Teerthanker Mahaveer University
College of Computing Sciences & IT

B.Tech. (Computer Sciences and Engineering)
Cloud Technology & Information Security (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 Cloud and Information Security concepts, techniques & tools used in IT industry.
PSO-2	**:**	Apply the knowledge of programming skills to develop the application and write the scripts to perform the automation in cloud.
PSO-3	**:**	Demonstrate the implementation of cloud with tools and technologies available from different vendors
PSO-4	**:**	Design the architectural solutions for cloud migration.

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.
ICS101	**CO-1**	Understanding about internet design principles and various protocols which is widely use in the Internet.
	CO-2	Understanding the use of different web development technologies.
	CO-3	Understanding the HTML document structure and its all tags.
	CO-4	Applying different cascading style sheet in web designing.
	CO-5	Creating interactive web page(s) using HTML, CSS and JavaScript.

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.
ICS201	**CO-1**	Understanding the use of basic concepts involved in Computer Programming.
	CO-2	Understanding the concepts of design, implement, test, debug and document programs in C.
	CO-3	Understanding the concepts of pointers and its application in arrays.
	CO-4	Analyzing the use of functions and parameter passing options in it.
	CO-5	Creating a C program using function and pointer.
TMUGE201	**CO-1**	Remembering & understanding the basics of English Grammar and

		Vocabulary
	CO-2	Understanding the basics of Listening, Speaking & Writing Skills, Understanding principles of letter drafting and various types of formats.
	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	Creating 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.
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.
IDS251	**CO-1**	Understanding the basic terminology used in computer programming
	CO-2	Understanding the concepts of compile and debug programs in C language
	CO-3	Applying the procedure oriented paradigm to design C program.
	CO-4	Creating a C programs involving decision structures, loops and functions.
	CO-5	Creating a C programs using array and pointer.
ICS301	**CO-1**	Understanding the knowledge of computing and mathematics.
	CO-2	Understanding the computing requirements appropriate to the problem solution.
	CO-3	Understanding the concepts of functions and graph.
	CO-4	Understanding the basic principles of probability and random variable.
	CO-5	Applying mathematical foundations, algorithmic principles, and computer science theory in the modelling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices.
ICS302	**CO-1**	Understanding basic data structures such as arrays, linked lists, stacks and queue.
	CO-2	Understanding 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	Applying various algorithms for solving problems like sorting, searching, insertion and deletion of data.
ICS303	**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
	CO-4	Understanding the importance of IT governance in cloud computing
	CO-5	Analyzing the various Jurisdictional Issues Raised by Virtualization and Data Location.
ICS304	**CO-1**	Understanding the register transfer and micro-operation.
	CO-2	Understanding the basic computer organization.
	CO-3	Understanding the various modes of data transfer.
	CO-4	Understanding the system architecture of multiprocessor and multicomputer.
	CO-5	Analyzing the memory organization and I/O systems
ICS305	**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	Understanding the basic approaches to the design of software applications.
TMUGE301	**CO-1**	Remembering and understanding the English grammar and vocabulary
	CO-2	Understanding the art of public speaking and strategies of reading comprehension.
	CO-3	Applying correct vocabulary and sentence construction during public speaking or professional writing.
	CO-4	Aanalyzing different types of sentences like simple, compound and complex.
	CO-5	Creating skills for Drafting notice, agenda and minutes of the meeting.
ICS351	**CO-1**	Understanding appropriate data structures as applied to specified problem definition
	CO-2	Applying various programming approaches to solve data structure problems.
	CO-3	Analyzing various data structure algorithms.
	CO-4	Creating appropriate searching technique for given problem.
	C05.	Creating appropriate sorting technique for given problem.
ICS352	**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 a Java program to show working of classes and methods.
	CO-5	Creating the Applet using java programs.
ICS353	**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.
TMUGA-301	**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 and Direction.
	CO-4	Operationalizing the inter-related concept of Percentage in Profit Loss and Discount, Si/CI and Mixture/Allegation.
ICS401	**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 various concurrency control protocols.
	CO-5	Creating Entity-Relationship Model for enterprise level databases.

ICS402	**CO-1**	Understanding the basic concepts of python programming.
	CO-2	Understanding the concepts of Python statements and expressions.
	CO-3	Understanding Python data structures – lists, tuples & dictionaries.
	CO-4	Applying control flow and functions concept in Python for solving problems.
	CO-5	Applying files, exception, modules and packages in Python for solving problems.
ICS403	**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.
ICS404	**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.
TMUGE401	**CO-1**	Remembering and understanding the English grammar and vocabulary.
	CO-2	Understanding the essentials of effective listening and speaking.
	CO-3	Understanding the corporate expectations and professional ethics.
	CO-4	Applying correct vocabulary and sentence construction during professional writing or job interviews.
	CO-5	Aanalyzing different types of interviews.
	CO-6	Developing the skills to create resume, C.V. or cover letter.
ICS451	**CO-1**	Understanding the database language commands to create simple database
	CO-2	Understanding the database using queries to retrieve records.
	CO-3	Understanding PL/SQL Commands for processing database.
	CO-4	Applying the JOIN, UNION and GROUPBY techniques in DBMS operationCreating solutions using database concepts for real time requirements.
	CO-5	Creating solutions using database concepts for real time requirements.
ICS452	**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 python programming concept to design GUI application.
	CO-4	Creating Python programs by defining functions and calling them
	CO-5	Creating Python lists, tuples and dictionaries for representing compound data.
ICS405	**CO-1**	Understanding the concepts of Server side scripting.
	CO-2	Understanding about various technologies use to design server side

		application.
	CO-3	Understanding the concepts of various databases use for dynamic web application.
	CO-4	Applying the Node.js functions to design application.
	CO-5	Analyzing the various Node.js Frameworks.
ICS406	**CO-1**	Understanding the concepts of Shell Scripting and basic commands.
	CO-2	Understanding the concepts of Process management and monitoring tools
	CO-3	Understanding the concepts of Arithmetic Operations in Shell Scripts.
	CO-4	Applying variables in a shell script to make program interactive.
	CO-5	Applying the concepts of loops and Functions to develop scripts.
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.
ICS501	**CO-1**	Understanding the key concepts of knowledge representation.
	CO-2	Understanding the concepts of knowledge representation techniques and different notations.
	CO-3	Understanding about ontologies as a KR paradigm and applications of ontologies.
	CO-4	Applying various KR techniques for problem solving.
	CO-5	Analyzing the various theorem used in KR and Statistical analysis.
ICS502	**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 machin
ICS503	**CO-1**	Understanding the concepts of IT security, Threats, Vulnerabilities, Impact and control measures
	CO-2	Understanding the concepts of network security and identifying common issues.
	CO-3	Applying various algorithms and processes used in cryptography for authenticating users, securing information and communication.
	CO-4	Analysing the importance of asset management and Digital Rights Management.
	CO-5	Creating the security policies and access controls for an organization.
ICS504	**CO-1**	Understanding the concept of Virtualization and its need.
	CO-2	Understanding the various Virtualization Techniques.
	CO-3	Understanding configuration of various applications used for Virtualization.
	CO-4	Applying System Settings to implement Virtualization.
	CO-5	Creating Virtual machines and client settings.
EHM501	**CO-1**	Understanding the importance of value education in life and method of

		self-exploration.
	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.
ICS551	**CO-1**	Understanding the basic concepts of information and network security.
	CO-2	Analyzing Asymmetric and Symmetric Crypto algorithms.
	CO-3	Creating the security policies and configure Firewall for network security.
	CO-4	Creating the security policies and configure of Virtual Private Network and Router.
	CO-5	Creating the security policies and configure Intrusion Detection System.
ICS552	**CO-1**	Understanding the working of advanced performance tool.
	CO-2	Applying the tool for testing the performance of CPU and Memory
	CO-3	Analyzing troubleshooting and monitoring the performance of vSphere Storage.
	CO-4	Creating and configuring Virtual Machines.
	CO-5	Creating and configuring ESXi 6.0 Server.
ICS553	**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 professiona
	CO-5	Demonstrate 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
ICS506	**CO-1**	Understanding the types of SQL Server Editions and Features.
	CO-2	Understanding the Backup types and Disaster Recovery options for SQL Server.
	CO-3	Understanding the types of Indexes and SQL Server protocols.
	CO-4	Understanding the SQL Server agent properties.
	CO-5	Applying the various methods for migration from other platforms.
ICS507	**CO-1**	Understanding the concepts of Storage and Data Center.
	CO-2	Understanding the advantages and functionality of NAS and SAN.
	CO-3	Understanding the concepts of Data Center Consolidation and its phases.
	CO-4	Applying various tools and methods for data Backups and Disaster Recovery.
	CO-5	Analyzing various Storage devices and technologies.
ICS508	**CO-1**	Understanding the concept of Android OS and Android architecture.
	CO-2	Understanding about Kotlin code to simplify application development.
	CO-3	Analyzing various UI elements of Android app.

	CO-4	Creating menus, alerts and option menus.
	CO-5	Creating a simple android media application.
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.
ICS601	**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.
	CO-6	Apply various testing to improve software quality.
ICS602	**CO-1**	Understanding the various Hacking Methodology
	CO-2	Understanding about vulnerability over the network and websites.
	CO-3	Understanding the Importance of Firewalls and various security measure
	CO-4	Understanding the Report writing and Mitigation concepts.
	CO-5	Applying various tools to identify network security problems.
ICS603	**CO-1**	Understanding the modern security concepts as they are applied to cloud computing
	CO-2	Understanding the compliance issues that arise from cloud computing.
	CO-3	Applying various methods to generate cloud control matrix.
	CO-4	Analysing the security issues related to multi-tenancy.
	CO-5	Analysing the security of virtual systems.
ICS604	**CO-1**	Understanding the basic set of commands and utilities in Linux/UNIX systems.
	CO-2	Understanding the important Linux/UNIX library functions and system calls.
	CO-3	Understanding the inner workings of UNIX-like operating systems.
	CO-4	Understanding of the steps involved installing Linux Operating System

	CO-5	Applying various Unix commands used in system processing and management.
ICS651	**CO-1**	Understanding the Installation and Configuration of ESXI Server
	CO-2	Analyzing the security policies and roles of vSphere.
	CO-3	Creating a security group for networking.
	CO-4	Creating rules for web application access.
	CO-5	Creating of Micro Segmentation and Distributed firewall.
ICS652	**CO-1**	Understanding the concept of network security and vulnerability.
	CO-2	Applying penetration test using standard hacking tools in an ethical manner.
	CO-3	Applying various tools and methods use for security and vulnerability assessment.
	CO-4	Analyzing legal and ethical issues related to vulnerability and penetration testing.
	CO-5	Analyzing best practices in security concepts to maintain confidentiality, integrity and availability of computer systems.
EHM601	**CO-1**	Understanding knowledge and skills needed to run a business successfully
	CO-2	Understanding the financing and accounting.
	CO-3	Understanding the basic support to Entrepreneurs.
	CO-4	Applying current information, theories, models, techniques and practices in all of the major business disciplines.
	CO-5	Analyzing situations and constructing and selecting viable solutions to solve problems.
ICS605	**CO-1**	Understanding the migration strategy that can be used in a given scenario.
	CO-2	Applying various methods used in cloud services migration.
	CO-3	Applying the steps involved in migrating Large scale services to the cloud.
	CO-4	Analyzing the migrating services to AWS cloud using a cloud adoption framework.
	CO-5	Analyzing various migrating strategies that can be used for a given case study scenario.
ICS606	**CO-1**	Understanding the various services of Server 2012.
	CO-2	Understanding the concepts of file management.
	CO-3	Applying various group policies to maintain and manage server
	CO-4	Analyzing the server performance.
	CO-5	Creating the AD domains in server 2012.
ICS607	**CO-1**	Understanding the Hybrid cloud and its management
	CO-2	Understanding the On-Premises Service Integration with cloud service.
	CO-3	Understanding the Architectural Considerations for Hybrid Cloud.
	CO-4	Applying the best practices to manage Hybrid cloud resources.
	CO-5	Analyzing the workloads and deployment of applications on Cloud.
ICS608	**CO-1**	Understanding fundamental concepts of information and network security
	CO-2	Understanding security principles for building a sustainable security architecture
	CO-3	Apply appropriate tools and techniques while designing the network security infrastructure

	CO-4	Analyzing the importance of managing the security architecture using policies, processes and framework for effective and efficient security.
	CO-5	Creating the security roles, regulations and policies to implement the proper security management.
ICS609	**CO-1**	Understanding the process involved in pre and post incident response.
	CO-2	Understanding the Disaster recovery operations and Disaster response phase.
	CO-3	Understanding the Incident response plan and Information security policy.
	CO-4	Apply the Data collection and possible indicator of incident.
	CO-5	Analyzing various techniques, types of contingency planning elements required to handle security incident
ICS610	**CO-1**	Understanding the different models of database Security Architecture.
	CO-2	Applying and contrast database management system facilities for establishing access.
	CO-3	Applying database auditing for security and reliability.
	CO-4	Analyzing how to adjust policies and practices based on feedback mechanisms using different security models.
	CO-5	Analyzing common strategies used to exploit database infrastructure.
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 understanding inertia of change and mastering the Laws of Change.
	CO-3	Analysing scenarios, synthesizing alternatives and thinking critically to negotiate, resolve conflicts and develop cordial interpersonal relationships.
	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.
ICS701	**CO-1**	Understanding the overview of Digital Forensics and Professional Conduct
	CO-2	Understanding the network traffic flows within and outside the network.
	CO-3	Understanding the expert witness and writing report considering the cyber law.
	CO-4	Analyzing the File Systems and Windows Registry for forensic investigation process.
	CO-5	Analyzing the phishing mail in Email forensics.
ICS702	**CO-1**	Understanding the components of Openstack.
	CO-2	Understanding the Installation and configuration of the Openstack components.
	CO-3	Understanding the resource creation in Openstack.

	CO-4	Applying the various steps to troubleshoot Openstack components.
	CO-5	Analyzing the performance of cloud by monitoring the Openstack components.
ICS703	**CO-1**	Understanding the concepts of Web Services and XML.
	CO-2	Understanding WSDL and UDDI for web services.
	CO-3	Understanding Resource Orient Architecture, services and user accounts.
	CO-4	Applying various Web Services using SOAP.
	CO-5	Creating AJAX based clients to consume Web Services.
ICS751	**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.
ICS752	**CO-1**	Understanding the dismantling and re-building PCs in order to access the storage media safely
	CO-2	Applying FTK Imager tool for Data Acquisition.
	CO-3	Applying Power Data Recovery Tool for Recovering deleted data from USB.
	CO-4	Analysing Memory of Windows and Linux machine using volatility framework.
	CO-5	Creating image of logical/physical drive by using FTK Tool.
ICS753	**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.
ICS704	**CO-1**	Understanding the need and importance of security and privacy for Big Data Analytics.
	CO-2	Understanding fundamental concepts of security, privacy and threats to Big Data.
	CO-3	Applying the Big Data Evidence in forensics investigation to present evidence inside the Courtroom.
	CO-4	Applying the Big Data Governance Certifications.
	CO-5	Analyzing the expert witness and writing report considering the cyber law.
ICS705	**CO-1**	Understanding how security is integrated with IT governance.
	CO-2	Understanding the best practices and cultural aspects associated with IT

		Governance.
	CO-3	Applying the risk IT framework of ISACA and CISCO security matrix in the organizations.
	CO-4	Analyzing the roles and responsibilities of strategy and steering committee
	CO-5	Analyzing the need for using standard frameworks in establishing robust information security and risk management.
ICS706	**CO-1**	Understanding how security is implemented as a management system.Understanding the role of ISO 27001 for securing organizations.
	CO-2	Understanding the role of ISO 27001 for securing organizations.
	CO-3	Understanding the need for using standards and frameworks for an effective and efficient information security program.
	CO-4	Analyzing the best practices available to secure Payment transactions through PCI-DSS.
	CO-5	Analyzing the purpose and scope of HIPPA in management process.
ICS707	**CO-1**	Understanding the Dockers architecture and its components.
	CO-2	Understanding about images and repository in Dockers.
	CO-3	Understanding about Dockers Orchestration and Service discovery features.
	CO-4	Analyzing the Containerized applications and implement continuous integration using Dockers.
	CO-5	Creating images and containers using Dockers API
ICS708	**CO-1**	Understand the features of Windows PowerShell.
	CO-2	Understanding the use of cmdlets for other server administration tasks.
	CO-3	Understanding the purpose of the Windows PowerShell pipeline and to manipulate arrays and hash tables
	CO-4	Understanding about error handling for a script.
	CO-5	Applying various Windows PowerShell commands.
ICS709	**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.
ICS851	**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.
ICS851	**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.
ICS801	**CO-1**	Understanding fundamental understanding of AWS cloud technologies.
	CO-2	Understanding Windows or Linux server in the cloud with its own private address.
	CO-3	Understanding the start-up of a CRM / Word Press / etc. website hosted in cloud.
	CO-4	Creating a highly scalable MySQL or Oracle database in the cloud with multiple read-replica databases (for scalability of database).
	CO-5	Creating a load-balancer setup in the cloud.
ICS802	**CO-1**	Understanding basics of Azure, Azure Services and Azure Portals.
	CO-2	Understanding basics of Storage, Types and Azure Storage Offerings.
	CO-3	Understanding basics of Virtual Networks, Address Spaces, Subnets and DNS Servers.
	CO-4	Understanding the Active Directory (AD), Identity and Authentication in Public Cloud.
	CO-5	Creating a SQL Server and Creating a SQL DB.
ICS803	**CO-1**	Understanding the need for Cloud architectural patterns.
	CO-2	Understanding the AutoScaling and MapReduce Architectural Patterns.
	CO-3	Understanding about Node Failure and Collocate Pattern.
	CO-4	Analyzing the Auto scaling and Map reduce architectur
	CO-5	Creating the Database Sharding Pattern and Busy Signal Pattern.