Teerthanker Mahaveer University
College of Computing Sciences & IT

B.Tech. (Computer Sciences and Engineering)
Data Science (In collaboration with i-Nurture)

Programme Outcome

PO-1	**:**	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO-2	**:**	Problem analysis& Solving: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO-3	**:**	Design/development of solutions: 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.
PO-4	**:**	Conduct investigations of complex problems: 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.
PO-5	**:**	Modern tool usage: 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.
PO-6	**:**	Social Interaction & effective citizenship: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO-7	**:**	Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO-8	**:**	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO-9	**:**	Attitude (Individual and team work): Function effectively as an individual, and as member or leader in diverse teams, and in multidisciplinary settings.
PO-10	**:**	Communication: 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 clean instructions.
PO-11	**:**	Project management and finance: 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.
PO-12	**:**	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.
PO-13	**:**	Entrepreneurship: An Entrepreneurship cut across every sector of human life including the field of engineering, engineering entrepreneurship is the process of harnessing the

		business opportunities in engineering and turning it into profitable commercially viable innovation.
PO-14	**:**	Interpersonal skills: Interpersonal skills involve the ability to communicate and build relationships with others. Effective interpersonal skills can help the students during the job interview process and can have a positive impact on your career advancement.
PO-15	**:**	Technology savvy/usage: Being technology savvy is essentially one‟s skill to be smart with technology. This skill reaches far beyond „understanding‟ the concepts of how technology works and encompasses the „utilization‟ of such modern technology for the purpose of enhancing productivity and efficiency.

Programme Specific Outcome

PSO-1	**:**	Understanding Data Science concepts, techniques & tools used in IT industry
PSO-2	**:**	Applying the knowledge of programming skills to create applications in the field of Data Science.
PSO-3	**:**	Implementing different machine learning algorithms on different data sets.
PSO-4	**:**	Developing Big Data solutions for real life scenario.

Course Outcomes

EAS116	**CO-1**	Understanding the concepts of eigenvalues and eigenvectors, Optimization & derivatives of functions of several variables, partial and total differentiation, implicit functions
	CO-2	Understanding the concepts of curl and divergence of vector field.
	CO-3	Understanding of Green‟s theorem, Gauss Theorem, and Stokes theorem.
	CO-4	Applying the concept of Leibnitz‟s theorem for successive derivatives.
	CO-5	Analyzing the intangibility of a differential equation to find the optimal solution of first order first degree equations.
	CO-6	Evaluating the double integration and triple integration using Cartesian, polar co-ordinates and the concept of Jacobian of transformation.
EAS112	**CO-1**	Understanding the basic concepts of interference, diffraction and polarisation.
	CO-2	Understanding the concept of bonding in solids and semiconductors.
	CO-3	Understanding the special theory of relativity.
	CO-4	Applying special theory of relativity to explain the phenomenon of length contraction, time dilation, mass-energy equivalence etc.
	CO-5	Applying the concepts of polarized light by the Brewster‟s and Malus Law
EAS113	**CO-1**	Understanding the concept of softening & purification of water.
	CO-2	Understanding calorific value& combustion, analysis of coal, Physical & Chemical properties of hydrocarbons & quality improvements.
	CO-3	Understanding the concept of lubrication, Properties of Refractory & Manufacturing of cements.
	CO-4	Applying the concepts of the mechanism of polymerization reactions, Natural and synthetic rubber& vulcanization.
	CO-5	Applying the concepts of spectroscopic & chromatographic techniques
EEE117	**CO-1**	Understanding the basics of Network, AC Waveform and its

		characteristics.
	CO-2	Understanding the basic concept of Measuring Instruments, Transformers & three phase Power systems.
	CO-3	Understanding the basic concepts of Transformer.
	CO-4	Understanding the basic concept of power measurement using two wattmeter methods.
	CO-5	Applying the concept of Kirchhoff‟s laws and Network Theorems to analyze complex electrical circuits.
EEC111	**CO-1**	Understanding the concepts of electronic components like diode, BJT & FET.
	CO-2	Understanding the applications of pn junction diode as clipper, clamper, rectifier & regulator whereas BJT & FET as amplifiers
	CO-3	Understanding the functions and applications of operational amplifier-based circuits such as differentiator, integrator, and inverting, non-inverting, summing & differential amplifier.
	CO-4	Understanding the concepts of number system, Boolean algebra and logic gates
	CO-5	Applying the knowledge of series, parallel and electromagnetic circuits.
TMU101	**CO-1**	Understanding environmental problems arising due to constructional and developmental activities.
	CO-2	Understanding the natural resources and suitable methods for conservation of resources for sustainable development.
	CO-3	Understanding the importance of ecosystem and biodiversity and its conservation for maintaining ecological balance.
	CO-4	Understanding the types and adverse effects of various environmental pollutants and their abatement devices.
	CO-5	Understanding Greenhouse effect, various Environmental laws, impact of human population explosion, environment protection movements, different disasters and their management.
TMUGE101	**CO-1**	Remembering and understanding of the basic of English grammar and vocabulary.
	CO-2	Understanding of the basic Communication process.
	CO-3	Applying correct vocabulary and tenses in sentences construction.
	CO-4	Analyzing communication needs and developing communication strategies using both verbal & non-verbal method.
	CO-5	Drafting applications in correct format for common issues.
	CO-6	Developing self-confidence.
EAS162	**CO-1**	Understanding of the operation of various model of optical devices.
	CO-2	Understanding types of Semiconductors using Hall experiments.
	CO-3	Applying the concept of interference, polarization & dispersion in optical devices through Newton’s ring, Laser, polarimeter & spectrometer.
	CO-4	Applying the concept of resonance to determine the AC frequency using sonometer & Melde’s apparatus.
	CO-5	Applying the concept of resolving & dispersive power by a prism.
EAS163	**CO-1**	Understanding the concepts of Hardness of water.
	CO-2	Analyzing & estimating of various parameters of water
	CO-3	Analyzing of Calorific value of Solid fuel by Bomb calorimeter & Liquid

		Fuels by Junkers Gas Calorimeter.
	CO-4	Analyzing of open & closed Flash point of oil by Cleveland & Pensky's Martens apparatus.
	CO-5	Analyzing of viscosity of lubricating oil using Redwood Viscometer.
EEE161	**CO-1**	Understanding the concepts of Kirchoff & Voltage law.
	CO-2	Understanding the concepts of Thevenin & Norton theorem.
	CO-3	Analyzing the energy by a single-phase energy meter.
	CO-4	Analyzing the losses and efficiency of Transformer on different load conditions.
	CO-5	Analyzing the electrical circuits using electrical and electronics components on bread board.
EEC161	**CO-1**	Understanding the implementation of diode-based circuits.
	CO-2	Understanding the implementation of Operational amplifier-based circuits.
	CO-3	Analyzing the characteristics of pn junction diode & BJT.
	CO-4	Analyzing the different parameters for characterizing different circuits like rectifiers, regulators using diodes and BJTs.
	CO-5	Analyzing the truth tables through the different type's adders.
EME161	**CO-1**	Understanding the concepts of Engineering Drawing.
	CO-2	Understanding how to draw and represent the shape, size & specifications of physical objects.
	CO-3	Applying the principles of projection and sectioning.
	CO-4	Applying the concepts of development of the lateral surface of a given object.
	CO-5	Creating isometric projection of the given orthographic projection.
EME162	**CO-1**	Understanding the concepts to prepare simple wooden joints using wood working tools.
	CO-2	Applying the techniques to produce fitting jobs of specified dimensions.
	CO-3	Applying the concepts to prepare simple lap, butt, T and corner joints using arc welding equipment.
	CO-4	Applying the concepts of black smithy and lathe machine to produce different jobs.
	CO-5	Creating core and moulds for casting.
EAS211	**CO-1**	Understanding the concepts of the wave, diffusion and Laplace equations & Fourier series.
	CO-2	Understanding the methods of separation of variables
	CO-3	Understanding the concepts of Fourier series' representation of single variable function.
	CO-4	Applying Laplace transform to determine the complete solutions of linear ODE
	CO-5	Applying the method of variations of parameters to find solution of equations with variable coefficients.
EAS212	**CO-1**	Understanding the basic concepts of interference, diffraction and polarisation.
	CO-2	Understanding the concept of bonding in solids and semiconductors.
	CO-3	Understanding the special theory of relativity.
	CO-4	Applying special theory of relativity to explain the phenomenon of length

		contraction, time dilation, mass-energy equivalence etc.
	CO-5	Applying the concepts of polarized light by the Brewster's and Malus Law
EAS213	**CO-1**	Understanding the concept of softening & purification of water.
	CO-2	Understanding calorific value& combustion, analysis of coal, Physical & Chemical properties of hydrocarbons & quality improvements.
	CO-3	Understanding the concept of lubrication, Properties of Refractory & Manufacturing of cements.
	CO-4	Applying the concepts of the mechanism of polymerization reactions, Natural and synthetic rubber& vulcanization.
	CO-5	Applying the concepts of spectroscopic & chromatographic techniques.
EEE217	**CO-1**	Understanding the basics of Network, AC Waveform and its characteristics.
	CO-2	Understanding the basic concept of Measuring Instruments, Transformers & three phase Power systems.
	CO-3	Understanding the basic concepts of Transformer.
	CO-4	Understanding the basic concept of power measurement using two wattmeter methods.
	CO-5	Applying the concept of Kirchhoff's laws and Network Theorems to analyze complex electrical circuits
EEC211	**CO-1**	Understanding the concepts of electronic components like diode, BJT & FET.
	CO-2	Understanding the applications of pn junction diode as clipper, clamper, rectifier & regulator whereas BJT & FET as amplifiers
	CO-3	Understanding the functions and applications of operational amplifier-based circuits such as differentiator, integrator, and inverting, non-inverting, summing & differential amplifier.
	CO-4	Understanding the concepts of number system, Boolean algebra and logic gates.
	CO-5	Applying the knowledge of series, parallel and electromagnetic circuits.
IDS201	**CO-1**	Understanding the concept of Problem solving.
	CO-2	Understanding the use of basic concepts involved in Computer Programming.
	CO-3	Understanding the concepts of design, implement, test, debug and document programs in C.
	CO-4	Understanding the concepts of various function in C and its application
	CO-5	Applying various programming concepts to design an application.
TMUGE201	**CO-1**	Remembering & understanding the basics of English Grammar and Vocabulary
	CO-2	Understanding the basics of Listening, Speaking & Writing Skills.
	CO-3	Applying correct vocabulary and grammar in sentence construction while writing and delivering presentations
	CO-4	Analyzing different types of listening, role of Audience & Locale in presentation
	CO-5	Drafting Official Letters, E-Mail & Paragraphs in correct format.
EAS262	**CO-1**	Understanding of the operation of various models of optical devices.
	CO-2	Understanding types of Semiconductors using Hall experiments.
	CO-3	Applying the concept of interference, polarization & dispersion in optical

		devices through Newton's ring, Laser, polarimeter & spectrometer.
	CO-4	Applying the concept of resonance to determine the AC frequency using sonometer & Melde's apparatus.
	CO-5	Applying the concept of resolving & dispersive power by a prism.
EAS263	**CO-1**	Understanding the concepts of Hardness of water.
	CO-2	Analyzing & estimating of various parameters of water.
	CO-3	Analyzing of Calorific value of Solid fuel by Bomb calorimeter & Liquid Fuels by Junkers Gas Calorimeter.
	CO-4	Analyzing of open & closed Flash point of oil by Cleveland & Pensky's Martens apparatus.
	CO-5	Analyzing of viscosity of lubricating oil using Redwood Viscometer.
EEE261	**CO-1**	Understanding the concepts of Kirchoff & Voltage law.
	CO-2	Understanding the concepts of Thevenin & Norton theorem.
	CO-3	Analyzing the energy by a single-phase energy meter.
	CO-4	Analyzing the losses and efficiency of Transformer on different load conditions.
	CO-5	Analyzing the electrical circuits using electrical and electronics components on bread board.
EEC261	**CO-1**	Understanding the implementation of diode-based circuits.
	CO-2	Understanding the implementation of Operational amplifier-based circuits.
	CO-3	Analyzing the characteristics of pn junction diode & BJT.
	CO-4	Analyzing the different parameters for characterizing different circuits like rectifiers, regulators using diodes and BJTs.
	CO-5	Analyzing the truth tables through the different type's adders.
EME261	**CO-1**	Understanding the concepts of Engineering Drawing
	CO-2	Understanding how to draw and represent the shape, size & specifications of physical objects
	CO-3	Applying the principles of projection and sectioning.
	CO-4	Applying the concepts of development of the lateral surface of a given object.
	CO-5	creating isometric projection of the given orthographic projection.
IDS251	**CO-1**	Understanding the basic terminology used in computer programming
	CO-2	Understanding the various concept of function in C programming.
	CO-3	Understanding the concepts of dynamic memory management.
	CO-4	Applying different data types to create C computer program.
	CO-5	Implementing the various concepts of decision structures, loops and functions in C programming.
EME262	**CO-1**	Understanding the concepts to prepare simple wooden joints using wood working tools.
	CO-2	Applying the techniques to produce fitting jobs of specified dimensions.
	CO-3	Applying the concepts to prepare simple lap, butt, T and corner joints using arc welding equipment.
	CO-4	Applying the concepts of black smithy and lathe machine to produce different jobs.
	CO-5	Creating core and moulds for casting.
IDS301	**CO-1**	Understanding the overview and definition of Data Science with its crucial

		role in current business world.
	CO-2	Understanding the importance of mathematics & Statistics in Data Science.
	CO-3	Understanding the role of machine learning techniques in Data Science and its different types
	CO-4	Understanding the integrated role of computers and its components in Data Science
	CO-5	Understanding the flow and process model of data science project management.
IDS302	**CO-1**	Understanding the basic concepts of statistics and probability.
	CO-2	Understanding the description of data using statistical techniques.
	CO-3	Understanding the statistical methods involved in hypothesis testing.
	CO-4	Understanding the difference between parametric and non-parametric tests
	CO-5	Understanding the concepts of regression and correlation analysis.
EECS302	**CO-1**	Understanding basic data structures such as arrays, linked lists, stacks and queue.
	CO-2	Analyzing the time and space complexities of algorithms.
	CO-3	Understanding the concept of linked list.
	CO-4	Understanding Non-linear Data Structures such as trees.
	CO-5	Understanding Algorithm for solving problems like sorting, searching, insertion and deletion of data.
IDS304	**CO-1**	Understanding the register transfer and micro-operation.
	CO-2	Understanding the basic computer organization.
	CO-3	Identifying the various modes of data transfer.
	CO-4	Understanding the system architecture of multiprocessor and multicomputer
	CO-5	Classifying the memory organization and I/O systems
IDS305	**CO-1**	Understanding of Java-based software code of medium-to-high complexity.
	CO-2	Understanding of the basic principles of creating Java applications with graphical user interface (GUI).
	CO-3	Understanding of the fundamental concepts of computer science: structure of the computational process, algorithms and complexity of computation.
	CO-4	Understanding the basic approaches to the design of software applications.
	CO-5	Applying various programming concepts to create a Java application
IDS306	**CO-1**	Understanding the art of public speaking and strategies of reading comprehension.
	CO-2	Understanding the essentials of effective listening and speaking
	CO-3	Applying correct vocabulary and sentence construction during public speaking or professional writing.
	CO-4	Analyzing different types of sentences like simple, compound and complex.
	CO-5	Demonstrating speaking skills during common conversation and power point presentation.

IDS351	**CO-1**	Understanding appropriate data structures as applied to specified problem definition
	CO-2	Applying various programming approaches to solve data structure problem
	CO-3	Analyzing various data structure algorithms
	CO-4	Creating appropriate searching technique for given problem
	CO-5	Creating appropriate sorting technique for given problem.
IDS352	**CO-1**	Understanding the concepts of OOPs in Java
	CO-2	Understanding the concepts abstract classes and string operations
	CO-3	Applying the various programming concepts to solve given problems
	CO-4	Creating the Applet using java programs.
	CO-5	Creating the Client Server Communication using Socket Programming
IDS353	**CO-1**	Understanding methodologies and professional way of documentation and communication.
	CO-2	Understanding about software development cycle with emphasis on different processes -requirements, design, and implementation phases.
	CO-3	Analyzing a software project and demonstrate the ability to communicate effectively in speech and writing.
	CO-4	Creating a new model over the selected field of research that will be useful for future activities.
	CO-5	Creating a project that help to gain confidence and technical knowledge.
TMUGA301	**CO-1**	Solving complex problems using Criss cross method, base method and square techniques.
	CO-2	Applying the arithmetical concepts of Average, Mixture and Allegation.
	CO-3	Evaluating the different possibilities of various reasoning based problems in series, Blood relation, Ranking and Direction.
	CO-4	Operationalizing the inter-related concept of Percentage in Profit Loss and Discount, Si/CI and Mixture/Allegation.
IDS401	**CO-1**	Understanding the history and development of Python Programming Language
	CO-2	Understanding the data structures and looping concepts in Python Programming Language.
	CO-3	Understanding the important packages and functions in Python Programming Language.
	CO-4	Understanding the importance of Python Programming Language in data wrangling or munging.
	CO-5	Analysing the impact of Python Programming Language in statistical analysis.
IDS402	**CO-1**	Understanding the important terminologies and need for sampling over complete enumeration
	CO-2	Understanding the need for learning and sampling proportion in sampling theory.
	CO-3	Understanding the concepts of mean and variance used in Data samples.
	CO-4	Understanding the concepts of systematic random sampling.
	CO-5	Applying the various data sampling method to analyze the sample data.
IDS403	**CO-1**	Understanding the basic concepts of database management system

	CO-2	Understanding the concepts DBMS and RDBMS
	CO-3	Understanding various Structure Query Languages and various Normal forms to carry out Schema refinement.
	CO-4	Understanding the concepts of various concurrency control protocols.
	CO-5	Creating Entity-Relationship Model for enterprise level databases
IDS404	**CO-1**	Understanding the fundamental concepts in Operating system
	CO-2	Understanding evolution of OS over the years and different components of OS
	CO-3	Understanding the significant functions of OS like Process management, storage and memory management etc
	CO-4	Understanding the necessary information of the OS while developing programs, working with applications and etc.
	CO-5	Analysing the different type of Operating System and their working.
IDS405	**CO-1**	Understanding the various components of Personality development
	CO-2	Understanding the importance of time management.
	CO-3	Applying the skills more effectively in team building and resolving conflicts both in personal and professional life.
	CO-4	Analyzing the various skills related to Personality Development.
	CO-5	Come out as more confident individuals with a lot of clarity and maturity in making decisions.
IDS451	**CO-1**	Understanding the database language commands to create simple database.
	CO-2	Understanding the database using queries to retrieve records.
	CO-3	Applying PL/SQL Commands for database processing.
	CO-4	Applying the JOIN, UNION and GROUPBY techniques in DBMS operation.
	CO-5	Creating solutions using database concepts for real time requirements.
IDS452	**CO-1**	Understanding various solutions to simple computational problems using Python programs.
	CO-2	Applying conditional statements and loops in Python to Solving problems.
	CO-3	Applying various ML algorithms on given data sets.
	CO-4	Creating Python programs by defining functions and calling them.
	CO-5	Creating Python lists, tuples and dictionaries for representing compound data
IDS406	**CO-1**	Understanding the data and its types for the appropriate exploratory data analysis.
	CO-2	Understanding the importance of Exploratory Data Analysis over summary statistics
	CO-3	Understanding the importance Univariate statistics in EDA
	CO-4	Applying Univariate statistical graphs for the better representation and interpretation.
	CO-5	Applying the various advanced graphs in Exploratory Data Analysis.
IDS407	**CO-1**	Understanding the important terminologies and need for sampling over complete enumeration.
	CO-2	Understanding the need for learning and sampling proportion in sampling theory
	CO-3	Understanding the mean and variance of the samples drawn using simple random sampling with and without replacement.

	CO-4	Understanding the mean and variance of the samples drawn using stratified and systematic random sampling.
	CO-5	Analyzing different type of sampling techniques.
IDS408	**CO-1**	Understanding the importance of data pre-processing for Data Analysis.
	CO-2	Understanding the concepts of graphical representation of Univariate, bivariate and multivariate data.
	CO-3	Applying data pre-processing techniques as part of data analysis.
	CO-4	Applying the suitable data aggregation function in appropriate situations.
	CO-5	Analyzing the missing value techniques and impute them using suitable techniques.
TMUGA-401	**CO-1**	Applying the arithmetical concepts in Ratio Proportion Variation
	CO-2	Employing the techniques of Percentage; Ratios and Average in inter related concepts of Time and Work, Time Speed and Distance
	CO-3	Identifying different possibilities of reasoning based problems of Syllogisms and Venn diagram
	CO-4	Examining the optimized approach to solve logs and Surds
IDS501	**CO-1**	Understanding the difference between CRISP –DM and KDD process of data mining.
	CO-2	Understanding the data pre-processing technique for the data mining project
	CO-3	Understanding the different data classification techniques and its practical use in data mining project.
	CO-4	Understanding the basic concepts of text mining and able to cluster the text using statistical programming language.
	CO-5	Understanding the basic concepts of text mining and able to cluster the text using statistical programming language.
IDS502	**CO-1**	Understanding the concepts of NoSQL databases.
	CO-2	understanding about basic principles and design criteria of NoSQL databases.
	CO-3	Understanding the concepts of different types of NoSQL databases
	CO-4	Understanding about data storage and processing techniques
	CO-5	Applying the various queries used in NoSQL databases.
IDS503	**CO-1**	Understanding the software engineering lifecycle by demonstrating competence in communication, planning, analysis, design, construction, and deployment.
	CO-2	Understanding the concepts of various software models
	CO-3	Understanding the concepts of developing quality software.
	CO-4	Applying current theories, models, and techniques that provide a basis for the software lifecycle.
	CO-5	Applying various techniques and tools necessary for engineering practice.
IDS504	**CO-1**	Understanding the concepts of Network fundamentals.
	CO-2	Understanding the basics of Network Devices and their uses.
	CO-3	Understanding the concepts of various Network Layers and its importance.
	CO-4	Understanding the various Network Technologies and Topologies.
	CO-5	Understanding Network Operating Systems and Troubleshooting Network.

IDS505	**CO-1**	Understanding the mathematical models for representing finite state systems.
	CO-2	Understanding the various applications of regular expressions and the properties of regular languages.
	CO-3	Understanding the concepts of PDA.
	CO-4	Applying the parse trees and analyze the ambiguity of grammar.
	CO-5	Applying the various grammars to design computational machine
EHM501	**CO-1**	Understanding the importance of value education in life and method of selfexploration
	CO-2	Understanding 'Natural Acceptance' and Experiential Validation- as the mechanism for self-exploration.
	CO-3	Applying right understanding about relationship and physical facilities.
	CO-4	Analysing harmony in myself, harmony in the family and society, harmony in the nature and existence.
	CO-5	Evaluating human conduct on ethical basis.
IDS551	**CO-1**	Understanding the concepts of designing a data mart or data warehouse for any organization
	CO-2	Understanding about various data mining tools.
	CO-3	Applying data mining techniques and methods to large data sets.
	CO-4	Applying the various classifiers used in data mining.
	CO-5	Creating a program using weka to perform operation on given data sets.
IDS552	**CO-1**	Understanding about NoSQL databases.
	CO-2	Understanding about basic principles and design criteria of NoSQL databases.
	CO-3	Applying various queries used in NoSQL databases.
	CO-4	Analyzing various data storage and processing techniques.
	CO-5	Creating NoSQL databases to perform various operations.
IDS553	**CO-1**	Understanding the past and present of the disciplines by exploring their purpose, practice, and philosophy.
	CO-2	Understanding of advanced research methodologies in the field, including theory, interdisciplinary approaches, and the analysis of available primary sources
	CO-3	Understanding historical and recent trends in theory and method and be able to identify and explain major trends and issues in industry and research.
	CO-4	Understanding the privileges and obligations associated with a career as a professional
	CO-5	Demonstrating through short written assignments and critical reviews the ability to synthesize and assess the arguments of scholarly articles and monographs at the level of professionals in the field.
IDS506	**CO-1**	Understanding the concept of SQL.
	CO-2	Understanding the different conditional statement for Aggregating and grouping data.
	CO-3	Understanding the application and importance of multi table join operation.
	CO-4	Applying the different methods to extract data from different tables in a database.

	CO-5	Applying the different methods to extract data from different tables in a database.
IDS507	**CO-1**	Understanding the importance of Excel for Data Analysis.
	CO-2	Understanding the various Functions and Formulae of Excel Workbook.
	CO-3	Applying Various Statistical Analysis techniques on data using Excel.
	CO-4	Analyzing various analysis techniques for filtering and conditional formatting of data.
	CO-5	Creating flexible data aggregations using pivot tables.
IDS508	**CO-1**	Understanding the basic programming concepts of R programming language.
	CO-2	Understanding the data structures in R Statistical computing programming language
	CO-3	Understanding the importance of packages and functions in R programming.
	CO-4	Applying the various statistical function on given data sets.
	CO-5	Analyzing the importance of R in statistical analysis and customizing the analysis.
TMUGA-501	**CO-1**	Applying the concepts of modern mathematics Divisibility rule, Remainder Theorem, HCF /LCM in Number System.
	CO-2	Relating the rules of permutation and combination, Fundamental Principle of Counting to find the probability.
	CO-3	Applying calculative and arithmetical concepts of ratio, Average and Percentage to analyze and interpret data.
	CO-4	Correlating the various arithmetic concepts to check sufficiency of data
TMUGS-501	**CO-1**	Utilizing effective verbal and non-verbal communication techniques in formal and informal settings
	CO-2	Understanding and analyzing self and devising a strategy for self growth and development.
	CO-3	Adapting a positive mindset conducive for growth through optimism and constructive thinking.
	CO-4	Utilizing time in the most effective manner and avoiding procrastination.
	CO-5	Making appropriate and responsible decisions through various techniques like SWOT, Simulation and Decision Tree.
	CO-6	Formulating strategies of avoiding time wasters and preparing to-do list to manage priorities and achieve SMART goals.
IDS601	**CO-1**	Understanding the concept of Hadoop Ecosystem.
	CO-2	Understanding the concept of Different Processing Too
	CO-3	Understanding the concept of ETL process.
	CO-4	Understanding about various big data technologies used in industry.
	CO-5	Applying different processing tools that help work on Hadoop cluster.
IDS602	**CO-1**	Understanding the different elementary models related to time series analysis.
	CO-2	Understanding the importance of stationarity in building time series models.
	CO-3	Understanding about various methods that used in time series analysis.
	CO-4	Applying different model evaluation technique to identify better model to forecast.

	CO-5	Applying VAR model to the dynamic behavior of financial time series conditions.
IDS603	**CO-1**	Understanding the different estimation methods in statistical inference.
	CO-2	Understanding the importance of maximum likelihood estimator in the parameter estimation in continuous probability distributions.
	CO-3	Understanding the importance of Neyman-Pearson lemma in deciding the critical region for the hypothesis testing procedure.
	CO-4	Applying various statistical functions to test the given data sets.
	CO-5	Analyzing the important difference between parametric and non - parametric tests for large and small samples.
IDS604	**CO-1**	Understanding the importance of an Algorithm for solving Computer problems.
	CO-2	Understanding the various measures of an Algorithm.
	CO-3	Understanding the concept of Brute force Approaches and its different methods.
	CO-4	Understanding the various elements and efficiency of sorting Algorithms.
	CO-5	Understanding the concepts of Graph and its Traversing methods.
IDS605	**CO-1**	Understanding various verbal activities like synonyms and antonyms.
	CO-2	Understanding various quantitative activities and concepts.
	CO-3	Understanding the concepts of graphs, charts and other data representation.
	CO-4	Applying the various methods to solve quantitative and reasoning problems.
	CO-5	Creating various chart and graph for given data.
IDS651	**CO-1**	Understanding the concept of Data structure.
	CO-2	Understanding the concept of complexity of various algorithms.
	CO-3	Applying the various algorithms to solve programming problems.
	CO-4	Creating a program to perform various sorting algorithms.
	CO-5	Creating a program to perform various algorithms to analyze time complexity.
IDS652	**CO.1.**	Understanding the concept of Hadoop Cluster
	CO.2.	Understanding the concept of Different Processing Tool
	CO.3.	Applying various processing tool to create Hadoop cluster.
	CO.4.	Creating the Hadoop Ecosystem.
	CO.5.	Creating a program to perform various Hadoop commands.
IDS606	**CO-1**	Understanding the concepts of Internet of things and Internet of Everything.
	CO-2	Understanding about architecture view and strategy of deploying things using cloud.
	CO-3	Understanding the concepts How cloud plays an important role in IoT Infrastructure
	CO-4	Understanding the real time applications and what is future scope related to same.
	CO-5	Analyzing the Privacy and Security issue with IOT devices.
IDS607	**CO-1**	Understanding the basic principle of AI.
	CO-2	Understanding the structure of intelligent system.
	CO-3	Understanding the concepts of artificial neural networks in Artificial

		Intelligence.
	CO-4	Understanding the concept of Deep Learning in Artificial Intelligence.
	CO-5	Analyzing the problems that are amenable to solution by AI methods.
IDS608	**CO-1**	Understanding the concept of cloud, various types of clouds and their working.
	CO-2	Understanding the need for migration on cloud and identify the economic considerations involved.
	CO-3	Understanding the Standards, Organizations and Groups associated with Cloud Computing.
	C04	Understanding the importance of IT governance in cloud computing.
	C05	Analyzing the various Jurisdictional Issues Raised by Virtualization and Data Location.
IDS609	**CO-1**	Understanding the concepts of Blockchain technology.
	CO-2	Understanding the key concepts like cryptography and cryptocurrency.
	CO-3	Understanding about Bitcoin, its network.
	CO-4	Understanding about different platforms in Block chain like Ethereum.
	CO-5	Analyzing how Bitcoin transactions are validated by miners.
IDS610	**CO-1**	Understanding about Intelligent Processing Automation.
	CO-2	Understanding the importance of automation tools.
	CO-3	Understanding the challenges and risks when implementing automation techniques.
	CO-4	Analyzing technical goals and tradeoffs.
	CO-5	Analyzing the automation and optimization of business process through AI.
IDS611	**CO-1**	Understanding the basic concepts of recommender systems in data science.
	CO-2	Understanding the different data mining techniques used in recommender system
	CO-3	Understanding the content based recommender system usage in business scenario.
	CO-4	Analyzing content based and neighbourhood based recommender system
	CO-5	Analyzing various algorithms used for Social Tagging Systems.
TMUGA-601	**CO-1**	Recognizing the rules of Crypt-arithmetic and relate them to find out the solutions.
	CO-2	Illustrating the different concepts of Height and Distance and Functions.
	CO-3	Employing the concept of higher level reasoning in Clocks, Calendars and Puzzle Problems.
	CO-4	Correlating the various arithmetic and reasoning concepts in checking sufficiency of data.
TMUGS-601	**CO-1**	Communicating effectively in a variety of public and interpersonal settings.
	CO-2	Applying concepts of change management for growth and development by Laws of Change. understanding inertia of change and mastering the
	CO-3	Analysing scenarios, synthesizing alternatives and thinking critically to negotiate, relationships. resolve conflicts and develop cordial interpersonal
	CO-4	Functioning in a team and enabling other people to act while encouraging

		growth and creating mutual respect and trust.
	CO-5	Handling difficult situations with grace, style, and professionalism.
IDS701	**CO-1**	Understanding the concept of Hadoop Environment.
	CO-2	Understanding the concept of different Processing Tool.
	CO-3	Understanding the frameworks like Pig and Hive.
	CO-4	Understanding the concepts of clustering and Node creation.
	CO-5	Applying the various command use in big data solution.
IDS702	**CO-1**	Understanding the different machine learning techniques and its application.
	CO-2	Understanding the importance of simple linear regression in predicting new observations.
	CO-3	Understanding the importance of assumptions in estimating the parameters in linear regression analysis. simple
	CO-4	Understanding the important multiple linear regression in predictive techniques and its assumptions.
	CO-5	Applying the non-linear model for the new observation predictions and its importance in business.
IDS703	**CO-1**	Understanding the different model validation techniques for goodness of fit.
	CO-2	Understanding the concepts of various machine learning methods.
	CO-3	Understanding the concepts of different classification algorithms.
	CO-4	Applying and evaluate model validation techniques for linear model.
	CO-5	Applying model validation technique for classification models.
IDS751	**CO.1.**	Understanding the concept of Hadoop Cluster.
	CO.2.	Applying various methods to setup Hadoop environment.
	CO.3.	Analysing roles and responsibilities of Big Data Administrator.
	CO.4.	Creating a Single Node Hadoop.
	CO.5.	Creating a Hadoop Cluster using different processing tools.
IDS752	**CO.1.**	Understanding the concept of Machine learning.
	CO.2.	Understanding the concept of various ML algorithms.
	CO.3.	Applying various algorithms on given data sets.
	CO.4.	Analysing the data using R Programming.
	CO.5.	Creating various chart and graph of given data using machine learning tool.
IDS753	**CO-1**	Understand methodologies and professional way of documentation and communication.
	CO-2	Understanding practical knowledge within the chosen area of technology for project development.
	CO-3	Applying technical knowledge to solve the real-life problems.
	CO-4	Analyzing programming projects with a comprehensive and Systematic approach.
	CO-5	Developing effective communication skills for presentation of project related activities.
IDS754	**CO-1**	Understanding the past and present of the disciplines by exploring their purpose, practice, and philosophy.
	CO-2	Understanding of advanced research methodologies in the field, including theory, interdisciplinary approaches, and the analysis of available primary

		sources.
	CO-3	Understanding the privileges and obligations associated with a career as a professional
	CO-4	Understanding historical and recent trends in theory and method and be able to identify and explain major trends and issues in industry and research.
	CO-5	Applying technical skill to solve industry problems.
IDS704	**CO-1**	Understanding the important terminologies and need for predictive analytics for business organization.
	CO-2	Applying data pre-processing techniques for predictive analytics.
	CO-3	Applying data wrangling techniques for predictive analytics.
	CO-4	Applying linear regression analysis and fine tune the model for higher accuracy.
	CO-5	Applying classification techniques and fine tune the model for higher accuracy
IDS705	**CO-1**	Understand the important terminologies and analytics techniques in social media analytics.
	CO-2	Analyzing the twitter data and conclude the important finding and insights of the society thought on particular issues.
	CO-3	Analyzing the facebook data and conclude the important finding and insights of the society thought on particular issues.
	CO-4	Analyzing the Instagram profile and find out the interesting insights.
	CO-5	Analyzing the GitHub profile and find out the latest trending article in GitHub
IDS706	**CO-1**	Understanding the basic concepts of pattern recognition.
	CO-2	Understanding the various pattern recognition approaches.
	CO-3	Applying various statistical pattern recognition techniques.
	CO-4	Analyzing the statistical and syntactical pattern recognition techniques.
	CO-5	Analyzing the various neural network techniques in pattern recognition.
IDS708	**CO-1**	Understand the application of different visualization tool for the business report representation.
	CO-2	Understand the different visualization techniques to find out the distribution of data set.
	CO-3	Understand the importance of visualization in multivariate environment.
	CO-4	Understand the importance of customization of graphical representation of data in business communication.
	CO-5	Analyzing various type of plotting method use in graphical validation
IDS709	**CO-1**	Understanding the ethical and social dilemmas and obligations of the practice of design.
	CO-2	Understanding complex and unstructured problem-solving challenges in unfamiliar domains
	CO-3	Applying new methods that lead innovation in creative and collaborative settings.
	CO-4	Analyzing common adoption barriers in individuals, groups and organizations.
	CO-5	Developing a design theory from independent and qualitative research and observations.

IDS851	**CO-1**	Understanding to take initiatives, communicate, work in a team and manage a project within a given time frame.
	CO-2	Understanding the use of interpretation and application of an appropriate international engineering standard in a specific situation.
	CO-3	Applying prior acquired knowledge in problem solving.
	CO-4	Analyzing a given engineering problem and use an appropriate problem solving methodology.
	CO-5	Analyzing sources of hazards, and identify appropriate health & safety measures.
IDS852	**CO-1**	Understanding about online line certification.
	CO-2	Understanding to manage a work within a given time frame.
	CO-3	Applying prior acquired knowledge in problem solving.
	CO-4	Analyzing various technical problem comes during online learning.
	CO-5	Developing the technical Knowledge of new subject.
IDS 851	**CO-1**	Understanding methodologies and professional way of documentation and communication.
	CO-2	Understanding about software development cycle with emphasis on different processes -requirements, design, and implementation phases.
	CO-3	Analyzing a software project and demonstrate the ability to communicate effectively in speech and writing.
	CO-4	Creating a new model over the selected field of research that will be useful for future activities.
	CO-5	Creating a project that help to gain confidence and technical knowledge.
IDS801	**CO-1**	Understanding what constitute the main component of a Reinforcement Learning method.
	CO-2	Understanding contemporary Reinforcement learning methods.
	CO-3	Understanding sequential decision making under uncertainty.
	CO-4	Applying machine learning algorithms to solving relational and first order logical Markov decision problem.
	CO-5	Applying the reinforcement learning to solve gamming problems.
IDS802	**CO-1**	Understanding the basic concept of economics and associated problems.
	CO-2	Understanding the concept of Indian economy.
	CO-3	Applying the appropriate engineering economics analysis, method for problem solving: present worth, annual cost, rate-of-return, payback, breakeven, benefit-cost ratio.
	CO-4	Applying statistical/econometric computer package to estimate an econometric model.
	CO-5	Analyzing the cost effectiveness of multiple projects using the methods learned, and make a quantitative.
IDS803	**CO-1**	Understanding the different machine learning tools available in cloud.
	CO-2	Understanding the importance of simple regression in predicting new observations.
	CO-3	Understanding the concepts of K-mean clustring.
	CO-4	Applying the deep model for the new observation predictions and its importance in business.
	CO-5	Creating the clusters in AWS cloud and implement pipelining.