Vision of the Institution

To ignite the minds of the students through academic excellence so as to bring about social transformation and prosperity.

Mission of the Institution

- To expand the frontiers of knowledge through Quality Education.
- To provide valued added Research and Development.
- To embody a spirit of excellence in Teaching, Creativity, Scholarship and Outreach.
- To provide a platform for synergy of Academy, Industry and Community.
- To inculcate high standards of Ethical and Professional Behavior.

Vision of EEE Department

"Centre of Excellence in Education and Research in the field of Electrical and Electronics Engineering and to become the foremost academic department through its education and research programs"

Mission of EEE Department

- To develop innovative, efficient and proficient electrical engineers.
- To keep the curriculum industry friendly, with due regard to the University curriculum.
- To participate in large projects of National and International importance.
- To promote ethical and moral values among the students so as to make them emerge as responsible professionals.

Program Educational Objectives (PEOs)

PEO 1. To produce Electrical and Electronics Engineering graduates who have strong foundation in Mathematics, Sciences and Basic Engineering.

PEO 2. To provide intensive training in problem solving, laboratory skills and design skills to use modern engineering tools through higher education and research.

PEO 3. Ability to seek employment in a variety of engineering (or) engineering technology positions to specialize in specific areas of interest and work successfully in their chosen career aspirations.

PEO 4. To inculcate in students professional and ethical attitude, effective communication skills, teamwork skills, multidisciplinary approach, and an ability to relate engineering issues to broader social context through life-long learning.

Program Outcomes(POs) of EEE Department

Engineering Graduates will be able to:

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes (PSOs) of EEE Department

PSO 1: The EEE program must demonstrate knowledge and hands-on competence in the application of electrical and electronics circuits in a rigorous mathematical

environment at or above the level of algebra and trigonometry.

PSO2: The EEE program must demonstrate that graduates can apply interdisciplinary project management techniques to electrical and electronics systems.

PSO 3: The EEE program must demonstrate that graduates can analyze, design and develop hardware and software for control systems, measurements, power electronics and power systems

Year/Semester	II B. Tech/I Sem	L	T	P	C
Regulation Year	2019-2020	2	1	0	3
Subject	Power Systems-I				
Branch	EEE				

Learning objectives:

- To study the purpose and principle of operation of different components of a thermal power station.
- To study the purpose and principle of operation of different components of a Nuclear power station.
- To study the concepts of DC and AC distribution systems and voltage drop calculations.
- To study the constructional details and operation of different components of an Air and Gas insulated substations.
- To study the constructional details of different types of cables.
- To study different types of load curves and tariffs applicable to consumers.

UNIT-I Thermal Power Stations

Selection of site, general layout of a thermal power plant showing paths of coal, steam, water, air, ash and flue gasses, ash handling system, Brief description of components: Boilers, Super heaters, Economizers, electrostatic precipitators steam Turbines : Impulse and reaction turbines, Condensers, feed water circuit, Cooling towers and Chimney.

UNIT-II Nuclear Power Stations

Location of nuclear power plant, Working principle, Nuclear fission, Nuclear fuels, Nuclear chain reaction, nuclear reactor Components: Moderators, Control rods, Reflectors and Coolants. Types of Nuclear reactors and brief description of PWR, BWR and FBR. Radiation: Radiation hazards and Shielding, nuclear waste disposal.

UNIT-III Distribution Systems

Classification of distribution systems, design features of distribution systems, radial distribution, ring main distribution, voltage drop calculations: DC distributors for following cases - radial DC distributor fed at one end and at ends (equal / unequal voltages), ring main distributor, stepped distributor and AC distribution, comparison of DC and AC distribution.

UNIT-IV Substations

Classification of substations:

Air Insulated Substations - Indoor & Outdoor substations, Substations layouts of 33/11 kV showing the location of all the substation equipment. Bus bar arrangements in the Sub-Stations: Simple arrangements like single bus bar, sectionalized single bus bar, double bus bar with one and two circuit breakers, main and transfer bus bar system with relevant diagrams.

Gas Insulated Substations (GIS) – Advantages of Gas insulated substations, different types of gas insulated substations, single line diagram of gas insulated substations, constructional aspects of GIS, Installation and maintenance of GIS, Comparison of Air insulated substations and Gas insulated substations.

UNIT-V Underground Cables

Types of Cables, Construction, Types of insulating materials, Calculation of insulation resistance, stress in insulation and power factor of cable. Capacitance of single and 3-Core belted Cables: Grading of Cables-Capacitance grading and Inter sheath grading.

UNIT-VI Economic Aspects of Power Generation & Tariff

Economic Aspects - Load curve, load duration and integrated load duration curves, discussion on economic aspects: connected load, maximum demand, demand factor, load factor, diversity factor, power capacity factor and plant use factor, Base and peak load plants.

Tariff Methods- Costs of Generation and their division into Fixed, Semi-fixed and Running Costs, Desirable Characteristics of a Tariff Method, Tariff Methods: Simple rate, Flat Rate, Block-Rate, two-part, three-part, and power factor tariff methods.

Learning Outcomes:

- Students are able to identify the different components of thermal power plants.
- Students are able to identify the different components of nuclear Power plants.
- Students are able to distinguish between AC & DC distribution systems and also estimate voltage drops of distribution systems.
- Students are able to locate the different components of air and gas insulated substations.
- Students are able to identify single core and multi core cables with different insulating materials.
- Students are able to analyze the effect of load factor, demand factor and diversity factor on the cost of generation of electrical power and also able to identify the types of tariff applicable to consumers based on their load demand.

TEXT BOOKS:

1. A Text Book on Power System Engineering by M.L.Soni, P.V.Gupta, U.S.Bhatnagar and A. Chakrabarti, Dhanpat Rai & Co. Pvt. Ltd, 2013.
2. Generation, Distribution and Utilization of Electric Energy by C.L. Wadhwa New age International (P) Limited, Revised third edition.

REFERENCE BOOKS:

1. Electrical Power Distribution Systems by - V. Kamaraju, Tata Mc Graw Hill, New Delhi.
2. Elements of Electrical Power Station Design by – M V Deshpande, PHI, New Delhi.

Year/Semester	II B. Tech/I Sem	L	T	P	C
Regulation Year	2019-2020	2	1	0	3
Subject	ELECTRICAL CIRCUIT ANALYSIS – I				
Branch	EEE				

Learning Objectives:

- To study the concepts of passive elements, types of sources and various network reduction techniques.
- To study the concept of magnetic coupled circuit.
- To understand the behavior of RLC networks for sinusoidal excitations.
- To study the performance of R-L, R-C and R-L-C circuits with variation of one of the parameters and to understand the concept of resonance.
- To understand the applications of network theorems for analysis of electrical networks.

UNIT-I

Introduction to Electrical Circuits-I: Basic definitions of electric charge, current, voltage, power and energy, Network elements classification, Passive components and their V-I relations, Sources (dependent and independent), Kirchoff's laws, Network reduction techniques(series, parallel, voltage division rule and current division rule).

UNIT-II

Introduction to Electrical Circuits-II: Network reduction techniques (star to delta and delta to star transformation), source transformation technique, nodal analysis and mesh analysis. Concepts of super node and super mesh.

UNIT-III

Analysis of Coupled Circuits: Basic definition of MMF, flux and reluctance. Analogy between electrical and magnetic circuits. Concept of Self, mutual Inductance, Dot convention, coefficient of coupling, Series and parallel aiding and opposing. Analysis of Coupled circuits using mesh analysis

UNIT-IV

Single Phase A.C Systems: Periodic waveforms (determination of rms, average value), Concept of phase angle and phase difference , Waveforms and phasor diagrams for lagging, leading networks, Power Factor and its significance, real, reactive power and apparent power.

UNIT-V

Analysis of AC Networks: Steady state analysis of R, L and C circuits, Extension of node and mesh analysis to AC networks, Series and parallel resonance, Variation of impedance with frequency, Bandwidth, Q factor, Selectivity.

UNIT-VI

Network theorems (DC Excitation): Thevenin's theorem, Norton's theorem, Superposition theorem, Maximum Power Transfer theorem, Reciprocity theorem, Millman's theorem.

Learning Outcomes: Students are able to solve

- Various electrical networks in presence of active and passive elements.
- Any magnetic circuit with various dot conventions.
- Any R, L, C network with sinusoidal excitation.
- Electrical networks by using principles of network theorems.

Text Books:

1. Engineering Circuit Analysis by William Hayt and Jack E.Kemmerley,McGraw Hill Company,6^{th} edition.
2. Network Analysis: Van Valkenburg; Prentice-Hall of India Private Ltd

Reference Books:

1. Fundamentals of Electrical Circuits by Charles K.Alexander and Mathew N.O.Sadiku, McGraw Hill Education (India)
2. Electric Circuits– (Schaum's outlines) by Mahmood Nahvi & Joseph Edminister, Adapted by KumarRao, 5th Edition – McGraw Hill.
3. Electric Circuits by David A. Bell, Oxford publications
4. Introductory Circuit Analysis by Robert L Boylestad, Pearson Publications
5. Circuit Theory(Analysis and Synthesis) by A.Chakrabarthi,DhanpatRai&Co.

Year/Semester	II B. Tech/I Sem	L	T	P	C
Regulation Year	2019-2020	2	1	0	3
Subject	ELECTROMAGNETIC FIELDS				
Branch	EEE				

Learning Objectives:

- To study the three dimensional coordinate system & vector calculus
- To study the production of electric field and potentials due to different configurations of static charges and To study dielectrics, calculate the capacitance
- To study the magnetic fields produced by currents in different configurations, application of ampere's law and the Maxwell's second and third equations.
- To study the magnetic force and torque through Lorentz force equation in magnetic field environment like conductors and other current loops.
- To develop the concept of self and mutual inductances and the energy stored.
- To study time varying and Maxwell's equations in different forms and Maxwell's fourth equation for the induced e.m.f..

UNIT-I Introduction to Vectors:

Three dimensional coordinate system:
Review of vectors-Co-ordinate systems-Cartesian coordinates-Circular cylindrical coordinates-Spherical coordinates & their transformation-Differential length, area and volume in different coordinate systems-Problems.

Vector calculus:
DEL operator-Gradient of a scalar-Divergence of a vector & Divergence theorem-Curl of a Vector & Stokes theorem-Laplacian of scalar-problems

UNIT – II Electrostatics:
Electrostatic Fields – Coulomb's Law – Electric Field Intensity (EFI) – EFI due to a line and a surface charge – Gauss's law – Application of Gauss's Law – Maxwell's first law, div(D)=ρv.

Work done in moving a point charge in an electrostatic field–Electric Potential – Potential gradient – Electric dipole – Dipole moment-potential and EFI due to an electric dipole- Dielectric-Capacitance of parallel plate with composite dielectrics - Energy stored in a static electric field.

UNIT – III Magneto Statics and Ampere's circuital law:
Static magnetic fields – Biot-Savart's law – Oesterd's experiment - Magnetic field intensity (MFI) – MFI due to a straight current carrying filament – MFI due to circular, square and solenoid current – Carrying wire – Relation between magnetic flux, magnetic flux density and MFI – Maxwell's second Equation, div(B)=0.
Ampere's circuital law and its applications viz. MFI due to an infinite sheet of current and a long current carrying filament – Point form of Ampere's circuital law – Field due to a circular loop, rectangular and square loops, Maxwell's third equation, Curl (H)=Jc,

UNIT – IV Force in Magnetic fields:
Magnetic force - Moving charges in a Magnetic field – Lorentz force equation – force on a current element in a magnetic field – Force on a straight and a long current carrying conductor in a magnetic field – Force between two straight long and parallel current carrying conductors –Magnetic dipole and dipole moment – a differential current loop as a magnetic dipole – Torque on a current loop placed in a magnetic field

UNIT – V Self and Mutual inductance:
Self and Mutual inductance – determination of self-inductance of a solenoid and toroid and mutual inductance between a straight long wire and a square loop wire in the same plane – energy stored and density in a magnetic field.

UNIT – VI Time Varying Fields:
Time varying fields – Faraday's laws of electromagnetic induction – Its integral and point forms – Statically and dynamically induced EMFs – Simple problems - Modification of Maxwell's equations for time varying fields – Significance of Displacement current- problems – Poynting Theorem and Poynting vector.

Learning Outcomes:
A student who has met the objective of the course will be able to:

- To determine the location of a point in three dimensional space.
- To determine electric fields and potentials using gauss's law for various electric charge distributions and to Calculate capacitance, energy stored in dielectrics.
- To Calculate the magnetic field intensity due to current, the application of ampere's law and the Maxwell's second and third equations.
- To determine the magnetic forces and torque produced by currents in magnetic field
- To determine self and mutual inductances and the energy stored in the magnetic field.
- To calculate induced e.m.f., understand the concepts of displacement current and time varying fields

TEXT BOOKS:
1. "Engineering Electromagnetics" by William H. Hayt& John. A. Buck Mc. Graw-Hill Companies, 8thEdition, 2014.
2. . "Principles of Electro Magnetics" by Sadiku, Oxford Publications, 6th Edition, 2015.

REFERENCE BOOKS:
1. "Introduction to Electro Dynamics" by D J Griffiths, Prentice-Hall of India Pvt.Ltd, 2nd edition.
2. "Electromagnetic Field Theory" by Yaduvir Singh, Pearson.
3. Electromagnetics J. A. Edminister McGraw Hill 3rd Edition, 2010.

Year/Semester	II B. Tech/I Sem	L	T	P	C
Regulation Year	2019-2020	2	1	0	3
Subject	ELECTRONIC DEVICES AND CIRCUITS				
Branch	EEE				

Learning Objectives:
The main objectives of this course are:

- The basic concepts of semiconductor physics are to be reviewed.
- Study the physical phenomena such as conduction, transport mechanism and electrical characteristics of different diodes.
- The application of diodes as rectifiers with their operation and characteristics with and without filters are discussed.
- The principal of working and operation of Bipolar Junction Transistor and Field Effect Transistor and their characteristics are explained.
- The need of transistor biasing and its significance is explained. The quiescent point or operating point is explained.
- Small signal equivalent circuit analysis of BJT and FET transistor amplifiers in different configuration is explained.

UNIT-I: Semi Conductor Physics : Classification of solids using energy band diagrams, Generation of charge carriers in intrinsic semi conductors and extrinsic semi conductors, mobility and conductivity ,drift and diffusion, charge densities in semiconductors, Fermi Dirac function, Fermi level in intrinsic and extrinsic Semi conductors, continuity equation Hall effect.

UNIT- II: Junction Diode Characteristics : Open circuited p-n junction, law of junction, current components in PN junction Diode, diode equation, V-I Characteristics, temperature dependence on V-I characteristics, Diode resistance, Diode capacitance, energy band diagram of PN junction Diode.

Special Semiconductor Diodes: Zener Diode, Breakdown mechanisms, LED, Photodiode, Tunnel Diode, UJT. Construction, operation and characteristics of all the diodes are required to be considered.

UNIT- III: Rectifiers and Filters: Basic Rectifier setup**,** half wave rectifier, full wave rectifier, bridge rectifier, derivations of characteristics of rectifiers, rectifier circuits-operation, input and output waveforms, Filters, Inductor filter, Capacitor filter, comparison of various filter circuits in terms of ripple factors.

UNIT- IV: Transistor Characteristics:

BJT: Introduction to transistor, Operating modes of transistor, transistor current components, transistor configurations, transistor asan amplifier, characteristics of transistor in Common Base, Common Emitter and Common Collector configurations, punch through/ reach through, typical transistor junction voltage values.

FET: FET types, construction, operation, characteristics, parameters, MOSFET-types, construction, operation, characteristics, comparison between JFET and MOSFET

UNIT- V: Transistor Biasing and Thermal Stabilization : Need for biasing and operating point, load line analysis, Stability factors, (S, S', S''), BJT biasing methods, fixed bias, collector to base bias, self bias, Stabilization against variations in V_{BE}, Ic, and β, Thermal runaway avoid condition.
FET Biasing- methods and stabilization.

UNIT- VI: Small Signal Low Frequency Transistor Amplifier Models:

BJT: Two port network, Transistor hybrid model, determination of h-parameters, conversion of h-parameters, generalized analysis of transistor amplifier model using h-parameters, Analysis of CB, CE and CC amplifiers using exact and approximate analysis, Comparison of transistor amplifiers.

FET: Generalized analysis of small signal model, Analysis of CG, CS and CD amplifiers, comparison of FET amplifiers.

Text Books:

1. Electronic Devices and Circuits- J. Millman, C. Halkias, Tata Mc-Graw Hill, Second Edition.
2. Integrated Electronics- Jacob Millman, C. Halkies, C.D.Parikh, Tata Mc-Graw Hill, 2009.

References:

1. Electronic Devices and Circuits-Salivahanan, Kumar, Vallavaraj, Tata Mc-Graw Hill, Second Edition.
2. Electronic Devices and Circuits – A.P.Godse, U.A.Bakshi, Technical publications.

Learning Outcomes:

At the end of this course the student can able to:

- Understand the basic concepts of semiconductor physics.
- Understand the formation of p-n junction and how it can be used as a p-n junction as diode in different modes of operation.
- Know the construction, working principle of rectifiers with and without filters with relevant expressions and necessary comparisons.
- Understand the construction, principle of operation of transistors, BJT and FET with their V-I characteristics in different configurations.
- Know the need of transistor biasing, various biasing techniques for BJT and FET and stabilization concepts with necessary expressions.
- Perform the analysis of small signal low frequency transistor amplifier circuits using BJT and FET in different configurations.

Year/Semester	II B. Tech/I Sem	L	T	P	C
Regulation Year	2019-2020	2	1	0	3
Subject	INTERNET OF THINGS (IOT)				
Branch	EEE				

Learning Objectives:

- To introduce the terminology, technology and its applications
- To introduce the concept of M2M (machine to machine) with necessary protocols
- To introduce the Python Scripting Language which is used in many IoT devices
- To introduce the Raspberry PI platform, that is widely used in IoT applications
- To introduce the implementation of web-based services on IoT devices.

UNIT – I INTRODUCTION

Introduction to Internet of Things –Definition and Characteristics of IoT, Physical Design of IoT – IoT Protocols, IoT communication models, IoT Communication APIs, Networking basics, Machine-to-Machine Communications

IOT enabled Technologies – Wireless Sensor Networks, Cloud Computing, Big data analytics, Communication protocols,

UNIT – II IoT SYSTEM MANAGEMENT

Software defined networks (SDN), network function virtualization, difference between SDN and NFV for IoT. Basics of IoT System Management with NETCOZF, YANG- NETCONF, YANG, SNMP NETOPEER

M2M to IoT, Definition and differing characteristics, M2M Value Chains, IoT Value Chains, An emerging industrial structure for IoT.

UNIT III IOT Architectural and Wireless Technologies for IoT

Building architecture, design principles and needed capabilities, IoT architecture outline, standards considerations. Reference Architecture and Reference Model, Wireless Technologies for IoT: Protocol Standardization for IOT, M2M, RFID & NFC protocols.

UNIT IV IOT Physical Devices

Introduction to different IoT tools, IoT Physical Devices and Endpoints, Introduction to Raspberry PI, Interfaces (serial, SPI, I2C)

Programming – Python program with Raspberry PI with focus of interfacing external gadgets, controlling output, reading input from pins.

UNIT – V DOMAIN SPECIFIC APPLICTION

Home Automation, Cities, Environment, Energy, Retail, Logistics, Agriculture, Industry, Health & Lifestyle, Embedded Systems, IoT Levels and Templates

UNIT – VI Cloud Analytics

Introduction to cloud computing, Role of Cloud Computing in IoT,Cloud-to-Device Connectivity. IoT Physical Servers and Cloud Offerings – Introduction to Cloud Storage models and communication APIs. Webserver – Web server for IoT, Cloud for IoT, Python web application framework. Designing a RESTful web API.

Learning Outcomes:

- Interpret the impact and challenges posed by IoT networks leading to new architectural models.
- Compare and contrast the deployment of smart objects and the technologies to connect them to network.
- Appraise the role of IoT protocols for efficient network communication.
- Elaborate the need for Data Analytics and Security in IoT.
- Illustrate different sensor technologies for sensing real world entities and identify the applications of IoT in Industry.

TEXT BOOKS:

1. Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, Universities Press, 2015, ISBN: 9788173719547
2. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014, ISBN: 9789350239759

REFERENCE BOOKS

1. 1.Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1st Edition, Academic Press, 2014.
2. Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1st Edition, Apress Publications, 2013
3. Cuno Pfister, Getting Started with the Internet of Things, O"Reilly Media, 2011, ISBN: 978-1-4493- 9357-1.

Year/Semester	II B. Tech/I Sem	L	T	P	C
Regulation Year	2019-2020	2	1	0	3
Subject	Artificial Intelligence Tools, Techniques and Applications				
Branch	EEE				

Course Objectives: To enable the students

- Define AI and ML and understand their relationship with data
- Understand different data wrangling techniques in Python and their significance.
- Understand different types of supervised learning techniques with their implementation in Python.
- Intuitively understand basic math fundamental behind each technique
- Understand performance metrics and tuning performance.
- Explain the mechanism of unsupervised learning and practice various clustering techniques, Dimensionality reduction and their importance
- Comprehend text mining and its applications
- Understand basic working of recommender system
- Know probabilistic learning models and their applications
- Understand basics of Artificial and Deep Neural Networks.

Unit I: Intro and basic tools in Python

Introduction to AI and Machine Learning. Emergence of AI. Relationship between AI, ML and Data Science. Types of Machine Learning with definitions and application areas. Types of Data. Data wrangling and manipulation using Numpy and Pandas in Python. Types of data. Data visualization using matplotlib and seaborn. Basic Statistic measures of central tendency and variability. Introduction to probability distributions like uniform, normal and skewed distributions, Covariance, Correlation Coefficient, Hypothesis.

Unit II: Supervised learning - Regression

Introduction, KNN, Train-Test-Split. k-fold Cross Validation, Linear Regression, Least Squares, Mean Square Error. Plotting regression line and predicting with Scikit Learn. Gradient Descent. Stochastic Gradient Descent. Learning rate. Polynomial Regression in Scikit Learn. Overfitting, Underfitting. Regularization. Measures of accuracy. Bias Vs. Variance trade-off. Hyperparameter tuning.

Unit III: Supervised Learning - Classification

Definition of classification, use cases and algorithms using Scikit Learn, KNN, Logistic Regression, Decision Tree classifier, Support Vector Machines, Naïve Bayes, Performance measures for classification.

Unit IV: Unsupervised Learning

Introduction, K-Means, Hierarchical clustering techniques. Dimensionality reduction using PCA. Feature Selection and Feature Engineering.

Unit V: Natural Language Processing / Text mining

Introduction. Applications NLP. Components of Natural Language. Steps to get text data into workable format. Term Frequency, Inverse Document Frequency, Bag of Words, ngram, One hot encoding. Notion of corpus. Introduction to NLTK.

Unit VI: Introduction to other common learning methods and applications

Introduction to ANN and deep learning with applications, introduction to ensemble learning with bagging and boosting, random forest and AdaBoost, Recommender Systems-Content and collaborative filtering, Association Rule Mining- Apriori algorithm.

Course Outcomes:

- Understand the necessary packages needed for various machine learning algorithms
- Understand the importance and applications of AI
- Understand concepts of Machine Learning algorithms and their limitations
- Understand how to showcase the machine learning outcomes
- Understand smart solutions for various domains

Text Books:

1.Python Machine Learning Cookbook- Practical Solutions from Preprocessing to Deep learning- Chris Albon-O'Reilly publication-First Edition.
2. Introduction to Machine Learning with Python A Guide for Data Scientists, Andreas C. Müller and Sarah Guido, O'Reilly

Reference books:

1. Python for Data Analysis Data Wrangling with Pandas, NumPy, and IPython, Wes McKinney, O'Reilly
2. Python Data Science Handbook, Essential Tools for Working with Data, Jake VanderPlas, O'Reilly
3. Machine Learning Algorithms, Giuseppe Bonaccorso, Packt Publishing

Year/Semester	II B. Tech/I Sem	L	T	P	C
Regulation Year	2019-2020	0	0	3	1.5
Subject	ELECTRONIC DEVICES AND CIRCUITS LAB				
Branch	EEE				

Electronic Workshop Practice:

1. **Identification, Specifications, Testing of R, L, C Components (Colour Codes), Potentiometers, Bread Boards.**
2. **Identification, Specifications and Testing of active devices, Diodes, BJTs, JEETs, LEDs, LCDs, SCR, UST.**
3. **Study and operation of Ammeters, Voltmeters, Transformers, Analog and Digital Multimeter, Function Generator, Regulated Power Supply and CRO.**

List of Experiments: (Minimum of Ten Experiments has to be performed)

1. P-N Junction Diode Characteristics Part A: Germanium Diode (Forward bias& Reverse bias) Part B: Silicon Diode (Forward Bias only)
2. Zener Diode Characteristics Part A: V-I Characteristics Part B: Zener Diode as Voltage Regulator
3. Half-wave Rectifier(without and with c-filter)
4. Full-wave Rectifier(without and with c-filter)
5. BJT Characteristics(CB Configuration) Part A: Input Characteristics Part B: Output Characteristics
6. BJT Characteristics(CE Configuration) Part A: Input Characteristics Part B: Output Characteristics
7. FET Characteristics(CS Configuration) Part A: Drain Characteristics Part B: Transfer Characteristics
8. UJT Characteristics
9. Transistor Biasing
10. BJT-CE Amplifier
11. Emitter Follower-CC Amplifier

Equipment Required:

Regulated Power supplies

Analog/Digital Storage Oscilloscopes

Year/Semester	II B.Tech. / I Sem.	L	T	P	C	Subject Code
Regulation Year	2019-20	-	-	2	1	
Name of the Subject	**Business Communication Lab**					
Branch	EEE					

COURSE OBJECTIVES:

- To expose student to different situations for better communication
- To inculcate the habit of learning vocabulary for effective communication
- To enable students to acquire Business English communication

UNIT – I: (2 sessions)

Listening: Listening to short conversations or monologues
Speaking: Giving information about oneself and their opinions and Giving a short talk on business related topics
Reading: Reading short and simple texts to understand the central idea/theme.
Writing: Writing a piece of internal business communication of 30-40 words (Email)

UNIT – II: (2 sessions)

Listening : Listening to a conversation/ monologue and taking notes
Speaking : Giving short talk on business related topics.
Reading: Matching descriptions of people to short texts. Matching statements to information given in a graph or graphs.
Writing : Writing a piece of internal business communication of 30-40 words (Message)

UNIT – III (2 sessions)

Listening: Listening to longer conversations/interviews.
Speaking: Debates & Extempore
Reading : Reading a longer text and deciding whether the statements about the text are right or wrong or if the information is not given.
Writing : Write a business letter 60-80 words, based on an input text and some notes.

UNIT – IV (2 sessions)

Listening: Listening to TV news channels and taking notes.
Listening to songs and writing down the lyrics.
Speaking: Interview sessions
Reading: Read a longer text and answering questions. .
Writing: Writing a Business Report

UNIT – V: (2 sessions)

Listening: Watching short documentaries and making notes.(General)
Speaking: Short plays, Presentations.
Reading : Read short texts and fill in a form using information from the texts.
Writing : Write a skit and enact.

UNIT – VI: (2 sessions)

Listening: Watching documentaries and making notes.(Business specific)
Speaking: Nail your point.
Reading : Critical Reading to know author's perspective.
Writing : Write a skit and enact.

REFERENCE BOOKS:

1. Cambridge English – Business English Certificate Preliminary
2. Suresh Kumar. E. & Sreehari P.A (2007), Handbook for English Language Laboratories,
3. Cambridge University Press India Pvt. Ltd, New Delhi.
4. Mandal S. K (2006),Effective Communication & Public Speaking , Jaico Publishing House, New Delhi.
5. Grant Taylor (2004), English Conversation Practice, Tata McGraw Hill, New Delhi.
6. Balasubramanian .T (2000), A text book of English Phonetics for Indian Student, MacMillan Publishers, India.
7. Kamalesh Sadanand, Susheela Punitha (2008), Spoken English: A foundation Course: Parts 1& 2, New Delhi, Orient Longman Pvt. Ltd

WEB REFERENCES:

1. www.cambridgeenglish.org.
2. www.esl-lab.com

ADDITIONAL SOURCES:

1.A Planning Checklist for Business Messages
https://open.lib.umn.edu/businesscommunication/chapter/5-2-a-planning-checklist-for-business-messages/
2. How to Improve Business Wrtiting https://www.writing-skills.com/how-to-improve-your-business-writing
3. Self Compassion (Source - YouTube)
Bailey Finishes Marathon (Source - YouTube)
How to Conquer Public Speaking Fear (Source - Wordpress)
I am Sorry, I am so Nervous- Rakesh Godhwani (Source - LinedIn)
Interpersonal Communication in the Future World (Source: YouTube)
The Power of Introverts (Source: YouTube)
Boost Power Through Body Language (Source: YouTube)
Take Control of your Non-Verbal Communication (Source: YouTube)
How to have a Good Conversation (Source: YouTube)

COURSE OUTCOMES:

Upon the completion of the course, the student will be able to:

CO1: Understand and interpret conversations in informal and formal contexts.

CO2: Exhibit one's vocabulary, body language, pronunciation and intonation with proper etiquette

CO3: Critique various written texts.

CO4: Construct appropriate Business English writing skills.

CO5: Develop skit exhibiting all LSRW skills.

CO6: Develop the skill of note making.

Year/Semester	II B. Tech/I Sem	L	T	P	C
Regulation Year	2019-2020	0	0	2	1
Subject	INTERNET OF THINGS (IOT) LAB				
Branch	EEE				

Course Objectives:

- To learn about IoT tools and different types of sensors
- To learn the Usage microcontroller based embedded platforms in IoT
- Use wireless peripherals for exchange of data.
- Use of Devices and Data Management in IoT.

Following are some of the programs that a student should be able to write and test on an Raspberry Pi, but not limited to this only.

Part A: All are compulsory

1. Start Raspberry Pi and try various Linix commands in command terminal window: *ls, cd, touch, mv, rm, man, mkdir, rmdir, tar, gzip, cat, more, less, ps, sudo, cron, chown, chgrp, ping etc.*
2. Study of Digital IO configuration
3. Study of different type of Sensors (IR Sensor, LDR, Ultrasonic sensors, Temperature, Humidity, Light Intensity).
4. Demonstration of peer to peer communication between coordinator and end device through Router.

Part B – 06 Experiments need to be conducted

1. Get input from two switches and switch on the corresponding LEDs.
2. Flash an LED at a given on time and off time cycle, where the two times are taken from a file.
3. Flash an LED based on cron output (acts as an alarm) with and without using Rasberry Pi.
4. Switch on a relay at a given time using cron, where the relay's contact terminals are connected to a load.
5. Get the status of a bulb at a remote place (on the LAN) through web.
6. Controlling LEDs blinking pattern through UART.
7. Timer based LED Toggle.
8. Designing of power supply circuit in simulation.
9. Reading Temperature and Relative Humidity value from the sensor.
10. Reading Light intensity value from light sensor.
11. Echo each character typed on serial terminal.

Course Outcomes:

- Able to understand the fundamental concepts of IoT
- Able to design a arduino based embedded platforms in IoT
- Apply the concept of IoT for a particular sensor based network
- Able to design raspberry pi based IOT platform with the access of IoT technology
- Analyze and design networks to support the development of intelligent services with given

performance requirements in a variety of application domains.

Year/Semester	II B. Tech/I Sem	L	T	P	C
Regulation Year	2019-2020	0	0	3	1.5
Subject	Artificial Intelligence Tools, Techniques and Applications Lab				
Branch	EEE				

Learning objectives: To enable students
1) Apply various NumPy and pandas' concepts to preprocess the data.
2) Understand visualization techniques and create reports for machine learning outcomes
3) Understand the importance of statistics in machine learning and apply them on datasets.
4) Understand how to apply machine learning models on data get inference from them.

1) NumPy
   i) Different ways to create NumPy arrays
   ii) Add, remove, modify elements in an array.
   iii) Arithmetic operations on NumPy array
   iv) Slicing and iterating of NumPy arrays
   V) Matrix operations onNumPy arrays
2) Pandas
   i) Create a data Frame manually
   ii) Different ways of importing a data frame
   iii) Adding, Deleting, Modifying the rows/columns in a dataframe.
   iv) Apply functions on dataframe.
   V) Iterations on dataframe
   vi) Accessing the elements from a dataframe
   Vii) Different ways to deal with NA's in dataframe
   viii) Groupby operations on dataframe
   ix) Merging dataframes
3) Data Visualizations:
   i) Line Graphs
   ii) Scatter Plots
   iii) Histograms
   iv) Subplots
   v) Joinplots
   vi) Heatmaps
4) Basic statistics for machine learning:

Consider a dataset. Apply the following statistical operations on it.
   i) Central Tendency- Mean, Median, Mode
   ii) Distribution of Data- Range, Interquartile range, Variance, Standard deviation, Correlation.
   iii) Draw a box plot to demonstrate Range, Interquartile range.
   iv) Show correlation between 2 variables using scatter plot.
   V) Draw histogram to show how data is distributed for a given data.
   Vi) For the given data, show which attributes as a) continuous b) Ordered c) Binary

5) Prediction

a. Consider a data set and perform univariate linear regression and find the coefficients. Show the relation between independent variable and dependent variable using scatter plot.Show the performance of the model using R-Square error, mean absolute error and Mean Square error

b. Consider a data set and perform multivariate linear regression and find the coefficients. Which attributes are mostly influencing the target variable? Show the performance of the model using R-Square error, mean absolute error and Mean Square error

6) Classification

Consider a datasetand apply following classifiers on it

i) KNN- Classifier
ii) Decision Tree
iii) SVM
iv) Logistic regression

Show the confusion matrix for every model.

Find the accuracy, sensitivity, specificity, F1 score of every model.

Compare the performance of all models

7) Clustering and feature reduction

Consider a dataset and apply the following

i) Apply K-means clustering on the data. Use Elbow method and find the optimal value of K.
ii) Apply Agglomerative clustering on the data. Use dendrograms.
iii) Apply PCA to reduce the number of features in a dataset.

8) Natural Language processing

a. Use NLTK package and perform the following

i) Tokenization
ii) Stemming
iii)Lemmatization
iv) Bag of words
v)TF/IDF

b. Given set of documents, use NLTK to classify them.

9) Ensemble methods.

Consider a dataset

i) Use ensemble method to combine predictive power of decision tree, Logistic regression using bagging technique

ii) Apply ADABOOST on the given data set and draw the confusion matrix for the strong classifier. Apply simple decision tree on the same dataset and compare the performance

iii)) Apply Random Forest on the given data set and draw the confusion matrix for the strong classifier. Apply simple decision tree on the same dataset and compare the performance

10) Association analysis

For a given sales dataset, apply apriori algorithm to generate association rules which is able certain support and confidence.

11) Recommender system.

Use collaborative filtering technique and find similar movies based on the movies watched and rated by a user.

Course outcomes:

By the end of the lab, the students will be able to.

1) Preprocess the raw data
2) Apply various statistical methods to understand the data
3) Apply various visualization techniques to understand the data and building reports.
4) Apply Machine learning models on real time data and check the quality of model.

Datasets url's

1) Kaggle.com
2) https://archive.ics.uci.edu/ml/index.php
3) https://data.gov.in/
4) https://vincentarelbundock.github.io/Rdatasets/datasets.html

Text books

1) Python Machine Learning Cookbook- Practical solutions from Preprocessing to Deep learning- Chris Albon-O'Reilly publication-First Edition.
2) Machine Learning Algorithms- Reference Guide for popular algorithms for Data Science and Machine Learning-Packt publications
3) Introduction to machine learning with python-Andreas C. Müller & Sarah Guido, O'Reilly publication-First Edition.

Reference Books

1) Machine Learning, Tom Mitchell, Mc Graw Hill, 1st edition

Year/Semester	II B. Tech/I Sem	L	T	P	C
Regulation Year	2019-2020	2	0	0	0
Subject	Quantitative Aptitude-I				
Branch	EEE				

Learning Objectives:

Enable the students to

- Understand different number systems, factorization, divisibility and concept of LCM and HCF.
- Find averages, relation between ratio and proportion, average price of mixture of different quantities and relation between fraction and percentage.
- Know the concepts of CP,SP, MRP, profit or loss incurred in a transaction.
- Know the concepts of principal, interest, difference between SI and CI, EMIs.
- Understand the relation between speed, distance and time for trains and boats in a river.
- Understand the relation between time and efficiency, combined work and wages paid for the work.

UNIT –I:Number Systems

Basic number systems –Face and Place Value, Digital sum-Applications, Factors, Multipliers, Prime & Composite Numbers, Divisibility Rules, LCM and HCF-Remainder Rules.

UNIT- II: Averages, Ratio& Proportion

Average-Weighted average, Ratio-Concept and properties, Proportions-Mean ,Third and Fourth proportions, Mixtures & Allegations-Definition-Allegation Rule, Percentages-Conversion of Percentages to Fractions and Vice-Versa.

UNIT –III: Profit& Loss

Cost Price- Selling Price- Marked Price, Discount- Successive Discounts, Profit or Loss Percentage, False Weights- Dishonest Dealer.

UNIT –IV: Simple & Compound Interest

Principal-Interest Rate-Tenure , Simple Interest-Formula-Sum, Compound Interest-Formula-Relation Between Simple & Compound Interest, loan-EMI, Investments-Shares.

UNIT – V:Time & Distance

Time-Distance-Speed-Relation, Conversion of Speed , Average Speed, Trains-Relative Speed-Same and Opposite –Platform, Races, Boats-Streams-Upstream and Downstream.

UNIT –VI:Time & Work

Work-Time-Efficiency, Combined Work-Partnership-Division of Wages, Chain Rule, Pipes and Cisterns-Inlet-Outlet.

Text Books:

1. Dr. R.S. Aggarwal , Quantitative Aptitude for competitive Examinations, Sultan Chand Publications, 2017.

References:

1. Arun Sharma, How to Prepare for Quantitative Aptitude for the CAT, Tata McGraw Hill Publishing Company, 2016.
2. Dinesh Khattar, The Pearson Guide to Quantitative Aptitude for Competitive Examinations, Pearson India, 2016

Learning Outcomes:

After completing this course, the students will be able to

- Find number of factors, LCM and HCF of numbers and fractions, least and greatest number divisible by given numbers and leaving some remainder(s).
- Evaluate average of numbers, Proportions of given ratio, ratio or average price of two quantities of different prices when mixed to get new mix, use relation between fractions and percentages in calculation.
- Identify the profit or loss incurred in a transaction and how cheating is possible by an unfair trader.
- Calculate the simple and compound interests ,difference between them and the EMI repayment for a loan.
- Evaluate the time taken by a train/car for crossing a static object or a moving object and time taken by a person to a row a boat in a river.

Calculate the time required for individual or combined work, shares of amount for their work and time taken for a tank/cistern to get filled by inlets and outlet.