation using First Order Logic	Knowledge and Reasoning: A Knowledge Based Agent, WUMPUS WORLD Environment, Propositional Logic, First Order Predicate Logic, Forward and Backward Chaining, Resolution. Planning as an application of a knowledge based agent. Concepts of Partial Order planning, Hierarchical Planning and Conditional Planning. Self-Learning Topics: Repres	6
IV	Introduction to DS	Introduction and Evolution of Data Science, Data Science Vs. Business Analytics Vs. Big Data, Data Analytics, Lifecycle, Roles in Data Science Projects. Self-Learning Topics : Applications and Case Studies of Data Science in various Industries	4
V	Exploratory Data Analysis	Introduction to exploratory data analysis, Typical data formats. Types of EDA, Graphical/Non graphical Methods, Univariate/multivariate methods Correlation and covariance, Degree of freedom Statistical Methods for Evaluation including ANOVA. Self-Learning Topics: Implementation of graphical EDA methods.	8
VI	Introduction	Introduction to Machine Learning, Types of Machine	8

	to ML	Learning: Supervised (Logistic Regression, Decision Tree, Support Vector Machine) and Unsupervised (K Means Clustering, Hierarchical Clustering, Association Rules) Issues in Machine learning, Application of Machine Learning Steps in developing a Machine Learning Application. Self-Learning Topics : Real world case studies on machine learning	
		Total	**39**

5) Textbooks:	
1	Stuart Russell and Peter Norvig, Artificial Intelligence: A Modern Approach, 2nd Edition, Pearson Education
2	. Elaine Rich, Kevin Knight, Shivshankar B Nair, Artificial Intelligence, McGraw Hill, 3rd Edition.
3	Howard J. Seltman, Experimental Design and Analysis, Carnegie Mellon University, 2012/1.
6) Reference Books:	
1	Deepak Khemani, A First Course in Artificial Intelligence, McGraw Hill Publication
2	. George Lugar, AI-Structures and Strategies for Complex Problem Solving., 4/e, 2002, Pearson Education.
3	Data Science & Big Data Analytics, 1st Edition, 2015, EMC Education Services, Wiley. ISBN: 978- 1118876138
4	Tom M.Mitchell "Machine Learning" McGraw Hill

7) Internal Assessment:
Assessment consists of one)Mid Term Test of 20 marks and Continuous Assessment of 20 marks.(Total 40
Mid Term test is to be conducted when approx. 50% syllabus is completed Duration of the midterm test shall be one hour.

8) Continuous Assessment:-
Continuous Assessment **is of 20 marks.** The rubrics for assessment will be considered on approval by the subject teachers. The rubrics can be any 2 or max 4 of the following:-

Sr.no	Rubrics	Marks
1.	*Certificate course for 4 weeks or more:- NPTEL/ Coursera/ Udemy/any MOOC	10 marks
2.	GATE Based Assignment test/Tutorials etc	10 marks
3.	Participation in event/workshop/talk / competition followed by small report and certificate of participation relevant to the subject(in other institutes)	5 marks
4.	Multiple Choice Questions (Quiz)	5 marks

*For sr.no.1, the date of certification exam should be within the term and in case a student is unable to complete the certification , the grading has to be done accordingly.

9)Rubrics for slow learners:-

1.) Case study, Presentation, group discussion, technical debate on recent trends in the said course   (10 marks)

2. Project based Learning and evaluation / Extra assignment / Question paper solution   (10 marks)

3) Multiple Choice Questions (Quiz)   (5marks)

4) Literature review of papers/journals (5 marks)

5) Library related work   (5 marks)

10)Rubrics for Indirect Assessment :-

1. Mock Viva/Practical

2. Skill Enhancement Lecture

3. Extra Assignments/lab/lecture

11)End Semester Theory Examination:	
1	Question paper will be of 60 marks
2	Question paper will comprise a total of five questions
3	All question carry 20 marks
4	Any three questions out of five needs to be solved.

Sample Template for Lab Work

Lab Code	**Lab Name**	**Credit**
ITL605	DS using Python Lab	**1**

1)Prerequisite: The Lab experiments aims:	
2)Lab Objectives:	
1	To know the fundamental concepts of data science and analytics.
2	To learn data collection, preprocessing and visualization techniques for data science.
3	To Understand and practice analytical methods for solving real life problems based on Statistical analysis.
4	To learn various machine learning techniques to solve complex real-world problems.

5	To learn streaming and batch data processing using Apache Spark .
6	To map the elements of data science to perceive information.

Lab Outcomes:On successful completion, of course, learner/student will be able to:	
1	Understand the concept of Data science process and associated terminologies to solve real-world problems L1.
2	Analyze the data using different statistical techniques and visualize the outcome using different types of plots.
3	Analyze and apply the supervised machine learning techniques like Classification, Regression or Support Vector Machine on data for building the models of data and solve the problems.
4	Apply the different unsupervised machine learning algorithms like Clustering, Decision Trees, Random Forests or Association to solve the problems.
5	Design and Build an application that performs exploratory data analysis using Apache Spark
6	Design and develop a data science application that can have data acquisition, processing, visualization and statistical analysis methods with supported machine learning technique to solve the real-world problem.

4)Suggested Experiments: (minimum number of experiments to be completed can be specified)	
Sr. No.	**Name of the Experiment**
1	For the following Experiments, use any available data set or download it from Kaggle/UCI or other repositories and use Python to solve each problem. 1. Data preparation using NumPy and Pandas a. Derive an index field and add it to the data set. b. Find out the missing values.

	c. Obtain a listing of all records that are outliers according to the any field. Print out a listing of the 10 largest values for that field. d. Do the following for the any field. i. Standardize the variable. ii. Identify how many outliers there are and identify the most extreme outlier.
2	Data Visualization / Exploratory Data Analysis for the selected data set using Matplotlib and Seaborn a. Create a bar graph, contingency table using any 2 variables. b. Create normalized histogram. c. Describe what this graphs and tables indicates?
3	Data Modeling a. Partition the data set, for example 75% of the records are included in the training data set and 25% are included in the test data set. Use a bar graph to confirm your proportions. b. Identify the total number of records in the training data set. c. Validate your partition by performing a two‑sample Z‑test.
4	Implementation of Statistical Hypothesis Test using Scipy and Sci-kit learn
5	Regression Analysis a. Perform Logistic Regression to find out relation between variables. b. Apply regression Model techniques to predict the data on above dataset
6	Classification modelling a. Choose classifier for classification problem. b. Evaluate the performance of classifier.

6) Term Work:	
1	**Term Work shall consist of at least 10 Practical based on the above list, but not limited to. Also, Term work Journal must include at least 2 assignments:**

	Term Work Marks: 25 Marks (Total marks) = 15 Marks (Experiment) + 5 Marks (Assignments) + 5 Marks (Attendance)
7) Continuous assessment exam:	
1.	Timely Submission of Experiments weekwise
2.	Explanation/concept:
3.	Algorithm/implementation:
4.	Analysis
5.	Documentation/Performance: