



**List of Open Electives offered by various departments for IV B.Tech**

**Applicable for 2019-20 Batch (R19)**

<b>Name of the department offering open elective</b>	<b>Open Elective-III (Fourth Year- Semester 1)</b>
Computer Science and Engineering	<b>19CS4165</b> - Introduction to Cloud Computing
	<b>19CS4166</b> -Blockchain Technology
Information Technology	<b>19IT4165</b> -Principles of Information Security
	<b>19IT4166</b> -Fundamentals of Data Mining
Electronics and Communications Engineering	<b>19EC4165</b> -Embedded System Design
	<b>19EC4166</b> -Electronic Measurements and Instrumentation
Electrical and Electronics Engineering	<b>19EE4165</b> -Electric and Hybrid Vehicles
	<b>19EE4166</b> -Energy Storage Systems
Civil Engineering	<b>19CE4165</b> -Road safety Engineering
	<b>19CE4166</b> - Environmental Impact Assessment
Mechanical Engineering	<b>19ME4165</b> - Total Quality Management
	<b>19ME4166</b> -Industrial Safety, Health, And Environmental Engineering

***\*Note: Students should take Open Electives from the List of Open Electives Offered by Other Departments/Branches Only.***

**19CS4165: INTRODUCTION TO CLOUD COMPUTING  
(Open Elective-III)**

**B.Tech IV Year I Semester**

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**Course Objectives**

- This course provides an insight into cloud computing.
- Topics covered include- distributed system models, different cloud service models, service-oriented architectures, cloud programming and software environments, resource management.
- To give students the skills and knowledge to understand how Cloud Computing Architecture can enable transformation.
- Describes the characteristics, delivery models and benefits of cloud computing.
- To provide an insight to the key security and compliance challenges of cloud computing.

**Course Outcomes:** By the end of this course, Students should be able to

- Understand the Concepts of computing paradigms.
- Understand the concepts of cloud computing and Deployment Models
- Understand various services of a network connectivity and managing cloud.
- Understanding cloud service providers.
- Understand the concepts of real time applications.

**UNIT-I:**

**Computing Paradigms:** High-Performance Computing, Parallel Computing, Distributed Computing, Cluster Computing, Grid Computing, Cloud Computing, Mobile Computing, Quantum Computing, Optical Computing, Nano computing.

**UNIT-II:**

**Cloud Computing Fundamentals:** Motivation for Cloud Computing, The Need for Cloud Computing, Defining Cloud Computing, Definition of Cloud computing, Cloud Computing Is a Service, Cloud Computing Is a Platform, Principles of Cloud computing, Five Essential Characteristics, Four Cloud Deployment Models

**UNIT-III:**

**Cloud Computing Architecture and Management:** Cloud architecture, Layer, Anatomy of the Cloud, Network Connectivity in Cloud Computing, Applications on the Cloud,

**UNIT-IV:**

**Cloud Service Models:** Infrastructure as a Service, Characteristics of IaaS. Suitability of IaaS, Pros and Cons of IaaS, Platform as a Service, Characteristics of PaaS, Pros and Cons of PaaS, Software as a Service, Characteristics of SaaS, Suitability of SaaS, Pros and Cons of SaaS.

**UNIT-V:**

**Cloud Service Providers:** EMC, EMC IT, Captiva Cloud Toolkit, Google, Cloud Platform, Cloud Storage, Google Cloud Connect, Google Cloud Print, Google App Engine, Amazon Web Services, Amazon Elastic Compute Cloud, Amazon Simple Storage Service, Amazon Simple Queue ,service, Microsoft, Windows Azure, Microsoft

Assessment and Planning Toolkit, SharePoint, IBM

**TEXT BOOKS:**

1. Essentials of cloud Computing: K. Chandrasekhran, CRC press, 2014

**REFERENCES:**

1. Cloud Computing: Principles and Paradigms by RajkumarBuyya, James Broberg and Andrzej M. Goscinski, Wiley, 2011.
2. Distributed and Cloud Computing, Kai Hwang, Geoffery C. Fox, Jack J. Dongarra, Elsevier, 2012.
3. Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance, Tim Mather, SubraKumaraswamy, ShahedLatif, O'Reilly, SPD, rp2011.

**19CS4166: BLOCKCHAIN TECHNOLOGY  
(Open Elective-III)**

**B.Tech IV Year I Semester**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
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**Course Objectives**

- To Introduce Blockchain technology and Crypto currency
- To give students the understanding of emerging abstract models for Blockchain Technology
- To familiarise with the functional/operational aspects of cryptocurrency eco-system
- To explore the ideas about private and public Blockchain, and smart contract
- Integrate ideas from Blockchain technology into their own projects.

**Course Outcomes:** By the end of this course, Students should be able to

- Understand basics of Blockchain Technology and Cryptocurrency
- Get Exposure on Blockchain Environment and Digital Identity Verification
- Understand Blockchain Science
- Learn Types of Cryptocurrency
- Learn about research advances related to one of the most popular technological areas today.

**UNIT- I**

**Introduction:** Blockchain or distributed trust, Protocol, Currency, Crypto currency, How a Crypto currency works, Crowd funding

**UNIT- II**

Extensibility of Blockchain concepts, Digital Identity verification, Blockchain Neutrality, Digital art, Blockchain Environment

**UNIT- III**

**Block chain Science:** Grid coin, Folding coin, Blockchain Genomics, Bit coin MOOCs

**UNIT - IV**

Currency, Token, Tokenizing, Campus coin, Coindrop as a strategy for Public adoption, Currency Multiplicity, Demurrage currency

**UNIT - V**

Technical challenges, Business model challenges, Scandals and Public perception, Government Regulations

**TEXTBOOK:**

1. Blockchain Blue prints for Economy by Melanie Swan.

**REFERENCES:**

1. Blockchain Basics: A Non-Technical Introduction in 25 Steps 1st Edition, by Daniel Drescher.

**19IT4165: PRINCIPLES OF INFORMATION SECURITY  
(Open Elective-III)**

**B.Tech IV Year I Semester**

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**Course Objectives:**

- To impart knowledge on network security issues, services, goals and mechanisms.
- To classify various algorithms and fundamental ideas of public-key cryptography.
- To explain the authentication codes and digital signatures.
- To analyze the security of communication systems, networks and protocols.
- To focus on the practical applications that have been implemented and are in use to provide email and web security.

**Course Outcomes:** By the end of this course, Students should be able to

- Demonstrate the knowledge of cryptography and network security concepts and applications.
- Compare various cryptographic algorithms.
- Identify the requirement of Message Authentication and hash functions.
- Apply security principles in networks and mobile devices.
- Analyze various E-Mail privacy techniques.

**UNIT- I**

**Introduction to Cryptography:** Introduction, The need for security, Security approaches, Principles of security, Types of Security attacks, Security services, Security Mechanisms, A model for Network Security Cryptography Concepts and Techniques: Introduction, plain text and cipher text, substitution techniques, transposition techniques, encryption and decryption, symmetric and asymmetric key cryptography, steganography, key range and key size, possible types of attacks.

**UNIT- II**

**Symmetric and Asymmetric key Ciphers:** Block Cipher principles, DES, AES, Blowfish, RC5, IDEA, Differential and Linear Cryptanalysis, Block cipher modes of operation, Stream ciphers, RC4. Principles of public key cryptosystems, RSA algorithm, Elgamal Cryptography, Diffie-Hellman Key Exchange, Knapsack Algorithm.

**UNIT- III**

**Message Authentication Algorithms and Hash Functions:** Message Authentication, MD5, Secure Hash Algorithm (SHA512), Message authentication codes: Authentication requirements, HMAC, CMAC, Digital signatures, Elgamal Digital Signature Scheme Symmetric Key Distribution Using Symmetric & Asymmetric Encryption, Distribution of Public Keys, Kerberos, X.509 Authentication Service, Public – Key Infrastructure.

**UNIT- IV**

**Transport-level and Wireless Network Security:** Web security considerations, Secure Socket Layer and Transport Layer Security, Secure Electronic Transaction (SET), HTTPS, Secure Shell (SSH), Wireless Security, Mobile Device Security, IEEE 802.11 Wireless LAN, IEEE 802.11i Wireless LAN Security.

**Security Technology and attacks:** Introduction, Access Control, Firewalls, Intrusion detection and prevention systems, Honeypots, Honeynets, TCP session hijacking, UDP hijacking, route table modification.

#### **UNIT-V**

**E-Mail and IP Security:** Pretty Good Privacy, S/MIME, IP Security overview, IP Security architecture, Authentication Header, Encapsulating security payload, combining security associations, Internet Key Exchange.

**Case Studies on Cryptography and security:** Secure Multiparty Calculation, Virtual Elections, Single sign On, Secure Inter-branch Payment Transactions, Cross site Scripting Vulnerability.

#### **TEXT BOOKS:**

1. Cryptography and Network Security: Principles and Practice: William Stallings, Pearson Education, 6th Edition.
2. Cryptography and Network Security: Atul Kahate, Mc Graw Hill, 3rd Edition.

#### **REFERENCE BOOKS:**

1. Cryptography and Network Security: C K Shyamala, N Harini, Dr T R Padmanabhan, Wiley India, 1st Edition.
2. Cryptography and Network Security: Forouzan Mukhopadhyay, Mc Graw Hill, 3rd Edition.
3. Information Security, Principles, and Practice: Mark Stamp, Wiley India.
4. Principles of Computer Security: WM. Arthur Conklin, Greg White, TMH
5. Introduction to Network Security: Neal Krawetz, CENGAGE Learning.
6. Network Security and Cryptography: Bernard Menezes, CENGAGE Learning.

**19IT4166: FUNDAMENTALS OF DATA MINING  
(Open Elective-III)**

**B.Tech IV Year I Semester**

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**Course Objectives:**

- To introduce the basic concept of data mining and its applications
- To understand stages in building a Data Mining.
- To analyze and evaluate performance of algorithms for Association Rules.
- To analyze classification algorithms and evaluate prediction techniques.
- To describe methods for data-clustering approaches.

**Course Outcomes:** By the end of this course, Students should be able to

- Identify the need and importance of pre-processing techniques.
- Compute associations and correlations among items by mining frequent patterns from transactional databases.
- Build model to classify unknown data objects.
- Build clusters using various clustering techniques and evaluate clusters formed.
- Perform mining of various Databases.

**UNIT- I**

**Introduction to Data Mining and its issues:**

Data, Types of data, Need for data mining, KDD process, Transactional databases, Data Mining functionalities, Applications, Classification of data mining systems, Major issues in Data Mining.

**Data Pre-processing:** Data Cleaning, Data Integration and Transformation, Data Reduction.

**UNIT- II**

**Mining Association rules in large databases:**

Mining Frequent Patterns, Associations and Correlations: Market Basket Analysis, Association rule mining, Mining Frequent Item sets- Apriori algorithm, compact representation of frequent item set-maximal frequent item set, closed frequent item set.

**UNIT- III**

**Classification and Prediction:** Basic concepts, Decision tree induction, Bayesian classification, Naive Bayes Classification, classification by Back propagation, other classification methods, Prediction, Classification accuracy.

**UNIT-IV**

**Clustering:** Types of Data in Cluster Analysis, Categorization of Major Clustering Methods, Partitioning Methods, Hierarchical Methods, Density-Based Clustering Method, Strengths and Weaknesses, Outlier Analysis.

**UNIT-V**

**Social Impacts of Data Mining:** Mining the World Wide Web, Mining Text databases, and Mining Spatial databases, Data mining Applications.

**TEXT BOOKS:**

1. Data Mining – Concepts and Techniques - Jiawei Han & Micheline Kamber, Elsevier.
2. Pang-Ning Tan & Michael Steinbach, —Introduction to Data Mining, Vipin Kumar, Pearson.
3. Data Warehousing, Data Mining & OLAP- Alex Berson and Stephen J. Smith- Tata McGraw-Hill Edition, Tenth reprint 2007.

**REFERENCE BOOKS:**

1. Data Mining Introductory and Advanced topics—Margaret H Dunham, Pearson Education.
2. Arun K Pujari, Data Mining Techniques, (2017), University Press.
3. Mohammed J. Zaki, Wagner Meira, Jr ,Data Mining and Analysis - Fundamental Concepts and Algorithms, Oxford.



**19EC4165: EMBEDDED SYSTEM DESIGN  
(Open Elective-III)**

**B.Tech IV Year I Semester**

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**Course Objectives:** The objectives of the course are to:

- Understand the basics and applications of an embedded system
- Learn the method of designing an embedded system for any type of application
- Understand Firmware design approach of an embedded system
- Understand operating system concepts , RTOS Architecture
- Understand the Task Communication and Device Drivers. How to Choose RTOS

**Course outcomes:** By the end of this course, Students should be able to

- Understand the design flow of an embedded system and they can implement this on real time embedded systems
- Differentiate different types of processors and interfacing memory types to design an embedded systems
- Design control circuits for embedded system and develop the programs using programming languages
- Learn about RTOS for Embedded system Design, multiprocessing, multitasking techniques
- Analyze Task Communications and Synchronization techniques in RTOS and task synchronization and latency issues

**UNIT – I**

**Introduction to Embedded Systems:** Definition of Embedded System, Embedded Systems Vs General Computing Systems, History of Embedded Systems, Classification, Major Application Areas, Purpose of Embedded Systems, Characteristics and Quality Attributes of Embedded Systems.

**UNIT – II**

**Typical Embedded System:** Core of the Embedded System: General Purpose and Domain Specific Processors, ASICs, PLDs, Commercial Off-The-Shelf Components (COTS). Memory: ROM, RAM, Memory according to the type of Interface, Memory Shadowing, Memory selection for Embedded Systems, Sensors and Actuators, Communication Interface: Onboard and External Communication Interfaces.

**UNIT – III**

**Embedded Firmware:** Reset Circuit, Brown-out Protection Circuit, Oscillator Unit, Real Time Clock, Watchdog Timer, Embedded Firmware Design Approaches and Development Languages.

**UNIT – IV**

**RTOS Based Embedded System Design:** Operating System Basics, Types of Operating

Systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling.

#### **UNIT – V**

**Integration and Testing of Embedded Hardware and Firmware:** Integration of Hardware and Firmware, Boards Bring up.

**The Embedded System Development Environment:** The Integrated Development Environment (IDE), Types of files generated on Cross-Compilation, Disassembler / Decompiler, Simulators, Emulators and Debugging, Target Hardware Debugging, Boundary Scan.

#### **TEXT BOOKS:**

1. Shibu K V, “Introduction to Embedded Systems”, Second Edition, Mc Graw Hill, 2016

#### **REFERENCES:**

1. Rajkamal, Embedded Systems Architecture, Programming and Design, TATA McGraw-Hill, 2017.
2. Frank Vahid and Tony Givargis, “Embedded Systems Design” - A Unified Hardware/Software Introduction, John Wiley, 2001.
3. Lyla B.Das, “Embedded Systems Integrated Approach” – First Edition Pearson, 2012
4. David E.Simon, An Embedded Software Primer, Pearson Education Asia, First Indian Reprint 2000.

**19EC4166: ELECTRONIC MEASUREMENTS AND INSTRUMENTATION  
(Open Elective-III)**

**B.Tech IV Year I Semester**

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**Course Objectives:**

- To understand the various measuring systems functions and metrics for performance analysis.
- To understand the principle of operation and working of different electronic instruments.
- To understand the construction and principle of operation of different electronic instruments via oscilloscope and special purpose oscilloscopes.
- To understand the working principles of various transducers
- How to use bridges to measure resistance, capacitance, and inductance using various measuring techniques.

**Course Outcomes:** By the end of this course, Students should be able to

- Understand and identify the various electronic instruments based on their specifications for carrying out a particular task of measurement.
- Analyze various types of signal generators and signal analysers for generating and analyzing various real time signals.
- Analyze different types of oscilloscopes and acquire the knowledge of measuring parameters of different real time signals.
- Measure various physical parameters by appropriately selecting the transducers.
- Understand about bridges for the measurement of resistance, capacitance and inductance and also can learn how all the physical parameters can be measured.

**UNIT - I**

**Block Schematics of Measuring Systems:** Performance Characteristics, Static Characteristics, Accuracy, Precision, Resolution, Types of Errors, Gaussian Error, Root Sum Squares formula, Dynamic Characteristics, Repeatability, Reproducibility, Fidelity, Lag; Measuring Instruments: DC Voltmeters, D' Arsonval Movement, DC Current Meters, AC Voltmeters and Current Meters, Ohmmeters, Multi meters, Meter Protection, Extension of Range, True RMS Responding Voltmeters, Specifications of Instruments.

**UNIT - II**

**Signal Analyzers:** AF, HF Wave Analyzers, Harmonic Distortion, Heterodyne wave Analyzers, Spectrum Analyzers, Power Analyzers, Capacitance-Voltage Meters, Oscillators. **Signal Generators:** AF, RF Signal Generators, Sweep Frequency Generators, Pulse and Square wave Generators, Function Generators, Arbitrary Waveform Generator, Video Signal Generators, and Specifications

### **UNIT - III**

**Oscilloscopes:** CRT, Block Schematic of CRO, Time Base Circuits, Lissajous Figures, CRO Probes, High Frequency CRO Considerations, Delay lines, Applications: Measurement of Time, Period and Frequency Specifications.

**Special Purpose Oscilloscopes:** Dual Trace, Dual Beam CROs, Sampling Oscilloscopes, Storage Oscilloscopes, Digital Storage CROs.

### **UNIT – IV**

**Transducers:** Classification, Strain Gauges, Bounded, unbounded; Force and Displacement Transducers, Resistance Thermometers, Hotwire Anemometers, LVDT, Thermocouples, Synchros, Special Resistance Thermometers, Digital Temperature sensing system, Piezoelectric Transducers, Variable Capacitance Transducers, Magneto Strictive Transducers.

### **UNIT - V**

**Bridges:** Wheat Stone Bridge, Kelvin Bridge, and Maxwell Bridge.

**Measurement of Physical Parameters:** Flow Measurement, Displacement Meters, Liquid level Measurement, Measurement of Humidity and Moisture, Velocity, Force, Pressure – High Pressure, Vacuum level, Temperature -Measurements, Data Acquisition Systems.

### **TEXT BOOKS:**

1. Electronic Measurements and Instrumentation – K. Lal Kishore, Pearson Education 2010.
2. Electronic Instrumentation: H. S. Kalsi – McGraw Hill Education, 2<sup>nd</sup> Edition 2004.
3. Electronic Instrumentation and Measurements – David A. Bell, 3rd Edition Oxford Univ.Press, 2013.

### **REFERENCES:**

1. Electronic Instrumentation and Measurements – David A. Bell, Oxford Univ. Press, 1997.
2. Modern Electronic Instrumentation and Measurement Techniques: A.D.Helbins, W.D. Cooper: PHI 5<sup>th</sup> Edition 2003.
3. Electronic Measurements and Instrumentation: B.M. Oliver, J.M. Cage McGraw Hill Education, Reprint 2009.
4. Industrial Instrumentation: T.R. Padmanabham, Springer 2009.

## 19EE4165: ELECTRIC AND HYBRID VEHICLES

(Open Elective-III)

B. Tech IV Year I Semester

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**Prerequisite:** Electrical Machines, Power Semiconductor Drives,

**Course Objectives:**

- To understand the fundamental concepts of conventional vehicles.
- To understand the fundamental concepts, principles, analysis and design of hybrid and electric vehicles.
- To understand the performance of electrical propulsion units with different motor drives.
- To understand electrical energy storage using batteries, fuel cells and super capacitors.
- To understand various energy management strategies in electric vehicles.

**Course Outcomes:** By the end of this course, Students should be able to

- Analyze mechanical design of conventional vehicles.
- Describe hybrid vehicles and their performance.
- Analyze various motor drives used in hybrid electrical vehicles.
- Discuss different possible ways of energy storage.
- Discuss the various energy management strategies in electric vehicles.

### UNIT I

**Introduction: Conventional Vehicles:** Basics of vehicle performance, vehicle power source characterization, transmission characteristics, and mathematical models to describe vehicle performance.

### UNIT-II

**Introduction to Hybrid Electric Vehicles:** History of hybrid and electric vehicles, social and environmental importance of hybrid and electric vehicles, impact of modern drive-trains on energy supplies.

**Hybrid Electric Drive Trains:** Basic concept of hybrid traction, introduction to various hybrid drive-train topologies, power flow control in hybrid drive-train topologies, fuel efficiency analysis.

### UNIT III

**Electric Trains: Electric Drive Trains:** Basic concept of electric traction, introduction to various electric drive train topologies, power flow control in electric drive-train topologies, fuel efficiency analysis.

**Electric Propulsion Unit:** Introduction to electric components used in hybrid and electric vehicles, Configuration and control of DC Motor drives, Configuration and control of Induction Motor drives, configuration and control of Permanent Magnet Motor drives,

Configuration and control of Switch Reluctance Motor drives, drive system efficiency.

#### **UNIT-IV**

**Energy Storage:** Introduction to Energy Storage Requirements in Hybrid and Electric Vehicles, Battery based energy storage and its analysis, Fuel Cell based energy storage and its analysis, Super Capacitor based energy storage and its analysis, Fly wheel based energy storage and its analysis, Hybridization of different energy storage devices.

**Sizing the drive system:** Matching the electric machine and the internal combustion engine (ICE), Sizing the propulsion motor, sizing the power electronics, selecting the energy storage technology, Communications, supporting subsystems.

#### **UNIT-V:**

**Energy Management Strategies:** Introduction to energy management strategies used in hybrid and electric vehicles, classification of different energy management strategies, comparison of different energy management strategies, implementation issues of energy management strategies.

#### **TEXTBOOKS:**

1. C. Mi, M. A. Masrur and D. W. Gao, “Hybrid Electric Vehicles: Principles and Applications with Practical Perspectives”, John Wiley & Sons, 2011.
2. S. Onori, L. Serrao and G. Rizzoni “Hybrid Electric Vehicles: Energy Management Strategies”, Springer, 2015.

#### **REFERENCES:**

1. M. Ehsani, Y. Gao, S. E. Gay and A. Emadi, “Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals, Theory and Design”, CRC Press, 2004.
2. T. Denton, “Electric and Hybrid Vehicles”, Routledge, 2016.

**19EE4166: ENERGY STORAGE SYSTEMS**  
**(Open Elective-III)**

**B. Tech IV Year I Semester**

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**Prerequisite:** Electrochemistry Course

**Course Objective:**

- To study and understand electrical energy storage technologies
- To study and understand the need for electrical energy storage
- To study about various features of energy storage systems
- To acquire knowledge about various types of energy storage systems
- To study various applications of energy storage systems

**Course Outcomes:** By the end of this course, Students should be able to

- Analyze the technologies for electrical energy storage
- Explain the need for electrical energy storage
- Discuss various features of energy storage systems
- Classify various types of energy storage and various devices used for the purpose
- Identify various real time applications.

**UNIT - I**

**Electrical Energy Storage Technologies:**

Characteristics of electricity, Electricity and the roles of EES, High generation cost during peak-demand periods, Need for continuous and flexible supply, Long distance between generation and consumption, Congestion in power grids, Transmission by cable.

**UNIT - II**

**Needs for Electrical Energy Storage:**

Emerging needs for EES, more renewable energy, less fossil fuel, Smart Grid uses, The roles of electrical energy storage technologies, The roles from the viewpoint of a utility, The roles from the viewpoint of consumers, The roles from the viewpoint of generators of renewable energy.

**UNIT - III**

**Features of Energy Storage Systems:**

Classification of EES systems, Mechanical storage systems, Pumped hydro storage (PHS), Compressed air energy storage (CAES), Flywheel energy storage (FES), Electrochemical storage systems, Secondary batteries, Flow batteries, Chemical energy storage, Hydrogen (H<sub>2</sub>), Synthetic natural gas (SNG).

**UNIT - IV**

**Types of Electrical Energy Storage systems:**

Electrical storage systems, Double-layer capacitors (DLC), Superconducting magnetic energy storage (SMES), Thermal storage systems, Standards for EES, Technical comparison of EES technologies.

**UNIT - V**

**Applications:**

Present status of applications, Utility use (conventional power generation, grid operation &

service) , Consumer use (uninterruptable power supply for large consumers), New trends in applications ,Renewable energy generation, Smart Grid, Smart Micro grid, Smart House, Electric vehicles, Management and control hierarchy of storage systems, Internal configuration of battery storage systems, External connection of EES systems , Aggregating EES systems and distributed generation (Virtual Power Plant), Battery SCADA–aggregation of many dispersed batteries.

**Text Books:**

1. “James M. Eyer, Joseph J. Iannucci and Garth P. Corey “, “Energy Storage Benefits and Market Analysis”, Sandia National Laboratories, 2004.
2. The Electrical Energy Storage by IEC Market Strategy Board.

**Reference Book:**

1. “Jim Eyer, Garth Corey”, Energy Storage for the Electricity Grid: Benefits and Market Potential Assessment Guide, Report, Sandia National Laboratories, Feb 2010.



**19CE4165: ROAD SAFETY ENGINEERING**  
**(Open Elective-III)**

**B.Tech IV Year I Semester**

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**Course Objects:** To learn

- The fundamental of traffic Engineering & some of the statistics methods to analysis the traffic safety.
- The accident interrogations risk involved with measures to identity the causes are dealt.
- The role of road safety in planning the urban infrastructures design is discussed.
- The various traffic management systems for safety & safety improvement strategies are dealt
- Road safety audit system for improvement of road safety.

**Course Outcomes:** By the end of this course, Students should be able to

- Understand fundamental of Traffic Engineering.
- Investigate & determine the collective factors & remedies of accident involved.
- Design & planning various road geometrics.
- Massage the traffic system from road safety point of view.
- Know various traffic management systems

**UNIT I:**

Fundamentals of Traffic Engineering - Basic Characteristics of Motor-Vehicle Traffic, Highway Capacity, Applications of Traffic Control Devices, Traffic Design of Parking Facilities, Traffic Engineering Studies; Statistical Methods in Traffic Safety Analysis – Regression Methods, Poisson Distribution, Chi- Squared Distribution, Statistical Comparisons.

**UNIT II:**

Accident Investigations and Risk Management, Collection and Analysis of Accident Data, Condition and Collision Diagram, Causes and Remedies, Traffic Management Measures and Their Influence on Accident Prevention, Assessment of Road Safety, Methods to Identify and Prioritize Hazardous Locations and Elements, Determine Possible Causes of Crashes, Crash Reduction Capabilities and Countermeasures, Effectiveness of Safety Design Features, Accident Reconstruction

**UNIT III:**

Road Safety in Planning And Geometric Design: Vehicle And Human Characteristics, Road Design and Road Equipment's, Redesigning Junctions, Cross Section Improvements, Reconstruction and Rehabilitation of Roads, Road Maintenance, Traffic Control, Vehicle Design and Protective Devices, Post Accident Care

**UNIT IV:**

Role of Urban infrastructure design in safety: Geometric Design of Roads; Design of Horizontal and Vertical Elements, Junctions, At Grade and Grade Separated Intersections, Road Safety in Urban Transport, Sustainable Modes and their Safety.

**UNIT V:**

Traffic Management Systems for Safety, Road Safety Audits and Tools for Safety Management Systems, Road Safety Audit Process, Approach to Safety, Road Safety Improvement Strategies, ITS and Safety.

**Text Books:**

1. Traffic Engineering and Transportation Planning – L.R. Kadiyali, Khanna Publishers
2. Fundamentals of Transportation Engineering - C. S. Papacostas, Prentice Hall India.
3. Transportation Engineering – An Introduction, C. Jotin khisty, B. Kent Lall

**References**

1. Fundamentals of Traffic Engineering, Richardo G Sigua
2. Handbook of Road Safety measures, second Edition, Rune Elvik, Alena Hoye, Truls Vaa, Michael Sorenson
3. Road Safety by NCHRP

**19CE4166: ENVIRONMENTAL IMPACT ASSESSMENT  
(Open Elective-III)**

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<b>B.Tech IV Year I Semester</b>	3	-	-	3

**Course Objectives:** The students will be able to

- Understand the basic terminologies of EIA and methodologies of EIA.
- Understand the assessment of deforestation and its impact predictions.
- Explain assessment of soil quality and its impact prediction.
- Understand environment Audits and its methods.
- Understand various Acts and case studies.

**Course Outcomes:** The students will be able to

- Discuss the objectives of EIA studies and identify the methodologies to prepare EIA.
- Identifies and incorporate mitigation measures of deforestation.
- Identifies and incorporate mitigation measures of soil quality.
- Executing Audit report.
- Use the knowledge of various environmental acts in the preparation of case study reports.

**.UNIT – I**

**Basic concept of EIA:** Initial environmental Examination, Elements of EIA, - factors affecting E-I-A Impact evaluation and analysis, preparation of Environmental Base map, Classification of environmental parameters.

**E I A Methodologies:** introduction, Criteria for the selection of EIA Methodology, E I A methods, Ad-hoc method, matrix method, Network method and overlay method.

**UNIT- II**

Assessment of Impact of development Activities on Vegetation and wildlife, environmental Impact of Deforestation – Causes and effects of deforestation.

**UNIT- III**

Procurement of relevant soil quality, Impact prediction, Assessment of Impact significance, Identification and Incorporation of mitigation measures.

**UNIT – IV**

Environmental Audit & Environmental legislation objectives of Environmental Audit, Types of environmental Audit, Audit protocol, stages of Environmental Audit, onsite activities, evaluation of Audit data and preparation of Audit report, Post Audit activities.

**UNIT – V**

The Environmental Protection Act, The water Act, The Air (Prevention & Control of pollution Act.), Motor Act, Wild life Act. Case studies and preparation of Environmental Impact assessment statement for various Industries-Water resource projects, sewage treatments plant, municipal solid waste processing plant, thermal plant and airport.

**TEXT BOOKS:**

1. Larry Canter – Environmental Impact Assessment, McGraw-Hill Publications
2. Environmental Impact Assessment, Barthwal, R. R. New Age International Publications
3. Anjaneyulu. Y & Manicram. V, Env. Impact Assessment methodologies, B,S Publications, Hyderabad 2017.

**REFERENCES:**

1. Environmental Pollution by R.K. Khitoliya S. Chand, 2014.
2. Glynn, J. and Gary, W. H. K. - Environmental Science and Engineering, Prentice Hall Publishers
3. Suresh K. Dhaneja - Environmental Science and Engineering, S.K. Kataria & Sons Publication. New Delhi.
4. Bhatia, H. S. - Environmental Pollution and Control, Galgotia Publication (P) Ltd, Delhi.
5. Wathern, P. – Environmental Impact Assessment: Theory & Practice, Publishers-Rutledge, London, 1992.

**19ME4165: TOTAL QUALITY MANAGEMENT  
(Open Elective-III)**

**B.Tech IV Year I Semester**

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**Course Objectives:**

- Understand the importance of Total Quality Management
- Understand about Customer Focus and Satisfaction
- Learn about TQM Tools
- Understand Accounting Systems and Quality Management.
- Learn about ISO Standards

**Course Outcomes:** By the end of this course, Students should be able to

- Understand fundamental concepts of Total Quality Management
- Apply quality principles for Customer satisfaction
- Understand TQM organization and Quality Circles
- Understand the concept of Cost of Quality
- Understand different ISO Standards

**UNIT - I**

**Introduction:** The concept of TQM, Quality and Business performance, attitude, and involvement of top management, communication, culture and management systems. Management of Process Quality: Definition of quality, Quality Control, a brief history, Product Inspection vs. Process Control, Statistical Quality Control, Control Charts and Acceptance Sampling.

**UNIT -II**

**Customer Focus and Satisfaction:** Process vs. Customer, internal customer conflict, quality focus, Customer Satisfaction, role of Marketing and Sales, Buyer – Supplier relationships. Bench Marking: Evolution of Bench Marking, meaning of bench marking, benefits of bench marketing, the bench marking procedure, pitfalls of bench marketing.

**UNIT- III**

**Organizing for TQM:** The systems approach, organizing for quality implementation, making the transition from a traditional to a TQM organization, Quality Circles, seven Tools of TQM: Stratification, check sheet, Scatter diagram, Ishikawa diagram, paneto diagram, Kepner &Tregoe Methodology.

**UNIT- IV**

**The Cost of Quality:** Definition of the Cost of Quality, Quality Costs, Measuring Quality Costs, use of Quality Cost information, Accounting Systems and Quality Management.

**UNIT -V**

**ISO9000:** Universal Standards of Quality: ISO around the world, The ISO9000 ANSI/ASQC Q- 90. Series Standards, benefits of ISO9000 certification, the third party audit, Documentation ISO9000 and services, the cost of certification implementing the system.

**TEXT BOOK:**

1. Total Quality Management / Joel E. Ross/Taylor and Francis Limited.
2. Total Quality Management/P. N. Mukherjee/PHI.

**REFERENCES:**

1. Beyond TQM / Robert L.Flood.
2. Statistical Quality Control / E.L. Grant.
3. Total Quality Management: A Practical Approach/H. Lal.
4. Quality Management/Kanishka Bedi/Oxford University Press/2011.

**19ME4166: INDUSTRIAL SAFETY, HEALTH, AND ENVIRONMENTAL ENGINEERING  
(Open Elective-III)**

**B.Tech IV Year I Semester**

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**Course Objectives:**

- To provide exposure to the students about safety and health provisions related to hazardous processes as laid out in Factories act 1948.
- To familiarize students with powers of inspectorate of factories.
- To help students to learn about Environment act 1948 and rules framed under the act.
- To provide wide exposure to the students about various legislations applicable to an industrial unit.
- To provide wide exposure to the students on Acts for Industrial safety, health and Environment

**Course Outcomes:** By the end of this course, Students should be able to

- Outline the Factories Act 1948
- Explain Environment Act – 1986
- Classify the Biomedical waste and procedure of treating them to minimize the pollution
- Develop onsite and offsite emergency plan
- Explain different statutory rules and Acts for Industrial safety, health and Environment

**UNIT - I**

**Factories Act – 1948 :** Statutory authorities – inspecting staff, health, safety, provisions relating to hazardous processes, welfare, working hours, employment of young persons – special provisions – penalties and procedures-Telangana Factories Rules 1950 under Safety and health chapters of Factories Act 1948

**UNIT II**

**Environment Act – 1986:** General Powers of the central government, prevention, control and abatement of environmental pollution-Biomedical waste (Management and handling Rules, 1989-The noise pollution (Regulation and control) Rules, 2000-The Batteries (Management and Handling Rules) 2001- No Objection certificate from statutory authorities like pollution control board. Air Act 1981 and Water Act 1974: Central and state boards for the prevention and control of air pollution-powers and functions of boards – prevention and control of air pollution and water pollution – fund – accounts and audit, penalties and procedures.

**UNIT - III**

**Manufacture, Storage and Import of Hazardous**

**Chemical Rules 1989 :** Definitions – duties of authorities – responsibilities of occupier – notification of major accidents –information to be furnished – preparation of offsite and onsite plans – list of hazardous and toxic chemicals – safety reports – safety data sheets.

#### **UNIT - IV**

**Other Acts and Rules :** Indian Boiler Act 1923, static and mobile pressure vessel rules (SMPV), motor vehicle rules, mines act 1952, workman compensation act, rules – electricity act and rules – hazardous wastes (management and handling) rules, 1989, with amendments in 2000- the building and other construction workers act 1996., Petroleum rules, Gas cylinder rules-Explosives Act 1983-Pesticides Act

#### **UNIT - V**

**International Acts and Standards:** Occupational Safety and Health act of USA (The Williams-Steiger Act of 1970) – Health and safety work act (HASAWA 1974, UK) – OSHAS 18000 – ISO 14000 – American National Standards Institute (ANSI).

#### **TEXT BOOKS:**

1. The Factories Act 1948, Madras Book Agency, Chennai, 2000.
2. The Environment Act (Protection) 1986, Commercial Law Publishers (India) Pvt. Ltd., New Delhi.
3. Industrial Safety, Health and Environment Management Systems / R. K. Jain, Sunil S.Rao / Khanna Publishers.

#### **REFERENCES:**

1. Water (Prevention and control of pollution) act 1974, Commercial Law publishers (India) Pvt. Ltd., New Delhi.
2. Air (Prevention and control of pollution) act 1981, Commercial Law Publishers (India) Pvt. Ltd., New Delhi.
3. The Indian boilers act 1923, Commercial Law Publishers (India) Pvt. Ltd., Allahabad.
4. The Mines Act 1952, Commercial Law Publishers (India) Pvt. Ltd., Allahabad.
5. The manufacture, storage, and import of hazardous chemical rules 1989, Madras Book Agency, Chennai.