Deccan Education Society's

Fergusson College (Autonomous), Pune

Program Specific Outcomes (PSOs) and Course Outcomes (COs) 2019-20
Department of Data Science
Programme: M.Sc. Data Science

PSO No.	Program Specific Outcomes (PSOs) Upon completion of this programme the student will be able to
PSO1	**Academic competence**: (i) Understand fundamental concepts in statistics, mathematics and Computer Science. (ii) Demonstrate an understanding of various analysis tools and software used in data science
PSO2	**Personal and Professional Competence**: (i) Apply laboratory-oriented problem solving and be capable in data visualization and interpretation. (ii) Solve case studies by applying various technologies, comparing results and analysing inferences. (iii) Develop problem solving approach and present output with effective presentation and communication skills
PSO3	**Research Competence:** (i) Design and develop tools and algorithms. (ii) Contribute in existing open sources platforms. (iii) Construct use case based models for various domains for greater Perspective
PSO4	**Entrepreneurial and Social competence :** (i) Cater to/ provide solutions particular domain specific problems by having in depth domain knowledge. (ii) Exposure to emerging trends and technologies to prepare students for industry. (iii) Develop skills required for social interaction.

FY. M.Sc. Semester I		
Title of the Course and Course Code	**Probability And Statistics (CSD4101)**	**Number of Credits: 04**
On completion of the course, the students will be able to:		**Bloom's Cognitive Level**
CO1	Describe basic features of the data.	1
CO2	Summarize the sample using different quantitative measures.	2
CO3	Apply and compare various counting techniques to analyse a particular problem.	3
CO4	Identify different forms of probability distribution for discrete and continuous data.	4
CO5	Evaluate and compute the chance of an event.	5
CO6	Build predictive models for the sample data.	6
Title of the Course and Course Code	**Applied Linear Algebra (CSD4102)**	**Number of Credits : 04**
On completion of the course, the students will be able to:		**Bloom's Cognitive Level**
CO1	Describe the concepts of vectors and linear transformations.	1
CO2	Explain linearly independent and dependent vectors.	2
CO3	Use different concepts of inner products and associated norms.	3
CO4	Explain and analyze basic algorithms for massive data problems.	4
CO5	Determine eigenvalues and eigenvectors of a given matrix and apply the concept for various methods of matrix factorization.	5
CO6	Perform different matrix operations and integrate them to solve complex data science problems.	6
Title of the Course and Course Code	**Data Structures (CSD4103)**	**Number of Credits : 04**
On completion of the course, the students will be able to:		**Bloom's Cognitive Level**
CO1	Describe the basics of python programming.	1
CO2	Explain programming constructs and apply them to build and package python modules for reusability.	2
CO3	Use various data structures to gain suitable knowledge about their implementation.	3
CO4	Compare various file handling techniques and database interactions.	4
CO5	Evaluate patterns, compile expressions and write scripts	5

| | to extract data. | |
| CO6 | Write an application to solve real life problems by applying Object-Oriented principles. | 6 |

Title of the Course and Course Code	**Database Management System (CSD4104)**	**Number of Credits : 04**
On completion of the course, the students will be able to:		**Bloom's Cognitive Level**
CO1	Describe different concepts of database management systems.	1
CO2	Discuss structure of relational databases and apply relational operations on it.	2
CO3	Apply the basic and advanced concepts of SQL language to solve the queries in the databases.	3
CO4	Analyse database requirements and determine the entities involved in the system and their relationship.	4
CO5	Compare traditional relational databases and NoSQL stores and explain types of NoSQL database.	5
CO6	Write the queries to implement different functionalities of SQL language.	6

Title of the Course and Course Code	**Data Science Practical - I (R Programming) (CSD4105)**	**Number of Credits : 04**
On completion of the course, the students will be able to:		**Bloom's Cognitive level**
CO1	Describe concepts of Data Science and its specialised branches. State the use of the R and R-Studio's interactive environment.	1
CO2	Illustrate fundamentals of R language.	2
CO3	Apply the data manipulation and transformation techniques to prepare data for further processing.	3
CO4	Analyze the nature of data with help of statistical methods, different tools and visualization techniques.	4
CO5	Evaluate various techniques and communicate observations.	5
CO6	Write R scripts to solve complex business problems from different domains.	6

Title of the Course and Course Code	**Data Science Practical - II (Data Structures and RDBMS) (CSD4106)**	**Number of Credits : 04**
On completion of the course, the students will be able to:		**Bloom's Cognitive level**
CO1	Identify the concepts of Data structures and RDBMS to design solutions for different types of problems.	1

CO2	Explain the use of data structures and stored functions, views.	2
CO3	Apply different concepts of data structures and write programs	3
CO4	Analyse/explain database application scenarios in the form of E-R and transform the ER-model to relational tables.	4
CO5	Test and validate the outputs of Data structures programs and SQL queries.	5
CO6	Write SQL queries to implement DDL, DML commands on relational databases to create and manipulate the table data.	6

F.Y. M.Sc.   Semester II

Title of the Course and Course Code	Statistical Inference (CSD4201)	Number of Credits : 04
On completion of the course, the students will be able to:		**Bloom's Cognitive level**
CO1	Identify sampling methods from the pattern of the observed data.	1
CO2	Predict the future behaviour of the time series data.	2
CO3	Predict different models of forecasting of time series data.	3
CO4	Analyze sample data and identify the parameters and their probability distributions.	4
CO5	Validate the hypothesis to ensure that the entire research process remains scientific and reliable.	5
CO4	Hypothesize and test an assumption regarding population parameters using sample data.	6

Title of the Course and Course Code	Mathematical Foundation (CSD4202)	Number of Credits : 04
On completion of the course, the students will be able to:		**Bloom's Cognitive level**
CO1	Describe the basics of mathematical foundations to deal with high-dimensional data.	1
CO2	Distinguish stochastic process for continuous or discrete time and state space.	2
CO3	Implement and apply machine learning algorithms.	3
CO4	Integrate the knowledge of SVD to find the best k-dimensional subspace.	4
CO5	Evaluate different ways to implement Markov Chains models in various applications.	5
CO6	Construct better and efficient Machine Learning algorithms based on mathematical knowledge.	6

Title of the Course and Course Code	Machine Learning (CSD4203)	Number of Credits : 04
On completion of the course, the students will be able to:		Bloom's Cognitive level
CO1	Define a problem to find appropriate solutions in the field of data science and other interdisciplinary areas.	1
CO2	Classify and explain machine learning techniques to solve real world problems.	2
CO3	Apply various classification algorithms and examine their performance.	3
CO4	Analyze various techniques of machine learning.	4
CO5	Evaluate performance of machine learning models by using various performance evaluation parameters.	5
CO6	Construct use case based models by analyzing datasets from various domains.	6

Title of the Course and Course Code	Design and Analysis of Algorithms (CSD4204)	Number of Credits : 04
On completion of the course, the students will be able to:		Bloom's Cognitive level
CO1	Define algorithms and its properties.	1
CO2	Differentiate between types of algorithms based on problem solving approach.	2
CO3	Demonstrate major algorithms and data structures.	3
CO4	Analyse the asymptotic performance of algorithms.	4
CO5	Evaluate and select algorithmic design paradigms and methods of analysis.	5
CO6	Develop analytical and problem-solving skills to design algorithms.	6

Title of the Course and Course Code	Soft Computing (CSD4205)	Number of Credits : 04
On completion of the course, the students will be able to:		Bloom's Cognitive level
CO1	Outline different basics and techniques of soft computing and its importance.	1
CO2	Interpret the concept of fuzzy logic and its importance.	2
CO3	Apply ANN or GA techniques in various scenarios to solve different kinds of problems and the fuzzification process to handle the veuness in real world data.	3
CO4	Discriminate the soft computing techniques on the basis of applications.	4
CO5	Evaluate the goodness measure of the soft computing techniques by comparing it with other techniques.	5

CO6	Formulate the combination of one or more soft computing techniques to generate a more optimized solution.	6

Title of the Course and Course Code	Data Science Practical - III (Machine Learning using R) (CSD4207)	Number of Credits : 04
On completion of the course, the students will be able to:		**Bloom's Cognitive level**
CO1	Define real world problem statements by performing data interpretation.	1
CO2	Represent large scale data using data visualization techniques in R.	2
CO3	Interpret the data using data pre-processing techniques in machine learning	3
CO4	Analyze different machine learning models to get better accuracy and results.	4
CO5	Evaluate performance of machine learning algorithms using performance metrics.	5
CO6	Construct models using machine learning algorithms and compare the results.	6

Title of the Course and Course Code	Data Science Practical - IV (Python for Data Science) (CSD4208)	Number of Credits : 04
On completion of the course, the students will be able to:		**Bloom's Cognitive level**
CO1	Define various validation curve techniques.	1
CO2	Exemplify the numerical computation with "Numpy" library.	2
CO3	Apply data transformation and data manipulation operations using "pandas".	3
CO4	Analyze nature of data with help of different tools and visualization techniques.	4
CO5	Assess Text Data processing techniques.	5
CO6	Write a script, follow data pipelining, transform data, build model and measure model accuracy and communicate observations.	6

S.Y. M.Sc.   Semester III

Title of the Course and Course Code	Optimization Techniques (CSD5301)	Number of Credits : 04
On completion of the course, the students will be able to:		**Bloom's Cognitive level**
CO1	Identify the role of linear programming problem solving skills in real life business models.	1
CO2	Distinguish between transportation problems and assignment problems and identify the importance of their applications.	2

CO3	Apply various tools to implement different optimization methods.	3
CO4	Analyze and appreciate a variety of performance measures for various optimization problems.	4
CO5	Validate mathematical minima/maxima problems into optimization framework.	5
CO6	Create efficient computational procedures to solve optimization problems.	6

Title of the Course and Course Code	Emerging Trends in Data Science (CSD5302)	Number of Credits : 04
On completion of the course, the students will be able to:		**Bloom's Cognitive level**
CO1	Outline different terms and concepts in Data science.	1
CO2	Explain the importance of different steps in data processing to get the desired result.	2
CO3	Implement different models and concepts in Data Science.	3
CO4	Analyze different visualizations to display the result.	4
CO5	Measure and test the performance of different models in different domains.	5
CO6	Develop and deploy models to solve different problems.	6

Title of the Course and Course Code	Deep Learning (CSD5303)	Number of Credits : 04
On completion of the course, the students will be able to:		**Bloom's Cognitive level**
CO1	Identify different techniques in deep learning and describe their importance and application ranges.	1
CO2	Discuss the deep learning techniques.	2
CO3	Implement the algorithms in deep learning and apply the knowledge in various domains.	3
CO4	Analyze the different types of data and map suitable techniques that suit the data.	4
CO5	Assess and criticize the model developed on the basis of different performance measures.	5
CO6	Build an optimized and efficient model to solve the problem statement.	6

Title of the Course and Course Code	Data Science Case Studies (CSD5304)		Number of Credits : 04
On completion of the course, the students will be able to:			**Bloom's Cognitive level**
CO1	Define steps for solving case studies of different domains.		1
CO2	Illustrate analytical tool's features for problem solving, filtering data and visualization.		2
CO3	Apply the data manipulation and transformation techniques to prepare data ready for processing.		3
CO4	Analyze data with the help of visualization and predict results.		4
CO5	Evaluate model performance and communicate results.		5
CO6	Build a comprehensive end to end project.		6

Title of the Course and Course Code	Artificial Intelligence (CSD5305)		Number of Credits : 04
On completion of the course, the students will be able to:			**Bloom's Cognitive level**
CO1	Describe an overview of artificial intelligence (AI) principles and approaches.		1
CO2	Discuss the various building blocks of AI.		2
CO3	Apply AI techniques to different real world problems and games.		3
CO4	Analyze, categorize the given search problem and write an algorithm for it.		4
CO5	Compare various methods for knowledge representation and select the optimized one.		5
CO6	Build the capability to represent various real life problem domains using logic based techniques to perform inference or planning.		6

Title of the Course and Course Code	Data Science Practical – V (Deep Learning) (CSD5307)	Number of Credits : 04
On completion of the course, the students will be able to:		**Bloom's Cognitive level**
CO1	Describe concepts of deep learning.	1
CO2	Discuss and compare the functionalities of various frameworks e.g. Pytorch and Tensorflow.	2
CO3	Apply neural networks (e.g. CNN, RNN etc.) in problem solving.	3
CO4	Analyze different unstructured data sets and solve them using classification techniques.	4
CO5	Evaluate model performance based on accuracy, tuning and hyper parameters.	5
CO6	Construct Deep learning models to solve real life problems.	6

Title of the Course and Course Code	Data Science Practical - VI (Project) (CSD5308)	Number of Credits : 04
On completion of the course, the students will be able to:		Bloom's Cognitive level
CO1	Identify and define problem statements.	1
CO2	Exemplify the software development life cycle of the project.	2
CO3	Solve problem statements by using different tools and techniques.	3
CO4	Analyze the gap between specifications defined, developed functionality and code quality.	4
CO5	Evaluate accuracy and efficiency of the model.	5
CO6	Build a comprehensive end to end project.	6

S.Y. M.Sc.   Semester IV

Title of the Course and Course Code	Industrial Training (CSD5401)	Number of Credits : 08
On completion of the course, the students will be able to:		Bloom's Cognitive level
CO1	Identify and describe the building blocks for solving problem statement.	1
CO2	Explain the organizational structure of the company and summarize the tools and technologies used in the real world.	2
CO3	Solve problem statements by applying acquired knowledge.	3
CO4	Analyze different ways to approach a problem and design solution. Integrate the actual work culture of the I.T. industry.	4
CO5	Evaluate the various approaches based on accuracy and efficiency.	5
CO6	Build a comprehensive end to end project.	6