Department Of Computer Science and Engineering

M. Tech (CSE)

R20

Department Vision:

To become a center of excellence in the field of Computer Science and Engineering that produces innovative,skillful, socially responsible and ethical professionals.

Department Mission:

- To provide a curriculum that balances engineering fundamentals, modern technologies and research.
- To provide opportunities for solving real world problems.
- To provide opportunities for overall personal and social skill development.

M.Tech (CSE) Program Educational Objectives (PEO's)

- Will be able to practice their profession with confidence and global competitiveness by making intellectual contributions.
- Will pursue a life-long career of personal and professional growth with superior work ethics and character.
- Will be engaged in research leading to innovations/products or become a successful entrepreneur.

M.Tech (CSE) Program Outcomes (PO's)

At the end of the program, students will be able to:

1. Apply the principles of Computer Science and Engineering to the appropriate problems
2. Investigate, analyze and formulate solutions to the complex real world problems
3. Demonstrate the use of modern tools and techniques in the field of Computer Science
4. Work with multidisciplinary groups in a collaborative manner to develop sustainable inclusivetechnologies
5. Communicate effectively and develop self-confidence and life-long learning
6 Able to possess leadership, project management and financial skills with professional ethics

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R19

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M. Tech (CSE) Program Outcomes (PO's)

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3. Demonstrate the use of modern tools and techniques in the field ofComputer Science
4. Work with multidisciplinary groups in a collaborative manner to de-velop sustainable inclusive technologies
5. Communicate effectively and develop self-confidence and life-longlearning

6 Able to possess leadership, project management and financial skillswith professional ethics

R16

Department Vision:

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Course Outcomes Statements for M.Tech(CSE)-R20

S.No	Course		Course Outcomes Statements
	Code	Name	
1	20CSC 101	Mathematical Foundations Of Computer Science	Solve the probability function by inequalities.
			Infer the data by hypothesis testing procedure.
			Apply graphs models in real time applications.
			Apply various counting techniques in solving combinatorial problems.
			Design solutions using Recurrence Relations for real time problems.
			Apply number theory to cryptography problems.
2	20CSC 102	Advanced Data Structures	Analyze the significance of Dictionaries and apply them to solve real-world problems.
			Apply various hashing techniques to perform linear and quadratic probing.
			Construct Skip Lists in a randomized and deterministic way.
			Develop algorithms for various tree data structures like red-black trees, B-trees and Splay trees.
			Apply the text processing operations for efficient space utilization.
			Analyze computational geometric problems in terms of priority and range search operations.
3	20CSE101	Machine Learning Elective-I	Identify complexity of Machine Learning algorithms and their limitations.
			Recognize the underlying mathematical relationships within and across Machine Learning algorithms and their paradigms.
			Design and implement machine learning solutions to classification, regression, and clustering problems.
			Evaluate and interpret the results of the algorithms.
			Develop an appreciation for what is involved in learning from data.
			Apply graphical models for probabilistic reasoning.
4	20CSE102	Internet Of Things Elective-I	Understand an overview of IoT.
			Use of devices and gateways in Service Oriented Architecture.
			Analyze various communication protocols in sensor networks.
			Design applications using Raspberry Pi and Node MCU.
			Develop different IoT Automation Systems.
			Apply IoT concepts in various domains such as Smart Cities, Home Automation, Weather Monitoring System, and Agriculture.

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5	20CSE103	Introduction To Intelligent Systems Elective-I	Describe knowledge of the fundamental principles of intelligent systems.
			Identify various search strategies to solve problems.
			Compare and contrast knowledge representation schemes.
			Appraise knowledge in Uncertainty and Probabilistic reasoning approaches.
			Apply different learning techniques to solve complex problems.
			Define the basic concepts of phases and applications of Natural Language processing.
6	20CSE113	Data Science And Big Data Analytics Elective-II	Understand and explore big data Ecosystem using exploratory and statistical evaluation methods.
			Analyze various machine learning algorithms and apply them to solve real-world problems.
			Apply advanced analytical tools to perform logistic regression through experiments and extract meaningful data.
			Apply data visualization techniques to evaluate models and to overcome data leakage problems.
			Understand and apply Hadoop Ecosystem to explore bigdata analytics using Map-reduce techniques.
			Analyze the significance of NoSQL database systems and apply them to perform bigdata analysis.
7	20CSE114	Distributed Database Systems Elective-II	Differentiate key concepts and techniques for centralized. databases and distributed databases.
			Analyze and design distributed database systems based on the principles of distributed indexing, query evaluation, data replication.
			Implement storage, indexing, query evaluation and query optimization techniques.
			Implement the concepts of transaction management, concurrency. control, crash recovery, deadlocks and catalog management.
			Apply suitable architecture for distributed databases and concepts of inter-operability of databases.
8	20CSE115	Advanced Wireless And Mobile Networks Elective-II	Identify the knowledge of wireless networking and its standards.
			Recognize different cellular technologies (like 3G, 4G, 5G) and WLAN, WPAN, WWAN for performance analysis.
			Demonstrate knowledge of protocols used in wireless networks and learn simulating wireless networks.
			Analyze various wireless network transmission to build effective communication.
			Relate Security techniques to resolve network vulnerabilities.
			Develop mobile applications to solve some of the real-world problems.

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9	20CSE104	Data Preparation And Analysis Elective-III	Identify and analyze various data gathering and preparation techniques to format, parse and transform data as required.
			Apply data cleaning techniques on various data sets to perform consistency check, transformation, and segmentation processes.
			Apply exploratory data analysis techniques to perform descriptive and comparative statistics on data.
			Analyze different visualization techniques and apply the suitable one to deal with real-world problems.
			Apply correlations, connectivity, and interactivity techniques on different data items for any given dataset.
			Analyze various statistical significance based testing mechanisms and apply them to build regression models.
10	20CSE105	Secure Software Design And Enterprise Computing Elective-III	Differentiate various software vulnerabilities and develop software to process vulnerabilities for an organization.
			Evaluate various enterprise application design and development tools and standard practices.
			Review techniques for successfully implementing and supporting network services on an enterprise scale and heterogeneous systems environment.
			Know essential techniques for reducing and avoiding system and software security Problems.
			Understand methodologies and tools to design and develop secure software containing minimum vulnerabilities and flaws.
			Solve enterprise scale problems emanating from lapses in security requirements and information system management practices.
11	20CSE106	Computer Vision Elective-III	Explain the basic principles of image processing and its significance in real world.
			Interpret and evaluate various approaches for image. transformation, segmentation, and restoration.
			Choose object, scene recognition and categorization algorithms for real time images.
			Analyze images and videos for problems such as tracking and structure from motion.
			Explain recovery of 3D structure of ill-posed scenes.
			Apply various techniques to build computer vision applications.
12	20CSE116	Human And Computer Interaction Elective-IV	Understand the structure of models and theories of human computer interaction.
			Understand the vision of a computer user.
			Understand the recognition and remembrance limitations of a computer user.
			Understand the mobile ecosystem and use the corresponding tools for mobile design.

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			Design an interactive web interface on the basis of models studied.
13	20CSE117	GPU Computing Elective-IV	List out CPU/GPU comparisons and identify the features of parallel programming.
			Write simple programs using CUDA programming model.
			Distinguish various memory hierarchies and carryout performance evaluation with different memories.
			Illustrate synchronization concepts in CPU and GPU.
			Point out advanced topics in multi-GPU processing and heterogeneous processing.
			Develop programs using GPUs for real world problems in image processing, simulation and deep learning.
14	20CSE118	Digital Forensics Elective-IV	Explain the fundamentals of digital forensics.
			Choose the methods for Collecting, preserving and recovering the evidence for use in investigations.
			Explain the need to maintain the chain of evidence in criminal investigations and apply this in the context of simple case studies.
			Analyze data acquired from various crime scene scenarios.
			Describe the Legal Aspects of Digital Forensics.
			Demonstrate the concept of Network Forensics and Mobile Forensics.
15	20CSE119	Mobile Applications And Services Elective-V	Identify the target platform and users and be able to define and sketch a mobile application.
			Design the User Interface for mobile applications.
			Develop database management system to retrieve and/or store data for mobile application.
			Analyze Android networking and Internet services use in Mobile Apps.
			Illustrate the packaging and deploying mobile apps with performance best practices and location based services.
			Evaluate the development process of mobile application with security concepts.
16	20CSE120	Compiler For HPC Elective-V	Identify the basic concepts needed for the development of a compiler structure of a compiler
			Explore the concepts of Parallel loops, data dependency, exception handling and debugging in a compiler.
			Interpret and analyze the concepts involved in loop structuring and concurrency analysis.
			Differentiate the various types of Machines, and the techniques like Vector Code from Sequential Loops for all Loops, Round off Error, Exceptions, and Debuggers, Multi.
			Elaborate the Message passing Machines and Scalable Shared Machines

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			Determine the recent trends in compilers for efficient compiler building.
17	20CSE121	Open Source Technologies Elective-V	Identify various OSS tools, platforms, licensing procedures, and development models, ethics
			Describe various OSS projects, development models and project management
			Adapt to the usage of OSS tools and technologies.
			Distinguish between Proprietary and Open Source tools, development methods
			Evaluate various Open Source projects like Linux, Apache, GIT
			Practice Open Source principles, ethics, and models.
18	20CSE107	Machine Learning Lab Elective-I	Apply mathematical foundations, algorithmic principles, and computer science theory to the modeling of computer- based systems.
			Identify and utilize modern tools that are useful for data analysis.
			Recognize and implement various ways of selecting suitable model parameters for different machine learning techniques.
			Implement unsupervised learning algorithms.
			Implement and evaluate various Machine Learning approaches.
			Design and develop solutions to real world problems using ML techniques.
19	20CSE108	Internet Of Things Lab Elective-I	Understand internet of Things and its hardware and software components.
			Interface I/O devices, sensors & communication module.
			Analyze the use of communication protocols in IoT.
			Remotely monitor data and control devices.
			Develop real time IoT based projects.
20	20CSE109	Introduction To Intelligent Systems Lab Elective-I	Write programs in Python/Prolog language.
			Recognize the underlying mathematics and logic behind various computing algorithms under AI system.
			Apply variety of uncertain algorithms to solve problems.
			Describe and apply various techniques for logic programming and machine learning.
			Implement problems using game search algorithms.
			Develop solutions for real world problems using NLP.
21	20CSE110	Data Preparation And Analysis Lab Elective-III	Differentiate between numerical and categorical attributes and apply various pre-processing techniques to clean any chosen dataset.
			Apply discretization and clustering techniques on preprocessed data.
			Apply Association Rule mining technique to explore relationships among various attributes.
			Apply exploratory data analysis techniques to develop meaningful data visualizations.

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			Apply various file-processing operations to deal with real-world datasets.
			Create applications to deal with interactive datasets suitable to explore the significance of variables.
22	20CSE111	Secure Software Design And Enterprise Computing Lab Elective-III	Develop a security model for any enterprise based application on its threats and vulnerabilities.
			Implement methodologies and tools to design secure software enterprise application.
			Compare different types of threats and attacks.
			Implement the various security algorithms to be implemented for secured computing and computer networks.
			Evaluate various methods of authentication and access control for web based applications.
			Analyze and apply different anti-intrusion techniques.
23	20CSE112	Computer Vision Lab Elective-III	Identify the fundamental issues and challenges of computer vision.
			Apply image enhancement techniques.
			Detect edges using various kernels and transformations.
			Apply histogram processing and conversion between various colour spaces.
			Analyze datasets using classification and clustering.
			Evaluate computer vision system for real world problems.
24	20CSC 103	Advanced Data Structures Lab	Analyze and implement various data structures like stacks, queues and priority queues using arrays.
			Analyze and implement various data structures like stacks, queues and priority queues using linked list.
			Implement Dictionary ADT using Linear and quadratic probing operations.
			Construct a skip list data structure and perform various operations on it.
			Analyze and implement various binary tree operations.
			Analyze and implement the significance of various text processing operations for pattern matching.
25	20CSC 104	Advanced Algorithms	Define and discuss the different problems solved by using algorithmic paradigms.
			Apply the suitable data structure for solving a problem using various strategies.
			Differentiate the complexities of a problem solved in various approaches.
			Evaluate various algorithmic design techniques.
			Design appropriate mathematical notation to solve a problem using algorithmic paradigms.
			Develop solutions for real world problem.

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26	20CSC 105	Soft Computing	Identify and describe soft computing techniques and their roles in building Intelligent Machines.
			Comprehend appropriate learning rules for each of the neural network architectures and learn several neural network paradigms, its applications and limitations.
			Apply fuzzy logic and reasoning to handle uncertainties and solve various engineering problems.
			Apply genetic algorithms to combinatorial optimization problems.
			Evaluate and compare solutions by various soft computing approaches for a given problem.
			Recognize the underlying mathematics and logic behind various soft computing algorithms.
27	20CSC 106	Advanced Algorithm And Soft Computing Lab	Describe and analyze various advanced Algorithms.
			Implement various algorithmic design techniques.
			Design and identify the suitable algorithmic paradigm to solve real world problems
			Design and analyze various Neural Networks Architectures.
			Implement fuzzy sets and Genetic Algorithms with its operators.
			Apply soft computing strategies for various real time applications
28	20MEC103	Research Methodology And IPR	Define research problem, review and asses the quality of literature from various sources.
			Improve the style and format of writing a report for technical paper/ Journal report, understand and develop various research designs.
			Collect the data by various methods: observation, interview, questionnaires.
			Analyze problem by statistical techniques: ANOVA, F-test, Chi-square.
			Understand apply for patent and copyrights.
29	20EGA101	English For Research Paper Writing	Illustrate the nuances of research paper writing and draw conclusions about the benefits and limitations of research.
			Classify different types of research papers and organize the format and citation of sources.
			Review the literature and categorize between different types of research.
			Draft paragraphs and write thesis statement in a scientific manner.
			Develop an original research paper while acquiring the knowledge of how and where to publish their papers.
30	20CEA101	Disaster Mitigation And Management	Analyze and critically examine existing programs in disaster management regarding vulnerability, risk and capacity at different levels.
			Understand and choose the appropriate activities and tools and set up priorities to build a coherent and adapted disaster management plan.

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			Understand various mechanisms and consequences of human induced disasters for the participatory role of engineers in disaster management.
			Understand the impact on various elements affected by the disaster and to suggest and apply appropriate measures for the same.
			Develop an awareness of the chronological phases of disaster preparedness, response and relief operations for formulating effective disaster management plans and ability to understand various participatory approaches/strategies and their application in disaster management
31	20EEA101	Sanskrit For Technical Knowledge	Develop passion towards Sanskrit language.
			Decipher the latent engineering principles from Sanskrit literature.
			Correlates the technological concepts with the ancient Sanskrit history.
			Develop knowledge for the technological progress.
			Explore the avenue for research in engineering with aid of Sanskrit.
32	20ECA101	Value Education	Gain necessary Knowledge for self-development.
			Learn the importance of Human values and their application in day to day professional life.
			Appreciate the need and importance of interpersonal skills for successful career and social life.
			Emphasize the role of personal and social responsibility of an individual for all-round growth.
			Develop a perspective based on spiritual outlook and respect women, other religious practices, equality, non-violence and universal brotherhood.
33	20EGA102	Indian constitution & Fundamental Rights	Understand the making of the Indian Constitution and its features.
			Understand the Rights of equality, the Right of freedom and the Right to constitutional remedies.
			Have an insight into various Organs of Governance - composition and functions.
			Understand powers and functions of Municipalities, Panchayats and Co-operative Societies.
			Understand Electoral Process, special provisions.
34	20ITA101	Pedagogy Studies	Illustrate the pedagogical practices followed by teachers in developing countries both in formal and informal classrooms.
			Examine the effectiveness of pedagogical practices.
			Understand the concept, characteristics and types of educational research and perspectives of research.
			Describe the role of classroom practices, curriculum and barriers to learning.

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			Understand Research gaps and learn the future directions.
35	20EGA103	Stress Management By Yoga	To understand yoga and its benefits.
			Enhance Physical strength and flexibility.
			Learn to relax and focus.
			Relieve physical and mental tension through asanas
			Improve work performance and efficiency.
36	20 EGA104	Personality Development Through Life's Enlightenment Skills	Develop their personality and achieve their highest goal of life.
			Lead the nation and mankind to peace and prosperity.
			To practice emotional self-regulation.
			Develop a positive approach to work and duties.
			Develop a versatile personality.
37	20CSO 101	Business Analytics (Open Elective)	Identify and describe complex business problems in terms of analytical models.
			Apply appropriate analytical methods to find solutions to business problems that achieve stated objectives.
			Interpret various metrics, measures used in business analytics
			Illustrate various descriptive, predictive and prescriptive methods and techniques.
			Model the business data using various business analytical methods and techniques.
			Create viable solutions to decision making problems.
38	20MEO101	Industrial Safety (Open Elective)	Identify the causes for industrial accidents and suggest preventive measures.
			Identify the basic tools and requirements of different maintenance procedures.
			Apply different techniques to reduce and prevent Wear and corrosion in Industry.
			Identify different types of faults present in various equipments like machine tools, IC Engines, boilers etc.
			Apply periodic and preventive maintenance techniques as required for industrial equipments like motors, pumps and air compressors and machine tools etc.
39	20MEO102	Introduction To Optimization Techniques (Open Elective)	Formulate a linear programming problems (LPP).
			Build and solve Transportation Models and Assignment Models.
			Apply project management techniques like CPM and PERT to plan and execute project successfully.
			Apply queing and inventory concepts in industrial applications.
			Apply sequencing models in industries.
40	20CEO101	Cost Management Of Engineering Projects (Open Elective)	Acquire in-depth knowledge about the concepts of project management and understand the principles of project management.
			Determine the critical path of a typical project using CPM and PERT techniques.

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			Prepare a work break down plan and perform linear scheduling using various methods.
			Solve problems of resource scheduling and leveling using network diagrams.
			Learn the concepts of budgetary control and apply quantitative techniques for optimizing project cost.
41	20MEO103	Composite Materials (Open Elective)	Classify and characterize the composite materials.
			Describe types of reinforcements and their properties.
			Understand different fabrication methods of metal matrix composites.
			Understand different fabrication methods of polymer matrix composites.
			Decide the failure of composite materials.
42	20EEO 101	Waste To Energy (Open Elective)	Understand the concept of conservation of waste.
			Identify the different forms of wastage.
			Chose the best way for conservation to produce energy from waste.
			Explore the ways and means of combustion of biomass.
			Develop a healthy environment for the mankind.
43	20PYO101	History Of Science and Technology (Open Elective)	Demonstrate the process of beginning of science and civilization, knowledge acquisition and philosophical approach of science and its advancements in the Stone Ages and Antiquity period.
			Illustrate the advancements in science and technology in the medieval period across Asia and Arab countries and decline and revival of science in Europe.
			Explain the scientific approach and its advances of the Europeans and how the role of engineer during the industrial revolution and the major advancements.
			Make use of the advancements in the field of science and technology by adopting new philosophies of 19th and first half of 20th century in finding ethical solutions to the societal problems.
			Interpret the changes in specializations of science and the technology and build the relation between information and society from second half of 20th century onwards.
44	20CSC 107	Mini Project with Seminar	Demonstrate a sound technical knowledge of their selected project topic
			Undertake problem identification, formulation and solution
			Design engineering solutions to complex problems using a systems approach
			Analyze and interpret the results using appropriate modern tools
			Communicate with engineers and the community at large in written an oral forms.
			Demonstrate the knowledge, skills and attitudes of a professional engineer

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45	20CSC 108	Dissertation Phase-I	Inculcate the culture of self-learning on various topics
			Review literature such as books, journal, technical documents related to problem specific domain
			Analyze the complex real world problems
			Formulate the solutions using the appropriate methodology
			Design and represent solutions using the appropriate design diagrams
			Develop research culture, communicate with engineers and the community at large in written an oral forms.
46	20CSC 109	Dissertation Phase-II	Use different experimentation techniques and technologies
			Develop experimental set up/ Environment test rig
			Conduct experiments by using the benchmark data sets
			Analyze and interpret the results by using appropriate modern tools
			Communicate effectively with technical reports and oral presentation
			Make research contributions by publishing their work to the research community

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Department Of Computer Science and Engineering

Course Outcomes Statements for M.Tech(CSE)-R19

S.No	Course		Course Outcomes Statements
	Code	Name	
1	19CSC 101	MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE	Understand the basic concepts of discrete and continuous probability.
			Understand the methods of statistical inference, and their roles.
			Apply graphs models in various applications
			Apply various counting techniques in solving combinatorial problems.
			Understand stochastic process and its applications.
2	19CSC 102	ADVANCED DATA STRUCTURES	Demonstrate Dictionaries and various hashing techniques.
			Analyze and construct Skip Lists.
			Develop and analyze algorithms for red-black trees, B-trees and Splay trees.
			Develop algorithms for text processing applications.
			Identify suitable data structures and develop algorithms for computational geometry problems.
3	19CSE101	MACHINE LEARNING Elective-I	Understand complexity of Machine Learning algorithms and their limitations, and also modern notions in data analysis oriented computing.
			Apply common Machine Learning algorithms in practice and implementing their own
			Design and implement machine learning solutions to classification, regression, and clustering problems;
			Evaluate and interpret the results of the algorithms
			Develop an appreciation for what is involved in learning from data.
4	19CSE102	INTERNET OF THINGS Elective-I	Understand an Overview of IoT
			Use Devices and Gateways in Service Oriented Architecture.
			Analyze the use of communication protocols in sensor networks.
			Design Applications using Raspberry Pi.
			Develop different IoT Automation systems.
5	19CSE103	INTRODUCTION TO INTELLIGENT SYSTEMS Elective-I	Understand knowledge of the fundamental principles of intelligent systems.
			Select a search algorithm for different applications.
			Understand the knowledge based systems.
			Acquire knowledge in Uncertainty and Probabilistic reasoning approaches.
			Apply different learning techniques to solve complex problems.
6	19CSE113	DATA SCIENCE AND BIG DATA ANALYTICS	Understand and apply suitable algorithms for data science.

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		Elective-II	Compare various techniques and use appropriate methods for given dataset.
			Design suitable models to extract and present useful information for the given data.
			Understand and analyze data leakage problems in data.
			Analyze various hypotheses for better understanding.
7	19CSE114	DISTRIBUTED DATABASE SYSTEMS Elective-II	Differentiate key concepts and techniques for centralized databases and distributed databases.
			Analyze and design distributed database systems based on the principles of distributed indexing, query evaluation, data replication.
			Implement storage, indexing, query evaluation and query optimization techniques.
			Implement the concepts of transaction management, concurrency control, crash recovery, deadlocks and catalog management.
			Apply suitable architecture for distributed databases and concepts of inter-operability of databases
8	19CSE115	ADVANCED WIRELESS AND MOBILE NETWORKS Elective-II	Demonstrate advanced knowledge of networking and wireless networking and understand various types of wireless networks, standards, operations and use cases.
			Design WLAN, WPAN, WWAN, and Cellular based upon underlying propagation and performance analysis.
			Demonstrate knowledge of protocols used in wireless networks and learn simulating wireless networks.
			Design wireless networks exploring trade-offs between wire line and wireless links.
			Develop mobile applications to solve some of the real world problems.
9	19CSE104	DATA PREPARATION AND ANALYSIS Elective-III	Understand the concepts of data gathering and preparation.
			Ability to perform data cleaning techniques on data sets.
			Analyze various data transformation and segmentation techniques.
			Apply and various visualization techniques for analyzing the data.
			Ability to solve correlations and connections, hierarchies and networks in business and scientific information using processing environment.
10	19CSE105	SECURE SOFTWARE DESIGN AND ENTERPRISE COMPUTING Elective-III	Differentiate between various software vulnerabilities.
			Software process vulnerabilities for an organization.
			Monitor resources consumption in a software.
			Interrelate security and software development process.

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11	19CSE106	COMPUTER VISION Elective-III	To develop algorithms and techniques to analyze and interpret the visible world around us.
			To implement boundary tracking techniques.
			To analyze Patterns in images
			To apply in the field of Biometrics, Medical diagnosis, document processing, mining of visual content, to surveillance, advanced rendering etc.
			To explore and contribute to research and further developments in the field of computer vision.
12	19CSE116	HUMAN AND COMPUTER INTERACTION Elective-IV	Understand the structure of models and theories of human computer interaction.
			Understand the vision of a computer user.
			Understand the recognition and remembrance limitations of a computer user.
			Understand the mobile ecosystem and use the corresponding tools for mobile design.
			Design an interactive web interface on the basis of models studied.
13	19CSE117	GPU COMPUTING Elective-IV	Gain basic knowledge of parallel programming
			Have an understanding of GPUs and the CUDA programming model
			Understand the memory management and data transfer methodology in CUDA;
			Be able to develop programs using GPUs for relevant real world problems
			Gain knowledge and acquire unique skills in multi-GPU processing and heterogeneous computing.
14	19CSE118	DIGITAL FORENSICS Elective-IV	Understand fundamentals of digital forensics.
			Collect, process, analyze, and present computer forensic evidence.
			Preserve digital evidence during forensic analysis
			Perform network investigations
			Understand mobile network investigations
15	19CSE119	MOBILE APPLICATIONS AND SERVICES Elective-V	Identify the target platform and users and be able to define and sketch a mobile application
			Develop database management system to retrieve data for mobile application.
			Use Intent, Broadcast receivers and Internet services in Android App.
			Understand the lifecycle of mobile application on Android platform.
			Design and develop a mobile application in one of the platform.
16	19CSE120	COMPILER FOR HPC Elective-V	Identify the basic concepts needed for the development of a compiler structure of a compiler.
			Analyze and understand Parallel loops, data dependency, exception handling and debugging in a compiler.
			Understand the concepts involved in loop structuring and concurrency analysis.
			Differentiate the various types of Machines, Message passing Machines
			Explores recent trends in compilers for efficient compiler building.

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17	19CSE121	OPEN SOURCE TECHNOLOGIES Elective-V	Differentiate between Open Source and Proprietary software and Licensing.
			Recognize the applications, benefits and features of Open Source Technologies.
			Understand and demonstrate Version Control System along with its commands.
			Gain knowledge to start, manage open source projects.
			Understand and practice the Open Source Ethics.
18	19CSE107	MACHINE LEARNING LAB Elective-I	To apply knowledge of computing and mathematics to machine learning problems, models and algorithms.
			To apply mathematical foundations, algorithmic principles, and computer science theory to the modeling and design of computer- based systems.
			To design, implement, and evaluate an algorithm to meet desired needs; and
			To design and development principles in the construction of software systems of varying complexity.
			To analyze a problem and identify the computing requirements appropriate for its solution;
19	19CSE108	INTERNET OF THINGS LAB Elective-I	Understand internet of Things and its hardware and software components.
			Interface I/O devices, sensors & communication module.
			Analyze the use of communication protocols in IoT.
			Remotely monitor data and control devices.
			Develop real time IoT based projects.
20	19CSE109	INTRODUCTION TO INTELLIGENT SYSTEMS LAB Elective-I	Write programs in Python/Scilab language.
			Recognize the underlying mathematics and logic behind various computing algorithms under AI system.
			Apply variety of uncertain algorithms to solve problems of moderate complexity.
			Describe and apply various techniques for logic programming and machine learning.
			Acquire knowledge in game playing algorithms.
21	19CSE110	DATA PREPARATION AND ANALYSIS LAB Elective-III	Apply pre-processing statistical methods for any given raw data.
			Ability to perform heterogeneous, cleaning techniques to replace missing data.
			Analyze various data transformation techniques on various data sets.
			Apply and analyze the various clustering techniques.
			Comprehend visualize the data related to in real world applications.
22	19CSE111	SECURE SOFTWARE DESIGN AND ENTERPRISE COMPUTING LAB Elective-III	Differentiate between various software vulnerabilities.
			Software process vulnerabilities for an organization.
			Monitor resources consumption in a software.
			Interrelate security and software development process.

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			How Enterprise Computing security issues are handled.
23	19CSE112	COMPUTER VISION LAB Elective-III	Understand the basic image processing techniques and enhance images by adjusting contrast.
			Detect edges using various kernels using transformation.
			Apply histogram processing, convert between various colour spaces.
			Partition dataset by classification and clustering.
			Comprehend computer vision system for real world problems.
24	19CSC 103	ADVANCED DATA STRUCTURES LAB	Develop programs for various data structures for stacks, queues and skip lists.
			Develop programs for various non-linear data structures for linked lists
			Develop programs for various non-linear data structures for binary search tree
			Develop programs for dictionaries.
			Implement various text processing algorithms
25	19CSC 104	ADVANCED ALGORITHMS	Understand the different problems solved by using algorithmic paradigms.
			Apply the suitable data structure for solving a problem using various strategies
			Differentiate the complexities of a problem solved in various approaches.
			Design appropriate mathematical notation to solve a problem using algorithmic paradigms.
			Develop solutions for real world problem.
26	19CSC 105	SOFT COMPUTING	Identify and describe soft computing techniques and their roles in building intelligent Machines.
			Apply fuzzy logic and reasoning to handle uncertainty and solve various engineering problems.
			Apply genetic algorithms to combinatorial optimization problems.
			Evaluate and compare solutions by various soft computing approaches for a given problem.
			Recognize the underlying mathematics and logic behind various soft computing algorithms.
27	19CSC 106	ADVANCED ALGORITHM and SOFT COMPUTING LAB	Understand and Analyze implementation of various advanced Algorithms.
			Design and identifies the suitable algorithmic paradigm for any application.
			Design and analyze various Neural Networks Architectures.
			Implement fuzzy sets and Genetic Algorithms with its operators.
			Apply soft computing strategies for various real time applications.
28	19MEC 103	RESEARCH METHODOLOGY AND IPR	Define research problem, review and asses the quality of literature from various sources
			Improve the style and format of writing a report for technical paper/ Journal report, understand and develop various research designs
			Collect the data by various methods: observation, interview, questionnaires
			Analyze problem by statistical techniques:

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			ANOVA, F-test, Chi-square
			Understand apply for patent and copyrights
29	19EGA101	ENGLISH FOR RESEARCH PAPER WRITING	Illustrate the nuances of research paper writing and draw conclusions about the benefits and limitations of research.
			Classify different types of research papers and organize the format and citation of sources.
			Review the literature and categorize between different types of research.
			Draft paragraphs and write thesis statement in a scientific manner.
			Develop an original research paper while acquiring the knowledge of how and where to publish their papers.
30	19CE A101	DISASTER MITIGATION AND MANAGEMENT	Ability to analyze and critically examine existing programs in disaster management regarding vulnerability, risk and capacity at different levels
			Ability to understand and choose the appropriate activities and tools and set up priorities to build a coherent and adapted disaster management plan
			Ability to understand various mechanisms and consequences of human induced disasters for the participatory role of engineers in disaster management
			To understand the impact on various elements affected by the disaster and to suggest and apply appropriate measures for the same
			Develop an awareness of the chronological phases of disaster preparedness, response and relief operations for formulating effective disaster management plans and ability to understand various participatory approaches/strategies and their application in disaster management
31	19EEM101	SANSKRIT FOR TECHNICAL KNOWLEDGE	Develop passion towards Sanskrit language
			Decipher the latent engineering principles from Sanskrit literature.
			Correlates the technological concepts with the ancient Sanskrit history.
			Develop knowledge for the technological progress
			Explore the avenue for research in engineering with aid of Sanskrit
32	19EC A101	VALUE EDUCATION	Gain necessary Knowledge for self-development
			Learn the importance of Human values and their application in day to day professional life.
			Appreciate the need and importance of interpersonal skills for successful career and social life
			Emphasize the role of personal and social responsibility of an individual for all-round growth.
			Develop a perspective based on spiritual outlook and respect women, other religious practices, equality, non-violence and universal brotherhood.
33	19EGA102	INDIANCONSTITUTION & FUNDAMENTAL RIGHTS	Understand the making of the Indian Constitution and its features.
			Understand the Rights of equality, the Right of freedom and the Right to constitutional remedies.

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			Have an insight into various Organs of Governance - composition and functions.
			Understand powers and functions of Municipalities, Panchayats and Co-operative Societies.
			Understand Electoral Process, special provisions.
34	19ITA101	PEDAGOGY STUDIES	Illustrate the pedagogical practices followed by teachers in developing countries both in formal and informal classrooms.
			Examine the effectiveness of pedagogical practices.
			Understand the concept, characteristics and types of educational research and perspectives of research.
			Describe the role of classroom practices, curriculum and barriers to learning.
			Understand Research gaps and learn the future directions.
35	19EGA103	STRESS MANAGEMENT BY YOGA	To understand yoga and its benefits.
			Enhance Physical strength and flexibility.
			Learn to relax and focus.
			Relieve physical and mental tension through asanas
			Improve work performance and efficiency.
36	19 EG A 104	PERSONALITY DEVELOPMENT THROUGH LIFE'S ENLIGHTENMENT SKILLS	Develop their personality and achieve their highest goal of life.
			Lead the nation and mankind to peace and prosperity.
			To practice emotional self regulation.
			Develop a positive approach to work and duties.
			Develop a versatile personality.
37	19CSO 101	BUSINESS ANALYTICS (Open Elective)	To understand the basic concepts of business analytics
			Identify the application of business analytics and use tools to analyze business data
			Become familiar with various metrics, measures used in business analytics
			Illustrate various descriptive, predictive and prescriptive methods and techniques
			Model the business data using various business analytical methods and techniques
38	19MEO 101	INDUSTRIAL SAFETY (Open Elective)	Identify the causes for industrial accidents and suggest preventive measures.
			Identify the basic tools and requirements of different maintenance procedures.
			Apply different techniques to reduce and prevent Wear and corrosion in Industry.
			Identify different types of faults present in various equipments like machine tools, IC Engines, boilers etc.
			Apply periodic and preventive maintenance techniques as required for industrial equipments like motors, pumps and air compressors and machine tools etc
39	19MEO 102	INTRODUCTION TO OPTIMIZATION	Formulate a linear programming problems (LPP)
			Build and solve Transportation Models and

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		TECHNIQUES (Open Elective)	Assignment Models.
			Apply project management techniques like CPM and PERT to plan and execute project successfully
			Apply queing and inventory concepts in industrial applications
			Apply sequencing models in industries
40	19CEO 101	COST MANAGEMENT OF ENGINEERING PROJECTS (Open Elective)	Acquire in-depth knowledge about the concepts of project management and understand the principles of project management.
			Determine the critical path of a typical project using CPM and PERT techniques.
			Prepare a work break down plan and perform linear scheduling using various methods.
			Solve problems of resource scheduling and leveling using network diagrams.
			Learn the concepts of budgetary control and apply quantitative techniques for optimizing project cost.
41	19MEO 103	COMPOSITE MATERIALS (Open Elective)	Classify and characterize the composite materials.
			Describe types of reinforcements and their properties.
			Understand different fabrication methods of metal matrix composites.
			Understand different fabrication methods of polymer matrix composites.
			Decide the failure of composite materials.
42	19EEO 101	WASTE TO ENERGY (Open Elective)	Understand the concept of conservation of waste.
			Identify the different forms of wastage.
			Chose the best way for conservation to produce energy from waste
			Explore the ways and means of combustion of biomass
			Develop a healthy environment for the mankind
43	19PYO 101	HISTORY OF SCIENCE AND TECHNOLOGY (Open Elective)	Demonstrate knowledge of broad concepts in the history of science, technology ranging over time, space and cultures.
			Recognize the values of a wide range of methodologies, conceptual approaches and the impact of competing narratives within the history of science, technology.
			Identify, locate and analyze relevant primary and secondary sources in order to construct evidence-based arguments.
			Think independently and critically, using appropriate methodologies and technologies to engage with problems in the history of science, technology.
			Demonstrate academic rig our and a sensitivity to cultural and other diversity, and understanding of the ethical implications of historical and scientific enquiry within a global context.
44	19CSC 107	MINI PROJECT with SEMINAR	Formulate a specific problem and give solution.
			Develop model/models either theoretical/practical/numerical form.
			Solve, interpret/correlate the results and

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			discussions.
			Conclude the results obtained.
			Write the documentation in standard format.
45	19CSC 108	DISSERTATION PHASE-I	Students will be exposed to self-learning various topics.
			Students will learn to survey the literature such as books, national/ international refereed
			journals and contact resource persons for the selected topic of research.
			Students will learn to write technical reports.
			Students will develop oral and written communication skills to present.
			Student will defend their work in front of technically qualified audience.
46	19CSC 109	DISSERTATION PHASE-II	Students will be able to use different experimental techniques and will be able to use different software/ computational/ analytical tools.
			Students will be able to design and develop an experimental set up/ equipment/test rig.
			Students will be able to conduct tests on existing set ups/equipment's and draw logicalconclusions from the results after analyzing them.
			Students will be able to either work in a research environment or in an industrial environment.
			Students will be conversant with technical report writing and will be able to present and convince their topic of study to the engineering community

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Department Of Computer Science and Engineering
Course Outcomes Statements for M.Tech(CSE)-R16

S.No	Course		Course Outcomes Statements
	Code	Name	
1	16CSC101	Advanced Algorithms	Design, analyze and evaluate algorithms
			Develop the skills to design and implement efficient programming solutions to various problems
			Use data structure techniques for various aspects of programming
			Gains knowledge in text processing, security algorithms and computational geometry.
			Design algorithms for real time problems.
2	16CSC102	Advanced Operating Systems	Knowledge about advanced concepts in OS
			Ability to develop OS for distributed systems
			Ability to implement protection and security for distributed systems
			Ability to develop Fault tolerant systems
			Ability to develop multiprocessor operating systems
			Ability to develop modules for Real time operating systems
3	16CSC103	Advanced Databases	Analyze and evaluate modeling and development methods/techniques in Object-based Databases
			Understand and analyze query processing and optimization.
			Understand how distributed and parallel databases are implemented, and how applications can be designed for those databases.
			Gain insight into some advanced topics in database such as Performance Tuning, spatial databases, temporal databases.
			Understand and implement cloud-based databases
			Develop applications for mobility and personal databases
4	16CSE111	Data Mining	Understand basic concepts related to Data mining, data quality and metrics
			Identify the applications of Data Mining
			Identify an understand working of various Data Mining Techniques
			Apply Data Mining Techniques to solve real world problems
			Analyze the complexity, limitation of application of various Data Mining algorithms
			Evaluate various Data mining Technologies
5	16CSE112	Artificial Intelligence	Describes the Basicscomponents and major techniques behind Artificial Intelligence Systems.
			Understands the Knowledge formulations representation, reasoning techniques and semantic tableau systems.

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			Understands architecture of an experts system, tools and applying uncertainty measures to solve real world problems
			Analyzes machine learning paradigms, various learning strategies and understands the differentiate learning strategies
			Exposure to various artificial neural networks and its functionality.
			The concepts needed to build an Artificial Intelligence Systems advanced knowledge representation techniques and fundamentals of Natural language processing.
6	16CSE113	Machine Learning	Acquire the basic knowledge ofMachineLearning, identify algorithms,machine learning problems
			Gets ability toapplytheknowledge ofcomputingandmathematics appropriatetothe discipline
			Identifiesvariousmachine learning techniques such asdecisiontree, artificialneural networks,Bayesian learning, geneticalgorithms,clusteringandclassification algorithmsetc. andtheir applications.
			Gets working knowledgeof applyingtheML algorithmsto the availablelarge data setswith the available simulation packages suchasWEKA ,Clementine etc.
			Analyze the Machine Learning algorithms
			Evaluate various Machine Learning Algorithms
7	16CSE121	Internet Of Things	Understand the vision of IoT from a global context.
			Determine the Market perspective of IoT.
			Use of Devices, Gateways and Data Management in IoT.
			Building state of the art architecture in IoT.
			Understand Application of IoT in Industrial and Commercial Building Automation and Real World Design Constraints.
8	16CSE122	Research Methodologies In Computer Science	Identify design and formulate a research problem
			Explore different data collection methods and analyze data
			Use different CI methodologies to solve a problem.
			Test, Analyze and interpret the data.
			Write a report of the findings of research problems.
9	16CSE123	Business Intelligence	Understand concepts of Data warehousing and data mining
			Explore different changing scenarios in business intelligence
			Learn analysis and reporting with available Business Intelligence software
			Apply various data mining tool for Business Intelligence
			Understand ethical and legal issues involved in Business Intelligence
10	16CSE131	Software Quality Assurance And Testing	Gained Knowledge about Software Quality assurance.
			Acquainted with various Quality tools.

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			Gained knowledge about Software Testing.
			Learned techniques to improve the quality of their own software development.
			Prepared a software quality plan for a software project.
11	16CSE132	Mobile Computing	Explain state-of-the-art wireless technologies.
			Describe the functional architecture of Telecommunication Systems and Broad cast systems.
			Distinguish various IEEE 802.11 standards of technologies in WLAN
			Explain the various routing algorithms used in Adhoc-Networks and discuss their pros and cons.
			Describe the publishing and accessing data and data delivery models and distributed file sharing Techniques and mobile Transaction models.
12	16CSE133	Natural Language Processing	Understand the basics of terms like words and words forms of natural language processing and also the concepts of morphology, syntax, semantics and pragmatics of the language.
			Recognize the significance of structures of the language and demonstrate the difference between the different parsing and ambiguity resolutions.
			Describe them capable to describe the application based on natural language processing and to show the points of lexical syntactic, semantic and pragmatic processing.
			Understand the basics of information retrieval and lexical resources and handling the pronoun relations, tagging, word net etc,.
			Understand the applications of NLP and semantic issues.
13	16CSC27	Advanced Network Technologies	Recollect the fundamental knowledge in computer networks
			Identify and understand the advanced network concepts
			Distinguish different flow control protocols
			Identify, install and use network simulators
			Conduct experiments to measure and analyze network performance
			Investigate and review the network issues
14	16CSC202	Big Data Analytics	Have a clear idea about the big data flow and its ecosystem.
			Be capable enough to apply the tools and techniques on big data.
			Be able to apply data mining techniques for solving big data problems.
			Be skilled to use the statistical tool and statistical methods that can be applied on big data.
			Have a clear idea about how to represent the unstructured data in the data bases.
			Grasp the Hadoop ecosystem.
15	16CSC203	Advanced Software Engineering	Analyze various software engineering models and patterns generally used.
			Choose the best model for the project based on the

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			type of project.
			Perform quality assessment testing on the software and measure the quality using various metrics.
			Perform testing through various techniques to make sure the software project is optimal and to achieve this at a reasonable cost.
			Design and conduct experiments, as well as to analyze and interpret data
16	16CSE241	Adhocandsensor Networks	Describe the unique issues in adhoc/sensor networks.
			Understand current technological trends for the implementation and deployment of wireless adhoc/sensor networks.
			Explain the challenges in designing MAC, routing and transport protocols for wireless adhoc sensor networks.
			Gain knowledge on implementation of protocols on a sensor test bed network.
			Explain the principles of mobile adhoc networks (MANETs)
			Explain the principles and characteristics of wireless sensor networks (WSNs).
17	16CSE242	Embedded Systems	Understand the basics concepts related to embedded systems and challenges in embedded systems
			Describe the architecture of embedded systems
			Understand the embedded hardware design and development using embedded EDA tools
			Write programs for embedded systems.
			Identify the characteristics of embedded operating systems and analyze the performance of embedded systems
			Understand the process of embedded product development
18	16CSE363	Image Processing	Understand the fundamentals of digital image processing.
			Gain knowledge about image transformation techniques used in Image processing
			Understand various image enhancement techniques used in digital image processing.
			Describe various image segmentation methods used in digital image processing.
			Explain various compression techniques their application.
			Describe the image restoration models.
19	16CSE251	Cloud Computing	Define Cloud Computing and related concepts and describe the characteristics, advantages, risks and challenges associated with cloud computing.
			Explain and characterize various cloud service models, cloud deployment models and explore virtualization techniques that serve in offering software, computation and storage services on the cloud.

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			Apply the fundamental concepts in datacenters to understand the tradeoffs in power, efficiency and cost.
			Illustrate the concepts of cloud storage and demonstrate their use in storage systems such as Amazon S3 and HDFS.
			Understand the security and privacy issues related to cloud computing environments.
			Analyze various cloud programming models and apply them to solve problems on the cloud.
20	16CSE252	Soft Computing	Evaluate and compare solutions by various soft computing approaches for give problem
			Develop the skills to design and implement Genetic algorithm solutions to various problems
			Applying Fuzzy Logic and the techniques of Neuro-fuzzy models.
			Effectively use existing tools to solve real problems using a soft computing approach
			Analyze various neural network architectures and apply the suitable model to solve engineering problems
			Apply the genetic algorithms to combinatorial optimization problems
21	16CSE253	High Performance Systems	Acquire knowledge to develop and execute parallel programs on high performance computing resources using parallel programming paradigms such as MPI
			Have an understanding of the various high performance computing and their potential for performance and programmability.
			Identify high performance computing paradigms like cluster, grid, heterogeneous and cloud computing
			Be capable of developing algorithms that yield good performance on high performance architectures and be able to estimate and evaluate their performance.
			Analyze a given problem for possibilities of parallel computations
			Have an awareness of modern field of computational science and engineering and of the impact of high performance computing on industry
22	16CSE261	Software Reuse Techniques	Students will be able to identify and describe the different approaches and techniques to the software reuse development.
			Students will be able to determine and apply the knowledge acquired on software reuse techniques.
			Students should be able to apply the design patterns in creating an object oriented design.
			Students will be able to use design patterns for real world situations.
			Students should able to list consequences of applying each pattern.
			Student will understand the benefits of a pattern approach over program in a software application.

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23	16CSE262	Storage Management	Able to identify key challenges in managing information and analyze different storage networking technologies.
			Able to understand components and the implementation of NAS
			Able to understand CAS architecture and types of archives and forms of virtualization
			Understand Storage security and Management
			Able to monitor the storage infrastructure and management activities.
24	16CSE263	Streaming Technology	Differentiate between types of Streaming Data.
			Understand the architecture of Stream Anlaytics
			Demonstrate the Distributed Data flows
			Apply concepts to Streaming Data
			Apply different metrics to real world Problems
25	16CSC104	Advanced Databases Lab (Lab-1)	Be familiar with a Object Oriented Databases and be able to develop application based on it.
			Be familiar with the XML databases and be able to write queries related to it.
			Be able to construct an Entity Relationship (ER) model from specifications and to transform them to relational model.
			Be able to develop database application using Relational Databases.
			Master the advanced concepts and appreciate the applications of database systems.
			Master the basics of Parallel Databases, Distributed Databases and Spatial Databases.
26	16EG104	Soft Skills Lab	Be effective communicators and participate in group discussions and case studies with confidence. Also be able to make presentations in a professional context.
			Write resumes, prepare and face interviews confidently.
			Be assertive and set short term and long term goals. Also learn to mange time effectively and deal with stress.
			Make the transition smoothly from campus to corporate. Also use media with etiquette and know what academic ethics are.
			Correct and complete sentences, have a good vocabulary and comprehend passages confidently
27	16CSC105	Seminar-I	Students will be exposed to self-learning various topics.
			Students will learn to survey the literature such as books, national/ international refereed
			Journals and contact resource persons for the selected topic of research.
			Students will learn to write technical reports.
			Students will develop oral and written communication skills to present.
			Student will defend their work in front of technically qualified audience.

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28	16CSC204	Big Data Analytics Lab (Lab-2)	Deploy a structured lifecycle approach to data science and big data analytics projects.
			Reframe a business challenge as an analytics challenge.
			Apply analytic techniques and tools to analyze big data.
			Create statistical models, and identify insights that can lead to actionable results
			Use tools such as R and RStudio, Hadoop, in-database analytics
			Apply big data techniques for real world problems.
29	16CSC56	Seminar-II	Students will be able to use different experimental techniques and will be able to use different software/ computational/ analytical tools.
			Students will be able to design and develop an experimental set up/ equipment/test rig.
			Students will be able to conduct tests on existing set ups/equipment's and draw logicalconclusions from the results after analyzing them.
			Students will be able to either work in a research environment or in an industrial environment.
			Students will be conversant with technical report writing and will be able to present and convince their topic of study to the engineering community
30	16CSC57	Mini Project	Formulate a specific problem and give solution.
			Develop model/models either theoretical/practical/numerical form.
			Solve, interpret/correlate the results and discussions.
			Conclude the results obtained.
			Write the documentation in standard format.

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