DEPARTMENT OF INFORMATION TECHNOLOGY:: VRSEC

M.TECH-23 REGULATIONS CO-PO MAPPING

Course Code	Course Name	CO	Course outcomes	PO1	PO2	PO3	PO4	PO5
23ITDS1001	**Mathematical Foundations For Data Science**							
		CO1	Understand basic mathematical concepts like calculus and linear algebra	1			3	
		CO2	Derive the probability mass and density functions of transformation of random variables				3	
		CO3	Apply the mathematical and probabilistic foundations of statistical inference in computing	2			2	1
		CO4	Interpret the results of Regression and Correlation Analysis, for forecasting , perform analysis of variance	1		1	1	2
23ITDS1002	**Advanced Data Structures**							

	And Algorithms							
		CO1	Analyze the time and space complexity of the algorithms	3	3		3	
		CO2	Experiment with Tree structures to solve the problems		3		3	3
		CO3	Develop algorithms using Graph structure to solve real-life problems		3		3	3
		CO4	Apply suitable data structure and design strategy to solve computing problems		3		3	3
23ITDS1003	**Machine Learning**							
		CO1	Summarize the fundamental concepts of machine learning				1	
		CO2	Apply linear, distance based, and decision tree based models for a given scenario	1			2	1
		CO3	Analyze probabilistic, neural network models	1			2	1
		CO4	Design a suitable machine learning model for a real world application	2		1	3	2
23ITDS1014A	**Statistics With R**							

		CO1	Demonstrate The Semantics, Data Handling And Control Statements In R.			1		
		CO2	Apply Data Manipulation Techniques And Linear, Nonlinear Models On The Given Datasets.	1		2	3	
		CO3	Analyze The Relationship Among Data Attributes With Appropriate Techniques.	3		2	3	
		CO4	Construct Suitable Plots Using Data Visualizations In R For The Given Application.				3	
23ITDS1014B	**Advanced Java Programming**							
		CO1	Understand features of Spring Boot, Spring Framework, Spring cloud and process involved to connect to Java Database Connectivity	2		2	2	1
		CO2	Apply concepts of Servlets to develop server side applications	2		1	2	
		CO3	Design web applications with Spring Boot Annotations and connecting to	2		2	2	2

			JPA with Spring MVC and Spring Boot					
		CO4	Develop Representational State Transfer services in Spring Boot applications Understand Object Oriented Programming and threads concepts in Java.	2		2	2	
23ITDS1014C	**Data Analysis With Python**							
		CO1	Illustrate the fundamental concepts of Python for data analysis.	1				
		CO2	Comprehend data by assessing its characteristics, engage in data preprocessing, and data visualization techniques	2	1			
		CO3	Analyze various Python packages, including those for mathematical, scientific, and web data analysis.	2		2	3	
		CO4	Evaluate the model development process for data analysis, and performance assessment.	2	1		2	
23ITDS1015A	**Data Science For Decision Making**							

		CO1	Outline the concept of data driven decision making.	1	1	2	2	
		CO2	Apply the knowledge of data analysis to solve decision problems.	1	1		2	
		CO3	Identify appropriate courses of action for a given managerial situation whether a problem or an opportunity	1	1	2		2
		CO4	Design viable solutions to decision making problems.	2	1		2	1
23ITDS1015B	**Cloud Data Engineering**							
			Summarize the needs to migrate databases onto the cloud systems			2		
			Identify data management in the cloud system to minimize risks of data loss and improper data handling.		1	2		
			Apply the cloud features to protect systems on the network	1	1	1		

			Analyse the impact of using cloud data systems and its migration		1	2		
23ITDS1015C	**Cyber Security&Forensics**							
			Categorize various types of attacks in Information security		1			1
			Apply data leakage prevention, protection and security policies on data	1			2	
			Explore the role of Digital Forensics and its readiness planning in investigation Process	3		1	1	1
			Analyze First Responder Procedure through Computer Forensics Investigation Process		2	2		
23MTMC1026	**Research Methodology And IPR**					2		
		CO1	Acquire an overview of the research methodology andtechniquesto define research problem		1	2		
		CO2	Review the literature and identify the	1	1	1		

			problem.					
		CO3	Analyze the optimum sampling techniques for collected data.		1	2		
		CO4	Apply various forms of the intellectual properties for research work.			2		
23ITDS1051	**Advanced Data Structures And Algorithms Lab**				1	2		
		CO1	Implement operations on tree data structures.	2				
		CO2	Perform operations on balanced data structures	2				
		CO3	Apply graph data structure to solve real world problems	2				
		CO4	Design an optimal solution using appropriate data structures and design techniques	3		2		
23ITDS1052A	**Statistics With R Lab**							
		CO1	Interpret different types of data manipulation and group manipulation			2		

			operations					
		CO2	Apply data visualizations tools to displaypatterns and insights of data.					3
		CO3	Build classification and regression models in R	1			3	
		CO4	Develop solutions to data analysis problems using statistical techniques	1		2		
23ITDS1052B	**Advanced Java Programming Lab**							
		CO1	Implement Java Database Connectivity Application Programming Interface to connect to relational databases	2		2		
		CO2	Build server side applications to interact with server using Java Servlets	2		2		3
		CO3	Implement dependency injection and inversion of control to solve problems in Spring Boot.	2		2	3	
		CO4	Create Spring Boot applications to solve real world problems that uses Representational State Transfer services	2		2		

23ITDS1052C	**Data Analysis With Python Lab**							
		CO1	Demonstrate competence in decision control, string handling, list manipulation, and object-oriented design.			2		
		CO2	Apply data analysis skills to glean insights from diverse datasets.					3
		CO3	Analyze web data critically to derive actionable business insights.	1			3	
		CO4	Create innovative data solutions, employing advanced processing and visualization techniques.	1		2		
		CO5	Evaluate data quality and reliability critically, cultivating discernment and data-driven decision-making for informed outcomes.					
23ITDS1052B	**Advanced Java Programming Lab**							
		CO1	Implement Java Database Connectivity Application Programming Interface to connect to relational databases	2		2		

		CO2	Build server side applications to interact with server using Java Servlets	2		2		3
		CO3	Implement dependency injection and inversion of control to solve problems in Spring Boot.	2		2	3	
		CO4	Create Spring Boot applications to solve real world problems that uses Representational State Transfer services	2		2		
23ITDS1052C	**Data Analysis With Python Lab**							
		CO1	Demonstrate competence in decision control, string handling, list manipulation, and object-oriented design.	2				
		CO2	Apply data analysis skills to glean insights from diverse datasets.	2			2	
		CO3	Analyze web data critically to derive actionable business insights.	3		2	2	
		CO4	Create innovative data solutions, employing advanced processing and visualization techniques.	3		2	2	3

		CO5	Evaluate data quality and reliability critically, cultivating discernment and data-driven decision-making for informed outcomes.	3		2	2	3
23ITDS2001	**Bigdata Framework For Data Science**							
		CO1	Summarize Big Data Characteristics, Hadoop, Hive, Hdfs And Map Reduce Architectures.	2		1		3
		CO2	Experiment With Nosql Databases To Process Unstructured And Semi Structured Data.	2		1		3
		CO3	Apply Pig Latin, Hive Scripts And Map Reduce Programming On Real Time Applications.	2		1		3
		CO4	Perform In-Memory Data Analytics With Spark And Spark Streaming.	2		1		3
23ITDS2002	**Deep Learning**							
		CO1	summarize basic concepts of neural networks, back propagation, Attention mechanisms			1		

		CO2	Apply ANN, CNN, Auto encoders and GANs on image processing applications	2		1	2	
		CO3	Design a suitable RNN model for time series applications	2		1	2	
		CO4	Create a suitable intelligent model for the given application	3		2	3	
23ITDS2003	**Data Visualization And Interpretation**							
		CO1	Articulate objectives of Data Visualization and techniques	`			1	1
		CO2	Analyze data to create a visualization for various real-time applications	1				2
		CO3	Develop programs and map visual layouts & graphical properties.			2		2
		CO4	Create and publish visualizations that enable clear interpretations of big, complex and real world data	2			3	3
23ITDS2014A	**Business Analytics And Modelling**							
			Understand the foundational concepts	1		2	2	2

			in business analytics, encompassing the evolution, scope, and models.					
			Analyze and model probability distributions, enabling them to make informed decisions based on various types of data.	1			2	2
			Develop appropriate forecasting techniques, demonstrating an ability to analyze time series data and implement statistical models for accurate predictions.	2			2	2
			Integrate optimization methods and decision analysis for solving complex business problems by applying linear optimization and decision-making strategies.	3		2	3	3
23ITDS2014B	**Image And Video Analytics**							
			Illustrate the principles and techniques of digital image in applications related to digital imaging system					1
			Understand various image preprocessing techniques and their				1	1

			significance.					
			Analyze various standard deep learning networks for real time applications.	2				2
			Understand the fundamentals of digital video processing	1			1	1
23ITDS2014C	**Natural Language Processing**							
			Apply Pre-Processing Techniques On Text Data.	1			2	1
			Solve NLP Problems Using Probabilistic Language Models	3			3	2
			Analyze Linguistic Structure In Text, Using Parsing And CFG				1	3
			Construct Syntactic And Semantics Structures For A Given Sentence			2	3	3
			Apply Pre-Processing Techniques On Text Data.	1			2	1
23ITDS2015A	**Web Mining And Social Network Analysis**							
			Apply graph basics to analyze the social media data and measure the	2	1	3	2	2

			network measures					
			Derive the similarities of people in the society and find the communities in the society.	3	1	3	2	2
			Generate recommendations, social recommendations and evaluate recommendations.	3	1	3	2	2
			Measuring influence and homophily, Analyze the individual behavior and collective behavior	2	1	3	2	2
23ITDS2015B	**Optimization Techniques For Data Analysis**							
			Summarize various techniques used for optimization problems arising from engineering areas.	3			3	1
			Analyze optimization algorithms for Linear Programming problems	2			2	
			Solve various constrained and unconstrained nonlinear programming problems	2			2	
			Apply modern and multi objective optimization techniques to provide	3			2	3

			optimal solution for real time problems					
23ITDS2015C	**Information Retrieval Systems**							
			Interpret the basic concepts and techniques in Information Retrieval	`			1	1
			Evaluate information retrieval system performance and queries formulation	1				2
			Infer relevance feedback and query operations on a text database			2		2
			Analyze the web characterization, web search tasks. and digital libraries implications	2			3	3
23MTAC2036	**Technical Report Writing**							
		CO1	Understand the significance of Technical Report Writing.		3			
		CO2	Develop proficiency in writing technical reports.		3			
		CO3	Apply the basic principles to prepare documentation using LATEX.		3			

		CO4	Understanding the need of Bibliography and Reference Books for quality report writing		3			
23ITDS2051	**Big Data Lab**							
			Implement Hdfs And Map Reduce Paradigm For Batch Oriented Applications.	2		1		3
			Apply NoSQL Concepts To Store And Process Varieties Of Data.	3		1		3
			Solve Data Intensive Problems Using Pig Latin And Hive.	3		1		3
			Develop Solutions For Real Time Problems Using Spark.	3		1		3
23ITDS2052	**Data Visualization Lab**							
			Understand the visualization pipeline with its relationship to other data	`			1	1
			Design considerations for the components of the good visualization	1				2

			Construct visualizations for different attributes and showcase them in plots, interpret using R/Python			2		2
			Construct visualizations for effective data analysis	2			3	3
23ITDS2063	**Term Paper**							
		CO1	Identify real world problems related to Data Science area					
		CO2	Analyse the problems from its state of the art for arriving at feasible solutions	3			1	
		CO3	Prepare an organized report employing elements of technical writing & critical thinking		2			
		CO4	Summarize and communicate the content to audience in an effective manner		2			
23ITDS3061	**Project Part-A**							
		CO1	Identify a topic in relevant areas of Data Science	2				

		CO2	Review literature to identify gaps and define objectives & scope of the project	2		1	1	
		CO3	Apply appropriate research methodology to provide a solution to the chosen problem	3		3	2	1
		CO4	Prepare a technical report effectively using modern tools		3			
23ITDS4061	**Project Part-B**							
		CO1	Identify methods and resources to carry out analysis and experiments	2			1	
		CO2	Reorganize the procedures with a concern for society, environment and ethics	1		1	1	
		CO3	Generate possible alternative solutions to chosen problem, compare, analyze them and derive performance metrics of the result	3		2	3	2
		CO4	Prepare a comprehensive report of the project work and also explore the possibility of publishing the work.		3	2		2