ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES: TIRUPATI

(Autonomous)

I.B.Tech AK19 Regulations

Common to I Sem – CSE, II Sem ECE/EEE

Subject Code	Subject Name	L T P	Credits:3
19ABS9904	CHEMISTRY	3 0 0	

Course Outcomes:

1. Understand the behaviour of, and interactions between mater and energy at both the atomic and molecular levels
2. Compare the materials of construction for battery and electrochemical sensors
3. Understand the preparation, properties. and applications of thermoplastics & thermosettings, elastomers & conducting polymers.
4. HPLC and GC methods used for separation of gaseous and liquid mixtures.
5. Understand the disadvantages of using hard water and select suitable treatments domestically and industrially.

Unit 1: Structure and Bonding Models (10 hrs)

Planck's quantum theory, Schrodinger wave equation. significance of Ψ^1 and Ψ^2 , applications to hydrogen, particle in a box and their applications for conjugated molecules, crystal field theory – salient features – energy level diagrams for transition metal ions – splitting of orbital's in tetrahedral and octahedral complexes, magnetic properties, molecular orbital theory – bonding in homo- and heteronuclear diatomic molecules – energy level diagrams of O_2 . N_2 and CO, calculation of bond order.

Unit 2: Electrochemistry and Applications (10 hrs)

Electrodes – concepts, reference electrodes (Calomel electrode. Ag/AgCl electrode and glass electrode) electrochemical cell, Nern'st equation, cell potential calculations, numerical problems. concept of pH, pH meter and applications of pH metry (acid-base titrations), potentiometry-potentiometric titrations (redox titrations), concept of conductivity, conductivity cell, conductometric titrations (acid-base titrations), photovoltaic cell – working and applications, photogalvanic cells with specific examples. Electrochemical sensors – potentiometric sensors with examples, amperometric sensors with examples.

Primary cells – Zinc-air battery, alkali metal sulphide batteries. Fuel cells, hydrogen-oxygen. methanol fuel cells – working of the cells.

Secondary cells – lead acid, nickel-metal hydride and lithium ion batteries- working of the batteries including cell reactions, button cells,

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Unit 3: Polymer Chemistry

(10 hrs)

Introduction to polymers, functionality of monomers, chain growth and step growth polymerization, coordination polymerization, copolymerization (stereospecific polymerization) with specific examples and mechanisms of polymer formation.

Plastics - Thermoplastics and Thermosettings, Preparation, properties and applications of – Bakelite, urea-formaldehyde, Nylon-66, carbon fibres, Elastomers–Buna-S, Buna-N–preparation, properties and applications.

Conducting polymers – polyacetylene, polyaniline, polypyrroles – mechanism of conduction and applications.

Unit 4: Instrumental Methods and Applications

(10 hrs)

Principle and applications of Colorimetry, AAS, AES, UV-Viscible spectrophotometry (Beer-Lambert's law, Instrumentation ,Principles and applications of Chromatographic techniques(GC & HPLC), separation of gaseous mixtures and liquid mixtures(GC & HPLC methods).

Unit 5: Water Technology

(10 hrs)

Introduction –Soft Water and hardness of water, Estimation of hardness by EDTA Method - Boiler troubles - scale and sludge, Industrial water treatment – specifications for drinking water, Bureau of Indian Standards(BIS) and World health organization(WHO) standards, zeolite and ion-exchange processes - desalination of brackish water, reverse osmosis (RO) and electrodialysis.

Text books:

1. Jain and Jain, Engineering Chemistry, 16/e, Dhanpat Rai, 2013.
2. Peter Atkins, Julio de Paula and James Keeler, Atkins' Physical Chemistry, 10/e, Oxford University Press, 2010.

Reference books:

1. J. D. Lee, Concise Inorganic Chemistry, 5/e, Oxford University Press, 2008.
2. Skoog and West, Principles of Instrumental Analysis, 6/e, Thomson, 2007.
3. Ben L. Feringa and Wesley R. Browne, Molecular Switches, 2/e, Wiley-VCH, 2011.
4. Willard Merritt Dean Settle, 7 th Edition Instrumental methods for analysis

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO: 1	PO 1: Apply the knowledge of basic science	1.2	1.2.1
CO: 2	PO 1: Apply the knowledge of basic science	1.4	1.4.1
CO: 3	PO 1: Apply the knowledge of basic science	1.2	1.2.1
CO: 4	PO 4: Analyse complex engineering problems	2.4	2.4.4
CO: 5	PO 1: Apply the knowledge of Basic science	1.2	1.2.1

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I.B.Tech

AK19 Regulations

Common to I Sem – CSE, II Sem ECE/EEE

Subject Code 19ABS0109	Subject Name CHEMISTRY LAB	L T P 0 0 3	Credits:1.5

Course Outcomes:

1. To familiarize the students with the basic concepts of chemistry of materials
2. Prepare advanced polymer materials
3. Measure the strength of an acid present in secondary batteries
4. To familiarize with digital and instrumental methods of analysis

List of Experiments:

1. Determination of Hardness of a groundwater sample.
2. Estimation of iron (II) using Diphenylamine indicator (Dichrometry – Internal indicator method)
3. Determination of pH metric titration of strong acid vs. strong base.
4. Conductometric titration of strong acid vs. strong base
5. Determination of Fe(II) in Mohr's salt by potentiometric method.
6. Determination of percentage of Iron in Cement sample by colorimetry
7. Determination of Strength of an acid in Pb-Acid battery
8. Preparation of phenol-formaldehyde resin
9. Preparation of TIO_2/ZnO nano particles
10. Estimation of Calcium in port land Cement
11. Adsorption of acetic acid by charcoal
12. Thin layer chromatography

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO:1	PO 4: Analysis and interpretation of data	4.3	4.3.3
CO:2	PO 4: Analysis and interpretation of data	4.3	4.3.1
CO:3	PO 4: Analysis and interpretation of data	4.3	4.3.1
CO:4	PO 4: Analysis and interpretation of data	4.3	4.3.2

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AK 19 Regulations

B.Tech I-Year **Semester** : I **Branch** : Common to all

Subject Code: **19AHS9901**	Subject Name: **Communicative English I**	L T P 2 0 0	Credits:2

Course Outcomes:

At the end of the course, the learners will be able to

1. Identify the context, topic, and pieces of specific information from social or transactional dialogues spoken by native speakers of English
2. Formulate sentences using proper grammatical structures and correct word forms
3. Speak clearly on a specific topic using suitable discourse markers in informal discussions
4. Write summaries based on global comprehension of reading/listening texts
5. Produce a coherent paragraph interpreting a figure/graph/chart/table
6. Take notes while listening to a talk/lecture to answer questions

Syllabus

Unit 1 : **10 Hours (4L+6P)**

Listening: Identifying the topic, the context and specific pieces of information by listening to short audio texts and answering a series of questions. **Speaking:** Asking and answering general questions on familiar topics such as home, family, work, studies and interests; introducing oneself and others.

Reading: Skimming to get the main idea of a text; scanning to look for specific pieces of information.

Reading for Writing: Beginnings and endings of paragraphs - introducing the topic, summarizing the main idea and/or providing a transition to the next paragraph.

Grammar and Vocabulary: Content words and function words; word forms: verbs, nouns, adjectives and adverbs; nouns: countable and un countable; singular and plural; basic sentence structures; simple question form - wh-questions; word order in sentences.

Unit 2: **10 Hours (4L+6P)**

Listening: Answering a series of questions about main idea and supporting ideas after listening to audio texts.

Speaking: Discussion in pairs/ small groups on specific topics followed by short structured talks.**Reading:** Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together.

Writing: Paragraph writing (specific topics) using suitable cohesive devices; mechanics of writing - punctuation, capital letters.

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Grammar and Vocabulary: Cohesive devices -linkers, sign posts and transition signals; use of articles and zero article; prepositions.

Unit 3: **10 Hours (4L+6P)**

Listening: Listening for global comprehension and summarizing what is listened to.

Speaking: Discussing specific topics in pairs or small groups and reporting what is discussed
Reading: Reading a text in detail by making basic inferences - recognizing and interpreting specific context clues; strategies to use text clues for comprehension.

Writing: Summarizing - identifying main idea/s and rephrasing what is read; avoiding redundancies and repetitions.

Grammar and Vocabulary: Verbs -tenses; subject-verb agreement; direct and indirect speech, reporting verbs for academic purposes.

Unit 4: **8 Hours (2L+6P)**

Listening: Making predictions while listening to conversations/ transactional dialogues without video; listening with video.

Speaking: Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions.

Reading: Studying the use of graphic elements in texts to convey information, reveal trends / patterns / relationships, communicate processes or display complicated data.

Writing: Information transfer; describe, compare, contrast, identify significance / trends based on information provided in figures/charts/graphs/tables.

Grammar and Vocabulary: Quantifying expressions - adjectives and adverbs; comparing and contrasting; degrees of comparison; use of antonyms.

Unit 5: **8 Hours (2L+6P)**

Listening: Identifying key terms, understanding concepts and answering a series of relevant questions that test comprehension. **Speaking:** Formal oral presentations on topics from academic contexts - without the use of PPT slides.**Reading:** Reading for comprehension. **Writing:** Writing structured essays on specific topics using suitable claims and evidences.

Grammar and Vocabulary: Editing short texts – identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, subject- verb agreement)
Suggested books:

Text Book: English all round: Communication Skills for Under graduation Learners Vol. I, Orient BlackSwan Publisers, First Edition 2019.

Reference Books

1. Bailey, Stephen. *Academic writing: A handbook for international students*. Routledge,2014.
   Chase, Becky Tarver. *Pathways: Listening, Speaking and Critical Thinking.* Heinley,ELT;
   2nd Edition, 2018.
2. Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.

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3. Hewings. Martin. *Cambridge Academic English (B2)*. CUP, 2012.

Sample Web Resources

Grammar/Listening/Writing, 1-language.com, http://www.5minuteenglish.com/, https://www.englishpractice.com/, Grammar/Vocabulary, English Language Learning Online http://www.bbc.co.uk/learningenglish/, http://www.better-english.com/, http://www.nonstopenglish.com/, https://www.vocabulary.com/, BBC Vocabulary Games Free Rice Vocabulary Game

Reading

https://www.usingenglish.com/comprehension/, https://www.englishclub.com/reading/short-stories.htm, https://www.english-online.at/

Listening

https://learningenglish.voanews.com/z/3613, http://www.englishmedialab.com/listening.html

Speaking

https://www.talkenglish.com/, BBC Learning English – Pronunciation tips, Merriam-Webster – Perfect pronunciation Exercises

All Skills

https://www.englishclub.com/, http://www.world-english.org/, http://learnenglish.britishcouncil.org/

Online Dictionaries, Cambridge dictionary online. MacMillan dictionary, Oxford learner's dictionaries

List of COs	PO no. and keyword	Competency Indicator: Description	Performance Indicator: Description
CO1.	PO6 Apply contextual knowledge to assess societal, health, safety, legal, and cultural issues.	6.1	6.1.1
CO2.	PO10-Able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	10.1	10.1.1
CO3.	PO9-Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	9.2	9.2.1
CO4.	PO10-Able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	10.1	10.1.1
CO5	PO10-Able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	10.3	10.3.1
CO6.	PO10-Able to comprehend and write effective reports and design documentation. make effective presentations, and give and receive clear instructions.	10.2	10.2.1

1) 2) 3) P. Krishna 4) 5) 6) 7) 8)

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B. Tech I-Year **Semester: I** **Branch : Common to all**

Subject Code: 19AHS9902	Subject Name: **Communicative English I Lab**	L T P 0 0 2	Credits:1

Course Outcomes

1. Remember and understand the different aspects of the English languageproficiency with emphasis on LSRW skills
2. Apply communication skills through various language learning activities
3. Analyze the English speech sounds, stress, rhythm, intonation and syllabledivision for better listening and speaking comprehension.
4. Evaluate and exhibit acceptable etiquette essential in social and professional settings.
5. Create awareness on mother tongue influence and neutralize it in order to improve fluency in spoken English.

Syllabus

Unit 1

1. Phonetics for listening comprehension of various accents
2. Reading comprehension
3. Describing objects/places/persons

Unit 2

1. JAM
2. Small talks on general topics
3. Debates

Unit 3

1. Situational dialogues – Greeting and Introduction
2. Summarizing and Note making
3. Vocabulary Building

Unit4

1. Asking for Information and Giving Directions
2. Information Transfer
3. Non-verbal Communication – Dumb Charade

Unit 5

1. Oral Presentations
2. Précis Writing and Paraphrasing
3. Reading Comprehension and spotting errors

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Software Source:

K-Van Solutions Software

Reference:

Teaching English - British Council

List of COs	PO No. and keyword	Competency Indicator: Description	Performance Indicator: Description
CO1	PO10: Able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	10.2	10.1.1
CO2	PO10: Able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	10.3	10.3.1
CO3	PO10: Able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	10.2	10.2.1
CO4	PO 9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	9.2	9.2.1
CO5	PO10: Able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	10.2	10.2.1

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Year : I B.Tech **Semester : I** **Branch of Study :** Common to All

Subject Code:19ABS9901	Subject Name: **Algebra and Calculus**	L T P 3 1 0	Credits:4

Course Outcomes:

1.Develop the use of matrix algebra techniques that is needed by engineers for practical applications.
2.Utilize mean value theorems to real life problems.
3.Familiarize with functions of several variables which is useful in optimization.
4.Students will also learn important tools of calculus in higher dimensions. Students will become familiar with 2- dimensional coordinate systems
5.Students will become familiar with 3- dimensional coordinate systems and also learn the utilization of special functions

Unit I : Matrix Operations and Solving Systems of Linear Equations **12 hrs**

Rank of a matrix by echelon form, solving system of homogeneous and non-homogeneous equations linear equations. Eigen values and Eigen vectors and their properties, Cayley-Hamilton theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton theorem,

Unit II : Quadratic Forms and Mean Value Theorems **9 hrs**

Diagonalisation of a matrix, quadratic forms and nature of the quadratic forms, reduction of quadratic form to canonical forms by orthogonal transformation.
Rolle's Theorem, Lagrange's mean value theorem, Cauchy's mean value theorem, Taylor's and Maclaurin's theorems with remainders (without proof);

Unit III: Multivariable calculus **9 hrs**

Partial derivatives, total derivatives, chain rule, change of variables, Jacobians, maxima and minima of functions of two variables, method of Lagrange multipliers.

Unit IV: Multiple Integrals **10hrs**

Double integrals, change of order of integration, double integration in polar coordinates, change of variables in double integration (Cartesian to polar), areas enclosed by plane curves. Evaluation of triple integrals.

Unit V: Special Functions **10 hrs**

Beta and Gamma functions and their properties, relation between beta and gamma functions, Bessel functions, Bessel's equation, Recurrence formulae or $J_n(x)$, Generating function-Orthoganality of Bessels functions.

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2) Dr R. Vijayalakshmi
3) Dr. V. K. Sangeetha
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Textbooks:

1. B. S. Grewal, Higher Engineering Mathematics, 44/e, Khanna Publishers, 2017.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e, John Wiley & Sons, 2011.

References:

1. Dr.T.K.V Iyengar, B.Krishna Gandhi, S. Ranganatham amd M.V.S.S.N Prasad, Mathematics – 1, S.Chand publications.
2. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, 3/e, Alpha Science International Ltd., 2002.
3. B.V.Ramana, Higher Engineering Mathematics, Mc Graw Hill Education.
4. N.Bali, M.Goyal, C.Watkins, Advanced Engineering Mathematics, Infinity Science Press.

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO1	PO1: Apply the knowledge of mathematics	1.1	1.1.1
CO2	PO1:Apply the knowledge of mathematics	1.1	1.1.1
CO3	PO1: Apply the knowledge of mathematics	1.1	1.1.1
CO4	Po2 : analyse complex engineering problems	2.1	2.1.3
CO5	Po2 : analyse complex engineering problems	2.1	2.1.3

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AK 19 Regulations

Year : I B.Tech – II Sem   **Branch of Study: Common to EEE, CE, ME and ECE**

Subject Code 19ABS9906	Subject Name: **Differential Equations and Vector Calculus**	L T P 3 1 0	Credits:4

Course Outcomes:

1. Apply the mathematical concepts of ordinary differential equations of higher order.
2. Solve the differential equations related to various engineering fields .
3. Identify solution methods for partial differential equations that model physical processes .
4. Interpret the physical meaning of different operators such as gradient, curl and divergence .
5. Estimate the work done against a field, circulation and flux using vector calculus .

UNIT I: Linear Differential Equations of Higher Order

Definitions, complete solution, operator D, rules for finding complimentary function. inverse operator, rules for finding particular integral (e^{ax}, sinax (or) cosax, X^k, $e^{ax}v$, x v(x)). method of variation of parameters, simultaneous linear equations with constant coefficients.

UNIT II: Equations Reducible to Linear Differential Equations and Applications
Cauchy's and Legendre's linear equations, Applications to simple pendulum, oscillations of a spring. L-C-R Circuit problems and Mass spring system.

UNIT III: Partial Differential Equations – First order
First order partial differential equations, solutions of first order linear and non-linear PDEs. Solutions to homogenous and non-homogenous higher order linear partial differential equations.

UNIT IV:Vector differentiation
Scalar and vector point functions, vector operator del, del applies to scalar point functions-Gradient, del applied to vector point functions-Divergence and Curl, vector identities

UNIT V: Vector integration

Line integral-circulation-work done, surface integral-flux, Green's theorem in the plane (without proof). Stoke's theorem (without proof), volume integral, Divergence theorem (without proof) and applications of these theorems.

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5) C. Jay [signature]
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Text Books :

1. B. S. Grewal, Higher Engineering Mathematics, 44th Edition, Khanna publishers, 2017.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, John Wiley & Sons, 2011.

References:

1. Dr.T.K.V.Iyengar, Engineering Mathematics-I,S.Chand publishers
2. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, 3/e, Alpha Science International Ltd., 2002
3. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics,Laxmi publication,2008
4. B. V. Ramana, Higher Engineering Mathematics, Mc Graw Hill Education.

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO1	PO1:Apply the knowledge of mathematics	1.1	1.1.1
CO2	PO2:Analyse complex engineering problems	2.1	2.1.3
CO3	PO1:Apply the knowledge of mathematics	1.1	1.1.1
CO4	PO1:Apply the knowledge of mathematics	1.1	1.1.1
CO5	PO2:Analyse complex engineering problems	2.1	2.1.3

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2) Dr. V. V. Srinivasa Rao
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4) Dr. R Vijaya Lakshmi
5) C. Jay Shyam
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Common to I Sem ECE/EEE & II Sem CSE

Subject Code:19ABS9902	Subject Name: **Applied Physics**	L T P 3 0 0	Credits:3

Course Outcomes

1. Analyze the wave properties of light and the interaction of energy with the matter.
2. Apply electromagnetic wave propagation in different guided media.
3. Asses the electromagnetic wave propagation and its power in different media
4. Analyze the conductivity of semiconductors.
5. Interpret the difference between normal conductor and superconductor and apply the nanomaterials for engineering applications.

Unit I : Optics and EM Theory 10 Hrs

Interference of light -principle of superposition-Conditions for sustained **Interference-Interference** in thin films (reflected light) - Newton's Rings -Determination of **Wavelength.**

Diffraction-Fraunhofer diffraction- Single slit and double slit- Diffraction Grating.

Divergence and Curl of Electric and Magnetic Fields - Gauss' theorem for divergence and **Stokes' theorem for** curl - Maxwell's Equations (Quantitative) – Electromagnetic **wave – propagation** in non-conducting medium - Poynting's Theorem.

Unit II : Lasers and Fiber Optics 10 Hrs

Lasers – Introduction – Characteristics – Spontaneous and Stimulated Emission – Einstein **Coefficients – Population** Inversion – Excitation Mechanism and Optical Resonator - He-Ne **Laser –Nd:YAG Laser** – Semiconductor Diode Laser – Applications of Lasers and Holography.

Introduction to Optical Fibers – Total Internal Reflection – Critical angle of propagation – **Acceptance angle** – Numerical Aperture – Classification of fibers based on Refractive index **profile – Propagation of** electromagnetic wave through optical fiber – modes – importance of V-**number-Attenuation,** Block Diagram of Fiber optic Communication – Industrial Applications – **Fiber optic Sensors.**

Unit III : Dielectric and Magnetic Materials 8 Hrs

Introduction—Dielectric polarization-Dielectric polarizability, Susceptibility and Dielectric **constant-Types of polarizations** : Electronic and Ionic,(Quantitative), Orientation Polarizations

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(Qualitative) - Frequency dependence of polarization-Lorentz (internal) field-Claussius-Mosotti equation-Applications of Dielectrics: Ferroelectricity.
Introduction-Magnetic dipole moment - Magnetization-Magnetic susceptibility and permeability-Origin of permanent magnetic moment – Classification of Magnetic materials - Weiss theory of ferromagnetism (qualitative) – Hysteresis– soft and hard magnetic materials – Magnetic memory device applications .

Unit IV: Semiconductors **8 Hrs**

Origin of Energy bands (Qualitative)-Intrinsic and Extrinsic semiconductors –Direct and indirect band gap semiconductors- Density of charge carriers – Fermi energy—Dependence of Fermi energy on carrier concentration and temperature – Electrical conductivity – Drift and Diffusion currents – Continuity equation - Hall effect -Applications of Hall effect and Semiconductors.

Unit V: Superconductors and Nanomaterials **10 Hrs**

Superconductors-Properties-Meissner'seffect-BCSTheory(Qualitative) - Josephson effect (AC&DC)-Types of Superconductors-Applications of superconductors.
Nanomaterials–Significance of nanoscale–: Physical, Mechanical, Magnetic, Optical properties of nanomaterials –Synthesis of nanomaterials:Top-down-Ball Milling, Bottom-up-Chemical vapour deposition–Characterization of nanomaterials : X-Ray Diffraction (XRD), Scanning Electron Microscope (SEM)-Applications of Nanomaterials.

Textbooks:

1. M. N. Avadhanulu, P. G. Kshirsagar &TVS Arun Murthy" A Text book of Engineering Physics"-S. Chand Publications,11th Edition2019.
2. B.K.Pandey and S.Chaturvedi, Engineering Physics, Cengage Learning,2012.

References:

1. K Thyagarajan "Engineering Physics",-Mc Graw Hill Publishing Company Ltd, 2016
2. Shatendra Sharma, Jyotsna Sharma, " Engineering Physics", Pearson Education,2018
3. David J.Griffiths,"Introduction to Electrodynamics"-4/e, Pearson Education, 2014
4. T Pradeep, "A Text book of NanoScience and NanoTechnology"-Tata Mc Graw Hill 2013.

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CO: 1	PO1 : Apply the knowledge of science	1.2	1.2.1
CO: 2	PO1: Apply the knowledge of science	1.2	1.2.1
CO: 3	PO1: Apply the knowledge of science	1.2	1.2.1
CO: 4	PO1: Apply the knowledge of science	1.2	1.2.1
CO: 5	PO1: Apply the knowledge of science	1.2	1.2.1

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List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO: 1	PO 4: Analysis and interpretation of data	4.3	4.3.3
CO: 2	PO 4: Analysis and interpretation of data	4.3	4.3.1
CO: 3	PO 4: Analysis and interpretation of data	4.3	4.3.1
CO: 4	PO 4: Analysis and interpretation of data	4.3	4.3.2
CO: 5	PO 4: Analysis and interpretation of data	4.3	4.3.2

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Common to I Sem ECE, EEE & II Sem CSE

Subject Code:19ABS9907	Subject Name: **Applied Physics Lab**	L T P 0 0 3	Credits:1.5

Course Outcomes

1. Analyze the wave properties of light and the interaction of energy with the matter.
2. Apply electromagnetic wave propagation in different guided media.
3. Asses the electromagnetic wave propagation and its power in different media
4. Analyze the conductivity of semiconductors.
5. Interpret the difference between normal conductor and superconductor and apply the nanomaterials for engineering applications.

List of Experiments

1. Determination of the thickness of the wire using wedge shape method.
2. Determination of the radius of curvature of the lens by Newton's ring method
3. Determination of wavelength by plane diffraction grating method
4. Dispersive power of a diffraction grating
5. Study of the Magnetic field along the axis of a circular coil carrying current.
6. Study the variation of B versus H of the magnetic material (B-H curve)
7. Determination of the numerical aperture of a given optical fiber and angle of acceptance.
8. Determination of Hall voltage and Hall coefficient of a given semiconductor using Hall effect.
9. Determination of the energy gap of a semiconductor
10. Determination of crystallite size using X-Ray diffraction spectra.
11. Determination of Wavelength of LASER using diffraction grating.
12. Determination of particle size using LASER.
13. Determination of the resistivity of semiconductor by Four probe method.
14. Determination of dielectric constant by charging and discharging method.
15. Study the temperature dependence of resistance of a thermister.

References:

1. S. Balasubramanian, M.N.Srinivasan, "A Text book of Practical Physics"-S Chand Publishers, 2017.
2. http://vlab.amrita.edu/index.php-VirtualLabs, Amrita University.

1. 2. 3. 4.

10/08/2019

5. 6. 8. 9. 10.

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List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO: 1	PO 4: Analysis and interpretation of data	4.3	4.3.3
CO: 2	PO 4: Analysis and interpretation of data	4.3	4.3.1
CO: 3	PO 4: Analysis and interpretation of data	4.3	4.3.1
CO: 4	PO 4: Analysis and interpretation of data	4.3	4.3.2
CO: 5	PO 4: Analysis and interpretation of data	4.3	4.3.2

1. 2. 3. 4.

5. 6. 7. 8. 9. 10. K. Sahu

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Year: II **Semester : I** **Branch of Study : EEE**

Subject Code	Subject Name	L	T	P	Credits
19ABS9912	Transform Techniques and Complex Variables	3	0	0	3

Course Outcomes:

CO: 1 Apply the Laplace transform for solving differential equations (continuoussystems)
CO: 2 Find the Fourier series of periodic signals
CO: 3 Know and be able to apply integral expressions for the forwards and inverse Fourier transform to a range of non-periodic waveforms
CO: 4 Solve linear/nonlinear algebraic and transcendental equations using numerical methods
CO: 5 Solve ordinary differential equations by Euler's method, modified Euler's method, Runge Kutta method, Predictor Corrector method and Milne's method

UNIT I
Laplace transforms:
Definition of Laplace transform, existence conditions, properties of Laplace transforms, inverse Laplace transforms, transforms of derivatives, transforms of integrals, multiplication by t^n, division by t, convolution theorem, periodic functions, unit step function, unit impulse function, applications to ordinary differential equations. (Without proofs).

UNIT II
Fourier series:
Dirichlet's conditions, Fourier series, conditions for a Fourier expansion, functions of any period, odd and even functions - half range series.

UNIT III
Fourier transforms:
Fourier integrals, Fourier cosine and sine integrals, Fourier transform, sine and cosine transform, properties, convolution theorem.

UNIT IV
Solution to algebraic equations:
Solution of polynomial and transcendental equations: bisection method, Newton-Raphson method and Regula-Falsi method. finite differences, relation between operators, interpolation using Newton's forward and backward difference formulae. Interpolation with unequal intervals: Newton's divided difference and Lagrange's formulae.

UNIT V
Numerical differentiation and integration:
Numerical Differentiation, numerical integration- trapezoidal rule and Simpson's 1/3rd and 3/8 rules. Ordinary differential equations-Taylor's series, Euler and modified Euler's methods. Runge-Kutta method of fourth order for solving first and second order equations.

Textbooks:

1. B. S. Grewal, Higher Engineering Mathematics, 44/e, Khanna Publishers, 2017.
2. Erwin kreyszig, Advanced Engineering Mathematics, 9/e, John Wiley & Sons, 2006.

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References

1. T.K.V.Iyengar,B.Krishna Gandhi and others, Engineering Mathematics-II,& Probability and Statistics, S.Chand Publishers
2. Veerarajan T., Engineering Mathematics, Tata McGraw-Hill, New Delhi, 2008.
3. Erwin kreyszig, Advanced Engineering Mathematics, 9/e, John Wiley & Sons, 2006.
4. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.

List of COs	PO no. and keyword	Competency	Performance Indicator
CO 1	PO1: Apply the knowledge of mathematics	1.1	1.1.2
CO 2	PO1:Apply the knowledge of mathematics	1.1	1.1.2
CO 3	PO 2: First principles of mathematics.	2.2	2.2.2
CO 4	PO1: Knowledge of mathematics	1.3	1.3.1
CO 5	PO1: Knowledge of mathematics	1.1	1.1.1

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B. Tech III Year **Semester : I** **Branch : Common to all**

Subject Code:	Subject Name:	L	T	P	Credits
19AHS9903	Communicative English III	2	0	0	2

Course Outcomes

At the end of the course, the learners will be able to

1. Prioritize information from reading texts after selecting relevant and useful points
2. Paraphrase short academic texts using suitable strategies and conventions
3. Make formal structured presentations on academic topics using PPT slides with relevantgraphical elements
4. Participate in group discussions using appropriate conventions and language strategies
5. Prepare a CV with a cover letter to seek internship/ job
6. Collaborate with a partner to make presentations and Project Reports

Unit 1 **(10 hrs)**

Listening : Listening for presentation strategies and answering questions on the speaker, audience, and key points.

Speaking: Formal presentations using PPT slides without graphic elements.

Reading: Reading for presenting – strategies to select, compile and synthesize information for presentation; reading to recognize academic style.

Writing: Paraphrasing; using quotations in writing; usingacademic style - avoiding colloquial words and phrases.

Grammar and Vocabulary: Formal/academicwords and phrases.

Unit 2 **(10 hrs)**

Listening: Following an argument/ logical flow of thought; answering questions on key concepts after listening to extended passages of spoken academic discourse.

Speaking: Formal presentations using PPT slides with graphic elements.

Reading: Understand formal and informal styles; recognize the difference between facts and opinions.

Writing: Formal letter writing and e-mail writing (enquiry, complaints, seeking permission, seeking internship); structure, conventions and etiquette.

Grammarand Vocabulary: Phrasal prepositions; phrasal verbs.

Unit 3 **10(hrs)**

Listening: Identifying views and opinions expressed by different speakers while listening to discussions.

Speaking: Group discussion on general topics; agreeing and disagreeing, using claims and examples/ evidences for presenting views, opinions and position.

Reading: Identifying claims, evidences, views, opinions and stance/ position.

Writing: Writing structured persuasive/argumentative essays on topics of general interest using suitable claims, examples and evidences.

Grammar andVocabulary: Language for different functions such as stating a point, expressing opinion, agreeing/disagreeing, adding information to what someone has stated, and asking for clarification.

Unit 4: **(8 hrs)**

Listening: Understanding inferences; processing of information using specific context clues from the text.

Speaking: Group discussion; reaching consensus in group work (academic context).

Reading: Reading for inferential comprehension.

Writing: Applying for internship/ job - Writing one's CV/Resume and cover letter.

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Grammar and Vocabulary: Active and passive voice – use of passive verbs in academic writing.

Unit 5: **(8hrs)**

Listening: Understanding inferences - processing of explicit information presented in the text andimplicit information inferable from the text or from previous/background knowledge.
Speaking: Formal team presentations on academic/ general topics using PPT slides.
Reading for Writing: Structure and contents of a Project Report; identifying sections in project reports; understanding the purpose of each section; significance of references.
Grammar and Vocabulary: Reinforcing learning; editing short texts; correcting common errors in grammar and usage.

***Course Materials would be compiled and provided to learners and teachers**

ReferenceBooks

1. Bailey, Stephen. *Academic writing: A handbook for international students*.Routledge,2014.
2. Chase, Becky Tarver. *Pathways: Listening, Speaking and Critical Thinking.* Heinley ELT; 2nd Edition,2018.
3. Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.
4. Hewings, Martin. *Cambridge Academic English (B2)*.CUP, 2012.Sample Web Resources Grammar/Listening/Writing 1-language.com http://www.5minuteenglish.com/ https://www.englishpractice.com/

Grammar/Vocabulary

English Language Learning Online, http://www.bbc.co.uk/learningenglish/, http://www.better-english.com/, http://www.nonstopenglish.com/, https://www.vocabulary.com/, BBC Vocabulary Games, Free Rice Vocabulary Game

Reading

https://www.usingenglish.com/comprehension/, https://www.englishclub.com/reading/short-stories.htm, https://www.english-online.at/

Listening

https://learningenglish.voanews.com/z/3613, http://www.englishmedialab.com/listening.html

Speaking

https://www.talkenglish.com/, BBC Learning English – Pronunciation tips, Merriam-Webster – Perfect pronunciation Exercises

All Skills

https://www.englishclub.com/, http://www.world-english.org/, http://learnenglish.britishcouncil.org/, Online Dictionaries, Cambridge dictionary online, MacMillan dictionary, Oxford learner's dictionaries

References:

1. www.pointblank7.in> News & Politics> Features dt. 15.05.2019
2. Learning English a Communication Approach by Orient Longman Pvt Ltd. Hyderabad , 2005.

List of COs	PO no. and keyword	Competency Indicator:	Performance Indicator:
CO1	PO10-Able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	10.1	10.1.1 10.1.2
CO2	PO10-Able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	10.3	10.3.1 10.3.2
CO3	PO10-Able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	10.2	10.2.2
CO4	PO9- Function effectively as an individual, and as a member or leader in diverse teams, and in multi disciplinary settings.	9.2	9.2.1 9.2.2 9.2.3

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Year: II **Semester : I** **Branch of Study : ME**

Subject Code	Subject Name	L	T	P	Credits
19AES0505	Internet of Things (IoT)	2	0	0	2

Course Outcomes:

CO: 1 Interpret the vision of IoT from a global context
CO: 2 Determine the Market perspective of IoT
CO: 3 Compare and Contrast the use of Devices, Gateways and Data Management in IoT
CO: 4 Implement state of the art architecture in IoT
CO: 5 Illustrate the application of IoT in Industrial Automation and identify Real World DesignConstraints

UNIT I

M2M to IoT-The Vision-Introduction, From M2M to IoT, M2M towards IoT-the global context, A usecase example, Differing Characteristics.

UNIT II

M2M to IoT - A Market Perspective- Introduction, Some Definitions, M2M Value Chains, IoT Value Chains, An emerging industrial structure for IoT, The international driven global value chain and global information monopolies. M2M to IoT-An Architectural Overview-Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations.

UNIT III

M2M and IoT Technology Fundamentals- Devices and gateways, Local and wide area networking, Data management, Business processes in IoT, Everything as a Service(XaaS), M2M and IoT Analytics, Knowledge Management.

UNIT IV

IoT Architecture-State of the Art - Introduction, State of the art.

UNIT V

IoT Reference Architecture- Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views. Real-World Design Constraints-Introduction, Technical Design constraints-hardware is popular again, Data representation and visualization, Interaction and remote control. Industrial Automation- Service-oriented architecture-based device integration, SOCRADES: realizing the enterprise integrated Web of Things, IMC-AESOP: from the Web of Things to the Cloud of Things.

Textbooks:

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.(ISBN-13:978-0124076846).

References

1. Vijay Madisetti and Arshdeep Bahga, "Internet of Things (A Hands-on-Approach)", 1st Edition, VPT, 2014. (ISBN-13:978-8173719547)

2. Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1st Edition, Apress Publications, 2013. (ISBN-13: 978-1430257400)P L Ballaney, Theory of Machines, Khanna Publishers.

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Year: II **Semester: I** **Branch of Study: EEE**

Course Code	Course Title	L	T	P	Credits
19APC0201	Electrical Circuit Analysis	3	0	0	3

COURSE OUTCOMES:

CO1: Apply network theorems for the analysis of electrical circuits.
CO2: Determine the transient and steady-state response of electrical circuits.
CO3: Analyze circuits in the sinusoidal steady-state domain (single-phase and three phase).
CO4: Analyze two port networks using network parameters
CO5: Apply mesh and nodal analysis to solve electrical circuit problems

UNIT-I

DC Circuits: Ohm's Law, Kirchhoff's Voltage Law and Current Law, Types of sources, Network elements, Voltage - Current Relationship for Passive Elements, Source Transformation, Network Reduction Techniques: Series, Parallel, Series Parallel, Star-to-Delta or Delta-to-Star Transformation, Analysis with dependent current and voltage sources. Node and mesh Analysis. Super node, super mesh analysis

UNIT-II

Network Theorems: Superposition theorem, Thevenin theorem, Norton theorem, Maximum power transfer theorem, Reciprocity theorem, Compensation theorem, millman's theorem, tellegan's theorem, Theorems for D.C and Sinusoidal Excitations. Concept of duality and dual networks.

UNIT-III

Single Phase AC Circuits: R.M.S, Average Values and Form Factor for Different Periodic Wave Forms: Sinusoidal Alternating Quantities. Phase and Phase Difference, Complex and Polar Forms Of Representations, j-Notation, Steady State Analysis of R, L and C (In Series, Parallel and Series Parallel Combinations) With Sinusoidal Excitation, Concept of Power Factor, Concept of Reactance, Impedance, Susceptance and Admittance-Real and Reactive Power and Complex Power. Three phase a.c circuits, Relation between Line and Phase Voltages and Currents, Measurement of Active and Reactive Power in Balanced and Unbalanced Three Phase Systems, Mutual coupled circuits, Dot convention in coupled circuits.

UNIT-IV

Two port networks & Resonance: Two Port Network Parameters: Impedance, Admittance, Transmission and Hybrid Parameters and their Relations. Inter-connection of two port networks.

Resonance: Series, Parallel Circuits, Concept of Bandwidth and Q Factor. Relation between quality factor and band width

UNIT-V

TRANSIENT RESPONSE ANALYSIS

D.C Transient Analysis: Transient Response of R-L, R-C, R-L-C Series Circuits for D.C Excitation-Initial Conditions-Solution Method Using Differential Equations and Laplace Transforms, Response of R-L & R-C Networks to Pulse Excitation.

A.C Transient Analysis: Transient Response of R-L, R-C, R-L-C Series Circuits for Sinusoidal Excitations-Initial Conditions-Solution Method Using Differential Equations and Laplace Transforms

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Text Books:

1. Alexander and sadiku's fifth edition "fundamentals of electric circuits" Indian edition,2013
2. Electrical Circuit Theory and Technology 4th Edition, John Bird, Rovtledge/T&F, 2011.

Reference Books:

1. Engineering Circuit Analysis, William Hayt and Jack E. Kemmerly, Mc Graw Hill Company, 6th edition.
2. Network Analysis 3rd Edition, M.E Van Valkenberg, PHI.

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO: 1	PO-1 –engineering knowledge	1.3	1.3.1
CO: 2	PO-2-problem analysis	2.2	2.2.2 2.2.3
CO: 3	PO-4-conduct investigations of complex problems	4.1	4.1.1
CO: 4	PO-4- conduct investigations of complex problems	4.3	4.3.1
CO: 5	PO-1- engineering knowledge	1.4	1.4.1

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Year: II **Semester: I** **Branch of Study: EEE**

Subject Code	Subject Name	L	T	P	Credits
19AMC9903	Environmental Studies	3	0	0	3

Course Outcomes:

CO: 1 Students get sufficient information that clarifies modern environmental concepts like equitable use of natural resources, more sustainable life styles etc.

CO: 2 Students realize the need to change their approach, so as to perceive our own environmental issues correctly, using practical approach based on observation and self-learning.

CO: 3 Students become conversant with the fact that there is a need to create a concern for our environment that will trigger pro-environmental action; including simple activities we can do in our daily life to protect it.

CO: 4 Interpretation of different types of environmental pollution problems and designing of new solid waste management techniques usage

CO: 5 To get knowledge on various environmental acts and to engage all the students life - long learning of rain water harvesting

UNIT I

Multidisciplinary Nature ofEnvironmental Studies: Introduction – Multidisciplinary Nature of Environmental Studies – Definition, Scope and Importance – Need for Public Awareness.

Natural Resources: Renewable and non-renewable energy resources –Natural resources and associated problems.

Forest resources: Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people.

Water resources: Use and over utilization of surface and sub-surface – Floods, drought, conflicts over water, dams – benefits and problems.

Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.

Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticides problems, water logging, salinity, case studies.

Energy resources: Renewable and non-renewable energy resources

UNIT II

Ecosystems: Concept of an ecosystem. – Structure and functions of anecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the following ecosystem: Forest ecosystem, Grassland ecosystem, Desert ecosystem and Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).

Biodiversity And Its Conservation : Introduction- Definition:genetic, species and ecosystem diversity – Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values – Biodiversity at global, National and local levels – India as a mega-diversity nation – Hot-sports of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man – wildlife conflicts – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity

UNIT III

Environmental Pollution: Definition, Causes, effects and its controlmeasures of : Air Pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution and Nuclear hazards.

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Solid Waste Management: Causes, effects and control measures ofurban and industrial wastes – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: floods, earthquake, cyclone, Tsunami and landslides.

UNIT IV

Social Issues and the Environment: From Unsustainable toSustainable development – Urban problems related to energy – Water conservation, rain water harvesting and watershed management – Resettlement and rehabilitation of people – Case studies – Environmental ethics: Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies–Wasteland reclamation. – Consumerism and waste products. – Environment Protection Act. – Air (Prevention and Control of Pollution) Act. – Water (Prevention and control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act – Public awareness.

UNIT V

Human Population and the Environment: Population growth,variation among nations. Population explosion – Family Welfare Programmed. – Environment and human health – Human Rights – Value Education – HIV/AIDS – Women and Child Welfare – Role of information Technology in Environment and human health – Case studies.

Text Books:

1. Text book of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission, Universities Press.
2. Environmental Studies by Kaushik, New Age Publishers.
3. Environmental Studies by Sri Krishna Hitech publishing Pvt. Ltd.

Reference Books:

1. Environmental studies by R.Rajagopalan, Oxford University Press.
2. Comprehensive Environmental studies by J.P.Sharma, Laxmi publications.
3. Introduction to Environmental engineering and science by Gilbert M. Masters and Wendell P. Ela - Printice hall of India Private limited.
4. Environmental studies by A. Ravi Krishnan, G. Sujatha Sri Krishna Hitech publications.

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO: 1	PO1:Apply the knowledge of Basic science	1.2	1.2.1
CO: 2	PO1:Apply the knowledge of Basic science	1.2	1.2.1
CO: 3	PO1:Apply the knowledge of Basic science	1.2	1.2.1
CO: 4	PO1:Apply the knowledge of Basic science	1.2	1.2.1
CO: 5	PO1:Apply the knowledge of Basic science	1.2	1.2.1

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Year: II **Semester: I** **Branch of Study: EEE**

Subject Code	Subject Name	L	T	P	Credits
19AHS9904	Communicative English II Lab	0	0	2	1

Course Outcomes:

CO: 1 Prioritize information from reading texts after selecting relevant and useful points.

CO: 2 Make formal structured presentations on academic topics using PPT slides with relevant graphical elements.

CO: 3 Participate in Group discussions using appropriate conventions and language strategies.

CO: 4 Paraphrase short academic text using suitable strategies and conventions.

CO: 5 Collaborate with a partner to make presentations and Project

UNIT I

Oral Presentation: Reading for presenting – strategies to select, compile and synthesize information for presentation; reading to recognize academic style. Listening for presentation strategies and answering questions- Formal presentations using PPT slides without graphic elements

UNIT II

Power point Presentation/Poster Presentation: Understand formal and informal styles; recognize the difference between facts and opinions. Following an argument/ logical flow of thought; answering questions, formal presentations using PPT slides with graphic elements.

UNIT III

Group discussion on general topics; agreeing and disagreeing, using claims and examples/ evidences for presenting views, opinions and position. Identifying claims, evidences, views, opinions and stance/ position. Identifying views and opinions expressed by different speakers while listening to discussions.

UNIT IV

Reading for inferential comprehension. Group discussion; reaching consensus in group work(academic context). Understanding inferences; processing of information using specific context clues from the text.

UNIT V

Formal team presentations on academic/ general topics using PPT slides-identifying sections in project reports; understanding the purpose of each section; significance of references.

Reference Books:

1. Effective Technical Communication, Rizvi,Tata McGraw-Hill Education2007.
2. A Practical Course in Effective English Speaking skills, J.K.Gangal, PHI Learning PvtLtd, 2012.
3. A Course in Communication Skills, P.Kiranmai Dutt,Geetha Rajeevan,C.L.N.Prakash, 2008.
4. Technical Communication, Meenakshi Raman, Oxford University Press.
5. Professional Communication Skills, Er.A.K.Jain, Pravin S.R.Bhatia, Dr.A.M.Sheikh, S.Chand & Company Ltd, 2001.

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List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO: 1	PO10 Able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	10.1	10.1.1 10.1.2
CO: 2	PO10 Able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	10.3	10.3.1 10.3.2
CO: 3	PO9 Functioneffectivelyasanindividual,andasamemberorlead erindiverse teams, and in multidisciplinarysettings.	9.2.	9.2.1 9.2.2 9.2.3
CO: 4	PO10 Able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions	10.3	10.3.1 10.3.2
CO: 5	PO10 Able to comprehend and write effective reports and design documentation.	10.3	10.3.1 10.3.2

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Year: II **Semester: I** **Branch of Study: EEE**

Subject Code	Subject Name	L	T	P	Credits
19AES0506	Internet of Things Lab (IoT Lab)	0	0	2	1

Lab Experiments:

1. Select any one development board (Eg., Arduino or Raspberry Pi) and control LED using the board.
2. Using the same board as in (1), read data from a sensor. Experiment with both analog and digital sensors.
3. Control any two actuators connected to the development board usingBluetooth.
4. Read data from sensor and send it to a requesting client.(using socket communication) Note: The client and server should be connected to same local area network.
5. Create any cloud platform account, explore IoT services and register a thing on the platform.
6. Push sensor data to cloud.
7. Control an actuator through cloud.
8. Access the data pushed from sensor to cloud and apply any data analytics or visualization services.
9. Create a mobile app to control an actuator.
10. Identify a problem in your local area or college which can be solved by integrating the thingsyou learned so far and create a prototype to solve it (MiniProject).

Text Book:

1. Adrian McEwen, Hakim Cassimally - Designing the Internet of Things, Wiley Publications, 2012

Reference Books:

1. Arshdeep Bahga, Vijay Madisetti - Internet of Things: A Hands-On Approach, Universities Press, 2014.
2. The Internet of Things, Enabling technologies and use cases – Pethuru Raj, Anupama C. Raman, CRCPress.

Reference sites:

https://www.arduino.cc/,https://www.raspberrypi.org/

Course outcomes: At the end of the course, students will be able to

- Choose the sensors and actuators for an IoTapplication.
- Select protocols for a specific IoTapplication.
- Utilize the cloud platform and APIs for IoTapplication.
- Experiment with embedded boards for creating IoTprototypes.

Design a solution for a given IoTapplication

List of COs	PO no. and keyword	Competency	Performance Indicator
CO 1	PO 5: Modern Tool Usage	5.1	5.1.1
CO 2	PO 5: Modern Tool Usage	5.2	5.2.1
CO 3	PO 4: Conduct investigations of complex Problem	4.3	4.3.1
CO 4	PO 3: Design/Development of Solutions	3.4	3.4.1
CO 5	PO 6: Engineer & Society	6.1	6.1.1

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Year : II **Semester : II** **Branch of Study : EEE**

Subject Code	Subject Name	L	T	P	Credits
19ABS9916	Numerical Methods and Probability	3	1	0	4

Course Outcomes:

1) Evaluate approximating the roots of polynomial and transcendental equations by different algorithms
2) Apply different algorithms for approximating the solutions of ordinary differential equations to its analytical computations
3) Apply discrete and continuous probability distributions
4) Design the components of a classical hypothesis test
5) Infer the statistical inferential methods based on small and large sampling tests

Unit 1: Solution to algebraic equations **8 hrs**

Solution of polynomial and transcendental equations: bisection method, Newton-Raphson method and Regula-Falsi method. finite differences, relation between operators, interpolation using Newton's forward and backward difference formulae. Interpolation with unequal intervals: Newton's divided difference and Lagrange's formulae.

Unit 2: Numerical differentiation and integration **8 hrs**

Numerical Differentiation, numerical integration- trapezoidal rule and Simpson's 1/3rd and 3/8 rules. Ordinary differential equations-Taylor's series, Euler and modified Euler's methods. Runge-Kutta method of fourth order for solving first and second order equations.

Unit 3: Probability **10 hrs**

probability axioms, addition law and multiplicative law of probability, conditional probability, Baye's theorem, random variables (discrete and continuous), probability distribution: Binomial -

Poisson approximation to the binomial distribution and normal distribution-their properties.

Unit 4: Testing of Hypothesis **8 hrs**

Formulation of null hypothesis, critical regions, level of significance.

Large sample tests: test for single proportion, difference of proportions, test for single mean and difference of means.

Unit 5: Small Sample Tests **8 hrs**

Student t-distribution (single mean, two means and paired t-test), Testing of equality of variances (F-test), $\chi 2$ - test for goodness of fit, $\chi 2$ - test for independence of attributes.

Textbooks:

1. B. S. Grewal, Higher Engineering Mathematics, 44/e, Khanna Publishers, 2017.
2. P. Kandasamy, K. Thilagavathy, K. Gunavathi, Numerical Methods, S. Chand & Company, 2/e, Reprint 2012.

References

1. T.K.V.Iyengar, B.Krishna Gandhi and others, Engineering Mathematics- III , S.Chand Publishers
2. T.K.V.Iyengar, B.Krishna Gandhi and others, Probability And Statistics , S.Chand Publishers
3. Veerarajan T., Engineering Mathematics, Tata McGraw-Hill, New Delhi, 2008.
4. Erwin kreyszig, Advanced Engineering Mathematics, 9/e, John Wiley & Sons, 2006.
5. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.

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Year: II Semester:II Branch of Study: EEE

Subject Code	Subject Name	L	T	P	Credits
19AES0509	Basics of Python Programming	2	0	0	2

Course Objectives:

- To learn the fundamentals of Python
- To elucidate problem-solving using a Python programming language
- To introduce a function-oriented programming paradigm through python
- To get training in the development of solutions using modular concepts
- To introduce the programming constructs of python

Unit – I

Introduction: What is a program, Running python, Arithmetic operators, Value and Types. Variables, Assignments and Statements: Assignment statements, Script mode, Order of operations, string operations, comments.

Functions: Function calls, Math functions, Composition, Adding new Functions, Definitions andUses, Flow of Execution, Parameters and Arguments, Variables and Parameters are local, Stackdiagrams, Fruitful Functions and Void Functions, Why Functions.

Unit – II

Case study: The turtle module, Simple Repetition, Encapsulation, Generalization, Interfacedesign, Refactoring, docstring.

Conditionals and Recursion: floor division and modulus, Boolean expressions, Logicaloperators, Conditional execution, Alternative execution, Chained conditionals, Nestedconditionals, Recursion, Infinite Recursion, Keyboard input.

Fruitful Functions: Return values, Incremental development, Composition, Boolean functions,More recursion, Leap of Faith, Checking types.

Unit – III

Iteration: Reassignment, Updating variables, The while statement, Break, Square roots,Algorithms.

Strings: A string is a sequence, len, Traversal with a for loop, String slices, Strings areimmutable, Searching, Looping and Counting, String methods, The in operator, Stringcomparison.

Case Study: Reading word lists, Search, Looping with indices.

Lists: List is a sequence, Lists are mutable, Traversing a list, List operations, List slices, Listmethods, Map filter and reduce, Deleting elements, Lists and Strings, Objects and values,Aliasing, List arguments.

Unit – IV

Dictionaries: A dictionary is a mapping, Dictionary as a collection of counters, Looping anddictionaries, Reverse Lookup, Dictionaries and lists, Memos, Global Variables.

Tuples: Tuples are immutable, Tuple Assignment, Tuple as Return values, Variable-lengthargument tuples, Lists and tuples, Dictionaries and tuples, Sequences of sequences.

Files: Persistence, Reading and writing, Format operator, Filename and paths, Catchingexceptions, Databases, Pickling, Pipes, Writing modules.

Classes and Objects: Programmer-defined types, Attributes, Instances as Return values, Objectsare mutable, Copying.

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Unit – V

Classes and Functions: Time, Pure functions, Modifiers, Prototyping versus Planning
Classes and Methods: Object oriented features, Printing objects, The init method, The_str_method, Operator overloading, Type-based Dispatch, Polymorphism, Interface andImplementation
Inheritance: Card objects, Class attributes, Comparing cards, decks, Printing the Deck, AddRemove shuffle and sort, Inheritance, Class diagrams, Data encapsulation.
The Goodies: Conditional expressions, List comprehensions, Generator expressions, any and all,Sets, Counters, defaultdict, Named tuples, Gathering keyword Args.

Course Outcomes:

Student should be able to

- Apply the features of Python language in various real applications.
- Select appropriate data structure of Python for solving a problem.
- Design object oriented programs using Python for solving real-world problems.
- Apply modularity to programs.

Text books:

1. Allen B. Downey, "Think Python", 2nd edition, SPD/O'Reilly, 2016.

Reference Books:

1. Martin C.Brown, "The Complete Reference: Python", McGraw-Hill, 2018.
2. Kenneth A. Lambert, B.L. Juneja, "Fundamentals of Python", CENGAGE, 2015.
3. R. Nageswara Rao, "Core Python Programming", 2nd edition, Dreamtech Press, 2019

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Year: II **Semester:II** **Branch of Study:EEE**

Subject Code	Subject Name	L	T	P	Credits
19AES0302	Design Thinking and Product Innovation	2	0	0	2

Course Outcomes:

CO: 1 Summarize the basics of Engineering design process.
CO: 2 Explain historical development of Physics and science to Engineering.
CO: 3 Apply systematic approach to innovative designs.
CO: 4 Identify new technologies and requirement for new product development.
CO: 5 Explain and study of Product Development.

UNIT I

Engineering Design: Introduction to Engineering design process, the process of design by evolution, the morphology of design, identification and analysis of need, true need, specifications, standards of performance, use of checklists, morphological analysis, measure of physical realizability, economic and financial feasibility, designing for shipping, handling and installation, design for maintenance, detaileddesign.

UNIT II

Physics to Engineering: Applied Physics, Application of Newton laws, Law of conservation of Energy, Ohm's law, Electrostatic laws, Electromagnetic laws, solid state electronics.

Science to Engineering: Scientist, Engineer, engineering units and measurement, Materials science: non-conductors, conductors, super conductors, science fields and engineering fields.

UNIT III

Systematic approach to product development: Design Thinking, Innovation, Empathize Design Thinking as a systematic approach to Innovation, brainstorming, visual thinking, design challenges, innovation, art of Innovation, strategies for idea generation, creativity, teams for innovation.

UNIT IV

New product development: Procedure for new product development, study of introducing electrical and electronic controls to the old products, importance of IOT in product development, environmental considerations in design, safety considerations indesign, testing, customer support.

UNIT V

Study of Product Development- Agriculture: development of machines for separation of corn seeds, peeling of groundnut shells, husk removing from paddy. Electrical: Design of burglar alarm, speedometer, water level indicator, smart gates, smart lights. Design of: electrical vehicles, unmanned vehicles, design principles in drones.

Reference Books:

1. Philip Kosky, Robert T. Balmer,William D. Keat,George Wise, "Exploring Engineering: An Introduction to Engineering and Design", 4/e, Elsevier,2016.
2. David Ralzman, "History of Modern Design", 2/e, Laurence King Publishing Ltd.,2010.
3. An AVA Book, "Design Thinking", AVA Publishing,2010.
4. G. Pahl, W.Beitz, J. Feldhusen, KH Grote, "Engineering Design: A Systematic Approach", 3/e, Springer,2007.
5. Tom Kelley, Jonathan Littman, "Ten Faces in Innovation", Currency Books,2006.
6. Fundamentals of Design and Manufacturing by G. K. Lal, Vijay Gupta, and N. Venkata Reddy, Narosa PublishingHouse.

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO: 1	PO3: Design/development of solutions	3.1	3.1.1
CO: 2	PO 1: Engineering knowledge	1.3	1.3.1
CO: 3	PO 1: Engineering knowledge	1.3	1.3.1
CO: 4	PO3: Design/development of solutions	3.1	3.1.1
CO: 5	PO 1: Engineering knowledge	1.3	1.3.1

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Year: II Semester: II Branch of Study: EEE

Course Code	Course Title	L	T	P	Credits
19APC0204	Electrical Machines - I	3	1	0	4

COURSE OUTCOMES:

CO1: Apply the concepts of magnetic circuits to compute induced EMF and force in Electro-magnetic systems.

CO2: Analyze the operation, conditions required of self excitation of DC Generators and parallel operation of DC Generators.

CO3: Distinguish the operation of various dc motors and determine the performance of DC machine using the results of tests.

CO4: Explain the principle, constructional features and evaluate the performance characteristics of single phase transformers by conducting various tests.

CO5: Analyze the operations of Auto Transformer, Three Phase Transformer and parallel operation of Transformers.

UNIT-I

Magnetic Circuits: Introduction, Magnetic materials and their properties, magnetically induced EMF and force, AC operation of magnetic circuits, hysteresis and eddy current losses, permanent magnets, and applications of permanent magnet materials.

Principles of electromechanical energy conversion: Energy in magnetic system, field energy and mechanical force, multiply-excited magnetic field systems, energy conversion via electric field, dynamical equations of electro mechanical systems

UNIT-II

DC Generators: Constructional details of DC machine, armature windings and its types, EMF equation, wave shape of Induced EMF, armature reaction, effect of brush lead, demagnetizing and cross magnetizing ampere turns, compensating windings, commutation, EMF induced in a coil undergoing commutation, time of commutation, methods of improving commutation, OCC and load characteristics of different types of generators. Parallel operation of DC Generators: DC shunt and series generators in parallel, Equalizing connections.

UNIT-III

DC Motors: Force on conductor carrying current, Torque and power developed by armature, speed control of DC Motors, starting of DC Motors: constructional details of 3-point and 4-point starters, load characteristics of DC Motors Losses in DC Machine, condition for maximum efficiency.

Testing of DC machines: Brake test, Swinburne's test, Hopkinson's test, Fields test, Retardation test, Separation of iron and frictional losses.

UNIT-IV

Transformers: Principle, construction and operation of single-phase transformers, equivalent circuit, phasor diagram, voltage regulation, losses and efficiency. Testing - open circuit and short circuit tests, polarity test, back-to-back test, separation of hysteresis and eddy current losses.

UNIT-V

Parallel operation of single-phase and three-phase transformers, Autotransformers - construction, principle, applications and comparison with two winding transformer, Magnetizing current, effect of nonlinear B-H curve of magnetic core material.

Three-phase transformer – construction, types of connection and their comparative features, Phase conversion - Scott connection, three-phase to six-phase conversion

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Text books:

1. I. J. Nagrath and D. P. Kothari, "Electric Machines", McGraw Hill Education, 2010.
2. P. S. Bimbhra, "Electrical Machinery", Khanna Publishers, 2011.

References:

1. A. E. Fitzgerald and C. Kingsley, "Electric Machinery", New York, McGraw Hill Education, 2013.
2. A. E. Clayton and N. N. Hancock, "Performance and design of DC machines", CBS Publishers, 2004.
3. M. G. Say, "Performance and design of AC machines", CBS Publishers, 2002.

CO No.	PO No. and keyword	Competency Indicator	Performance Indicator
CO 1	PO 1: Engineering Knowledge	1.2	1.2.1
CO2	PO 2: Problem analysis	2.3	2.3.1, 2.3.2
CO3	PO 4: Conduct investigations of complex problems	4.2	4.2.1, 4.2.2
CO4	PO 2: Problem analysis PO 4: Conduct investigations of complex problems	2.3 4.2	2.3.1, 2.3.2 4.2.1, 4.2.2
CO5	PO 2: Problem analysis	2.3	2.3.1, 2.3.2

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Year: II Semester : II Branch of Study : EEE

Subject Code	Subject Name	L	T	P	Credits
19AMC9901	Biology for Engineers	3	0	0	0

Course Outcomes:

CO: 1 Explain about cells and their structure and function. Different types of cells and basics for classification of living Organisms.

CO: 2 Explain about biomolecules, their structure, function and their role in the living organisms. How biomolecules are useful in Industry.

CO: 3 Brief about human physiology.

CO: 4 Explain about genetic material, DNA, genes and RNA how they replicate, pass and preserve vital information in living Organisms.

CO: 5 Know about application of biological principles in different technologies for the production of medicines and pharmaceutical molecules through transgenic microbes, plants and animals

UNIT I

Evolution: Different patterns of evolution, Darwin's theory of evolution, Cell as Basic unit of life, cell theory, Cell shapes, Cell structure, Cell cycle. Chromosomes. Prokaryotic and eukaryotic Cell. Plant Cell, Animal Cell, Plant tissues and Animal tissues, Brief introduction to five kingdoms of classification, Tissue Engineering.

UNIT II

Carbohydrates, lipids, proteins, Vitamins and minerals, Nucleic acids (DNA and RNA) and their types. Enzymes, Enzyme application in Industry. Large scale production of enzymes by Fermentation.

UNIT III

Digestive system, Respiratory system, (aerobic and anaerobic Respiration). Respiratory organs, respiratory cycle, Central Nerves System and Excretory system.

UNIT IV

Prokaryotic gene and Eukaryotic gene structure. DNA replication, Transcription and Translation. DNA technology. Introduction to gene cloning.

UNIT V

Brief introduction to industrial Production of Enzymes, Pharmaceutical and therapeutic Proteins, Vaccines and antibodies. Basics of biosensors, Properties and Classification of virus, Immune response to virus, Definitions-Pandemic, Epidemic and outbreak, pandemic alert system ranges, Prevention of pandemic disease and pandemic preparation.

TEXT BOOKS :

1. P.K.Gupta, Cell and Molecular Biology, 5th Edition, Rastogi Publications.
2. U. Satyanarayana. Biotechnology, Books & Allied Ltd 2017.

REFERENCE BOOKS :

1. N. A. Campbell, J. B. Reece, L. Urry, M. L. Cain and S. A. Wasserman, "Biology: A Global Approach", Pearson Education Ltd, 2018.
2. T Johnson, Biology for Engineers, CRC press, 2011
3. J.M. Walker and E.B. Gingold, Molecular Biology and Biotechnology 2nd ed.. Panima Publications. PP 434.
4. David Hames, Instant Notes in Biochemistry –2016
5. Phil Tunner, A. Mctennan, A. Bates & M. White, Instant Notes – Molecular Biology – 2014.

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Year: II **Semester: II** **Branch of Study: EEE**

Course Code	Course Title	L	T	P	Credits
19APC0205	Electrical Machines – I Lab	0	0	3	1.5

COURSE OUTCOMES:

CO1: Identify the reason as to why D.C. Generator is not building up voltage
CO2: Conduct experiments to obtain the no-load and load characteristics of D.C. Generators
CO3: Conduct tests on D.C. motors for determination and predetermination of efficiency
CO4: Control the speed of D.C. motor in a given range using appropriate method
CO5: Conduct tests on transformers for predetermination of efficiency and load sharing

From the following experiments students may select any 10 Experiments:

1. Magnetization characteristics of DC shunt generator. Determination of critical field resistance and critical speed.
2. Load test on DC shunt generator. Determination of characteristics.
3. Brake test on DC shunt motor. Determination of performance curves.
4. Swinburne's test and speed control of DC shunt motor. Predetermination of efficiencies.
5. Fields test on DC series machines. Determination of efficiency.
6. Brake test on DC compound motor. Determination of performance curves.
7. O.C. & S.C. Tests on Single phase Transformer.
8. Parallel Operation of Single Phase Transformers.
9. Sumpner's Test on a Pair of identical Single Phase Transformers.
10. Scott Connection of Transformers.
11. Load test on DC series generator. Determination of characteristics.
12. Load test on single phase transformer

Text book:

1. I. J. Nagrath and D. P. Kothari, "Electric Machines", McGraw Hill Education, 2010.
2. P. S. Bimbhra, "Electrical Machinery", Khanna Publishers, 2011.

References:

1. A. E. Fitzgerald and C. Kingsley, "Electric Machinery", New York, McGraw Hill Education, 2013.
2. A. E. Clayton and N. N. Hancock, "Performance and design of DC machines", CBS Publishers, 2004.

CO No.	PO No. and keyword	Competency Indicator	Performance Indicator
CO 1	PO 1: Engineering Knowledge	1.2	1.2.1
CO 2	PO 2: Problem analysis	2.3	2.3.1, 2.3.2
CO 3	PO 4: Conduct investigations of complex problems	4.2	4.2.1, 4.2.2
CO 4	PO 2: Problem analysis PO 4: Conduct investigations of complex problems	2.3 4.2	2.3.1, 2.3.2 4.2.1, 4.2.2
CO 5	PO 2: Problem analysis	2.3	2.3.1, 2.3.2

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Year: II **Semester:II** **Branch of Study: EEE**

Subject Code	Subject Name	L	T	P	Credits
19AES0510	**Basics of Python Programming Lab**	**0**	**0**	**2**	**1**

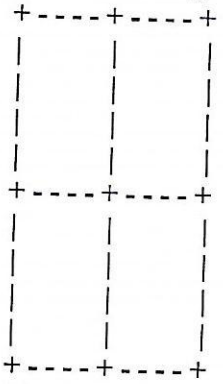
Lab Outcomes:

Student should be able to

- Design solutions to mathematical problems.
- Organize the data for solving the problem.
- Develop Python programs for numerical and text based problems.
- Select appropriate programming construct for solving the problem.
- Illustrate object oriented concepts.

Laboratory Experiments

1. Install Python Interpreter and use it to perform different Mathematical Computations. Tryto do all the operations present in a Scientific Calculator
2. Write a function that draws a grid like the following:



3. Write a function that draws a Pyramid with # symbols

Up to 15 hashes at the bottom

4. Using turtles concept draw a wheel of your choice
5. Write a program that draws Archimedean Spiral
6. The letters of the alphabet can be constructed from a moderate number of basic elements,like vertical and horizontal lines and a few curves. Design an alphabet that can be drawnwith a minimal number of basic elements and then write functions that draw the letters.The alphabet can belong to any Natural language excluding English. You should considerat least Ten letters of the alphabet.
7. The time module provides a function, also named time that returns the current GreenwichMean Time in "the epoch", which is an arbitrary time used as a reference point. On UNIXsystems, the epoch is 1 January 1970.

   >>> import time
   >>>time.time()
   1437746094.5735958

   Write a script that reads the current time and converts it to a time of day in hours,minutes, and seconds, plus the number of days since the epoch.
8. Given n+r+1 <= 2r . n is the input and r is to be determined. Write a program whichcomputes minimum value of r that satisfies the above.
9. Write a program that evaluates Ackermann function
10. The mathematician Srinivasa Ramanujan found an infinite series that can be used togenerate a numerical approximation of $1/\pi$:

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Write a function called estimate_pi that uses this formula to compute and return anestimate of π.

$$\frac{1}{\pi} = \frac{2\sqrt{2}}{9801} \sum_{k=0}^{\infty} \frac{(4k)!(1103 + 26390k)}{(k!)^4 396^{4k}}$$

It should use a while loop to compute terms of the summation until the last term is smaller than $1e^{-15}$ (which is Python notation for 10^{-15}). You can check the result bycomparing it to math.pi.

11. Choose any five built-in string functions of C language. Implement them on your own inPython. You should not use string related Python built-in functions.
12. Given a text of characters, Write a program which counts number of vowels, consonantsand special characters.
13. Given a word which is a string of characters. Given an integer say 'n', Rotate eachcharacter by 'n' positions and print it. Note that 'n' can be positive or negative.
14. Given rows of text, write it in the form of columns.
15. Given a page of text. Count the number of occurrences of each latter (Assume caseinsensitivity and don't consider special characters). Draw a histogram to represent thesame
16. Write program which performs the following operations on list's. Don't use built-infunctions
    a) Updating elements of a list
    b) Concatenation of list's
    c) Check for member in the list
    d) Insert into the list
    e) Sum the elements of the list
    f) Push and pop element of list
    g) Sorting of list
    h) Finding biggest and smallest elements in the list
    i) Finding common elements in the list
17. Write a program to count the number of vowels in a word.
18. Write a program that reads a file, breaks each line into words, strips whitespace and punctuation from the words, and converts them to lowercase.
19. Go to Project Gutenberg (http://gutenberg.org) and download your favourite out-of-copyright book in plain text format. Read the book you downloaded, skip over the header information atthe beginning of the file, and process the rest of the words as before. Then modify the program to count the total number of words in the book, and the number of times each word is used. Print the number of different words used in the book. Compare different books by different authors, written in different eras.
20. Go to Project Gutenberg (http://gutenberg.org) and download your favourite out-of-copyright book in plain text format. Write a program that allows you to replace words, insert words and delete words from the file.
21. Consider all the files on your PC. Write a program which checks for duplicate files in your PC and displays their location. Hint: If two files have the same checksum, they probably have the same contents.
22. Consider turtle object. Write functions to draw triangle, rectangle, polygon, circle and sphere. Use object oriented approach.
23. Write a program illustrating the object oriented features supported by Python.
24. Design a Python script using the Turtle graphics library to construct a turtle bar charter presenting the grades obtained by N students read from a file categorizing them in to distinction, first class, second class, third class and failed.
25. Design a Python script to determine the difference in date for given two dates in YYYY:MM:DD format(0 <= YYYY <= 9999, 1 <= MM <= 12, 1 <= DD <= 31) following the leap year rules.

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Year: II **Semester : II** **Branch of Study : Common to all**

Subject Code	Subject Name	L	T	P	Credits
19AES0303	**Design Thinking and Product Innovation Lab**	0	0	2	1

Practice Problems use software wherever applicable.

1) (a) Study of mechanisms: linear motion to rotary motion and rotary motion to linear motion and their applications.
   (b) Study of eccentric, cam, linear actuator.
2) Study of motion transmission through belts, chains and gears.
3) Study of mechanical advantage through pulleys and other mechanisms.
4) Study of different electrical equipments such as mechanical calculators, automotive devices such as wiper.
5) To design a device for measurement of Temperature/ pressure.
6) Open any mechanical part to identify bad features and improve the design.
7) Exercise in 3D printing of a design
   Ex: Institute emblem, small toy car or any other item of student choice.
8) To design a device for Water Level Indicator.
9) Design and Simulation of a Hydraulic Shaper.
10) Design of simple pneumatic and hydraulic circuits using basic components.

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO: 1	PO1: Engineering knowledge	1.3	1.3.1
CO: 2	PO2: Modern tool usage	2.1	2.1.3
CO: 3	PO4: Conduct investigations of complex problems	4.1	4.1.2
CO: 4	PO2: Problem analysis	2.1	2.1.2
CO: 5	PO7: Environment and sustainability:	7.1	7.1.2

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Year: III **Semester: I** **Branch of Study: EEE**

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19APC0206	Power Systems - I	3	0	0	3

Course Outcomes:

CO1: Acquire knowledge on thermal, gas and nuclear power plants operation.
CO2: Understand the operation of AC and DC distribution systems.
CO3: Understand the operation of Air Insulated & Gas Insulated (GIS) Substations.
CO4: Familiarize with voltage control and power factor improvement techniques.
CO5: Analyze economic aspects of power generation and different types of tariff methods.

UNIT-I:

Power Stations:

Thermal Power Station: Brief description of thermal power plant components - Line diagram of Thermal Power Station (TPS) showing paths of coal, steam, water, air, ash and flue gasses.

Nuclear Power Stations: Nuclear Fission and Chain reaction, nuclear fuels, Principle of operation of nuclear reactor, Reactor Components-Moderators, Control rods, Reflectors and Coolants, Radiation hazards- Shielding and Safety precautions, Types of Nuclear reactors and brief description of PWR, BWR and FBR.

Gas Power Stations: Principle of Operation and Components (Block Diagram Approach Only).

UNIT-II:

General Aspects of D.C & A.C Distribution Systems: Bulk Power Grids and Micro-grids. Transmission and Distribution Systems: Line diagrams, transmission and distribution voltage levels and topologies (meshed and radial systems). Synchronous Grids and Asynchronous (DC) interconnections. Classification of Distribution Systems - Comparison of DC vs. AC and Under-Ground vs. Over - Head Distribution Systems.

UNIT-III:

Air Insulated & Gas Insulated (GIS) Substations: Classification of substations: - Indoor & Outdoor substations: Sub-stations layout 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, main and transfer bus bar system with relevant diagrams. Advantages of Gas insulated substations, different types of gas insulated substations, single line diagram of gas insulated substations construction aspects of GIS, Installation and maintenance of GIS, Comparison of Air insulated substations and Gas insulated substations.

UNIT-IV:

Power Factor & Voltage Control: Causes of low power factor -Methods of Improving power factor -Phase advancing and generation of reactive KVAR using static Capacitors-Most economical power factor for constant KW load and constant KVA type loads, Numerical Problems. Methods of Voltage Control: Shunt Capacitors, Series Capacitors, Synchronous Capacitors, Tap changing and Booster Transformers.

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UNIT-V:

Economic Aspects of Power Generation & Tariff: Load curve, load duration and integrated load duration curves-load, demand, diversity, capacity, utilization and plant use factors- Numerical Problems. Costs of Generation and their division into Fixed, Semi-fixed and Running Costs.

Desirable Characteristics of a Tariff Method-Tariff Methods: Flat Rate, Block- Rate, two-part, three –part, and power factor tariff methods and Numerical Problems.

TEXT BOOKS:

1. Principles of Power Systems by V. K Mehta and Rohit Mehta S. Chand Company Pvt. Ltd, New Delhi 2004.
2. Electrical Power Systems, PSR. Murty, BS Publications.

REFERENCE BOOKS:

1. A Text book of Power system Engineering, R. K. Rajput, Laxmi Publications (P) Limited.
2. Electrical Power Generation, Transmission and Distribution,. S.N.Singh., PHI.
3. Electrical Power Systems by C.L.Wadhawa New Age International (P) Limited, Publishers.
4. Generation of Electrical Energy, Dr. B. R. Gupta, S. Chand.

CO No.	PO No. and keyword	Competency Indicator	Performance Indicator
CO1	PO1: Engineering knowledge	1.3	1.3.1
CO2	PO1: Engineering knowledge	1.3	1.3.1
CO3	PO2: Problem analysis	2.4	2.4.1
	PO4: Conduct investigations of complex problems	4.3	4.3.1
CO4	PO1: Engineering knowledge	1.3	1.3.1
		1.4	1.4.1
CO5	PO4: Conduct investigations of complex problems	4.3	4.3.1

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Annamacharya Institute of Technology & Sciences
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ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI

(AUTONOMOUS)

Year: III **Semester: I** **Branch of Study: EEE**

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19APC0207	Electrical Machines - II	2	1	0	3

Course Outcomes:

1. Understand the fundamentals of windings, pulsating magnetic fields and revolving magnetic field.
2. Understand the fundamentals and performance analysis of three phase and single-phase induction.
3. Understand operation, various methods of starting, braking and speed control of induction motors.
4. Analyze the phasor diagrams, parallel operation of alternators, synchronization and load division of synchronous generators.
5. Analyze the phasor diagram, determination of V and inverted V curves and power circles of synchronous motor.

UNIT-I

Fundamentals of AC machine windings

Physical arrangement of windings in stator and cylindrical rotor; slots for windings; single-turn coil - active portion and overhang; full-pitch coils, concentrated winding, distributed winding, winding axis, Air-gap MMF distribution with fixed current through winding - concentrated and distributed, Sinusoidally distributed winding, winding distribution factors.

UNIT-II

Induction Machines

Operating principle, Construction, Types, Equivalent circuit, Phasor Diagram, Torque-Slip Characteristics, power flow in induction machines, Losses and Efficiency, No load and blocked rotor test, Circle diagram- performance characteristics, Numerical problems. Methods of starting, braking and speed control for induction motors, crawling and cogging.

UNIT-III

Single-phase induction motors

Constructional features, double revolving field theory, equivalent circuit, determination of parameters. Split-phase starting methods and its applications, capacitor start and run single phase motors, reluctance single phase motors, stepper motors, BLDC motors.

UNIT-IV

Synchronous generators

Constructional features, cylindrical rotor synchronous machine - generated EMF, equivalent circuit and phasor diagram, armature reaction, synchronous impedance, voltage regulation-EMF, MMF, ZPF and ASA methods. Operating characteristics of synchronous machines, Salient pole machine - two reaction theory, analysis of phasor diagram, power angle characteristics. Parallel operation of alternators - synchronization and load division.

UNIT-V

Synchronous motors

Principle of operation, methods of starting, Phasor diagram of synchronous motor, variation of current and power factor with excitation, Predetermination of V and inverted V curves, Hunting and use of damper bars, Synchronous condenser and power factor correction, Excitation and power circles.

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Text Books:

1. A. E. Fitzgerald and C. Kingsley, "Electric Machinery", McGraw Hill Education, 2013.
2. P. S. Bimbhra, "Electrical Machinery", Khanna Publishers, 2011.

References:

1. M. G. Say, "Performance and design of AC machines", CBS Publishers, 2002.
2. I. J. Nagrath and D. P. Kothari, "Electric Machines", McGraw Hill Education, 2010.
3. A. S. Langsdorf, "Alternating current machines", McGraw Hill Education, 1984.
4. P. C. Sen, "Principles of Electric Machines and Power Electronics", John Wiley & Sons, 2007.

CO No.	PO No. and keyword	Competency Indicator	Performance Indicator
CO1	PO1: Engineering knowledge	1.3	1.3.1
CO2	PO1: Engineering knowledge	1.3	1.3.1
CO3	PO2: Problem analysis	2.4	2.4.1
	PO4: Conduct investigations of complex problems	4.3	4.3.1
CO4	PO1: Engineering knowledge	1.3	1.3.1
		1.4	1.4.1
CO5	PO4: Conduct investigations of complex problems	4.3	4.3.1

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Year: III **Semester: I** **Branch of Study: EEE**

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19APC0208	CONTROL SYSTEMS	2	1	0	3

Course Outcomes:

1. Understand the basics of systems, modelling of various kind of systems, detection of transfer function from the pictorial representation.
2. Acquire knowledge of open loop and closed loop systems.
3. Learn to use block diagram to find the overall transfer function of first and second order systems.
4. Understand transient and steady state response, time domain specifications and the concept of Root loci.
5. Analyze frequency domain specifications, Bode diagrams and Nyquist plots.

UNIT - I
CONTROL SYSTEMS CONCEPTS

Basic elements of control systems- open and close loop systems – Differential equation - Transfer function – Modelling of Electrical systems, translational and rotational mechanical systems – Block diagram reduction techniques – Signal flow graphs.

UNIT-II
TIME RESPONSE ANALYSIS

Step Response - Impulse Response - Time response of first order systems - Characteristic Equation of Feedback control systems, Transient response of second order systems - Time domain specifications - Steady state response - Steady state errors and error constants, P, PI, PID Controllers.

UNIT- III
STABILITY ANALYSIS IN TIME DOMAIN

The concept of stability - Routh's stability criterion - Stability and conditional stability - limitations of Routh's stability. The Root locus concept - construction of root loci-effects of adding poles and zeros to G(s)H(s) on the root loci.

UNIT- IV
FREQUENCY RESPONSE ANALYSIS

Introduction, Frequency domain specifications-Bode Diagrams-Determination of Frequency domain specifications and transfer function from the Bode Diagram-Stability Analysis from Bode Plots. Polar Plots-Nyquist Plots- Phase margin and Gain Margin-Stability Analysis. Compensation techniques - Lag, Lead, Lag-Lead Compensator design in frequency Domain.

UNIT- V
STATE SPACE ANALYSIS OF CONTINUOUS SYSTEMS

Concepts of state, state variables and state model, state models - differential equations & Transfer function models - Block diagrams. Diagonalization, Transfer function from state model-State Transition Matrix and it's Properties-System response through State Space models-The concepts of controllability and observability, Duality between controllability and observability.

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TEXT BOOKS:

1. Katsuhiko Ogata, "Modern Control Engineering", 5th edition, Prentice Hall of India Pvt. Ltd., 2010.
2. I. J. Nagrath and M. Gopal, "Control Systems Engineering" 5th edition, New Age International (P) Limited Publishers, 2007.

REFERENCE BOOKS:

1. M. Gopal, "Control Systems Principles & Design" 4th Edition, Mc Graw Hill Education, 2012.
2. B. C. Kuo and Farid Golnaraghi, "Automatic Control Systems" 8th edition, John wiley and sons, 2003.
3. Joseph J Distefano III, "Feedback and Control Systems", Allen R Stubberud & Ivan Williams, 2nd Edition, Schaum's outlines, Mc Graw Hill Education, 2013.
4. Graham C. Goodwin, "Control System Design" Stefan F. Graebe and Mario E. Salgado, Pearson, 2000.
5. Gene F. Franklin, "Feedback Control of Dynamic Systems", J.D. Powell and Abbas Emami- Naeini, 6th Edition, Pearson, 2010.

CO No.	PO No. and keyword	Competency Indicator	Performance Indicator
CO1	PO1: Engineering knowledge	1.3	1.3.1
CO2	PO1: Engineering knowledge	1.3	1.3.1
CO3	PO2: Problem analysis	2.4	2.4.1
	PO4: Conduct investigations of complex problems	4.3	4.3.1
CO4	PO1: Engineering knowledge	1.3	1.3.1
		1.4	1.4.1
CO5	PO4: Conduct investigations of complex problems	4.3	4.3.1

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Year: III **Semester: I** **Branch of Study: EEE**

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19APC0209	Power Electronics	3	0	0	3

Course Outcomes:

1. Understand the basic operating principles of power semiconductor switching devices.
2. Analyze the operation of AC-DC and DC to DC converters and their control.
3. Analyze the operation of DC-AC and AC to AC converters and their control.
4. Understand the operation of cycloconverters.

UNIT-I
POWER SEMICONDUCTOR DEVICES

Basic structure and switching characteristics of Power Diode, Power Transistor, Power MOSFET, IGBT and GTO.SCR-Basic Operation, VI characteristics, Turn-on, Turn-off methods, Switching characteristics, Combination of SCRs, Snubber circuits, Ratings and Protection circuits.

UNIT-II
AC-DC CONVERTERS

Principles of Phase control, Natural commutation, Operation of single-phase half wave-controlled converters with R, RL, RL+FWD, RLE Loads, fullwave-controlled converters with R, RL load, RL+FWD for bridge type converters. Operation of three phase half wave-controlled converters and full wave-controlled converters with R, RL, Effect of source inductance on single phase and three phase-controlled converters - Operation of dual converters.

UNIT-III
DC-DC CONVERTERS

Voltage, Current and Load commutation, Principles of chopper, Control strategies, step-up, step-down, Step-up-down choppers, Classification and operation of Choppers (A,B,C,Dand E). Introduction to Resonant converters – Effect of EMI on converters.

UNIT-IV
DC-AC CONVERTERS

Inverters - Single Phase Inverter - Basic Series Inverter - Basic Parallel Capacitor Inverter Bridge Inverter - Waveforms - Simple Forced Commutation Circuits for Bridge Inverters - Single Phase Half and Full Bridge Inverters-Pulse Width Modulation Control-Harmonic Reduction Techniques-Voltage Control Techniques for Inverters -Numerical Problems, Three Phase VSI in 120° and 180° Modes of Conduction.

UNIT-V
AC-AC CONVERTERS

Types of control (phase & Integrated cycle control), Operation of single-phase voltage regulator with R, RL Loads.Operation of three phase AC voltage controls (with Anti parallel SCR configuration) with R load operation.Cyclo-converters: single phase - step up & step down cyclo-converters, three phase cyclo-converter with R, RL loads.

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Text Books:

1. M. H. Rashid, Power Electronics: Circuits, Devices and Applications, Prentice Hall of India 3rd Edition, 2014.
2. Theory of Power Electronics, "K.L.Rao, C.H.SaiBabu - S.Chand& Company Ltd.", New Delhi.-2006

References:

1. M. D. Singh & K. B. Kanchandhani, "Power Electronics", Tata McGraw – Hill Publishing Company, 2nd Edition, 2010.
2. N.Mohan, T.M.Undeland, W.P.Robbins, "Power Electronics, Converters and Applications & Design",3rd Edition John Wiley & sons.
3. Dr P S Bimbhra "Power Electronics ", Khanna Publishers, New Delhi, Edition 2012.

CO No.	PO No. and keyword	Competency Indicator	Performance Indicator
CO1	PO1: Engineering knowledge	1.3	1.3.1
CO2	PO1: Engineering knowledge	1.3	1.3.1
CO3	PO2: Problem analysis	2.4	2.4.1
CO4	PO1: Engineering knowledge	1.3	1.3.1
		1.4	1.4.1

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AK 19 Regulations

B.Tech- II,III Year **Semester: I** **Branch: Common to all**

Subject Code	Subject Name	L	T	P	Credits: 0
19AMC9902	CONSTITUTION OF INDIA	3	0	0	

Course Outcomes:

Students will be able to:

1. Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
2. Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
3. Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
4. Discuss the Powers and functions of Governor, President, Judiciary.
5. Discuss the functions of local administration bodies.

Syllabus

Unit:1 **4 hrs**

History of Making of the Indian Constitution - History Drafting Committee, (Composition & Working)

Unit:2 **8 hrs**

Philosophy of the Indian Constitution - Preamble Salient Features

Unit:3 **8hrs**

Contours of Constitutional Rights & Duties - Fundamental Rights - Right to Equality - Right to Freedom - Right against Exploitation - Right to Freedom of Religion - Cultural and Educational Rights - Right to Constitutional Remedies - Directive Principles of State Policy - Fundamental Duties.

Unit:4 **8hrs**

Organs of Governance - Parliament – Composition - Qualifications and Disqualifications - Powers and Functions - Executive, President, Governor - Council of Ministers -Judiciary, Appointment and Transfer of Judges, Qualifications - Powers and Functions.

Unit:5 **8hrs**

Local Administration - District's Administration head: Role and Importance - Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation - Pachayati raj: Introduction, PRI: ZillaPachayat - Elected officials and their roles, CEO Zilla Panchayat: Position and role - Block level: Organizational Hierarchy (Different departments) - Village level: Role of Elected and Appointed officials - Importance of grass root democracy.

Suggested books for reading:

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO 1	PO 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	6.2.	6.2.1
CO 2	PO 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	6.2.	6.2.1
CO 3	PO 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	6.2.	6.2.1
CO 4	PO 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	6.2.	6.2.1
CO 5	PO 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	6.2	6.1.1

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Year: III **Semester: I** **Branch of Study: EEE**

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19APC0210	Electrical Machines – II Lab	0	0	2	1

Course outcomes:

1. Analyze and apply load test, no-load and blocked-rotor tests for construction of circle diagram and equivalent circuit determination in a single-phase induction motor.
2. Predetermine regulation of a three-phase alternator by synchronous impedance & m.m.f methods.
3. Predetermine the regulation of Alternator by Zero Power Factor method X_d and X_q determination of salient pole synchronous machine.
4. Evaluate and analyze V and inverted V curves of 3 phase synchronous motor

List of experiments:

1. No-load & Blocked-rotor tests on Squirrel cage Induction motor.
2. Load test on three phase slip ring Induction motor.
3. Speed control of three phase induction motor
4. Rotor resistance starter for slip ring induction motor
5. Load test on single phase induction motor.
6. Determination of Equivalent circuit of a single-phase induction motor.
7. Predetermination of Regulation of a three-phase alternator by synchronous impedance & m.m.f methods.
8. Predetermination of Regulation of three-phase alternator by Z.P.F. method.
9. Determination of X_d and X_q of a salient pole synchronous machine.
10. V and inverted V curves of a 3-phase synchronous motor.

Reference Book:

1. D. P.Kothari and B. S. Umre, *"Laboratory Manual for Electrical Machines"* I.K International Publishing House Pvt. Ltd, 2017.
2. D.R. Kohli and S.K. Jain, "A Laboratory Course in Electrical Machines" NEM Chand & Bros.

CO No.	PO No. and keyword	Competency Indicator	Performance Indicator
CO1	PO1: Engineering knowledge	1.3	1.3.1
		1.4	1.4.1
CO2	PO2: Problem analysis	2.3	2.3.1
			2.3.2
CO3	PO1: Engineering knowledge	1.3	1.3.1
	PO4: Conduct investigations of complex problems	4.3	4.3.1
CO4	PO4: Conduct investigations of complex problems	4.3	4.3.1

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Year: III **Semester: II** **Branch of Study: EEE**

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19APC0213	POWER SYSTEMS - II	3	0	0	3

COURSE OUTCOMES:

1. Understand the classification and parameters of conductors, transmission lines.
2. Analyze power system transients and the effect on power systems.
3. Understand the factors governing the performance of transmission lines.
4. Analyze the properties of overhead lines and their types.
5. Understand the types and construction of underground cables.

UNIT-I: TRANSMISSION LINE PARAMETERS

Types of conductors - calculation of resistance for solid conductors - Calculation of inductance for single phase and three phase, single and double circuit lines, concept of GMR & GMD, symmetrical and asymmetrical conductor configuration with and without transposition, Numerical Problems. Calculation of capacitance for 2 wire and 3 wire systems, effect of ground on capacitance, capacitance calculations for symmetrical and asymmetrical single and three phase, single and double circuit lines, Numerical Problems.

UNIT-II: PERFORMANCE OF SHORT, MEDIUM AND LONG LENGTH TRANSMISSION LINES:

Classification of Transmission Lines - Short, medium and long line and their model representations - Nominal-T, Nominal-Pie and A, B, C, D Constants for symmetrical & Asymmetrical Networks.

Long Transmission Line-Rigorous Solution, evaluation of A, B, C, D Constants, Interpretation of the Long Line Equations -Surge Impedance and SIL of Long Lines, Wave Length and Velocity of Propagation of Waves.

UNIT – III POWER SYSTEM TRANSIENTS & FACTORS GOVERNING THE PERFORMANCE OF TRANSMISSION LINES

Types of System Transients - Travelling or Propagation of Surges - Attenuation, Distortion, Reflection and Refraction Coefficients - Termination of lines with different types of conditions - Open Circuited Line, Short Circuited Line, T-Junction, Lumped Reactive Junctions (Numerical Problems). Bewley's Lattice Diagrams (for all the cases mentioned with numerical examples). Skin and Proximity effects - Description and effect on Resistance of Solid Conductors -Ferranti effect - Charging Current - Effect on Regulation of the Transmission Line. Corona - Description of the phenomenon, factors affecting corona, critical voltages and power loss, Radio Interference.

UNIT-IV

OVERHEAD LINE INSULATORS & SAG, TENSION CALCULATIONS:

Types of Insulators, String efficiency and Methods for improvement, Numerical Problems - voltage distribution, calculation of string efficiency, Capacitance grading and Static Shielding.

Sag and Tension Calculations with equal and unequal heights of towers, Effect of Wind and Ice on weight of Conductor, Numerical Problems - Stringing chart and sag template and its applications.

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UNIT-V UNDERGROUND CABLES

Types of Cables, Construction, Types of Insulating materials, Calculations of Insulation resistance and stress. Capacitance of Single and 3-Core belted cables. Grading of Cables - Capacitance grading, Description of Inter-sheath grading, HV cables.

TEXT BOOKS:

1. Electrical power systems, C.L.Wadhwa, New Age International (P) Limited, Publishers.
2. Electrical Power Systems, PSR. Murty, BS Publications.

REFERENCE BOOKS:

1. A Text Book on Power System Engineering, M.L.Soni, P.V.Gupta, U.S.Bhatnagar, A.Chakrabarthy, Dhanpat Rai & Co Pvt. Ltd.
2. A Textbook of Power System Engineering, R. K. Rajput, Laxmi Publications (P) Limited.
3. Electrical Power Generation, Transmission and Distribution, S.N.Singh, PHI.
4. Principles of Power Systems, V. K Mehta and Rohit Mehta S. Chand Company Pvt. Ltd.
5. Power System Engineering, I.J.Nagarath & D.P Kothari , TMH.
6. Power System Analysis and Design, Dr. B. R. Gupta, S. Chand & Company Limited.
7. Power System Analysis, Operation and control, Abhijit Chakrpabarti, Sunitha Halder, PHI, 3/e, 2010
8. Electrical Power Transmission system engineering Analysis and design by Turan Gonen, CRC Press (Taylor & Francis Group) Special Indian Edition,2/e.

CO No.	PO No. and keyword	Competency Indicator	Performance Indicator
CO1	PO1: Engineering knowledge	1.3	1.3.1
CO2	PO1: Engineering knowledge	1.3	1.3.1
CO3	PO2: Problem analysis	2.4	2.4.1
CO4	PO1: Engineering knowledge	1.3	1.3.1
		1.4	1.4.1
CO5	PO1: Engineering knowledge	1.3	1.3.1

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Year: III **Semester: II** **Branch of Study: EEE**

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19APC0214	ELECTRICAL MEASUREMENTS AND INSTRUMENTATION	3	0	0	3

Course outcomes:

1. Understand different types of measuring instruments, their construction, operation and characteristics.
2. Identify the instruments suitable for typical measurements.
3. Apply the knowledge about transducers and instrument transformers to use them effectively.

UNIT- I INTRODUCTION TO MEASURING INSTRUMENTS:

Classification – deflecting, control and damping torques – Ammeters and Voltmeters – PMMC, moving iron type instruments – expression for the deflecting torque and control torque – Errors and compensations, extension of range using shunts and series resistance. Electrostatic Voltmeters-electrometer type and attracted disc type – extension of range of E.S. Voltmeters.

UNIT– II POTENTIOMETERS & INSTRUMENT TRANSFORMERS:

Principle and operation of D.C. Crompton's potentiometer – standardization – Measurement of unknown resistance, current, voltage. A.C. Potentiometers: polar and coordinate type's standardization – applications. CT and PT – Ratio and phase angle errors

UNIT –III MEASUREMENT OF POWER & ENERGY:

Single phase dynamometer wattmeter, LPF and UPF, Double element and three element dynamometer wattmeters, expression for deflecting and control torques – Measurement of active and reactive powers in balanced and unbalanced systems. Single phase induction type energy meter – driving and braking torques – errors and compensations – testing by phantom loading using R.S.S. meter. Three phase energy meter – tri-vector meter, maximum demand meters.

UNIT – IV DC & AC BRIDGES:

Method of measuring low, medium and high resistance – sensitivity of Wheat-stone's bridge – Carey Foster's bridge, Kelvin's double bridge for measuring low resistance, measurement of high resistance – loss of charge method.

Measurement of inductance- Maxwell's bridge, Hay's bridge, Anderson's bridge - Owen's bridge. Measurement of capacitance and loss angle –Desaunty's Bridge - Wien's bridge – Schering Bridge.

UNIT-V TRANSDUCERS:

Definition of transducers, Classification of transducers, Principle operation of LVDT and capacitor transducers; LVDT Applications, Strain gauge and its principle of operation, gauge factor, Thermistors, Thermocouples, Piezo electric transducers, photovoltaic, photo conductive cells, and photo diodes.

Measurement of Non-Electrical Quantities: Measurement of strain, Displacement, Velocity, Angular Velocity, Acceleration, Force, Torque, Temperature, Pressure, Vacuum, Flow and Liquid level.

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TEXT BOOKS:

1. "G. K. Banerjee", "Electrical and Electronic Measurements", PHI Learning Pvt. Ltd., 2nd Edition, 2016
2. "S. C. Bhargava", "Electrical Measuring Instruments and Measurements", BS Publications, 2012.

REFERENCE BOOKS:

1. "A. K. Sawhney", "Electrical & Electronic Measurement & Instruments", Dhanpat Rai & Co. Publications, 2005.
2. "R. K. Rajput", "Electrical & Electronic Measurement & Instrumentation", S. Chand and Company Ltd., 2007.
3. "Buckingham and Price", "Electrical Measurements", Prentice – Hall, 1988.
4. "Reissland, M.U", "Electrical Measurements: Fundamentals, Concepts, Applications", New Age International (P) Limited Publishers, 1st Edition 2010.
5. "E.W. Golding and F. C. Widdis", "Electrical Measurements and measuring Instruments", fifth Edition, Wheeler Publishing, 2011.

CO No.	PO No. and keyword	Competency Indicator	Performance Indicator
CO1	PO1: Engineering knowledge	1.3	1.3.1
CO2	PO1: Engineering knowledge	1.3	1.3.1
CO3	PO2: Problem analysis	2.4	2.4.1

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Year: III **Semester: II** **Branch of Study: ECE**

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19APC0216	NEURAL NETWORKS AND FUZZY LOGIC	3	0	0	3

COURSE OUTCOMES

1. Understand the basic architecture of artificial neural network terminologies and techniques.
2. Understand approaches and architectures of Artificial Intelligence.
3. Perform the training of neural networks using various learning rules.
4. Create different neural networks of various architectures both feed forward and feed backward.
5. Application of ANN to System Identification and Pattern recognition.

UNIT – I ARTIFICIAL NEURAL NETWORKS

Approaches to AI – Architectures of AI – Symbolic Reasoning System – Rule based Systems – Knowledge Representation – Expert Systems. Introduction and motivation: Neural Network, Human Brain, Structure of biological neuron, Memory, Comparison between Artificial and Biological Neural Networks – Basic Building Blocks of ANN – Artificial Neural Network Terminologies, Artificial Intelligence and Neural Networks.

UNIT – II

Learning Process: Layers, activation functions, learning methods: Error Correction Learning, Memory Based Learning, Hebbian Learning, Competitive, Boltzmann Learning, Memory, Adaption, Back Propagation and Differentiation, Supervised Learning, unsupervised learning.

UNIT – III NETWORKS

Basic Building Blocks of ANN – Artificial Neural Network Terminologies – McCulloch Pitts Neuron Model – Learning Rules – ADALINE and MADALINE Models – Perceptron Networks – Back Propagation Neural Networks – Associative Memories - Self-Organization Map – Hopfield models – ART networks.

UNIT – IV UNIT – IV FUZZYLOGC

Classical Sets – Fuzzy Sets – Fuzzy Properties and Operations – Fuzzy Logic System – Fuzzification – Defuzzification – Membership Functions – Fuzzy Rule base – Fuzzy Logic Controller Design.

UNIT – V FUZZY LOGIC APPLICATIONS

Fuzzy pattern recognition – Fuzzy control system – Aircraft landing control problem - Statistical process control- Fuzzy cognitive mapping – Probability measures – Possibility and necessity measures.

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TEXT BOOKS:

1. S. N. Sivanandam, S. Sumathi and S. N. Deepa, "Introduction to Neural Networks using MATLAB", McGraw Hill Edition, 2006.
2. Timothy J. Ross, "Fuzzy Logic with Engineering Applications", Third Edition, WILEY India Edition, 2012.

REFERENCES:

1. S. N. Sivanandam, S. Sumathi and S. N. Deepa, "Introduction to Fuzzy Logic using MATLAB", Springer International Edition, 2013.
2. Laurene V. Fausett "Fundamentals of Neural Networks: Architectures, Algorithms and Applications" United States Edition.
3. Yung C. Shin and Chengying Xu, "Intelligent System – Modeling, Optimization & Control, CRC Press, 2009.

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CO1	PO1: Engineering knowledge	1.3	1.3.1
CO2	PO1: Engineering knowledge	1.3	1.3.1
CO3	PO2: Problem analysis	2.4	2.4.1
CO4	PO1: Engineering knowledge	1.3	1.3.1
		1.4	1.4.1
CO5	PO1: Engineering knowledge	1.3	1.3.1

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AK19 Regulations

III B.Tech **Semester-II** **Branch : Common to all**

Subject Code	Subject Name	L T P	Credit: 3
19AHE9902	**Principles of Effective Public Speaking**	3 0 0	

Course Objectives:

1. Gain and demonstrate the basic skills of effective oral communication, for use throughout your academic career and beyond.
2. Learn and develop the skills necessary to maximize public speaking effectiveness, including effective research and organization of information, how to make the most of presentation aids (and not become reliant on them!), and understanding the speaker-audience relationship.
3. Develop critical thinking and listening skills, enabling you to maximize your own understanding as an audience member, and offer considered and constructive critiques of others' speeches.
4. Become more confident in public speaking arenas, whether as a formal speech giver or as a participant in group settings. Improvement will be valued over perfection.

Syllabus

Unit -1

Introduction to Public Speaking:

Basic communication concepts, processes, and models Communication concepts and principles and public speaking Steps and methods of speech preparation; Ethics in public speaking

Unit -2

Listening and Speech Criticism:

Effective listening, the listening process, and types of listening; Listening barriers; Identifying and improving listening styles; Evaluating speech and effective speech techniques.

Unit -3

Selecting Topic and Knowing your Audience:

Identifying sources; Tools and techniques for selecting and refining speech topics; Identifying speech purposes; Central idea statement; The central idea; Audience analysis techniques.

Unit – 4

Speaking with a Purpose:

Informative, persuasive, and ceremonial speeches

Unit:5

Delivering your speech and using Visual Aids.

The mechanics of verbal and nonverbal communication in speech delivery; Modes of speech delivery; Speaking style and language; Effective delivery techniques; Incorporating presentation aids

Course Outcomes:

Students will be able to:

1. Apply knowledge of principles, concepts and skills learned in speech preparation.
2. Develop skills in effective listening.
3. Evaluate the delivery of speeches.
4. Develop skills in speech composition.
5. Use supporting materials and presentation aids in speech preparation.

References:

1. DeVito, J.A. (2009). The Essential Elements of Public Speaking. (3rd ed.) Boston: Pearson Education, Inc.

2. Lucas, S.E. (2009). The Art of Public Speaking. (10th ed.) New York: McGraw - Hill Co

3. Zarefsky, D. (2011). Public Speaking: Strategies for Success. (6th ed. Boston: Pearson Education, Inc).

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List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO1	PO10: 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.	10.2	10.2.2
CO2	PO10: 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.	10.2	10.2.1
CO3	PO9: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings..	9.2	9.2.1
CO4	PO10: 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.	10.2	10.2.2
CO5	PO10: 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.	10.3	10.3.1

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III B.Tech **AK 19 Regulations**

Common to II Sem ECE/EEE

SubjectCode:19AHE9907	Subject Name **OPTICS**	L T P 3 0 0	Credits:3

Course Outcomes

1. Analyze the wave properties of light.
2. Interpret the interaction of energy with matter.
3. Analyze the semiconductor photo devices.
4. Interpret structural spectroscopic techniques.
5. Analyze NMR and ESR spectra.

UNIT I Polarization **10 Hours**

Polarization-Experimental observation-Polarization by reflection and refraction-Brewster angle-Pile of plates-Biot's polariscope- Malus laws, Double refraction - Optic axis, Uniaxial and biaxial crystals, Geometry of calcite crystals, Nicol prism, Nicol as analyzer and polarizer. Huygen's explanation of double refraction, Quarter wave and Half wave plates, Production and detection of plane, elliptical and circular polarization of light

UNIT II Semiconductor Optics **12 Hours**

Semiconductor light emitting diodes (LEDs)- Radiative and non-radiative recombination mechanisms in semiconductors-LED: device structure, materials and characteristics,- Review of laser physics-Rate equations for carrier- and photon-density, and their steady state solutions-Semiconductor laser: structure, materials, device characteristics, and figures of merit; DFB, DBR, and vertical-cavity surface-emitting lasers (VECSEL)- Tunable semiconductor lasers.

UNIT III Photo devices and their instrumentation **8 Hours**

Photodetectors -Types of semiconductor photodetectors -p-n junction, PIN, and Avalanche --- and their structure, materials, working principle and characteristics-Noise limits on performance- Solar cells. Low-dimensional optoelectronic devices -Quantum-well, -wire, and -dot based LEDs, lasers, and photodetectors.

UNIT IV Spectroscopic Techniques-I **9 Hours**

UV-visible Spectroscopy: principles- instrumentation- quantitative analysis by absorption measurements- simultaneous determinations- applications.

Raman Spectroscopy:Quantum theory of Raman effect –degree of depolarisation–FT Raman spectrometer- Instrumentation and sampling methods– construction of character table – calculation of normal modes of vibration - Raman and I.R activity.

UNIT V Spectroscopic Techniques-II **11 Hours**

NMR Spectroscopy : Theory of NMR method – Bloch equations- Steady state solution of Bloch

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equations- Theory of chemical shifts- Experimental methods –Single coil and double coil methods – Pulse method –High resolution method –Application of NMR to quantitative measurements. ESR Spectroscopy: Quantum mechanical treatment of ESR- hyperfine structure-Basic principles of spectrographs-Application of ESR method.

Textbooks:

1. Optics by Ajay Ghotak.
2. A textbook of Optics by Brij Lal and Dr. M. Subhramanyam.
3. Optics by Dr. S. P. Singh and Dr. A.P. Agarwal.

References:

1. Fundamental of Optics by F.A. Jenkins and H. E. White.
2. The Feynman Lecture of Physics by Richard Feynman.
3. Optics by Eugene Hecht.

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO: 1	PO1 : Apply the knowledge of science	1.2	1.2.1
CO: 2	PO1: Apply the knowledge of science	1.2	1.2.1
CO: 3	PO1: Apply the knowledge of science	1.2	1.2.1
CO: 4	PO1: Apply the knowledge of science	1.2	1.2.1
CO: 5	PO1: Apply the knowledge of science	1.2	1.2.1

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III B.Tech **AK 19 Regulations**

Common to II Sem ECE & EEE

Subject Code:19AHE9909	Subject Name: **Quantum Mechanics**	L T P 3 0 0	Credits:3

Course Outcomes

1. Analyze the Classical theory of quantum mechanics and Different effects.
2. Illustrate the experimental evidence of matter waves.
3. Analyze Heisenberg's Uncertainty Principle and Experimental Verification.
4. Analyze the Time dependent and independent Schrodinger's Equation.
5. Evaluate the One Dimensional Potential Well and Barrier Potential.

UNIT I

Origin of Quantum Mechanics

Introduction, Black body radiation, Rayleigh-Jeans law of spectral distribution of energy, Planck's radiation law, Photoelectric effect, Experimental observations, Einstein theory for photoelectric effect Compton effect, Classical theory of specific heat Einstein theory of specific heat of solids.

UNITII

Basics of Wave Mechanics

Introduction, de Broglie Matter Wave, Derivation of deBroglie's Relation ,deBroglie wavelength of High Energy Electrons, Properties of deBroglie Waves (Matter Waves) , Experimental Evidence of Matter Wave: Proof of deBroglie's Hypothesis, Davisson and Germer Experiment, G.P. Thomson's Experiment, Electron Double Slit Experiment, Group and Wave Velocities , Wave Packet and its Formation , Relation between Group Velocity and Particle Velocity. , Relation between Phase Velocity and Group Velocity.

UNIT III

Heisenberg's Uncertainty Principle

Introduction, Heisenberg's Uncertainty Principle, Elementary Proof of Uncertainty Principle, Conclusions from Uncertainty Relation, Time-Energy Uncertainty Relation, Elementary Proof of Time Energy Uncertainty Relation ,Angular Position – Angular Momentum Uncertainty Principle. , Derivation of Uncertainty Principle from deBroglie's Wave Concept. Illustration (Experimental Verification) of Heisenberg's Uncertainty Principle. , Electron Diffraction through a Single Slit.

UNIT IV

Schrodinger Wave Equation

Introduction, Schrodinger's Equation, Time dependent Schrodinger's Equation, Validity of Schrodinger's Equation, Time dependent Schrodinger's Equation in three Dimensions, Time independent Schrodinger's Equation, One dimensional Time Independent Schrodinger's Equation , Three dimensional Time Independent Schrodinger's Equation, Wave function, Physical Significance of Wave function, Conditions on a Wave function, Probabilistic Interpretation of a Wave function, Eigen Values and Eigen Function and Operators.

UNIT- V

One Dimensional Potential Well and Barrier Potential

Introduction, Properties of one-dimensional motion, Bound States (Discrete Spectrum, Unbound States (Continuous Spectrum), One dimensional potential well,Energy levels for one-dimensional square well potential of finite depth (OR finite potential well), Potential step or a single step barrier, Boundary conditions.

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Textbooks:

1. Introduction to Quantum Mechanics by J. Griffithis David.
2. A.K.Ghatak and S.Lokanathan – Quantum Mechanics – Theory and applications – 3rd edition – Macmillan Publisher (2012).[units 1-5]
3. S.N.Biswas - Quantum Mechanics - Books & Allied Ltd; 2nd Revised edition (2012)

References:

1. Quantum Mechanics by E. Mearzbacher
2. Quantum Mechanics: A textbook for Undergraduates by Jain Mahesh

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO: 1	PO1 : Apply the knowledge of science	1.2	1.2.1
CO: 2	PO1: Apply the knowledge of science	1.2	1.2.1
CO: 3	PO1: Apply the knowledge of science	1.2	1.2.1
CO: 4	PO1: Apply the knowledge of science	1.2	1.2.1
CO: 5	PO1: Apply the knowledge of science	1.2	1.2.1

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B.Tech II,III Year **Semester: I** **Branch of Study: Common to all**
MANDATORY COURSE

Subject Code	Subject Name	L	T	P	Credits: 0
19AMC9904	Professional Ethics And Human Values	3	0	0	

Course Outcomes:

1. It ensures students sustained happiness through identifying the essentials of human values and skills.
2. The students will understand the importance of Values and Ethics in their personal lives and professional careers.
3. The students will learn the rights and responsibilities as an employee, team member and a global citizen.
4. Students understand practically the importance of trust, mutually satisfying human behavior and enriching interaction with nature.
5. Students can able to develop appropriate technologies and management patterns to create harmony in professional and personal life.

Syllabus

UNIT - I: **12hrs**

Introduction to Human Values: Need, basic Guidelines, Content and Process for Value Education, Self Exploration - 'Natural Acceptance' and Experiential Validation. Continuous Happiness and Prosperity - A look at basic Human Aspirations. Right understanding, Relationship and Physical Facilities. Understanding Happiness and Prosperity correctly.

UNIT - II: **12hrs**

Understanding Harmony in the Family and Society: Harmony in Human - Human Relationship: Understanding harmony in the Family the basic unit of human interaction. Understanding values in human - human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhay-tripti; Trust (Vishwas) and Respect (Samman) as the foundational values of relationship. Understanding the harmony in the society (society being an extension of family). Visualizing a universal harmonious order in society - Undivided Society (Akhand Samaj), Universal Order (Sarvabhaum Vyawastha) - from family to world family!

UNIT – III: **12hrs**

Introduction to Professional Ethics: Basic Concepts, Governing Ethics, Personal & Professional Ethics, Ethical Dilemmas, Life Skills, Emotional Intelligence, Thoughts of Ethics, Value Education, Dimensions of Ethics, Profession and professionalism, Professional Associations, Professional Risks, Professional Accountabilities, Professional Success, Ethics and Profession.

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UNIT – IV: **15hrs**

Professional Practices in Engineering: Work Place Rights & Responsibilities, Professions and Norms of Professional Conduct, Norms of Professional Conduct vs. Profession; Responsibilities, Obligations and Moral Values in Professional Ethics, Professional codes of ethics, the limits of predictability and responsibilities of the engineering profession. Central Responsibilities of Engineers – The Centrality of Responsibilities of Professional Ethics; lessons from 1979 American Airlines DC-10 Crash and Kansas City Hyatt Regency Walk away Collapse.

UNIT – V: **12hrs**

Global issues in Professional Ethics: Introduction – Current Scenario, Technology Globalization of MNCs, International Trade, World Summits, Issues, Business Ethics and Corporate Governance, Sustainable Development Ecosystem, Energy Concerns, Ozone Depletion, Pollution, Ethics in Manufacturing and Marketing, Media Ethics, War Ethics, Bio Ethics, Intellectual Property Rights.

Text Books:

1.R. R. Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Human Values and Professional Ethics.

2.Professional Ethics: R. Subramanian, Oxford University Press, 2015. 3.Ethics in Engineering Practice & Research, Caroline Whitbeck, 2e, Cambridge University Press 2015.

Reference Books:

1.Prof. K. V. Subba Raju, 2013, Success Secrets for Engineering Students, Smart Student Publications, 3rd Edition.

2.Ivan IIlich, 1974, Energy & Equity, The Trinity Press, Worcester, and HarperCollins, USA

3.Engineering Ethics, Concepts Cases: Charles E Harris Jr., Michael S PritchaMichael J Rabins, 4e , Cengage learning, 2015.

4.Business Ethics concepts & Cases: Manuel G Velasquez, 6e, PHI, 2008.

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO1	PO8: Ethics: Apply Ethical principles and commit to professional ethics and responsibilities and norms of the Engineering practice.	8.1	8.1.1
CO2	PO8:Ethics: Apply Ethical principles and commit to professional ethics and responsibilities and norms of the Engineering practice.	8.1	8.1.1
CO3	PO8: Ethics: Apply Ethical principles and commit to professional ethics and responsibilities and norms of the Engineering practice.	8.1	8.1.1
CO4	PO8: Ethics: Apply Ethical principles and commit to professional ethics and responsibilities and norms of the Engineering practice.	8.1	8.1.1
CO5	PO8: Ethics: Apply Ethical principles and commit to professional ethics and responsibilities and norms of the Engineering practice.	8.1	8.1.1

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Year: III **Semester: II** **Branch of Study: EEE**

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19APC0218	ELECTRICAL MEASUREMENTS LAB	0	0	2	1

Course outcomes:

1. Understand calibration of various electrical measuring instruments.
2. Accurately determine the values of inductance and capacitance using AC bridges.
3. Analyze coefficient of coupling between two coupled coils.
4. Accurately determine the values of very low resistances.
5. Understand the working principles of displacement transducers.

The following experiments are required to be conducted as compulsory experiments:

1. Calibration and Testing of single-phase energy Meter
2. Calibration of dynamometer power factor meter
3. Calibration of D.C. Potentiometer: PMMC ammeter and PMMC voltmeter.
4. Kelvin's double Bridge - Measurement of low resistance - Determination of Tolerance.
5. Determination of Coefficient of coupling between two mutually coupled coils
6. Schering Bridge & Anderson bridge
7. Measurement of 3-phase reactive power with single-phase wattmeter
8. Measurement of parameters of a choke coil using 3-voltmeter and 3-ammeter methods

In addition to the above eight experiments, at least any two of the experiments from the following list are required to be conducted:

9. Maxwell's bridge and DeSauty bridge
10. Calibration of LPF wattmeter - by Phantom loading
11. Wheatstone bridge - measurement of medium resistances
12. LVDT and capacitance pickup - characteristics and Calibration
13. Resistance strain gauge - strain measurement and Calibration
14. Measurement of Earth Resistance by Megger.

Reference Books:

1. Patranabis, 'Sensors and Transducers', Prentice Hall of India, 2004
2. Cooper W.D., "Electronic Instrumentation and Measurement Techniques", Prentice Hall of India, New Delhi, 2003.Joseph J Carr, Elements of Electronic Instrumentation & Measurement, Pearson, 3rd Edition 1995.

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CO No.	PO No. and keyword	Competency Indicator	Performance Indicator
CO1	PO1: Engineering knowledge	1.3	1.3.1
CO2	PO1: Engineering knowledge	1.4	1.4.1
	PO2: Problem analysis	2.4	2.4.2
CO3	PO1: Engineering knowledge	1.3	1.3.1
	PO4: Conduct investigations of complex problems	4.3	4.3.1
CO4	PO1: Engineering knowledge	1.3	1.3.1
	PO4: Conduct investigations of complex problems	4.3	4.3.1
CO5	PO1: Engineering knowledge	1.4	1.4.1
	PO2: Problem analysis	2.4	2.4.2

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Year: IV **Semester: I** **Branch of Study: EEE**

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19APC0219	SWITCHGEAR AND PROTECTION	3	0	0	3

COURSE OUTCOMES:

At the end of the course the student should be able to:

1. Acquire knowledge on various types of fuses, breakers and relays used for power system protection.
2. Design protection system for generators and transformers.
3. Identify various types of the relays in protecting feeders, lines and bus bars.
4. Demonstrate the protection of a power system from over voltages.

UNIT – I SWITCHGEAR FOR PROTECTION

Fuses: Definitions, characteristics, types, HRC fuses.
Circuit Breakers: Elementary Principles of Arc Interruption, Restriking Voltage and Recovery Voltage - Restriking Phenomenon, Average and Maximum RRRV, Current Chopping and Resistance Switching - CB Ratings and Specifications – Auto Reclosures - Types of Circuit Breakers: Air blast, Air break, Oil, SF6, Vacuum circuit breakers, Minimum Oil Circuit Breakers and Earth leakage circuit breakers - Difference between circuit breakers and isolators– making and breaking capacity.

UNIT – II RELAYS

Electromagnetic Relays - Basic Requirements of Relays – Primary and Backup Protection - Construction Details of – Attracted Armature, Balanced Beam, Inductor Type and Differential Relays – Universal Torque Equation – Characteristics of Over Current, Direction and Distance Relays. Static Relays – Advantages and Disadvantages – Definite Time, Inverse and IDMT. Static Relays – Comparators – Amplitude and Phase Comparators. Microprocessor Based Relays – Advantages and Disadvantages – Block Diagram for Over Current (Definite, Inverse and IDMT) and Distance Relays.

UNIT – III PROTECTION OF GENERATORS & TRANSFORMERS

Principles and need for protective schemes – Equipment earthing and neutral grounding - Protection of Generators against Stator Faults, Rotor Faults and Abnormal Conditions. Restricted Earth Fault and Inter-Turn Fault Protection – calculation of percentage winding unprotected. Protection of Transformers: Percentage Differential Protection, Numerical Problems on Design of CT Ratio, Buchholtz Relay Protection, Numerical Problems.

UNIT – IV PROTECTION OF FEEDERS & LINES

Protection of Feeder (Radial & Ring Main) Using Over Current Relays. Protection of Transmission Line – 3 Zone Protection Using Distance Relays. Carrier Current Protection. Protection of Bus Bars.

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UNIT – V OVER VOLTAGES IN POWER SYSTEMS

Generation of Over Voltages in Power Systems - Protection against Lightning over Voltages - Valve Type and Zinc-Oxide Lighting Arresters - Insulation Coordination – Surge arresters – Special earthing for lightning arresters.

TEXT BOOKS:

1. Badri Ram, D.N Viswakarma, "Power System Protection and Switchgear", TMH Publications, 2011.
2. Sunil S Rao, "Switchgear and Protection", Khanna Publishers, 1992.

REFERENCE BOOKS:

1. C.L.Wadhwa, "Electrical Power Systems", New Age international (P) Limited, Publishers, 2012.
2. Y.G. Paithankar , "Transmission network Protection", Taylor and Francis,2009.
3. Bhuvanesh Oza, "Power system protection and switch gear", TMH, 2010.

CO No.	PO No. and keyword	Competency Indicator	Performance Indicator
CO1	PO1: Engineering knowledge	1.3	1.3.1
		1.4	1.4.1
CO2	PO1: Engineering knowledge	1.4	1.4.1
CO3	PO1: Engineering knowledge	1.3	1.3.1
CO4	PO1: Engineering knowledge	1.3	1.3.1
		1.4	1.4.1

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Year: IV **Semester: I** **Branch of Study: EEE**

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19APE0201	ELECTRICAL DISTRIBUTION SYSTEMS	3	0	0	3

COURSE OUTCOMES:

On the completion of this course the student will be able to:

1. Understand basics of distribution systems and substations.
2. To understand about modelling of various loads.
3. To perform distribution load flow solutions.
4. To evaluate power loss and feeder cost.
5. To know the principles of SCADA, Automation distribution system and management

UNIT-I: DISTRIBUTION SYSTEM FUNDAMENTALS

Brief description about electrical power transmission and distribution systems, Different types of distribution sub-transmission systems, Substation bus schemes, Factors effecting the substation location, Factors effecting the primary feeder rating, types of primary feeders, Factors affecting the primary feeder voltage level, Factors effecting the primary feeder loading.

UNIT-II: DISTRIBUTION SYSTEM SUBSTATIONS AND LOADS

Substations: Rating of a distribution substation for square and hexagonal shaped distribution substation service area, K constant, Radial feeder with uniformly and non-uniformly distributed loading. Loads: Various types of loads, Definitions of various terms related to system loading, detailed description of distribution transformer loading, feeder loading.

UNIT-III: DISTRIBUTION SYSTEM LOAD FLOW

Exact line segment model, Modified line model, approximate line segment model, Step-Voltage Regulators, Line drop compensator, Forward/Backward sweep distribution load flow algorithm – Numerical problems.

UNIT-IV: VOLTAGE DROP AND POWER LOSS CALCULATION

Analysis of non-three phase primary lines, concepts of four-wire multi-grounded common-neutral distribution system, Percent power loss calculation, Distribution feeder cost calculation methods, Capacitor installation types, types of three-phase capacitor-bank connections, Economic justification for capacitors – Numerical problems

UNIT-V: DISTRIBUTION AUTOMATION

Distribution automation, distribution management systems, distribution automation system functions, Basic SCADA system, outage management, decision support applications, substation automation, control feeder automation, database structures and interfaces.

Text Books:

1. William H. Kersting, "Distribution System Modelling and Analysis", CRC Press, Newyork, 2002.
2. Turan Gonen, "Electric Power Distribution System Engineering", McGraw-Hill Inc., New Delhi, 1986.

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Reference Books:

1. James Northcote-Green and Robert Wilson, "Control and automation of electrical power distribution systems", CRC Press (Taylor & Francis), New York, 2007.

CO No.	PO No. and keyword	Competency Indicator	Performance Indicator
CO1	PO1: Engineering knowledge	1.3	1.3.1
CO2	PO1: Engineering knowledge	1.4	1.4.1
CO3	PO1: Engineering knowledge	1.4	1.4.1
CO4	PO1: Engineering knowledge	1.3	1.3.1
CO5	PO1: Engineering knowledge	1.3	1.3.1
		1.4	1.4.1

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Year: IV **Semester: I** **Branch of Study: EEE**

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19APE0204	POWER SYSTEM OPERATION AND CONTROL	3	0	0	3

COURSE OUTCOMES:

On the completion of this course the student will be able to:

1. Understand to deal with problems in Power System as Power System Engineer.
2. Understand to deal with AGC problems in Power System.
3. Understand to deal the problems in hydro electric and hydro thermal problems.
4. Understand the complexity of reactive power control problems and to deal with them.
5. Understand the necessity of deregulation aspects and demand side management problems in the modern power system era.

UNIT-I: ECONOMIC OPERATION OF POWER SYSTEMS

Brief description about electrical power systems, introduction to power system operation and control, Characteristics of various steam units, combined cycle plants, cogeneration plants, Steam units economic dispatch problem with & without considering losses and its solutions, B Matrix loss formula – Numerical problems.

UNIT-II: HYDRO-THERMAL COORDINATION AND OPTIMAL POWER FLOW

Hydro-thermal Coordination: Characteristics of various types of hydro-electric plants and their models, Introduction to hydro-thermal Coordination, Scheduling energy with hydro-thermal coordination, Short-term hydro-thermal scheduling. Optimal Power Flow: Optimal power flow problem formulation for loss and cost minimisation, Solution of optimal power flow problem using Newton's method and Linear Programming technique – Numerical problems.

UNIT-III: AUTOMATIC GENERATION CONTROL

Speed governing mechanism, modelling of speed governing mechanism, models of various types of thermal plants (first order), definitions of control area, Block diagram representation of an isolated power system, Automatic Load Frequency control of single area system with and without control, Steady state and dynamic responses of single area ALFC loop, Automatic Load-frequency control of two area system, Tie-line bias control of two area and multi-area system, Static response of two-area system – Numerical examples.

UNIT-IV: REACTIVE POWER CONTROL

Requirements in ac power transmission, factors affecting stability & voltage control, fundamental transmission line equation, surge impedance, Natural loading, uncompensated line on open circuit, uncompensated line under load, types of compensations on compensated transmission lines, passive and active compensators, uniformly distributed fixed and regulated shunt compensation, series compensation, compensation by sectioning – Numerical problems.

UNIT-V: OPERATION OF MODERN POWER SYSTEMS

Principle of economics, utility functions, power exchanges, electricity market models, market power indices, ancillary services, transmission and distribution charges, principles of transmission charges, transmission pricing methods, demand-side management, regulatory framework – Numerical problems.

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TEXT BOOKS:

1. Allen J. Wood and Bruce F. Wollenberg, "Power Generation, Operation and Control", 2nd edition, John Wiley & Sons, Inc., New York, 1996.
2. D P Kothari and I J Nagrath, "Power System Engineering", McGraw Hill Education India Pvt. Limited, Chennai, 3e, 2019.

REFERENCES:

1. Olle I. Elgerd, "Electric Energy Systems Theory: An Introduction", TMH Publishing Company Ltd., New Delhi, 2nd edition, 1983.
2. T J E Miller, "Reactive Power Control in Electric Systems", John Wiley & Sons, New York, 1982.

CO No.	PO No. and keyword	Competency Indicator	Performance Indicator
CO1	PO1: Engineering knowledge	1.3	1.3.1
	PO2: Problem analysis	2.4	2.4.1
CO2	PO1: Engineering knowledge	1.3	1.3.1
	PO2: Problem analysis	2.4	2.4.1
CO3	PO1: Engineering knowledge	1.4	1.4.1
	PO2: Problem analysis	2.4	2.4.1
CO4	PO1: Engineering knowledge	1.3	1.3.1
	PO2: Problem analysis	2.4	2.4.1
CO5	PO1: Engineering knowledge	1.3	1.3.1
	PO2: Problem analysis	2.4	2.4.1

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Year: IV **Semester: I** **Branch : Common to all**

Humanities Elective

Subject Code	Subject Name	L	T	P	
19AHE9901	Technical Writing	2	0	0	Credit: 2

Course Objectives:

1. To acquaint students with a variety of forms of writing in science and technology;
2. Develop research skills;
3. Discuss and apply writing and formatting techniques;

Syllabus

Unit -1

An Introduction to Technical Writing

Technical writing vs. General writing b. Purpose, importance and characteristics of technical writing, Objectives of technical writing: Clarity, conciseness, accuracy, organization, ethics, Audience recognition and involvement: High tech audience, low-tech. audience, gender neutral language

Unit -2

Memorandum

Objectives, difference between memos, letters and emails. Criteria and format for writing and memos, minutes & agenda

Unit -3

Letter Writing

Business letters- (Greetings, salutations, order, complaint, inquiry), Job-applications (Covering letters) Resume writing.

Unit – 4

Report Writing

Characteristics, types and writing of various reports: feasibility reports, inventory report, mishap report, progress report, laboratory report, Project report, clusters & link words.

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Course Outcomes:

Students will be able to:

1. Participate actively in writing activities (individually and in collaboration) that model effective scientific and technical communication in the workplace.
2. Understand how to apply technical information and knowledge in practical documents for a variety of a professional audiences (including peers and colleagues or management and b) public audiences.
3. Practice the unique qualities of professional writing style, including sentence conciseness, readability, clarity, accuracy, honesty, avoiding wordiness or ambiguity, previewing, using direct order organization, objectivity, unbiased analyzing, summarizing, coherence and transitional devices.

References:

1. Sharon J. Gerson and Steven M. Gerson, Technical writing – process and product, Pearson Education Asia
2. Andrea J. Ratherford, Basic Communication Skills for Technology, Pearson Education Asia
3. Pfeiffer, W.S. and T.V.S. Padmaja. Technical Communication. Pearson.
4. Muralikrishna and Sunita Mishra. Communication Skills for Engineers. Pearson
5. CharlesW.Knisely and KarinI.Knisely.Engineering Communication. Cengage

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO 1	PO9: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	9.2	9.2.1 9.2.2 9.2.3 9.2.4
CO 2	PO10: 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.	10.2	10.2.1 10.2.2
CO 3	PO10: 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.	10.3	10.3.1 10.3.2

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Year: IV **Semester: I** **Branch of Study: EEE**

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19APC0221	SWITCHGEAR AND PROTECTION LAB	0	0	2	1

COURSE OUTCOMES:

1. Understand the operation and characteristics of switch gear used in protection of power systems.
2. Analyze the protection of parallel, radial feeders & over voltage induction relay.
3. Analyze the functioning of various protection schemes using MATLAB.

Conduct any 10 from the following:

1. Study the characteristics of miniature circuit breaker.
2. Study the characteristics of fuse and thermal overload protection.
3. Study the operation and characteristics of over voltage, over current relays.
4. Obtain the ABCD parameters of a given power system.
5. Modeling of Differential Relay using MATLAB.
6. Radial Feeder Protections.
7. Parallel Feeder Protections.
8. Principle of Reverse Power Protection.
9. Differential Protection of Transformer.
10. To the study time Vs voltage characteristics of over voltage induction relay.
11. Characteristics of single, combined and lightning earth pits.
12. Study of efficiency and regulation of a transmission line.
13. Study of string efficiency of insultors.

Text books:

1. A.G.Phadkeand J. S. Thorp, "Computer Relaying for Power Systems", Wiley/Research studies Press, 2009
2. A.T. Johns and S. K. Salman, "Digital Protection of Power Systems", IEEE Press,1999

Reference Books:

1. Gerhard Zeigler, "Numerical Distance Protection", Siemens Publicis Corporate Publishing, 2006
2. S.R. Bhide "Digital Power System Protection" PHI Learning Pvt. Ltd. 2014

CO No.	PO No. and keyword	Competency Indicator	Performance Indicator
CO1	PO1: Engineering knowledge	1.4	1.4.1
	PO2: Problem analysis	2.3	2.3.1
			2.3.2
CO2	PO1: Engineering knowledge	1.3	1.3.1
	PO4: Conduct investigations of complex problems	4.3	4.3.1
CO3	PO5: Modern tool usage	5.1	5.1.1
		5.2	5.2.1

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AK20 Regulations

I B.Tech **Branch : Common to all**

Subject Code 20AHS9901	Subject Name **COMMUNICATIVE ENGLISH**	L T P 3 0 0	Credit: 3	CLC 2

Course Objectives

* Facilitate effective listening skills for better comprehension of academic lectures and English spoken by native speakers

- Focus on appropriate reading strategies for comprehension of various academic texts and authentic materials
- Help improve speaking skills through participation in activities such as role plays, discussions and structured talks/oral presentations
- Impart effective strategies for good writing and demonstrate the same in summarizing, writing well organized essays, record and report useful information
- Provide knowledge of grammatical structures and vocabulary and encourage their appropriate use in speech and writing

SYLLABUS

UNIT -1

Lesson: On the Conduct of Life: William Hazlitt

Listening: Identifying the topic, the context and specific pieces of information by listening to short audio texts and answering a series of questions.

Speaking: Asking and answering general questions on familiar topics such as home, family, work, studies and interests; introducing oneself and others.

Reading: Skimming to get the main idea of a text; scanning to look for specific pieces of information.

Writing: Beginnings and endings of paragraphs – introducing the topic, summarizing the main idea and/or providing a transition to the next paragraph.

Grammar and Vocabulary- I : Parts of Speech, Content words and function words; word forms: verbs, nouns, adjectives and adverbs; nouns: countable and uncountable; singular and plural; basic sentence structures; simple question form – Wh questions; word order in sentences.

Vocabulary -2: Formal/academic words and phrases.

UNIT -2

Lesson: The Brook: Alfred Tennyson

Listening: Answering a series of questions about main idea and supporting ideas after listening to audio texts.

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3. G. Aruna 6.

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Speaking: Discussion in pairs/small groups on specific topics followed by short structured talks.
Reading: Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together.
Writing: Paragraph writing (specific topics) using suitable cohesive devices;
Mechanics of writing – punctuation, capital letters.
Grammar & Vocabulary building-1: Cohesive devices – linkers, sign posts and transition signals; use of articles and zero article; prepositions.
Vocabulary building: 2 Idioms and Phrases, Homonyms, Homophones and Homographs.

UNIT -3
Lesson: The Death Trap: Saki
Listening: Listening for global comprehension and summarizing what is listened to.
Speaking: Discussing specific topics in pairs or small groups and reporting what is discussed
Reading: Reading a text in detail by making basic inferences – recognizing and interpreting specific context clues; strategies to use text clues for comprehension.
Writing: Summarizing – identifying main idea/s and rephrasing what is read.
Grammar and Vocabulary building-II: Direct and indirect speech, reporting verbs for academic purposes.
Technical Writing-1: personal experiences, unforgettable incidents, travelogues. (Imaginative, Narrative and Descriptive)

UNIT-4
Lesson: Innovation: Muhammad Yunus
Listening: Making predictions while listening to conversations/ transactional dialogues without video; listening with video.
Speaking: Role plays for practice of conversational English in academic contexts (formal and informal) – asking for and giving information/directions
Reading: Studying the use of graphic elements in texts to convey information, reveal trends / patterns / relationships, communicate processes or display complicated data.
Writing: Letter Writing: Official Letters/Report writing, ***e-mail writing***
Grammar and Vocabulary: Quantifying expressions -- adjectives and adverbs; comparing and contrasting; Voice – Active & Passive Voice.
Vocabulary:2 : Jigsaw Puzzles, Vocabulary Activities through Web tools

UNIT -5
Lesson: Politics and the English Language: George Orwell
Listening: Identifying key terms, understanding concepts and answering a series of relevant questions that test comprehension.
Speaking: Formal oral presentations on topics from academic contexts – without the use of PPT slides.
Reading: Reading for comprehension.
Writing: Writing structured essays on specific topics using suitable claims and evidences.
Grammar and Vocabulary: Editing short texts –identifying and correcting common errors in grammar and usage.
Technical Writing-2: Narrative short story, News paper articles on science fiction.

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2. P. Kishen
3. G. Aruna
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5. M. Ramesh
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Course Outcomes:

Students will be able to

1. Understand the context, topic, and pieces of specific information from social or transactional dialogues spoken by native speakers of English.
2. Apply grammatical structures to formulate sentences and correct word forms
3. Analyze discourse markers to speak clearly on a specific topic in informal discussions
4. Evaluate reading/listening texts and to write summaries based on global comprehension of these texts.
5. Create a coherent paragraph interpreting a figure/graph/chart/table

Text Book:

1. Language and Life: A Skills Approach- I Edition 2019, Orient Black Swan

Reference Books:

1. Bailey, Stephen. Academic writing: A handbook for international students. Routledge, 2014.
2. Chase, Becky Tarver. Pathways: Listening, Speaking and Critical Thinking. Heinley ELT; 2nd Edition, 2018.
3. Raymond Murphy's English Grammar in Use Fourth Edition (2012) E-book
4. Hewings, Martin. Cambridge Academic English (B2). CUP, 2012.
5. Oxford Learners Dictionary, 12th Edition, 2011
6. Norman Lewis Word Power Made Easy- The Complete Handbook for Building a Superior Vocabulary (2014)
7. Speed Reading with the Right Brain: Learn to Read Ideas Instead of Just Words by David Butler

Web links

www.englishclub.com
www.easyworldofenglish.com
www.languageguide.org/english/
www.bbc.co.uk/learningenglish
www.eslpod.com/index.html
www.myenglishpages.com

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List of Cos	PO no. and keyword	Competency Indicator: Description	Performance Indicator: Description
CO1.	PO10-Able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	10.1	10.1.1
CO2.	PO9-Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	9.2	9.2.1
CO3.	PO10-Able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	10.1	10.1.1
CO4	PO10-Able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	10.3	10.3.1
CO5.	PO10-Able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	10.2	10.2.1

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ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES: TIRUPATI

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AK20 Regulations

B. Tech I-Year

Branch : Common to all

Subject Code: 20AHS9902	Subject Name: **Communicative English Lab**	L T P 0 0 2	Credits: 1.5	CLC - 1

Course Objectives:

1. Students will be exposed to a variety of self instructional, learner friendly modes of language learning.
2. Students will learn better pronunciation through Phonetics.
3. Students will be trained to use language effectively to face interviews, group discussions, public speaking .
4. Students will be initiated into greater use of the computer in resume preparation, report writing, format making etc.

Syllabus

Unit 1

1. Phonetics
2. Non - verbal communication
3. Vocabulary (word formation, one word substitutes, words often misused & confused, collocations idioms & phrases)

Unit 2

1. Reading Comprehension
2. JAM
3. Distinction between Native and Indian English accent (Speeches by TED and Kalam).

Unit 3

1. Situational dialogues/Giving Directions
2. Describing objects/places/persons

Unit 4

1. Fun – Buzz (Tongue twisters, riddles, puzzles etc)
2 Formal Presentations

Unit 5

1. Debate (Contemporary / Complex topics)
2. Group Discussion

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3. G. Aleema
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Course Outcomes

1. Create awareness on mother tongue influence and neutralize it in order to improve fluency in spoken English.
2. Understanding the different aspects of the language with emphasis on LSRW skills and make use of different strategies in discussions.
3. Improve words knowledge and apply skills in various language learning activities.
4. Analyze speech sounds, stress, rhythm, intonation and syllable division for better listening and speaking comprehension.
5. Evaluate and exhibit acceptable etiquette essentials in social and professional presentations.

Software Source:

K-Van Solutions Software

Reference:

Teaching English - British Council

List of COs	PO No. and keyword	Competency Indicator: Description	Performance Indicator: Description
CO1	PO10: Able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	10.2	10.1.1
CO2	PO 9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	9.2	9.2.1
CO3	PO10: Able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	10.2	10.2.1
CO4	PO10: Able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	10.2	10.2.1
CO5	PO10: Able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	10.2	10.2.1

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Year: II Semester: III Branch of Study: EEE

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20APC0201	ELECTRICAL CIRCUITS - I	3	0	0	3

COURSE OUTCOMES:

1. Apply mesh and nodal analysis to determine Voltage, current and power involved through any electrical circuit and its elements.
2. Analyze magnetic circuits for their various properties.
3. Analyze single phase AC circuits in steady state domain.
4. Apply network theorems for analysis of Electrical circuits.
5. Analyze three phase balanced and unbalanced circuits.

UNIT- 1 INTRODUCTION TO ELECTRICAL & MAGNETIC CIRCUITS

Electrical Circuits: Circuit Concept – Types of elements - Source Transformation-Voltage - Current Relationship for Passive Elements. Current division and voltage division rule Kirchhoff's Laws–Network Reduction Techniques-Series, Parallel, Series Parallel, Star-to-Delta or Delta-to-Star Transformation. Examples

Definitions – Graph – Tree, Basic Cut set and Basic Tie set Matrices for Planar Networks – Loop and Nodal Methods of Analysis of Networks & Independent Voltage and Current Sources – Duality & Dual Networks, Nodal Analysis, Mesh Analysis

UNIT- 2 MAGNETIC CIRCUITS

Magnetic Circuits: Faraday's Laws of Electromagnetic Induction-Concept of Self and Mutual Inductance-Dot Convention-Coefficient of Coupling-Composite Magnetic Circuit-Analysis of Series and Parallel Magnetic Circuits, MMF Calculations.

UNIT- 3 SINGLE PHASE A.C CIRCUITS

R.M.S, Average Values and Form Factor for Different Periodic Wave Forms – Sinusoidal Alternating Quantities – Phase and Phase Difference - Complex and Polar Forms of Representations, j-Notation, Steady State Analysis of R, L and C (In Series, Parallel and Series Parallel Combinations) with Sinusoidal Excitation- Resonance - Phasor diagrams - Concept of Power Factor- Concept of Reactance, Impedance, Susceptance and Admittance-Apparent Power, Active and Reactive Power, Examples.

UNIT- 4 NETWORK THEOREMS

Superposition, Reciprocity, Thevenin's, Norton's, Maximum Power Transfer, Millmann's, Tellegen's, and Compensation Theorems for D.C and Sinusoidal Excitations.

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UNIT- 5 THREE PHASE A.C. CIRCUITS

Introduction - Analysis of Balanced Three Phase Circuits – Phase Sequence- Star and Delta Connection - Relation between Line and Phase Voltages and Currents in Balanced Systems - Measurement of Active and Reactive Power in Balanced and Unbalanced Three Phase Systems. Analysis of Three Phase Unbalanced Circuits - Loop Method - Star Delta Transformation Technique – for balanced and unbalanced circuits - Measurement of Active and reactive Power – Advantages of Three Phase System.

TEXT BOOKS:

1. FundamentalsofElectricCircuitsCharlesK.AlexanderandMatthew.N.O.Sadiku,McGraw Hill,5th Edition, 2013.
2. Engineering circuit analysis William Haytand Jack E. Kemmerly, McGrawHillCompany,7th Edition, 2006.

REFERENCE BOOKS:

1. Circuit Theory Analysis & Synthesis A. Chakrabarti, DhanpatRai& Sons, 7thRevised Edition,2018.
2. Network Analysis M.E Van Valkenburg, Prentice Hall (India), 3rd Edition,1999.
3. Electrical Engineering Fundamentals V. DelToro, Prentice Hall International, 2ndEdition, 2019.
4. Electric Circuits- Schaum's Series, Mc Graw Hill, 5th Edition,2010.
5. Electrical Circuit Theory and Technology JohnBird, Routledge, Taylor&Francis, 5thEdition,2014.

CO No.	PO No. and keyword	Competency Indicator	Performance Indicator
CO1	PO1: Engineering knowledge	1.3	1.3.1
CO2	PO1: Engineering knowledge	1.3	1.3.1
CO3	PO2: Problem analysis	2.4	2.4.1
CO4	PO1: Engineering knowledge	1.3	1.3.1
		1.4	1.4.1
CO5	PO1: Engineering knowledge	1.3	1.3.1

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Year: II Semester: III Branch: EEE

Course Code	Course Title	L	T	P	Credits
20APC0203	Electrical Machines-I	3	0	0	3

COURSE OUTCOMES:

CO1: Apply the concepts of magnetic circuits to compute induced EMF and force in Electro-magnetic systems.
CO2: Analyze the operation, conditions required of self-excitation of DC Generators and parallel operation of DC Generators.
CO3: Distinguish the operation of various dc motors and determine the performance of DC machine using the results of tests.
CO4: Explain the principle, constructional features and evaluate the performance characteristics of single-phase transformers by conducting various tests.
CO5: Analyze the operations of Auto Transformer, Three Phase Transformer and parallel operation of Transformers.

UNIT-I: Electromechanical Energy Conversion:
Electromechanical Energy Conversion - Forces and torques in magnetic field system, Energy balance, singly excited and multiple excited magnetic systems, MMF, Flux, Reluctance, Series and Parallel Magnetic Circuits, B-H curve of magnetic materials.

UNIT-II: DC Generators:
Constructional details of a DC machine, principle of operation, armature windings and its types, EMF equation, armature reaction and its effects, commutation, methods of improving commutation, methods of excitation and classification of DC Generators, voltage build-up in a shunt generator, critical field resistance and critical speed, generator characteristics, parallel operation of DC shunt and series generators, applications of DC Generators.

UNIT-III: DC Motors:
Principle of operation, significance of back EMF, torque equations, types of DC Motors, characteristics, speed control of DC Motors, necessity of starter, 3-point and 4- point starters, Losses and efficiency, applications of DC Motors.
Testing of DC machines: Brake test, Swinburne 's test, Hopkinson's test, Fields test, Separation of iron and frictional losses.

UNIT-IV: Transformers:
Constructional features, principle of operation, EMF equation, ideal transformer, transformer on No load and ON load and its phasor diagrams, equivalent circuit, voltage regulation, losses and efficiency. Testing of transformer - polarity test, open circuit and short circuit tests, Sumpner's test, separation losses.

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UNIT-V:

Parallel operation of single-phase transformers, Autotransformers - construction, principle, applications and comparison with two winding transformer.

Three-phase transformer– construction, types of connection and their comparative features, Phase conversion - Scott connection, three-phase to six-phase conversion.

TEXT BOOKS:

1. P.S. Bimbhra, Electrical Machinery, Khanna Publishers, 7th Edition, Delhi, 2011.
2. R.K. Rajput, Electrical Machinesin S.I. Units, Laxmi Publications (P) Ltd, 6th Edition, New Delhi, 2017.
3. JB Gupta, Theory and performance of Electrical Machines (DC machines, Poly phase Circuits & AC machines) in SI Units, S.K. Kataria& Sons, New Delhi, 15th Edition, 2015.

REFERENCE BOOKS:

1. Electrical Machines by U ABakshi and M V Bakshi, Technical Publications.
2. B.L. Theraja and A.K. Theraja, *A Text Book of Electrical Technology (in S. I. Units)*, Vol.2, S. Chand & Company Ltd, Multicolour illustrative Edition, New Delhi, 2014.

ADDITIONAL LEARNING RESOURCES:

1. http://www.nptelvideos.in/2012/11/electrical-machines-i.html
2. https://nptel.ac.in/courses/108/102/108102146/
3. https://freevideolectures.com/course/3085/electrical-machines-i
4. https://www.youtube.com/playlist?list=PL9RcWoqXmzaJpnkjoNIcyFNgGk9-znOji

CO No.	PO No. and keyword	Competency Indicator	Performance Indicator
CO1	PO1: Engineering knowledge	1.3	1.3.1
CO2	PO1: Engineering knowledge	1.3	1.3.1
CO3	PO2: Problem analysis	2.4	2.4.1
	PO4: Conduct investigations of complex problems	4.3	4.3.1
CO4	PO1: Engineering knowledge	1.3	1.3.1
		1.4	1.4.1
CO5	PO4: Conduct investigations of complex problems	4.3	4.3.1

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Year: II Semester: III Branch of Study: EEE

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20APC0204	ELECTRICAL CIRCUITS-I LAB	0	0	3	1.5

COURSE OUTCOMES:

1. Remember, understand and apply various theorems and verify practically.
2. Understand and analyze active, reactive power measurements in three phase balanced & un balanced circuits.

List of Experiments:

1. Verification of Ohm law.
2. Verification of KVL and KCL.
3. Verification of Mesh and Nodal Analysis.
4. Verification of Thevenin's and Norton's Theorems
5. Verification of Superposition Theorem for average and RMS values.
6. Maximum Power Transfer Theorem for DC circuits.
7. Verification of Reciprocity Theorem for DC circuits.
8. Verification of Compensation Theorem for DC circuits.
9. Verification of, Millmann's Theorems for DC circuits
10. Determination of Self, Mutual Inductances and Coefficient of Coupling.
11. Measurement of Active Power for Star Connected Balanced Loads.
12. Measurement of Reactive Power for Star Connected Balanced Loads.
13. Measurement of Active Power for Delta Connected Balanced Loads.
14. Measurement of Reactive Power for Delta Connected Balanced Loads.

REFERENCE BOOKS:

1. Circuit Theory Analysis & Synthesis A. Chakrabarti, DhanpatRai&Sons,7th Revised Edition,2018.
2. Network Analysis M.E Van Valkenberg, Prentice Hall (India), 3rd Edition,1999.
3. Electrical Engineering Fundamentals V. Del Toro, Prentice Hall International, 2nd Edition, 2019
4. Electric Circuits- Schaum's Series, Mc Graw Hill, 5th Edition,2010.
5. Electrical Circuit Theory and Technology John Bird, Routledge, Taylor & Francis, 5th Edition,2014.

CO No.	PO No. and keyword	Competency Indicator	Performance Indicator
			2.3.2
CO1	PO1: Engineering knowledge	1.3	1.3.1
	PO4: Conduct investigations of complex problems	4.3	4.3.1
CO2	PO4: Conduct investigations of complex problems	4.3	4.3.1

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Year: II Semester: III Branch: EEE

Course Code	Course Title	L	T	P	Credits
20APC0205	Electrical Machines-I Lab	0	0	3	1.5

Course Outcomes:

1. Conduct and analyze load test on DC shunt generator.
2. Understand and analyze magnetization characteristics of DC shunt generator.
3. Understand and analyze speed control techniques and efficiency of DC machines.
4. Understand to predetermine efficiency and regulation of single-phase Transformers.

List of Experiments:

Minimum ten experiments from the following list are required to be conducted

1.Magnetization characteristics of DC shunt generator. Determination of critical field resistance and critical speed.
2. Load test on DC shunt generator. Determination of characteristics.
3. Brake test on DC shunt motor. Determination of performance curves.
4. Swinburne's test on DC shunt motor, Predetermination of efficiency.
5. Speed control of DC shunt motor (Armature control and Field control method).
6. Hopkinson's tests on DC shunt machines. Predetermination of efficiency.
7. OC and SC test on single phase transformer.
8. Parallel operation of single phase transformers.
9. Sumpner's test on single phase transformers.
10. Load test on DC long shunt compound generator. Determination of characteristics.
11. Load test on DC short shunt compound generator. Determination of characteristics.
12. Separation of losses in DC shunt motor.
13. Separation of losses of single phase transformer

References:

D. P. Kothari and B. S. Umre, Laboratory Manual for Electrical Machines, I.K International Publishing House Pvt. Ltd., 2017

Online Learning Resources/Virtual Labs:

http://em-coep.vlabs.ac.in/List%20of%20experiments.html?domain=Electrical Engineering
http://vlabs.iitb.ac.in/vlabs- dev/vlab_bootcamp/bootcamp/Sadhya/experimentlist.html

CO No.	PO No. and keyword	Competency Indicator	Performance Indicator
CO1	PO1: Engineering knowledge	1.3	1.3.1
		1.4	1.4.1
CO2	PO2: Problem analysis	2.3	2.3.1
			2.3.2
CO3	PO1: Engineering knowledge	1.3	1.3.1
	PO4: Conduct investigations of complex problems	4.3	4.3.1
CO4	PO4: Conduct investigations of complex problems	4.3	4.3.1

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Year: II Semester: IV Branch of Study: EEE

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20APC0206	ELECTRICAL CIRCUITS-II	3	0	0	3

COURSE OUTCOMES

1. Determine the transient response of R-L, R-C, R-L-C circuits for D.C and A.C excitations.
2. Analyze two port networks.
3. Apply Fourier transforms to electrical circuits excited by non-sinusoidal sources.
4. Design different types of filters.

UNIT- I D.C TRANSIENT ANALYSIS

Transient Response of R-L, R-C, R-L-C Series Circuits for D.C Excitation Initial Conditions-Solution Method Using Differential Equation and Laplace Transforms, Response of RL & R-C Networks to Pulse Excitation.

UNIT- II A.C TRANSIENT ANALYSIS

Transient Response of R-L, R-C, R-L-C Series Circuits for Sinusoidal Excitations-Initial Conditions-Solution Method Using Differential Equations and Laplace Transforms.

UNIT-III TWO PORT NETWORKS

Two Port Networks Two port network parameters – Z, Y, ABCD and Hybrid parameters and their relations, Cascaded networks - Poles and zeros of network functions

UNIT- IV FOURIER TRANSFORMS

Fourier Theorem- Trigonometric Form and Exponential Form of Fourier Series – Conditions of Symmetry- Line Spectra and Phase Angle Spectra- Analysis of Electrical Circuits to Non-Sinusoidal Periodic Waveforms. Fourier Integrals and Fourier Transforms – Properties of Fourier Transforms and Application to Electrical Circuits.

UNIT V: FILTERS & CIRCUITS SIMULATION

Filters – Low Pass – High Pass and Band Pass – RC, RL filters– derived filters and composite filters design – Attenuators – Principle of Equalizers – Series and Shunt Equalizers – L Type, T type and Bridged – T and Lattice Equalizers. Circuit Analysis – Description of Circuit elements, nodes and sources, Input and Output variables – Modeling of the above elements – Types of DC analysis.

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TEXT BOOKS:

1. Electrical Circuit Theory and Technology 4th Edition, John Bird, Rovtled / T&F, 2011.
2. Network Analysis 3rd Edition, M.E Van Valkenberg, PHI, .
3. Engineering Circuit Analysis by William Hayt and Jack E.Kemmerley,McGraw Hill Company,6 th edition.

REFERENCE:

1. Circuit Theory (Analysis & Synthesis) 6th Edition, A. Chakrabarti, Dhanpat Rai & Sons, 2008.
2. Electric Circuits by N.Sreenivasulu, REEM Publications
3. Fundamentals of Electrical Circuits by Charles K.Alexander and Mathew N.O.Sadiku, McGraw Hill Education (India)
4. Electric Circuits by David A. Bell, Oxford publications

CO No.	PO No. and keyword	Competency Indicator	Performance Indicator
CO1	PO1: Engineering knowledge	1.3	1.3.1
CO2	PO2: Problem analysis	2.4	2.4.1
	PO4: Conduct investigations of complex problems	4.3	4.3.1
CO3	PO1: Engineering knowledge	1.3	1.3.1
		1.4	1.4.1
CO4	PO4: Conduct investigations of complex problems	4.3	4.3.1

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ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES: TIRUPATI
(AUTONOMOUS)
AK20 Regulations

II B.Tech SEMESTER: IV Branch: Common to all

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20AHS9905	Universal Human Values	3	0	0	3

Course Objectives

1. Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
2. Understanding (or developing clarity) of the harmony in the human being, family, society and Nature /existence
3. Strengthening of self-reflection.
4. Development of commitment and courage to act.

UNIT – 1: Course Introduction - Need, Basic Guidelines, Content and Process for Value Education

- Purpose and motivation for the course, recapitulation from Universal Human Values-I
- Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration
- Continuous Happiness and Prosperity- A look at basic Human Aspirations
- Right understanding, Relationship and Physical Facility- the basic requirements for fulfillment of aspirations of every human being with their correct priority
- Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario
- Method to fulfill the above human aspirations: understanding and living in harmony at various levels.

Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking.

UNIT II: Understanding Harmony in the Human Being - Harmony in Myself!

- Understanding human being as a co-existence of the sentient 'I' and the material 'Body'
- Understanding the needs of Self ('I') and 'Body' - happiness and physical facility
- Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)
- Understanding the characteristics and activities of 'I' and harmony in 'I'
- Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail
- Programs to ensure Sanyam and Health.

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Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease.

UNIT III: Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship.

- Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfillment to ensure mutual happiness; Trust and Respect as the foundational values of relationship
- Understanding the meaning of Trust; Difference between intention and competence
- Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship
- Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals
- Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family

Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives

UNIT IV:Understanding Harmony in the Nature and Existence - Whole existence as Coexistence

- Understanding the harmony in the Nature
- Interconnectedness and mutual fulfillment among the four orders of nature recyclability and self-regulation in nature
- Understanding Existence as Co-existence of mutually interacting units in all- pervasive space
- Holistic perception of harmony at all levels of existence. Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.

Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.

UNIT- V: Implications of the above Holistic Understanding of Harmony on Professional Ethics.

- Natural acceptance of human values
- Definitiveness of Ethical Human Conduct
- Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order

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- Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems.
- Case studies of typical holistic technologies, management models and production systems
- Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations
- Sum up.

Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions eg. To discuss the conduct as an engineer or scientist etc.

Course Outcomes:

On completion of this course, the students will be able to

1. Students are expected to become more aware of themselves, and their surroundings (family, society, nature)
2. They would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.
3. They would have better critical ability.
4. They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society).
5. It is hoped that they would be able to apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction.

TEXT BOOKS

1. R R Gaur, R Asthana, G P Bagaria, "A Foundation Course in Human Values and Professional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1
2. R R Gaur, R Asthana, G P Bagaria, "Teachers' Manual for A Foundation Course in Human Values and Professional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2

REFERENCE BOOKS

1. Jeevan Vidya: EkParichaya, A Nagaraj, Jeevan Vidya Prakashan, Amar kantak, 1999.
2. A. N. Tripathi, "Human Values", New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. Mohandas Karamchand Gandhi "The Story of My Experiments with Truth"
5. E. FSchumacher. "Small is Beautiful"
6. Slow is Beautiful –Cecile Andrews
7. J C Kumarappa "Economy of Permanence"
8. Pandit Sunderlal "Bharat Mein Angreji Raj"
9. Dharampal, "Rediscovering India"
10. Mohandas K. Gandhi, "Hind Swaraj or Indian Home Rule"
11. India Wins Freedom - Maulana Abdul Kalam Azad
12. Vivekananda - Romain Rolland(English)
13. Gandhi - Romain Rolland (English)

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List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO 1	**PO 7: Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and the need for sustainable development	7.1	7.1.2
CO 2	**PO 7: Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and the need for sustainable development	7.1	7.1.2
CO 3	**PO 8: Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice	8.1 8.2	8.1.1 8.2.2
CO 4	**PO 8: Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice	8.1 8.2	8.1.1 8.2.2
CO5	**PO 8: Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice	8.1 8.2	8.1.1 8.2.2

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Year: II Semester: IV Branch of Study: EEE

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20APC0209	ELECTRICAL CIRCUITS-II LAB	0	0	3	1.5

COURCE OUTCOMES:

1. Able to understand simulation programs for DC circuit analysis using PSPICE.
2. Understand and compare basic electric circuit theorems with actual working circuits.
3. Design and understand RLC series and parallel circuits and its resonance condition.
4. Able to measure power in three phase circuits in day to day life.
5. Characterize and model the network in terms of all network parameters.

List of Experiments

1. Simulation of DC Circuits
2. DC Transient Response
3. Mesh Analysis in p-spice
4. Nodal Analysis in p-spice
5. Measure and calculate RC time constant for a given RCcircuit.
6. Measure and calculate RL time constant for a given RL circuit.
7. Frequency response of RLC Series Circuits
8. Analysis of RL and RC Series circuits for DC Excitation
9. Analysis of RL and RC Series circuits for AC Excitation
10. Verification of the maximum power dissipation (plot the power dissipated versus the load).
11. Measure and calculate Z, Y parameters of two-port network.
12. Measure and calculate ABCD & h parameters of two-port network.

REFERENCES:

1. Simulation of Power Electronics Circuit, M B Patil, V Ramanarayan and V T Ranganat, Alpha Science International Ltd., 2009.
2. Public Domain Simulator: http:// www.ee.iitb.ac.in/~sequel 3. PSPICE A/D user's manual – Microsim, USA. 4. PSPICE reference guide – Microsim, USA.

CO No.	PO No. and keyword	Competency Indicator	Performance Indicator
CO1	PO1: Engineering knowledge	1.3	1.3.1
CO2	PO1: Engineering knowledge	1.3	1.3.1
CO3	PO2: Problem analysis	2.4	2.4.1
	PO4: Conduct investigations of complex problems	4.3	4.3.1
CO4	PO1: Engineering knowledge	1.3	1.3.1
		1.4	1.4.1
CO5	PO4: Conduct investigations of complex problems	4.3	4.3.1

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ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
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DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING
SKILL ORIENTED COURSE

Year: II Semester: IV Branch of Study: EEE

COURSE CODE	COURSE TITLE	L		P	CREDITS
20ASC0201	SIMULATION OF CIRCUITS USING PSPICE	1	0	2	2

COURCE OUTCOMES:

1. Able to understand features and programming basics of PSPICE.
2. Understand the procedures for simulation of AC and DC circuits using PSPICE.
3. Design and understand nodal and frequency response analysis of circuits.

List of Experiments

1. Introduction to the use of P-Spice.
2. Procedure to use of P-Spice.
3. Design a circuit for 3-node system using following data.
   Voltage=20V, R1= 3Ω & R2= 2Ω
4. Design an RC circuit with a suitable switch for DC transient analysis.
   Voltage=20V, R=10 Ω, C=0.1F
5. Perform the nodal analysis for a 4-node circuit.
   Voltage=10V, R1=10 Ω, R2=5 Ω, R3= 3 Ω, R4=10 Ω
6. Perform the frequency response of an RC network. Vrms=100V, R=10Ω, C=50μF
7. Perform the analysis of an RL series circuit for DC Excitation.
   Voltage= 20V, R= 500Ω, L=2mH

REFERENCES:

1. Simulation of Power Electronics Circuit, M B Patil, V Ramanarayan and V T Ranganat, Alpha Science International Ltd., 2009.
2. Public Domain Simulator: http:// www.ee.iitb.ac.in/~sequel 3. PSPICE A/D user's manual – Microsim, USA. 4. PSPICE reference guide – Microsim, USA.

CO No.	PO No. and keyword	Competency Indicator	Performance Indicator
CO1	PO5: Modern tool usage	5.1	5.1.1
CO2	PO5: Modern tool usage	5.1	5.1.1
CO3	PO5: Modern tool usage	5.2	5.2.1

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Year: III Semester: V Branch of Study: EEE

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20APC0211	ELECTRICAL MACHINES - III	3	0	0	3

COURSE OUTCOMES:

On the completion of this course the student will be able to:

1. Acquire knowledge on construction and operation of brushless D.C motor.
2. Understand construction and operation of PMSM.
3. Acquire knowledge on synchronous and switched reluctance motors.
4. Acquire knowledge of other modern special machines.

UNIT I PERMANENT MAGNET BRUSHLESS D.C. MOTORS 9

Fundamentals of Permanent Magnets -Construction-Principle of operation – Magnetic circuit analysis – EMF and torque equations – Performance characteristics - Closed loop control– Applications

UNIT II PERMANENT MAGNET SYNCHRONOUS MOTORS 9

Principle of operation – EMF and Torque equations – Phasor diagram – Performance characteristics – Closed loop control– Applications.

UNIT III SYNCHRONOUS RELUCTANCE MOTORS 9

Constructional features – Types – Axial and Radial flux motors – Operating principles – Phasor diagram- Voltage and Torque Equations - Performance Characteristics – Applications.

UNIT IV SWITCHED RELUCTANCE MOTORS 9

Constructional features – Principle of operation – Torque production - Power Converters and their controllers – Performance Characteristics – Closed loop control – Applications.

UNIT V OTHER SPECIAL MACHINES 9

Constructional features – Principle of operation and characteristics of : Stepper Motor, Hysteresis motor, AC series motors, Linear motor, Hybrid motor, Polyphase induction motors, premium efficiency motors.

TEXT BOOKS:

1. K. Venkataratnam, 'Special Electrical Machines', Universities Press (India) Private Limited, 2008.
2. T. Kenjo, 'Stepping Motors and Their Microprocessor Controls', Clarendon Press London, 1984.
3. E.G. Janardanan, 'Special electrical machines', PHI learning Private Limited, Delhi, 2014.

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REFERENCES:

1. R. Krishnan, 'Switched Reluctance Motor Drives – Modeling, Simulation, Analysis, Design and Application', CRC Press, New York, 2001.
2. T. Kenjo and S. Nagamori, 'Permanent Magnet and Brushless DC Motors', Clarendon Press, London, 1988.
3. T. J. E. Miller, 'Brushless Permanent-Magnet and Reluctance Motor Drives', Oxford University Press, 1989.
4. Energy-Efficient Electric Motors, Revised and Expanded by Ali Emadi, 3rd Edition, ISBN 9780824757359, Published August 30, 2004 by CRC Press.
4. R.Srinivasan, 'Special Electrical Machines', Lakshmi Publications, 2013.

CO No.	PO No. and keyword	Competency Indicator	Performance Indicator
CO1	PO1: Engineering knowledge	1.3	1.3.1
CO2	PO1: Engineering knowledge	1.3	1.3.1
CO3	PO1: Engineering knowledge	1.3	1.3.1
CO4	PO1: Engineering knowledge	1.3	1.3.1
		1.4	1.4.1

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Year: III Semester: V Branch of Study: EEE

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20ASC0202 (Skill oriented course)	INTRODUCTION TO PROGRAMMING WITH MATLAB	1	0	2	2

COURSE OUTCOMES:

1. Learn fundamental computer programming concepts such as variables, control structures, functions and many others.
2. Learn about various data types and how to handle them in MATLAB.
3. Learn the powerful support MATLAB provides for working with matrices.
4. Learn about file input/output.

MODULE-1

Introduction - Running MATLAB - The MATLAB Desktop - MATLAB as a Calculator - Syntax and Semantics - Help - Plotting

MODULE-2

Introduction to Matrices and Operators - The Colon Operator - Accessing Parts of a Matrix - Combining and Transforming Matrices - Arithmetic

MODULE-3

Introduction to Functions - Function I/O - Formal Definition of Functions - Subfunctions - Scope - Advantages of Functions - Scripts

MODULE-4

Introduction to Programmer's Toolbox - Matrix Building - Input / Output - Plotting - Debugging

MODULE-5

Selection - If-Statements, Continued - Relational and Logical Operators - Nested If-Statements - Variable Number of Function Arguments - Robustness - Persistent Variables

MODULE-6

Loops - For-Loops - While-Loops - Break Statements - Logical Indexing - Preallocation

MODULE-7

Introduction to Data Types - Character Arrays - Structs - Cells - The String Type (Introduced in 2017a) - The Datetime and Duration Types (Introduced in 2014b)

MODULE-8

File Input/Output - Excel Files - Text Files - Binary Files

REFERENCE & TRAINING RSOURCE: Coursera course "INTRODUCTION TO PROGRAMMING WITH MATLAB"

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Year: III Semester: VI Branch of Study: EEE

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20ASC0203 (Skill oriented course)	NUMERICAL TECHNIQUES USING MATLAB	1	0	2	2

COURSE OUTCOMES:

1. Learn fundamental computer programming concepts used for numerical analysis.
2. Solve linear equations, difference equations and differential equations in MATLAB.
3. Determination of roots for polynomials.
4. Determination of polynomials using Euler, Runge-Kutta and LSC fitting methods.

LIST OF EXPERIMENTS:

1. Study of Introduction to numerical techniques.
2. Study of basic matrix operations.
3. Solve linear equation using MATLAB.
4. Solution of Linear equations for Underdetermined and Overdetermined cases.
5. Determination of Eigen values and Eigen vectors of a square matrix.
6. Solution of Difference Equations.
7. Solution of Difference Equations using Euler Method.
8. Solution of differential equation using 4th order Runge- Kutta method.
9. Determination of roots of a polynomial.
10. Determination of polynomial using method of Least Square Curve Fitting.
11. Determination of polynomial fit, analyzing residuals, exponential fit and error bounds from the given data.
12. Determination of time response of an R-L-C circuit.

Text Books:

1. Grewal, B.S., and Grewal, J.S., Numerical Methods in Engineering and Science, Khanna Publishers, 10th Edition, New Delhi, 2015.
2. Johnson, R.A., Miller, I and Freund J., Miller and Freundâ Probability and Statistics for Engineers, Pearson Education, Asia, 8th Edition, 2015.

References:

1. Burden, R.L and Faires, J.D, Numerical Analysis, 9th Edition, Cengage Learning, 2016.
2. Gerald. C.F. and Wheatley. P.O. Applied Numerical Analysis Pearson Education, Asia, New Delhi, 7th Edition, 2007.
3. Gupta S.C. and Kapoor V. K., Fundamentals of Mathematical Statistics, Sultan Chand and Sons, New Delhi, 12th Edition, 2020.

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Year: I Semester: I Branch of Study: Power Systems , EEE

Course Code	Course Title	L	T	P	Credits
19DPC8202	POWER SYSTEM DYNAMICS-I	3	0	0	3

COURSE OUTCOMES:

1. Understand the modeling of synchronous machine in details.
2. Carry out simulation studies of power system dynamics using MATLAB- SIMULINK, MI-POWER.
3. Carry out stability analysis with and without power system stabilizer (PSS).
4. Understand the load modeling in power system.

UNIT-I

Power system stability states of operation and system security – system dynamics – problems system model analysis of steady State stability and transient stability – simplified representation of Excitation control.

UNIT-II

Synchronous machine – park's Transformation-analysis of steady state performance per – unit quantities-Equivalent circuits of synchronous machine determination of parameters of equivalent circuits..

UNIT-III

Sub-transient and transient inductance and Time constants, Simplified models of synchronous machines

UNIT-IV

Small signal analysis with block diagram – Representation Characteristic equation and application of Routh Hurwitz criterion- synchronizing and damping torque analysis-small signal model – State equations.

UNIT-V

Excitation systems and Philips-Heffron model, PSS Load modeling, Modeling of Induction Motors, Prime mover controllers.

Text book:

1. P. M. Anderson & A. A. Fouad "Power System Control and Stability", Galgotia , New Delhi, 1981
2. J Machowski, J Bialek& J. R W. Bumby, "Power System Dynamics and Stability", John Wiley & Sons, 1997

References:

1. P.Kundur, "Power System Stability and Control", McGraw Hill Inc., 1994.
2. E.W. Kimbark, "Power system stability", Vol. I & III, John Wiley & Sons, New York 2002

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Year: I **Semester: I** **Branch of Study: Power Systems, EEE**

Course Code	Course Title	L	T	P	Credits
19DPE8201	RENEWABLE ENERGY SYSTEM	3	0	0	3

COURSE OUTCOMES:

1. Knowledge about renewable energy
2. Understand the working of distributed generation system in autonomous/grid Connected modes
3. Know the Impact of Distributed Generation on Power System

UNIT-I

Introduction, Distributed vs Central Station Generation, Sources of Energy such as Micro-turbines, Internal Combustion Engines.

UNIT-II

Introduction to Solar Energy, Wind Energy, Combined Heat and Power Hydro Energy, Tidal Energy, Wave Energy, Geothermal Energy, Biomass and Fuel Cells.

UNIT-III

Introduction to power electronic devices, AC/DC converters, Pulse width modulation(PWM) and Total harmonic distortion(THD).

UNIT-IV

Power quality management (voltage dips, harmonics and flickers). Frequency management. Influence of WECS on system transient response – IEEE standard and Polices

UNIT-V

Transmission System Operation, Protection of Distributed Generators, Economics of Distributed Generation Case Studies.

Text book:

1. RanjanRakesh, Kothari D.P, Singal K.C, "Renewable Energy Sources and Emerging Technologies", 2nd Ed. Prentice Hall of India ,2011
2. Math H.Bollen, Fainan Hassan, "Integration of Distributed Generation in the Power System", July 2011, Wiley –IEEE Press

References:

1. Loi Lei Lai, Tze Fun Chan, "Distributed Generation: Induction and Permanent Magnet Generators", October 2007, Wiley-IEEE Press.
2. Roger A.Messenger, Jerry Ventre, "Photovoltaic System Engineering", 3rd Ed, 2010
3. James F.Manwell, Jon G.McGowan, Anthony L Rogers, "Wind energy explained: Theory Design and Application", John Wiley and Sons 2nd Ed, 2010

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Year:I Semester : I Branch of Study: Power Systems,EEE

Course Code	Course Title	L	T	P	Credits
19DPE8202	SMART GRIDS	3	0	0	3

COURSE OUTCOMES :

1. Appreciate the difference between smart grid & conventional grid
2. Apply smart metering concepts to industrial and commercial installations
3. Formulate solutions in the areas of smart substations ,distributed generation and wide area measurements
4. Come up with smart grid solutions using modern communication technologies

UNIT I

Introduction to Smart Grid, Evolution of Electric Grid, Concept of Smart Grid, Definitions.Need of Smart Grid. Concept of Robust &Self Healing Grid.Present development & International policies in Smart Grid

UNIT II

Introduction to Smart Meters. Real Time Prizing. Smart Appliances. Automatic Meter Reading(AMR). Outage Management System(OMS). Plug in Hybrid Electric Vehicles(PHEV).Vehicle to Grid. Smart Sensors. Home& Building Automation.Smart Substations.Substation Automation.Feeder Automation

UNIT III

Geographic Information System(GIS).Intelligent Electronic Devices(IED) & their application for monitoring & protection. Smart storage like Battery. SMES. Pumped Hydro. Compressed Air Energy Storage.Wide Area Measurement System(WAMS).Phase easurement Unit(PMU)

UNIT IV

Concept of micro-grid.Need & applications of micro-grid, Formation of micro-grid.Issues of Interconnection, Protection & control of micro-grid, Plastic & Organic solar cells,Thin film solar cells, Variable speed wind generators. Fuel-cells, Micro-turbines., Captive power plants. Integration of renewable energy sources.

UNIT V

Power Quality & EMC in Smart Grid. Power Quality issues of Grid connected Renewable Energy Sources. Power Quality Conditioners for Smart Grid.Web based Power Quality monitoring. Power Quality AuditAdvanced Metering Infrastructure (AMI). Home Area Network (HAN),Neighborhood Area,Network (NAN),Wide Area Network (WAN), Bluetooth,ZigBee. GPS, Wi-Fi.Wi-Max based communication.Wireless MeshNetwork.Basics of CLOUD Computing & Cyber Security for Smart Grid. Broadband over Powerline (BPL).IP based protocols

Text book:

1. Ali Keyhani, "Design of smart power grid renewable energy systems", Wiley IEEE,2011
2. Clark W. Gellings, "The Smart Grid: Enabling Energy Efficiency and Demand Response", CRC Press ,2009

References:

1. JanakaEkanayake, Nick Jenkins, KithsiriLiyanage, "Smart Grid: Technology and Applications", Wiley 2012
2.StuartBorlase,"Smart Grid :Infrastructure , Technology and solutions " CRC Press
3. A.G.Phadke, "Synchronized Phasor Measurement and their Applications", Springer.

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Year: I Semester: I Branch of Study: Power Systems,EEE

Course Code	Course Title	L	T	P	Credits
19DPE8203	HIGH POWER CONVERTERS	3	0	0	3

COURSE OUTCOMES:

1. Analyze various single phase and three phase power converters.
2. Select and design DC - DC converter topologies for a broad range of power conversion applications.
3. Develop improved power converters for any stringent application requirements.
4. Design AC - AC converters for variable frequency applications.

UNIT I
SINGLE PHASE & THREE PHASE CONVERTERS

Principle of phase controlled converter operation - single-phase full converter and semi-converter (RL,RLE load)- single phase dual converter - Three phase operation fullconverter and semi-converter(R,RL,RLE load) - reactive power - power factorimprovement techniques - PWM rectifiers.

UNIT II
DC-DC CONVERTERS

Limitations of linear power supplies, switched mode power conversion - Non-isolated DC- DC converters: operation and analysis of Buck, Boost, Buck-Boost, Cuk& SEPIC under continuous and discontinuous operation - Isolated converters: basic operation of Flyback.

UNIT III
DESIGN OF POWER CONVERTER COMPONENTS

Introduction to magnetic materials- hard and soft magnetic materials - types of cores, copper windings - Design of transformer - Inductor design equations - Examples ofinductor design for buck/flyback converter-selection of output filter capacitors - selection ofratings for devices - input filter design.

UNIT IV
RESONANT DC-DC CONVERTERS

Switching loss, hard switching, and basic principles of soft switching- classification ofresonant converters- load resonant converters - series and parallel - resonant switch converters - operation and analysis of ZVS, ZCS converters comparison of ZCS/ZVS - Introduction to ZVT/ZCT PWM converters.

UNIT V
AC-AC CONVERTERS

Principle of on-off and phase angle control - single phase AC voltage controller – analysiswith R & RL load - Three phase AC voltage controller - principle of operation of cycloconverter - single phase and three phase Cycloconverters – Introduction to matrixconverters.

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TEXT BOOKS:

1. N. Mohan,T.M. Undeland and W.P. Robbins, "Power Electronics: converters, application and design" John Wiley and sons.Wiley India edition, 2006.
2. Rashid M.H., "Power Electronics Circuits, Devices and Applications ", Prentice HallIndia, Third Edition, New Delhi, 2004.
3. P.C. Sen, "Modern Power Electronics", Wheeler Publishing Co, First Edition,New Delhi, 1998.

REFERENCE BOOKS:

1. P.S.Bimbra, "Power Electronics", Khanna Publishers, Eleventh Edition, 2003.
2. Simon Ang, Alejandro Oliva, "Power-Switching Converters", Second Edition,CRC Press, Taylor & Francis Group, 2010.
3. Marian K.Kazimierczuk and DariuszCzarkowski, "Resonant Power Converters",John Wiley & Sons limited, 2011.

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Year: I Semester: I Branch of Study: Power Systems,EEE

Course Code	Course Title	L	T	P	Credits
19DPE8204	WIND AND SOLAR SYSTEMS	3	0	0	3

COURSE OUTCOMES:

1. Appreciate the importance of energy growth of the power generation from the renewable energy sources and participate in solving these problems
2. Demonstrate the knowledge of the physics of wind power and solar power generation and all associated issues so as to solve practical problems
3. Demonstrate the knowledge of physics of solar power generation and the associated issues
4. Identify, formulate and solve the problems of energy crises using wind and solar energy

UNIT-I

Historical development and current status, characteristics of wind power generation, network integration issues.

UNIT-II

Generators and power electronics for wind turbines, power quality standards for wind turbines, Technical regulations for interconnections of wind farm with power systems.

UNIT-III

Isolated wind systems, reactive power and voltage control, economic aspects, Impacts on power system dynamics, power system interconnection.

UNIT-IV

Introduction of solar systems, merits and demerits, concentrators, various applications.

UNIT-V

Solar thermal power generation, PV power generation, Energy Storage device, Designing the solar system for small installations.

Text Books:

1. Thomas Ackermann, Editor, "Wind power in Power Systems", John Willy and sons ltd.2005.
2. Siegfried Heier, "Grid integration of wind energy conversion systems", John Willy and sons ltd.,2006.

Reference Book:

1. K. Sukhatme and S.P. Sukhatme, "Solar Energy". Tata MacGraw Hill, Second Edition, 1996.

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Year: I Semester: I Branch of Study: Power Systems,EEE

Course Code	Course Title	L	T	P	Credits
19DPE8205	ELECTRIC POWER DISTRIBUTION SYSTEM	3	0	0	3

COURSE OUTCOMES:

1. Knowledge of power distribution system
2. Study of Distribution automation and its application in practice
3. To learn SCADA system

UNIT-I:

Distribution of Power, Management, Power Loads, Load Forecasting Short-term & Long-term, Power System Loading, Technological Forecasting.

UNIT-II:

Advantages of Distribution Management System (D.M.S.) Distribution Automation: Definition, Restoration / Reconfiguration of Distribution Network, Different Methods and Constraints, Power Factor Correction.

UNIT-III:

Interconnection of Distribution, Control & Communication Systems, Remote Metering, Automatic Meter Reading and its implementation

UNIT-IV:

SCADA: Introduction, Block Diagram, SCADA Applied To Distribution Automation.Common Functions of SCADA, Advantages of Distribution Automation through SCADA.

UNIT-V:

Calculation of Optimum Number of Switches, Capacitors, Optimum,Switching Device Placement in Radial, Distribution Systems, Sectionalizing Switches – Types, Benefits, Bellman's Optimality Principle, Remote Terminal Units, Energy efficiency in electrical distribution & Monitoring.Maintenance of Automated Distribution Systems,Difficulties in Implementing istribution. Automation in Actual Practice, Urban/Rural Distribution, Energy Management, AI techniques applied to Distribution Automation

Text Books

1. A.S. Pabla, " Electric Power Distribution", Tata McGraw Hill Publishing Co. Ltd., Fourth Edition.
2. M.K. Khedkar, G.M. Dhole, "A Text Book of Electrical power Distribution Automation", University Science Press, New Delhi
3. Anthony J Panseni, "Electrical Distribution Engineering", CRC Press

References:

1. L. S. Bobrow - "Fundamentals of Electrical Engineering" - Oxford University Press -2011.
2. C.L. Wadhwa – "Generation Distribution and Utilization of Electrical Energy", 3rd Edition, New Age International Publications.

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Year: I Semester: I Branch of Study: Power Systems,EEE

Course Code	Course Title	L	T	P	Credits
19DPE8206	MATHEMATICAL METHODS FOR POWER ENGINEERING	3	0	0	3

COURSE OUTCOMES:

1. Knowledge about vector spaces, linear transformation, eigen values and eigenvectors of linear operators
2. To learn about linear programming problems and understanding the simplex method for solving linear programming problems in various fields of science and technology
3. Acquire knowledge about nonlinear programming and various techniques used for solving constrained and unconstrained nonlinear programming problems
4. Understanding the concept of random variables, functions of random variable and their probability distribution
5. Understand stochastic processes and their classification

UNIT-I

Vector spaces, subspaces, Linear dependence, Basis and Dimension, Linear transformations, Kernels and Images , Matrix representation of linear transformation, Change of basis, Eigen values and Eigen vectors of linear operator.

UNIT-II

Mathematical formulation of Linear Programming Problems, Simplex Method, Duality in Linear Programming, Dual Simplex method.

UNIT-III

Non Linear Programming preliminaries, Unconstrained Problems ,Search methods , Fibonacci Search, Golden Section Search, Constrained Problems , Lagrange method ,Kuhn- Tucker conditions .

UNIT-IV

Operations on Random Variables, Distributions and Density functions, Moments and Moment generating function, Independent Random Variables, Marginal and Conditional distributions, Conditional Expectation,

UNIT-V

Elements of stochastic processes, Classification of general stochastic processes.

Text Books:

1. Kenneth Hoffman and Ray Kunze, "Linear Algebra", 2nd Edition, PHI, 1992
2. Erwin Kreyszig, "Introductory Functional Analysis with Applications", John Wiley & Sons, 2004
3. Irwin Miller and Marylees Miller, John E. Freund's "Mathematical Statistics", 6th Edn, PHI, 2002

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Year: I Semester: I Branch of Study: Power Systems, EEE

Course Code	Course Title	L	T	P	Credits
19DPE8207	PULSE WIDTH MODULATION FOR PE CONVERTERS	3	0	0	3

COURSE OUTCOMES:

1. Use the knowledge of PWM techniques in controlling different powerelectronicconverters.
2. Apply the knowledge of power electronics in design and analysis of DC-PWMconverters.
3. Design and analyze DC-AC and AC-DC converters and control their operation usingPWM techniques.
4. Design and analyze different resonant converters and their control circuits.
5. Analyze AC – AC converters and multilevel converters.

UNIT-I

PWM DC-DC Converters: Analysis of Galvanically Isolated Forward Converter, BoostConverter, Push – Pull (Symmetric) Converters - Analysis of Idealized Circuit in Continuous mode, Output Characteristics, Selection of Components, DC Pre-magnetization of the Core, HalfBridge Converter, Bridge Converter, Hamilton Circuit, Ćuk Converters - Elimination of theCurrent Ripple, Ćuk Converters with Galvanic Isolation.

UNIT- II

Control Modules:Basic Principles and Characteristics of PWM Control Modules – CircuitAnalysis, Simple PWM, Voltage-Controlled PWM, Current-Controlled PWM-CompensatedPWM.DC/AC Converters - Inverters: Single-Phase Voltage Inverters - Pulse-Controlled OutputVoltage, Pulse-Width Modulated Inverters - Unipolar PWM, Three-Phase Inverters-Overmodulation (ma > 1), Asynchronous PWM, Space Vector Modulation - Space Vector Modulation:Basic Principles, Application of Space Vector Modulation Technique, Direct and InverseSequencing, Real Drive Influence.

UNIT- III

AC-DC Converters - Rectifiers: Rectifiers with Circuit for Power Factor Correction, ActiveRectifier - Active Rectifier with Hysteresis Current Controller, PWM Rectifiers – AdvancedControl Techniques of PWM Rectifiers , PWM Rectifier with Current Output, PWM Rectifiers inActive Filters, Some Topologies of PWM Rectifiers, Applications of PWM Rectifiers.

UNIT -IV

Resonant Converters: Resonant Circuits - Resonant Converters of Class D, Series ResonantConverters, Parallel Resonant Converters, Series – Parallel Resonant Converter, Series ResonantConverters Based on GTO Thyristors, Class E Resonant Converters, DC/DC Converters Based onResonant Switches - ZCS Quasi-resonant Converters, ZVS Quasi-resonant Converters,Multiresonant Converters, ZVS Resonant DC/AC Converters, Soft Switching PWM DC/DCConverters.

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UNIT- V

AC/AC Converters: Single-Phase AC/AC Voltage Converters - Basic Characteristics, Bidirectional Switches, Realization of InputFilter,Current Commutation, Protection of Matrix Converter, Application of Matrix Converter.Introduction to Multilevel Converters: Basic Characteristics -Multilevel DC/DC Converters,Time Interval: $nT < t < nT + DT$, $n = 0, 1, 2$,Time Interval: $nT + DT < t < (n + 1)T$, MultilevelInverters - Cascaded H-Bridge Inverters, Diode-Clamped Multilevel Inverters, Flying CapacitorMultilevel Inverter.

TEXT BOOKS:

1. D. Grahame Holmes and Thomas A. Lipo "Pulse Width Modulation For Power ConvertersPrinciples and Practice" Wiley-IEEE Press 2003.
2. N. Mohan, T. M. Undeland and W. P. Robbins, "Power Electronics: converters, application and design" John Wiley and sons. Wiley India edition, 2006.

REFERENCE BOOKS:

1. Branko L. Doki ć BrankoBlanu, "Power Electronics Converters and Regulators", Springer(International Publishing, Switzerland) 3rd Edition, 2015.
2. V. T. Ranganathan, Course Notes on Electric Drives, Indian Institute of Science, Bangalore2004.
3. Erickson RW, "Fundamentals of Power Electronics", Chapman Hall, 1997.
4. Joseph Vithyathil, "Power Electronics- Principles and Applications", Tata McGraw-Hill, 2011.

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Year: I Semester: I Branch of Study: Power Systems, EEE

Course Code	Course Title	L	T	P	Credits
19DPE8208	ELECTRIC AND HYBRID VECHILES	3	0	0	3

COURSE OUTCOMES:

1. Acquire knowledge about fundamental concepts, principles, analysis and design of hybrid and electric vehicles.
2. To learn electric drive in vehicles / traction.

UNIT-I

History of hybrid and electric vehicles, Social and environmental importance of hybrid and electric vehicles Impact of modern drive-trains on energy supplies Basics of vehicle performance, vehicle power source characterization Transmission characteristics Mathematical models to describe vehicle performance

UNIT-II

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

Introduction to electric components used in hybrid and electric vehicles Configuration and control of DC Motor drives Configuration and control of Introduction Motor drives configuration and control of Permanent Magnet Motor drives Configuration and control of Switch Reluctance Motor drives, drive system efficiency

UNIT-IV

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

Introduction to energy management and their strategies used in hybrid and electric vehicle Classification of different energy management strategies Comparison of different energy management strategies Implementation issues of energy strategies

Text Books :

1. Sira -Ramirez, R. Silva Ortigoza, "Control Design Techniques in Power Electronics Devices", Springer.
2. Siew-Chong Tan, Yuk-Ming Lai, Chi Kong Tse, "Sliding mode control of switching Power Converters"

Reference Books:

1. Electric and Hybrid Vehicles: Design Fundamentals, Second Edition by Iqbal Husain

2. Advanced Hybrid and Electric Vehicles: System Optimization and Vehicle Integration

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Year: I Semester: I Branch of Study: Power Systems, EEE

Subject Code	Subject Name	L	T	P	Credits
19DMC9901	English for Research Paper Writing	2	0	0	0

Course Outcomes: At the end of the course, students will be able to

1. Understand that how to improve your writing skills and level of readability
2. Learn about what to write in each section
3. Understand the skills needed when writing a Title
4. Develop writing skill
5. Able to quote phrases

UNIT – I

Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness

UNIT – II

Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticizing, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts. Introduction

UNIT – III

Review of the Literature, Methods, Results, Discussion, Conclusions, the Final Check.Key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature,

UNIT – IV

Skill needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions

UNIT -V

Useful phrases, how to ensure paper is as good as it could possibly be the first- time submission

REFERENCES:

1. Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books)
2. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press
3. Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman'sbook .
4. Adrian Wallwork, English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011

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Year: I Semester: I Branch of Study: Power Systems, EEE

Subject Code	Subject Name	L	T	P	Credits
19DMC0101	Disaster Management	2	0	0	0

Course Outcomes: At the end of the course, students will be able to

1. Learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.
2. Critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
3. Develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
4. Critically understand the strengths and weaknesses of disaster management approaches, planning and programming in different countries, particularly their home country or the countries they work in

UNIT – I

Introduction: Disaster: Definition, Factors and Significance; Difference between Hazard and Disaster; Natural and Manmade Disasters: Difference, Nature, Types and Magnitude.Repercussions of Disasters and Hazards: Economic Damage, Loss of Human and Animal Life, Destruction of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts And Famines, Landslides And Avalanches, Man- made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks And Spills, Outbreaks Of Disease And Epidemics, War And Conflicts.

UNIT – II

Disaster Prone Areas in IndiaStudy Of Seismic Zones; Areas Prone To Floods and Droughts, Landslides andAvalanches; Areas Prone To Cyclonic and Coastal Hazards with Special Referenceto Tsunami; Post-Disaster Diseases and Epidemics

UNIT – III

Disaster Preparedness and ManagementPreparedness: Monitoring of Phenomena Triggering a Disaster or Hazard;Evaluation of Risk: Application of Remote Sensing, Data from Meteorological andother Agencies, Media Reports: Governmental and Community Preparedness.

UNIT – IV

Risk Assessment Disaster Risk: Concept and Elements, Disaster Risk Reduction, Global And National Disaster Risk Situation. Techniques Of Risk Assessment, Global Co-Operation In Risk Assessment And Warning, People's Participation In Risk Assessment. Strategies for Survival.

UNIT -V

Disaster Mitigation Meaning, Concept and Strategies of Disaster Mitigation, Emerging Trends In Mitigation. Structural Mitigation and Non-Structural Mitigation, Programs Of Disaster Mitigation In India.

REFERENCES:

1. R. Nishith, Singh AK, "Disaster Management in India: Perspectives, issues and strategies" New Royal book Company.

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Year: I Semester: I Branch of Study: Power Systems, EEE

Subject Code	Subject Name	L	T	P	Credits
19DMC9902	Sanskrit for Technical Knowledge	2	0	0	0

Course Outcomes: At the end of the course, students will be able to

1. To get a working knowledge in illustrious Sanskrit, the scientific language in the world
2. Learning of Sanskrit to improve brain functioning
3. Understanding basic Sanskrit language
4. Ancient Sanskrit literature about science & technology can be understood
5. Being a logical language will help to develop logic in students

UNIT – I

Alphabets in Sanskrit, Past/Present/Future Tense,

UNIT – II

Simple Sentences

UNIT – III

Order, Introduction of roots

UNIT – IV

Technical information about Sanskrit Literature

UNIT -V

Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics

REFERENCES:

1. "Abhyaspustakam" – Dr. Vishwas, Samskrita-Bharti Publication, New Delhi
2. "Teach Yourself Sanskrit" Prathama Deeksha-VempatiKutumbshastri, Rashtriya Sanskrit Sansthanam, New Delhi Publication
3. "India's Glorious Scientific Tradition" Suresh Soni, Ocean books (P) Ltd., New Delhi.

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Year: I Semester: I Branch of Study: Power Systems, EEE

Course Code	Course Title	L	T	P	Credits
19DPC8203	POWER SYSTEM STEADY STATE ANALYSIS LAB	0	0	4	2

Course outcomes

1. Calculate voltage phasors at all buses , given the data using various methods of load flow
2. Calculate fault currents in each phase
3. Estimate closeness to voltage collapse and calculate PV curves using continuation power flow

List of the Experiments

1. Transient Stability Studies.
   (i).Transient and Small Signal Stability Analysis: Single-Machine Infinite Bus System
   (ii).Transient and Small Signal Stability Analysis: Multi-Machine Power system.
2. Short Circuit Studies.
3. Load Flow Studies
   (i).Load flow study for a given power system using NR
   (ii).Load flow study for a given power system using Fast decoupled method.
4. Load Forecasting and Unit Commitment
5. Load-frequency control of a single area power system.
6. Load-frequency control of a two-area power system.

Text Books:

1. J.J. Grainger &W.D.Stevenson, "Power system analysis ", McGraw Hill ,2003
2. A. R. Bergen & Vijay Vittal , "Power System Analysis" ,Pearson , 2000.

Reference Books:

1.L.P. Singh , "Advanced Power System Analysis and Dynamics", New Age International, 2006
2. G.L. Kusic, "Computer aided power system analysis" ,Prentice Hall India, 1986
3.A.J. Wood, " Power generation, operation and control" , John Wiley, 1994

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Year: I **Semester: I** **Branch of Study: Power Systems, EEE**

Course Code	Course Title	L	T	P	Credits
19DPC8204	RENEWABLE ENERGY LAB	0	0	4	2

COURSE OUTCOMES:

1. Knowledge about renewable energy
2. Understand the working of distributed generation system in autonomous/grid Connected modes
3. Know the Impact of Distributed Generation on Power System

List of Experiments:

1. Power Curves
2. Build a Wind Farm
3. Test the Capabilities of the Hydrogen Fuel Cells and Capacitors
4. Effect of Temperature on Solar Panel Output
5. Variables Affecting Solar Panel Output
6. Effect of Load on Solar Panel Output
7. Wind Turbine Output: The Effect of Load
8. Test the Capabilities of Solar Panels and Wind Turbines

Text books:

1. RanjanRakesh, Kothari D.P, Singal K.C, "Renewable Energy Sources and Emerging Technologies", 2nd Ed. Prentice Hall of India ,2011
2. Math H.Bollen, Fainan Hassan, "Integration of Distributed Generation in the Power System", July 2011, Wiley –IEEE Press

References:

1. Loi Lei Lai, Tze Fun Chan, "Distributed Generation: Induction and Permanent Magnet Generators", October 2007, Wiley-IEEE Press.
2. Roger A.Messenger, Jerry Ventre, "Photovoltaic System Engineering", 3rd Ed, 2010
3. James F.Manwell, Jon G.McGowan, Anthony L Rogers, "Wind energy explained: Theory Design and Application", John Wiley and Sons 2nd Ed, 2010

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Year: I Semester: II Branch of Study: Power Systems, EEE

Course Code	Course Title	L	T	P	Credits
19DPC8205	DIGITAL PROTECTION OF POWER SYSTEM	3	0	0	3

COURSE OUTCOMES:

1. Learn the importance of Digital Relays.
2. Apply Mathematical approach towards protection
3. Learn to develop various Protection algorithms

UNIT-I

Evolution of digital relays from electromechanical relays, Performance and operational characteristics of digital protection, Mathematical background to protection algorithms: Finite difference techniques

UNIT-II

Interpolation formulae: Forward, backward and central difference interpolation , Numerical differentiation, Curve fitting and smoothing, Least squares method, Fourier analysis, Fourier series and Fourier transform, Walsh function analysis

UNIT-III

Basic elements of digital protection: Signal conditioning: transducers, surge protection, analog filtering, analog multiplexers

Conversion subsystem: the sampling theorem, signal aliasing error, sample and hold circuits, multiplexers, analog to digital conversion, Digital filtering concepts, The digital relay as a unit consisting of hardware and software

UNIT-IV

Sinusoidal wave based algorithms: Sample and first derivative (Mann and Morrison) algorithm. Fourier and Walsh based algorithms,

UNIT-V

Fourier Algorithm: Full cycle window algorithm, fractional cycle window algorithm. Walsh function based algorithm, Least Squares based algorithms, Differential equation based algorithms, and Traveling Wave based Techniques, Digital Differential Protection of Transformers, Digital Line Differential Protection, and Recent Advances in Digital Protection of Power Systems

Text books:

1. A.G. Phadke and J. S. Thorp, **"Computer Relaying for Power Systems"**, Wiley/Research studies Press, 2009
2. A.T. Johns and S. K. Salman, **"Digital Protection of Power Systems",** IEEE Press, 1999

Reference Books:

1. Gerhard Zeigler, "Numerical Distance Protection", Siemens Publicis Corporate Publishing, 2006
2. S.R. Bhide "Digital Power System Protection" PHI Learning Pvt. Ltd. 2014

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Year: I Semester: II Branch of Study: Power Systems, EEE

Course Code	Course Title	L	T	P	Credits
19DPC8206	POWER SYSTEM DYNAMICS-II	3	0	0	3

COURSE OUTCOMES:

1. Gain valuable insights into the phenomena of power system including obscure ones.
2. Understand the power system stability problem.
3. Analyze the stability problems and implement modern control strategies.
4. Simulate small signal and large signal stability problems.

UNIT-I

Basic Concepts of Dynamic Systems and Stability Definition Small Signal Stability (Low Frequency Oscillations) of Unregulated and Regulated System.

UNIT-II

Effect of Damper, Flux Linkage Variation and AVR 8 Large Signal Rotor Angle Stability Dynamic Equivalents And Coherency, Direct Method of Stability Assessment Stability Enhancing Techniques, Mitigation Using Power System Stabilizer.

UNIT-III

Asynchronous Operation and Resynchronization Multi-Machine Stability.

UNIT-IV

Dynamic Analysis of Voltage Stability, Voltage Instability and Collapse, Causes of Voltage Collapse and Improvement methods of Voltage Stability.

UNIT-V

Frequency Stability, Automatic Generation Control, Primary and Secondary Control Sub-Synchronous Resonance and Counter Measures.

Text Books:

1. P. Kundur, "Power System Stability and Control", McGraw Hill Inc, 1994
2. J. Machowski, Bialek, Bumby, "Power System Dynamics and Stability", John Wiley & Sons,1997

Reference Books:

1. L. Leonard Grigsby (Ed.); "Power System Stability and Control", Second edition, CRC Press,2007
2. V. Ajjarapu, "Computational Techniques for voltage stability assessment & control"; Springer,2006

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Year: I Semester: II Branch of Study: Power Systems, EEE

Course Code	Course Title	L T P	Credits
19DPE8209	RESTRUCTURED POWER SYSTEMS	3 0 0	3

COURSE OUTCOMES:

1. Learners will have knowledge on restructuring of power industry.
2. Learners will attain knowledge about locational margin prices and financial.
3. Learners will understand basics of congestion management.

UNIT I
INTRODUCTION TO RESTRUCTURING OF POWER INDUSTRY

Introduction: Deregulation of power industry, Restructuring process, Issues involved in deregulation, Deregulation of various power systems – Fundamentals of Economics: Consumer behavior, Supplier behavior, Market equilibrium, Short and long run costs, Various costs of production – Market models: Market models based on Contractual arrangements, Comparison of various market models, Electricity vis – a – vis other commodities, Market architecture, Case study.

UNIT II
TRANSMISSION CONGESTION MANAGEMENT

Introduction: Definition of Congestion, reasons for transfer capability limitation, Importance of congestion management, Features of congestion management – Classification of congestion management methods – Calculation of ATC - Non – market methods – Market methods – Nodal pricing – Inter zonal and Intra zonal congestion management – Price area congestion management – Capacity alleviation method.

UNIT III
LOCATIONAL MARGINAL PRICES AND FINANCIAL TRANSMISSION RIGHTS

Mathematical preliminaries: - Locational marginal pricing– Lossless DCOPF model for LMP calculation – Loss compensated DCOPF model for LMP calculation – ACOPF model for LMP calculation – Financial Transmission rights – Risk hedging functionality -Simultaneous feasibility test and revenue adequency – FTR issuance process: FTR auction, FTR allocation – Treatment of revenue shortfall – Secondary trading of FTRs – Flow gate rights – FTR and market power - FTR and merchant transmission investment.

UNIT IV
ANCILLARY SERVICE MANAGEMENT AND PRICING OF TRANSMISSION NETWORK

Introduction of ancillary services – Types of Ancillary services – Classification of Ancillary services – Load generation balancing related services – Voltage control and reactive power support devices – Black start capability service - How to obtain ancillary service –Co-optimization of energy and reserve services - Transmission pricing – Principles – Classification – Rolled in transmission pricing methods – Marginal transmission pricing paradigm – Composite pricing paradigm – Merits and demerits of different paradigm.

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UNIT V

REFORMS IN INDIAN POWER SECTOR

Introduction – Framework of Indian power sector – Reform initiatives - Availability based tariff – Electricity act 2003 – Open access issues – Power exchange – Reforms in the near future

Text Books:

1. Mohammad Shahidehpour, Muwaffaq Alomoush, Marcel Dekker, "Restructured electrical power systems: operation, trading and volatility" Pub., 2001.
2. Kankar Bhattacharya, Jaap E. Daadler, Math H.J. Boolen, "Operation of restructured power systems", Kluwer Academic Pub., 2001.

Reference Books:

1. Paranjothi, S.R. , "Modern Power Systems" Paranjothi, S.R. , New Age International, 2017.
2. Sally Hunt," Making competition work in electricity", John Willey and Sons Inc. 2002.
3. Steven Stoft, "Power system economics: designing markets for electricity", John Wiley & Sons, 2002.

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Year: I Semester: II Branch of Study: Power Systems, EEE

Course Code	Course Title	L	T	P	Credits
19DPE8210	ADVANCED DIGITAL SIGNAL PROCESSING	3	0	0	3

COURSE OUTCOMES:

1. Knowledge about the time domain and frequency domain representations as well analysis of discrete time signals and systems
2. Study the design techniques for IIR and FIR filters and their realization structures.
3. Acquire knowledge about the finite word length effects in implementation of digital filters.
4. Knowledge about the various linear signal models and estimation of power spectrum of stationary random

Unit-I

Discrete time signals, Linear shift invariant systems, Stability and causality,Sampling of continuous time signals,Discrete time Fourier transform- Discrete Fourier series- Discrete Fourier,transform Z transform-Properties of different transforms.

Unit-II

Linear convolution using DFT, Computation of DFT Design of IIR digital filters from analog filters, Impulse invariance method, Bilinear transformation method.

Unit-III

FIR filter design using window functions, Comparison of IIR and FIR digital filters, Basic IIR and FIR filter realization structures, Signal flow graph representations Quantization process and errors, Coefficient quantisation effects in IIR and FIR filters.

Unit-IV

A/D conversion noise- Arithmetic round-off errors , Dynamic range scaling, Overflow oscillations and zeroInput limit cycles in IIR filters, Linear Signal Models.

Unit-V

All pole, All zero and Pole-zero models Power spectrum estimation- Spectral analysis of deterministic signals, Estimation of power spectrum of stationary random signals. Optimum linear filters Optimum signal estimation, Mean square error estimation, Optimum FIR and IIR Filters.

Text Books:

1. Sanjit K Mitra, "Digital Signal Processing: A computer-based approach ",TataMc Grow-Hill Edition 1998
2. Dimitris G .Manolakis, Vinay K. Ingle and Stephen M. Kogon, "Statistical and Adaptive Signal Processing", Mc Grow Hill international editions .-2000.

Reference Books:

1. A.T. Johns and S. K. Salman, "Digital Protection of Power Systems", IEEE Press,1999
2. Gerhard 2.Zeigler, "Numerical Distance Protection", Siemens Publicis Corporate Publishing, 2006

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Year: I Semester: II Branch of Study: Power Systems, EEE

Course Code	Course Title	L	T	P	Credits
19DPE8211	DYNAMICS OF ELECTRICAL MACHINES	3	0	0	3

COURSE OUTCOMES:

1. Formulation of Electrodynamic equations of all electric machines and analyze the performance characteristics
2. Knowledge of transformations for the dynamic analysis of machines
3. Knowledge of determination of stability of the machines under small signal and transient conditions
4. Study about synchronous machine

UNIT-I

Stability, Primitive 4 Winding Commutator Machine, Commutator Primitive Machine, Complete Voltage Equation of Primitive 4 Winding Commutator Machine.

UNIT-II

Torque Equation Analysis of Simple DC Machines using the Primitive Machine Equations, The Three Phase Induction Motor, Transformed Equations, Different Reference Frames for Induction Motor Analysis Transfer Function Formulation.

UNIT-III

Three Phase Salient Pole Synchronous Machine, Parks Transformation, Steady State Analysis.

UNIT-IV

Large Signal Transient, Small Oscillation Equations in State Variable form, Dynamical Analysis of Interconnected Machines, Large Signal Transient Analysis using Transformed Equations

UNIT-V

DC Generator / DC Motor System, Alternator / Synchronous Motor System.

Text Books:

1. D.P. Sengupta& J.B. Lynn, " Electrical Machine Dynamics", The Macmillan Press Ltd. 1980
2. R Krishnan "Electric Motor Drives, Modeling, Analysis, and Control", Pearson Education.,2001

Reference Books:

1. P.C. Kraus, "Analysis of Electrical Machines", McGraw Hill Book Company,1987
2. I. Boldia& S.A. Nasar, "Electrical Machine Dynamics", The Macmillan Press Ltd. 1992
3. C.V. Jones, "The Unified Theory of Electrical Machines", Butterworth, London. 1967

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Year: I Semester: II Branch of Study: Power Systems, EEE

Course Code	Course Title	L T P	Credits
19DPE8212	POWER APPARATUS DESIGN	3 0 0	3

COURSE OUTCOMES:

1. To give a systematic approach for modeling and analysis of all rotating machines Under both transient and steady state conditions with the dimensions and material used
2. Ability to model and design all types of rotation machines including special machines

UNIT I

Principles of Design of Machines -Specific loadings, choice of magnetic and 8 electric loadings Real and apparent flux densities, temperature rise calculation, dimension for DC machines, Induction machines and synchronous machines, Design of Transformers-General considerations, output equation, emf per turn, choice of flux density and current density, main dimensions, leakage reactance and conductor size, design of tank and cooling

UNIT II

Specific loadings, choice of magnetic and electric loadings Real and apparent flux 8 - densities, temperature rise calculation Separation of main dimension for DC machines, Induction machines and synchronous machines, Heating and cooling of machines, types of ventilation, continuous and intermittent, rating

UNIT III

Calculation of losses, efficiency and regulation, Forces winding during short circuit, Choice of specific electric and magnetic loadings, efficiency, power factor, Number of slots in stator and rotor, Elimination of harmonic torques

UNIT IV

Design of stator and rotor winding, slot leakage flux squirrel cage rotor, Leakage reactance, equivalent resistance of squirrel cage rotor, Magnetizing current, efficiency from design data

UNIT V

Types of alternators, comparison, specific loadings, output co-efficient, design of main dimensions. Introduction to Computer Aided Electrical Machine Design Energy efficient machines

Text Books:

1. Clayton A.E, "The Performance and Design of D.C. Machines", Sir I. Pitman & sons, Ltd.
2. M.G. Say, "The Performance and Design of A.C. Machines ", Pitman.

Reference Books:

1. Sawhney A.K, "A course in Electrical Machine Design", DhanpatRai & Sons, 5th Edition.

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Year: I Semester: II Branch of Study: Power Systems, EEE

Course Code	Course Title	L	T	P	Credits
19DPE8213	ADVANCED MICRO-CONTROLLER BASED SYSTEMS	3	0	0	3

COURSE OUTCOMES:

1. To learn how to program a processor in assembly language and develop an advanced processor based system.
2. To learn configuring and using different peripherals in a digital system.
3. To compile and debug a Program.
4. To generate an executable file and use it.

UNIT-I

Basic Computer Organization, Accumulator based processes-Architecture-Memory Organization-I/O Organization

UNIT-II

Micro-Controllers-Intel 8051, Intel 8056- Registers, Memories.I/O Ports, Serial Communication. Timers, Interrupts, Programming.

UNIT-III

Intel 8051 – Assembly language programming-Addressing-Operations Stack & Subroutines, Interrupts-DMA.

UNIT-IV

PIC 16F877- Architecture Programming, Interfacing Memory/ I/O Devices, Serial I/O and data communication

UNIT-V

Digital Signal Processor (DSP) - Architecture – Programming, Introduction to FPGA Microcontroller development for motor control applications.

Stepper motor control using micro controller, Microcontroller development for motor control applications. Stepper motor control using micro controller.

Text Books:

1. Stuart A. Boyer: "SCADA-Supervisory Control and Data Acquisition", Instrument Society of AmericaPublications, USA,2004.
2. Gordon Clarke, Deon Reynders: "Practical Modern SCADA Protocols: DNP3, 60870.5 and RelatedSystems", Newnes Publications, Oxford, UK,2004.

Reference Books:

1. William T. Shaw, "Cybersecurity for SCADA systems", PennWell Books, 2006.
2. David Bailey, Edwin Wright, "Practical SCADA for industry", Newnes, 2003.

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Year: I Semester: II Branch of Study: Power Systems, EEE

Course Code	Course Title	L	T	P	Credits
19DPE8214	SCADA SYSTEM AND APPLICATIONS	3	0	0	3

COURSE OUTCOMES:

1. Describe the basic tasks of Supervisory Control Systems (SCADA) as well as their typical applications.
2. Acquire knowledge about SCADA architecture, various advantages and disadvantages of eachsystem.
3. Knowledge about single unified standard architecture IEC 61850.
4. To learn about SCADA system components: remote terminal units, PLCs, intelligent electronic devices, HMI systems, SCADA server.
5. Learn and understand about SCADA applications in transmission and distribution sector, industries etc.

UNIT-I

Introduction to SCADA: Data acquisition systems, Evolution of SCADA, Communication technologies.

UNIT-II

Monitoring and supervisory functions, SCADA applications in Utility, Automation, Industries SCADA.

UNIT-III

Industries SCADA System Components: Schemes- Remote Terminal Unit (RTU), Intelligent Electronic Devices (IED), Programmable Logic Controller (PLC), Communication Network, SCADA Server, SCADA/HMI Systems

UNIT-IV

SCADA Architecture: Various SCADA architectures, Advantages and Disadvantages of each system - single unified standard architecture -IEC 61850.

UNIT-V

SCADA Communication: various industrial communication technologies -wired and wireless methods and fiber optics. open standard communication protocols.

SCADA Applications: Utility applications- Transmission and Distribution sector-operations, monitoring, analysis and improvement. Industries - oil, gas and water

Text Books:

1. Stuart A. Boyer: "SCADA-Supervisory Control and Data Acquisition", Instrument Society of AmericaPublications, USA,2004.
2. Gordon Clarke, Deon Reynders: "Practical Modern SCADA Protocols: DNP3, 60870.5 and RelatedSystems", Newnes Publications, Oxford, UK,2004.

ReferenceBooks:

1. William T. Shaw, "Cybersecurity for SCADA systems", PennWell Books, 2006.
2. David Bailey, Edwin Wright, "Practical SCADA for industry", Newnes, 2003.
3. Wiebe, "A guide to utility automation: AMR, SCADA, and IT systems for electric power",PennWell 1999.

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Year: I Semester: II Branch of Study: Power Systems, EEE

Course Code	Course Title	L	T	P	Credits
19DPE8215	ARTIFICIAL INTELLIGENCE TECHNIQUES	3	0	0	3

COURSE OUTCOMES:

1. Learn the concepts of biological foundations of artificial neural networks
2. Learn Feedback networks and radial basis function networks and fuzzy logics
3. Identifications of fuzzy and neural network
4. Acquire the knowledge of GA

UNIT-I

Biological foundations to intelligent Systems, Artificial Neural Networks, Single layer and Multilayer Feed Forward NN, LMS and Back Propagation Algorithm, Feedback networks and Radial Basis Function Networks.

UNIT-II

Fuzzy Logic, Knowledge Representation and Inference Mechanism, Defuzzification Methods

UNIT-III

Fuzzy Neural Networks, some algorithms to learn the parameters of the network like GA, System Identification using Fuzzy and Neural Network.

UNIT-IV

Genetic algorithm, Reproduction cross over, mutation, Introduction to evolutionary program.

UNIT-V

Applications of above mentioned techniques to practical problems.

Text Books:

1.J M Zurada , "An Introduction to ANN",Jaico Publishing House
2. Simon Haykins, "Neural Networks", Prentice Hall
3. Timothy Ross, "Fuzzy Logic with Engg.Applications", McGraw. Hill

ReferenceBooks:

1. Golding, "Genetic Algorithms", Addison-Wesley Publishing Com

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Year: I Semester: II Branch of Study: Power Systems, EEE

Course Code	Course Title	L	T	P	Credits
19DPE8216	POWER QUALITY	3	0	0	3

COURSE OUTCOMES:

1. Acquire knowledge about the harmonics, harmonic introducing devices and effect of harmonics on system equipment and loads
2. Develop analytical modeling skills needed for modeling and analysis of harmonics in networks and components
3. To introduce the student to active power factor correction based on static VAR compensators and its control techniques
4. To introduce the student to series and shunt active power filtering techniques for harmonics.

UNIT-I

Introduction-power quality-voltage quality-overview of power Quality phenomena classification of power quality issues, Power quality measures and standards-THD-TIF-DIN-C-message weights, Flicker factor transient phenomena-occurrence of power quality problems, Power acceptability curves-IEEE guides, Standards and recommended practices.

UNIT-II

Harmonics-individual and total harmonic distortion RMS value of a harmonic waveform, Triplex harmonics. Important harmonic introducing devices. SMPS, Three phase power converters-arcing devices saturable devices, Harmonic distortion of fluorescent lamps-effect of power system harmonics on power system equipment and loads.

UNIT-III

Modeling of networks and components under non-sinusoidal conditions, Transmission and distribution systems, Shunt capacitors-transformers, Electric machines, Ground systems loads that cause power quality problems, Power quality problems created by drives and its impact on drive.

UNIT-IV

Power factor improvement- Passive Compensation, Passive Filtering, Harmonic Resonance. Impedance Scan Analysis, Active Power Factor Corrected Single Phase Front End Control.

UNIT-V

Methods for Single Phase APFC, Three Phase APFC and Control Techniques, PFC based on Bilateral Single Phase and Three Phase Converter.

Text Books:

1. G.T. Heydt, "Electric power quality", McGraw-Hill Professional, 2007
2. Math H. Bollen, "Understanding Power Quality Problems", IEEE Press, 2000

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Year: I Semester: I Branch of Study: Power Systems, EEE

Subject Code	Subject Name	L	T	P	Credits
19DMC9903	Value Education	2	0	0	0

Course Outcomes: At the end of the course, students will be able to

1. Understand value of education and self- development
2. Imbibe good values in students
3. Let the should know about the importance of character
4. Learn the importance of Human values
5. Developing the overall personality

UNIT – I

Values and self-development –Social values and individual attitudes, Work ethics, Indian vision of humanism, Moral and non- moral valuation, Standards and principles, Value judgments

UNIT – II

Importance of cultivation of values, Sense of duty, Devotion, Self-reliance, Confidence, Concentration, Truthfulness, Cleanliness, Honesty, Humanity, Power of faith, National Unity, Patriotism, Love for nature, Discipline

UNIT – III

Personality and Behavior Development - Soul and Scientific attitude, Positive Thinking, Integrity and discipline, Punctuality, Love and Kindness, Avoid fault Thinking, Free from anger, Dignity of labour, Universal brotherhood and religious tolerance, True friendship, Order, Introduction of roots

UNIT – IV

Happiness Vs suffering, love for truth, Aware of self-destructive habits, Association and Cooperation, Doing best for saving nature

UNIT -V

Character and Competence –Holy books vs. Blind faith, Self-management and Good health, Science of reincarnation, Equality, Nonviolence, Humility, Role of Women, All religions and same message, Mind your Mind, Self-control. Honesty, studying effectively

REFERENCES:

1. Chakroborty, S.K. "Values and Ethics for organizations Theory and practice", Oxford University Press, New Delhi

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Year: I Semester: II Branch of Study: Power Systems, EEE

Subject Code	Subject Name	L	T	P	Credits
19DMC5801	Pedagogy Studies	2	0	0	0

Course Outcomes: At the end of the course, students will be able to

1. What pedagogical practices are being used by teachers in formal and informal classrooms in developing countries?
2. What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?
3. How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy? Perspective.
4. Review existing evidence on the review topic to inform programme design and policy making undertaken by the DfID, other agencies and researchers.
5. Identify critical evidence gaps to guide the development.

UNIT – I

Introduction and Methodology: Aims and rationale, Policy background, Conceptual framework and terminology Theories of learning, Curriculum, Teacher education. Conceptual framework, Research questions, Overview of methodology and Searching.

UNIT – II

Thematic overview: Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries. Curriculum, Teacher education.

UNIT – III

Evidence on the effectiveness of pedagogical practices, Methodology for the in depth stage: quality assessment of included studies, How can teacher education (curriculum and practicum) and the school, curriculum and guidance materials best support effective pedagogy? Theory of change, Strength and nature of the body of evidence for effective pedagogical practices, Pedagogic theory and pedagogical approaches, Teachers' attitudes and beliefs and Pedagogic strategies.

UNIT – IV

Professional development: alignment with classroom practices and follow up support Peer support, Support from the head teacher and the community, Curriculum and assessment, Barriers to learning: limited resources and large class sizes

UNIT -V

Research gaps and future directions, Research design, Contexts, Pedagogy, Teacher education, Curriculum and assessment, Dissemination and research impact.

REFERENCES:

1. Ackers J, Hardman F (2001) Classroom interaction in Kenyan primary schools, Compare, 31 (2): 245-261.
2. Agrawal M (2004) Curricular reform in schools: The importance of evaluation, Journal of Curriculum Studies, 36 (3): 361-379.
3. Akyeampong K (2003) Teacher training in Ghana - does it count? Multi-site teacher education research project (MUSTER) country report 1. London: DFID.
4. Akyeampong K, Lussier K, Pryor J, Westbrook J (2013) Improving teaching and learning of basic maths and reading in Africa: Does teacher preparation count? International Journal Educational Development, 33 (3): 272–282.

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Year: I **Semester: II** **Branch of Study: Power Systems, EEE**

Subject Code	Subject Name	L	T	P	Credits
19DMC9905	Stress Management by Yoga	2	0	0	0

Course Outcomes: At the end of the course, students will be able to

1. Develop healthy mind in a healthy body thus improving social health also
2. Improve efficiency
3. To achieve overall health of body and mind
4. To overcome stress
5. Identify critical evidence gaps to guide the development.

UNIT – I

Definitions of Eight parts of yoga (Ashtanga)

UNIT – II

Yam and Niyam. Ahinsa, satya, astheya, bramhacharya and aparigraha

UNIT – III

Shaucha, santosh, tapa, swadhyay, ishwarpranidhan

UNIT – IV

Asan and Pranayam: Various yoga poses and their benefits for mind & body

UNIT -V

Regularization of breathing techniques and its effects-Types of pranayam

REFERENCES:

1. 'Yogic Asanas for Group Tarining-Part-I" :Janardan Swami Yogabhyasi Mandal, Nagpur
2. "Rajayoga or conquering the Internal Nature" by Swami Vivekananda, AdvaitaAshrama
(Publication Department), Kolkata

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Year: I Semester: II Branch of Study: Power Systems, EEE

Subject Code	Subject Name	L	T	P	Credits
19DMC9906	Personality Development through Life Enlightenment Skills	2	0	0	0

Course Outcomes: At the end of the course, students will be able to

1. Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality andb achieve the highest goal in life
2. The person who has studied Geeta will lead the nation and mankind to peace and prosperity
3. Study of Neetishatakam will help in developing versatile personality of students.
4. To become a person with stable mind, pleasing personality and determination
5. To awaken wisdom in students

UNIT – I

Neetisatakam-Holistic development of personality

1. Verses- 19,20,21,22 (wisdom)
2. Verses- 29,31,32 (pride & heroism)
3. Verses- 26,28,63,65 (virtue)
4. Verses- 52,53,59 (dont's)
5. Verses- 71,73,75,78 (do's)

UNIT – II

1. Approach to day to day work and duties.
2. Shrimad Bhagwad Geeta: Chapter 2-Verses 41, 47,48,

UNIT – III

1. Chapter 3-Verses 13, 21, 27, 35, Chapter 6-Verses 5,13,17, 23, 35,
2. Chapter 18-Verses 45, 46, 48.

UNIT – IV

1. Statements of basic knowledge.
2. Shrimad Bhagwad Geeta: Chapter2-Verses 56, 62, 68
3. Chapter 12 -Verses 13, 14, 15, 16,17, 18

UNIT -V

1. Personality of Role model.
2. Shrimad Bhagwad Geeta: Chapter2-Verses 17, Chapter 3-Verses 36,37,42,
3. Chapter 4-Verses 18, 38,39
4. Chapter18 – Verses 37,38,63

REFERENCES:

1. "Srimad Bhagavad Gita" by Swami SwarupanandaAdvaita Ashram (Publication Department), Kolkata
2. Bhartrihari's Three Satakam (Niti-sringar-vairagya) by P.Gopinath, Rashtriya Sanskrit Sansthanam, New Delhi.

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Year: I **Semester: II** **Branch of Study: Power Systems, EEE**

Course Code	Course Title	L	T	P	Credits
19DPC8207	POWER SYSTEM PROTECTION LAB	0	0	4	2

COURSE OUTCOMES:

1. Analyze the protection of parallel, radial feeders & over voltage induction relay
2. Understand the principle of Reverse Power protection
3. Analyze the functioning of over voltage induction relay & Differential Relay

LIST OF THE EXPERIMENTS:

1. Apply a relay for phase sequence, phase failure and voltage asymmetry to a three-phase circuit
2. To use a timer with different time functions to extend the protection relays operation
3. Modeling of Differential Relay using MATLAB
4. Radial Feeder Protections
5. Parallel Feeder Protections
6. Principle of Reverse Power Protection
7. Differential Protection of Transformer
8. To the study time Vs voltage characteristics of over voltage induction relay

Text books:

1. A.G. Phadke and J. S. Thorp, "Computer Relaying for Power Systems", Wiley/Research studies Press, 2009
2. A.T. Johns and S. K. Salman, "Digital Protection of Power Systems", IEEE Press,1999

Reference Books:

1. Gerhard Zeigler, "Numerical Distance Protection", Siemens Publicis Corporate Publishing, 2006
2. S.R. Bhide "Digital Power System Protection" PHI Learning Pvt. Ltd. 2014

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Year: I Semester: II Branch of Study: Power Systems, EEE

Course Code	Course Title	L	T	P	Credits
19DPC8208	POWER QUALITY LAB	0	0	4	2

COURSE OUTCOMES:

1. Analyze harmonics, voltage and current distortions
2. Understand the effects of ground loop, voltage flicker & sags
3. Evaluate the harmonics using PSCAD software

From the following experiments students may select any 10 experiments:

1. To study the effect of non linear loads on power quality.
2. To demonstrate the voltage and current distortions experimentally.
3. To reduce the current harmonics with filters.
4. To study the voltage sag due to starting of large induction motor.
5. To study the capacitor switching transients.
6. To study the effect of balanced non linear load on neutral current , in a three phase circuit
7. To study the effect of ground loop.
8. To study the effect of voltage flicker.
9. To calculate the distortion power factor.
10. Study the effect of harmonics on energy meter reading.
11. To study effect of voltage sag on electrical equipments.
12. To obtain the current harmonics drawn by power electronics interface using PSCAD software

Text books:

1. G.T. Heydt, "Electric power quality", McGraw-Hill Professional, 2007
2. Math H. Bollen, "Understanding Power Quality Problems", IEEE Press, 2000

Reference Books:

1. J. Arrillaga, "Power System Quality Assessment", John wiley, 2000
2. J. Arrillaga, B.C. Smith, N.R. Watson & A. R.Woo ,"Power system Harmonic Analysis", Wiley, 1997

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Year: I Semester: II Branch of Study: Power Systems, EEE

Course Code	Course Title	L	T	P	Credits
19DPC8209	ARTIFICIAL INTELLIGENCE LAB	0	0	4	2

COURSE OUTCOMES:

1. Learn the concepts of biological foundations of artificial neural networks
2. Learn Feedback networks and radial basis function networks and fuzzy logics
3. Identifications of fuzzy and neural network
4. Acquire the knowledge of GA

List of Experiments:

1. Write A Program For Best First Search.
2. Write A Program to Generate the output for A* Algorithm.
3. Write a Program To Show the Tic Tac Toe Game for 0 and X.
4. Write A Program For Expert System By Using Forward Chaining.
5. Comparing the Search Methods.
6. Implement the Greedy Search Algorithm.
7. Implement the min-max Algorithm.
8. Adding a Heuristic

Text Books:

1. J M Zurada , "An Introduction to ANN",Jaico Publishing House
2. Simon Haykins, "Neural Networks", Prentice Hall
3. Timothy Ross, "Fuzzy Logic with Engg.Applications", McGraw. Hill

Reference Books:

1. Driankov, Dimitra, "An Introduction to Fuzzy Control", Narosa Publication
2. Golding, "Genetic Algorithms", Addison-Wesley Publishing Com

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Year: II Semester: I Branch of Study: Power Systems, EEE

Course Code	Course Title	L	T	P	Credits
19DPE8217	POWER SYSTEM TRANSIENTS	3	0	0	3

COURSE OUTCOMES:

1. Knowledge of various transients that could occur in power system and their mathematical Formulation.
2. Ability to design various protective devices in power system for protecting equipment and Personnel.
3. Coordinating the insulation of various equipments in power system.
4. Modeling the power system for transient analysis

UNIT I:

Fundamental circuit analysis of electrical transients, Laplace Transform method of solving simple Switching transients, Damping circuits -Abnormal switching transients, Three-phase circuits and transients, Computation of power system transients

UNIT II:

Principle of digital computation, Matrix method of solution, Modal analysis, Z transform, Computation using EMTP, Lightning, switching and temporary over voltages, Lightning, Physical phenomena of lightning.

UNIT III:

Interaction between lightning and power system, Influence of tower footing resistance and Earth Resistance, Switching: Short line or kilometric fault, Energizing transients, closing and re-closing of lines, line dropping, load rejection – over voltages induced by faults.

UNIT IV:

Switching HVDC line Travelling waves on transmission line, Circuits with distributed Parameters Wave Equation, Reflection, Refraction, Behavior of Travelling waves at the line Terminations, Lattice Diagrams, Attenuation and Distortion, Multi-conductor system and Velocity wave.

UNIT V:

Insulation co-ordination: Principle of insulation co-ordination in Air, Insulated substation (AIS) and Gas Insulated Substation (GIS) Coordination between insulation and protection level, Statistical approach, Protective devices Protection of system against over voltages lightning arresters, substation earthling.

Text Books:

1. Allan Greenwood, "Electrical Transients in Power System", Wiley & Sons Inc. New York, 1991
2. D. P. Kothari,C. S. Indukar and K. Ramalingam "Power System Transients",Second Edition.

Reference Books:

1. Elichi Haginomori and Tadashi Koshiduka "Power System Transient Analysis"

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Year: II Semester: I Branch of Study: Power Systems, EEE

Course Code	Course Title	L	T	P	Credits
19DPE8218	FACTS AND CUSTOM POWER DEVICES	3	0	0	3

COURSE OUTCOMES:

1. Acquire knowledge about the fundamental principles of Passive and Active Reactive Power Compensation Schemes at Transmission and Distribution level in Power Systems.
2. Learn various Static VAR Compensation Schemes like Thyristor/GTO Controlled Reactive Power Systems; PWM Inverter based Reactive Power Systems and their controls.
3. To develop analytical modeling skills needed for modeling and analysis of such Static VARS systems.

UNIT I

Reactive power flow control in Power Systems, Control of dynamic power unbalances in Power System, Power flow control -Constraints of maximum transmission line loading, Benefits of FACTS Transmission line compensation, Uncompensated line -Shunt compensation, Series compensation, Phase angle control, Reactive power compensation, Shunt and Series compensation principles, Reactive compensation at transmission and distribution level .

UNIT II

Static versus passive VAR compensator, Static shunt compensators: SVC and STATCOM, Operation and control of TSC, TCR and STATCOM, Compensator control, Comparison between SVC and STATCOM.

UNIT III

Static series compensation: TSSC, SSSC, Static voltage and phase angle regulators TCVR and TCPAR Operation and Control, Applications, Static series compensation GCSC,TSSC, TCSC and Static synchronous series compensators and their Control.

UNIT IV

SSR and its damping Unified Power Flow Controller: Circuit Arrangement, Operation and control of UPF, Basic Principle of P and Q control- Independent real and reactive power flow control, Applications.

UNIT V

Introduction to interline power flow controller, Modeling and analysis of FACTS Controllers, Simulation of FACTS controllers Power quality problems in distribution systems, harmonics, Loads that create harmonics, modeling, harmonic propagation, series and parallel resonances, mitigation of harmonics, passive filters, active filtering hunt , series and hybrid and their control.

Text Books:

1. K R Padiyar, "FACTS Controllers in Power Transmission and Distribution", New Age International Publishers, 2007.
2. X P Zhang, C Rehtanz, B Pal, "Flexible AC Transmission Systems- Modelling and Control", Springer Verlag, Berlin, 2006.

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3. N.G. Hingorani, L. Gyugyi, "Understanding FACTS: Concepts and Technology of Flexible AC Transmission Systems", IEEE Press Book, Standard Publishers and Distributors, Delhi, 2001.

Reference Books:

1. K. S. Sureshkumar, S.Ashok , "FACTS Controllers & Applications", E-book edition, Nalanda Digital Library, NIT Calicut, 2003.
2. G. T. Heydt, "Power Quality", McGraw-Hill Professional, 2007.
3. T. J. E. Miller, "Static Reactive Power Compensation", John Wiley and Sons, Newyork, 1982.

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Year: II Semester: I Branch of Study: Power Systems, EEE

Course Code	Course Title	L	T	P	Credits
19DPE8219	INDUSTRIAL LOAD MODELING AND CONTROL	3	0	0	3

COURSE OUTCOMES:

1. Know about load control techniques in industries and its application
2. Learn different types of industrial processes and optimize the process using tools like LINDO and LINGO
3. Apply load management to reduce demand of electricity during peak time
4. Apply different energy saving opportunities in industries

UNIT-I

Electric Energy Scenario-Demand Side Management-Industrial Load Management. Load Curves-Load Shaping Objectives-Methodologies-Barriers. Classification of Industrial Loads- Continuous and Batch processes, Load Modelling

UNIT-II

Electricity pricing – Dynamic and spot pricing –Models. Direct load control- Interruptible load control. Bottom up approach- scheduling- Formulation of load models.Optimization and control algorithms.

UNIT-III

Reactive power management in industries-controls. Power quality impacts-application of filters Energy saving in industries.

UNIT-IV

Cooling and heating loads, Load profiling- Modeling, Cool storage-Types-Control strategies, Optimal operation, Problem formulation.

UNIT-V

Captive power units-Operating and control strategies, Power Pooling- Operation models, Energy banking, Industrial Cogeneration, Selection of Schemes- Optimal Operating Strategies-Peak load saving, Constraints. Integrated Load management for Industries.

Text Books:

1. C.O. Bjork " Industrial Load Management - Theory, Practice and Simulations", Elsevier, the Netherlands,1989
2. C.W. Gellings and S.N. Talukdar, . Load management concepts. IEEE Press, New York, 1986,pp. 3-28
3. Y. Manichaikul and F.C. Schweppe ," Physically based Industrial load", IEEE Trans. on PAS,April 1981

Reference Books:

1. H. G. Stoll, "Least cost Electricity Utility Planning", Wiley Interscience Publication, USA, 1989.
2. I.J.Nagarath and D.P.Kothari, .Modern Power System Engineering., Tata McGraw Hill publishers,NewDelhi, 1995 6. IEEE Bronze Book- "Recommended Practice for Energy Conservation and cost effective planninginIndustrial facilities", IEEE Inc, USA.

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Year: II Semester: I Branch of Study: Power Systems, EEE

Course Code	Course Title	L	T	P	Credits
19DPE8220	DYNAMICS OF LINEAR SYSTEMS	3	0	0	3

COURSE OUTCOMES:

1. To learn linear system modeling, analysis and design so as to obtain the ability to apply the same to engineering problems in a global perspective.
2. Knowledge on carrying out detailed stability analysis of both linear and nonlinear systems
3. Design observers and controllers for linear systems
4. Acquire knowledge of discrete time linear systems modeling, analysis and design
5. Develop and utilize modern software tools for analysis and design of linear continuous and Discrete time systems.

UNIT- I

State variable representations of system, transfer function and transfer function matrix, solutions of state equations.

UNIT- II

Observability and controllability, minimal realization of MIMO systems, analysis of linear time varying systems, the concepts of stability.

UNIT -III

Lyapunov stability analysis, Lyapunov function and its properties, controllability by state variable feedback.

UNIT- IV

Ackerman"s Formula - stabilisation by output feedback , asymptotic observers for state measurement, observer design.

UNIT- V

State space representation of discrete systems, solution of state equations, controllability and observability, stability analysis using Lyapunov method, State feedback of linear discrete time systems, design of observers - MATLAB Exercises

Text Books:

1. Thomas Kailath, "Linear Systems", Prentice Hall Inc., Englewood Cliffs, N.J. 1980.
2. K. Ogata, "State Space Analysis of Control Systems", Prentice Hall Inc., Englewood Cliffs, N.J., 1965.
3. K. Ogata, "Modern Control Engineering, (second edition)" , Prentice Hall Inc., Englewood Cliffs, N.J., 1990
4. M.Gopal, "Digital Control and State Variable Methods", Tata McGraw Hill Publishing Company Ltd., New Delhi, 1997.

Reference Books:

1. C.T. Chen, "Linear System Theory and Design", New York: Holt Rinehart and Winston ,1984.
2. R.C. Dorf, and R. T. "Bishop, Modern Control Systems", Addison Wesley Longman Inc., 1999.

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Year: II Semester: I Branch of Study: Power Systems, EEE

Course Code	Course Title	L	T	P	Credits
19DOE5801	BUSINESS ANALYTICS	3	0	0	3

Unit I

Business Analysis: Overview of Business Analysis, Overview of Requirements, Role of the Business Analyst.

Stakeholders: the project team, management, and the front line, Handling Stakeholder Conflicts.

Unit II

Life Cycles: Systems Development Life Cycles, Project Life Cycles, Product Life Cycles, Requirement Life Cycles.

Forming Requirements: Overview of requirements Attributes of Good Requirements, Types of Requirements, Requirement Sources, Gathering Requirements from Stakeholders,Common Requirements Documents.

Unit III

Transforming Requirements: Stakeholder Needs Analysis, Decomposition Analysis, Additive/Subtractive Analysis, Gap Analysis, Notations (UML & BPMN), Flowcharts, Swim Lane Flowcharts, Entity-Relationship Diagrams, State-Transition Diagrams, Data Flow Diagrams, Use Case Modeling, Business Process Modeling

Unit IV

Finalizing Requirements: Presenting Requirements, Socializing Requirements and Gaining Acceptance, Prioritizing Requirements. Managing Requirements Assets: Change Control, Requirements Tools

Unit V

Recent Trends in: Embedded and collaborative business intelligence, Visual data recovery, Data Storytelling and Data Journalism.

Text Book:

1. Business Analysis by James Cadle et al. Project Management:
2. The Managerial Process by Erik Larson and, Clifford Gray
3. Business analytics Principles, Concepts, and Applications by Marc J. Schniederjans, Dara G. Schniederjans, Christopher M. Starkey, Pearson FT Press.
4. Business Analytics by James Evans, persons Education.

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Year: II Semester: I Branch of Study: Power Systems, EEE

Course Code	Course Title	L	T	P	Credits
19DOE9001	Industrial Safety	3	0	0	3

Course Outcomes:

CO: 1 Analyze the basics of industrial safety.
CO: 2 Understand the Fundamentals of maintenance engineering
CO: 3 Apply the methods of prevention of corrosion and wear.
CO: 4 Understand the Fault tracing and their applications.
CO: 5 Understand the methods of preventive measures and maintenance

Unit I

Industrial safety: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment and methods

Unit II

Fundamentals of maintenance engineering: Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment.

Unit III

Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricants-types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.

Unit IV

Fault tracing: Fault tracing-concept and importance, decision tree concept, need and applications, sequence of fault finding activities, show as decision tree, draw decision tree for problems in machine tools, hydraulic, pneumatic, automotive, thermal and electrical equipment's like, i. Any one machine tool, ii. Pump iii. Air compressor, iv. Internal combustion engine, v. Boiler, vi. Electrical motors, Types of faults in machine tools and their general causes.

Unit V

Periodic and preventive maintenance: Periodic inspection-concept and need, degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electrical motor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance. Steps/procedure for periodic and preventive maintenance of: i. Machine tools, ii. Pumps, iii. Air compressors, iv. Diesel generating (DG) sets, Program and schedule of preventive maintenance of mechanical and electrical equipment, advantages of preventive maintenance. Repair cycle concept and importance.

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Year: II Semester: I Branch of Study: Power Systems, EEE

Course Code	Course Title	L	T	P	Credits
19DOE9001	Industrial Safety	3	0	0	3

Course Outcomes:

CO: 1 Analyze the basics of industrial safety.
CO: 2 Understand the Fundamentals of maintenance engineering
CO: 3 Apply the methods of prevention of corrosion and wear.
CO: 4 Understand the Fault tracing and their applications.
CO: 5 Understand the methods of preventive measures and maintenance

Unit I

Industrial safety: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment and methods

Unit II

Fundamentals of maintenance engineering: Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment.

Unit III

Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricants-types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.

Unit IV

Fault tracing: Fault tracing-concept and importance, decision tree concept, need and applications, sequence of fault finding activities, show as decision tree, draw decision tree for problems in machine tools, hydraulic, pneumatic, automotive, thermal and electrical equipment's like, i. Any one machine tool, ii. Pump iii. Air compressor, iv. Internal combustion engine, v. Boiler, vi. Electrical motors, Types of faults in machine tools and their general causes.

Unit V

Periodic and preventive maintenance: Periodic inspection-concept and need, degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electrical motor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance. Steps/procedure for periodic and preventive maintenance of: i. Machine tools, ii. Pumps, iii. Air compressors, iv. Diesel generating (DG) sets, Program and schedule of preventive maintenance of mechanical and electrical equipment, advantages of preventive maintenance. Repair cycle concept and importance.

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Year: II **Semester: I** **Branch of Study: Power Systems, EEE**

Course Code	Course Title	L	T	P	Credits
19DOE9002	**Operations Research**	**3**	**0**	**0**	**3**

Course Outcomes:

CO: 1 Understand the characteristics and phases, types of models, allocation in linear programming

CO: 2 Apply the concept of optimal solution, unbalanced problem, degeneracy and Transportation problem & sequencing.

CO: 3 Understand the concept of replacement of items and related problems, theory of games related problems

CO: 4 Apply the concept of the knowledge of queuing models, inventory management models.

CO: 5 Apply the knowledge of dynamic programming, the concept of the simulation and simulation languages.

Unit I

Optimization Techniques, Model Formulation, models, General L.R Formulation, Simplex Techniques, Sensitivity Analysis, Inventory Control Models

Unit II

Formulation of a LPP - Graphical solution revised simplex method - duality theory – dual simplex method - sensitivity analysis - parametric programming.

Unit III

Nonlinear programming problem - Kuhn-Tucker conditions min cost flow problem - max Flowproblem - CPM/PERT

Unit IV

Scheduling and sequencing - single server and multiple server models - deterministic Inventorymodels - Probabilistic inventory control models - Geometric Programming.

Unit V

Competitive Models, Single and Multi-channel Problems, Sequencing Models, Dynamic Programming, Flow in Networks, Elementary Graph Theory, Game Theory Simulation

References:

1. H.A. Taha, Operations Research, An Introduction, PHI, 2008
2. H.M. Wagner, Principles of Operations Research, PHI, Delhi, 1982.
3. J.C. Pant, Introduction to Optimisation: Operations Research, Jain Brothers, Delhi, 2008
4. Hitler Libermann Operations Research: McGraw Hill Pub. 2009
5. Pannerselvam, Operations Research: Prentice Hall of India 2010
6. Harvey M Wagner, Principles of Operations Research: Prentice Hall of India 2010

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Year: II Semester: I Branch of Study: Power Systems, EEE

Course Code	Course Title	L	T	P	Credits
19DOE2002	Project Management	3	0	0	3

Course Outcomes: At the end of the course, students will be able to

1. Able to understand the importance of construction project management, organization and leadership capabilities
2. Able to apply theoretical and practical aspects of project management planning techniques to achieve project goals.
3. Possess ideas on contract, tender and arbitration in construction projects.
4. Understand to apply knowledge and skills of quality and safety management in construction.
5. Have necessary knowledge in resource planning, costing and accounting.

UNIT I

ntroduction to Project management:Characteristics of projects, Definition and objectives of Project Management, Stages of Project Management, Project Planning Process, Establishing Project organization.

UNIT-II

Project Planning:Planning techniques- Bar Chart, Gantt Charts- Networks: basic terminology, preparation of CPM-computation of float values, critical paths-PERT- Determination of three time estimates- Comparison between CPM and PERT

UNIT-III

Resources Management:Flow chart of Resources Management, Labour's requirement, Factors behind the selection of equipment, Material Management- flow chart and functions.

Cost and Accounts Management:Cost–volume relationship-BasicCost Control System-Principle of accounting, Account process, Balance sheet.

Unit IV

Project Implementation: Project Monitoring and Control with PERT/Cost, Computers applications in Project Management, Contract Management, Project Procurement Management.

UNIT-V

Quality management

Inspection, quality control and quality assurance in projects- Cost of quality, cost versus quality levels- ISO standards- benefits-ISO 9001-2000 family of standards- Audit- types, ISO9001-2000 for internal audit.

Safety management

Cause for accident in construction site- -Principle of safety- Role of safety personnel's - General safety conditions

Text/Reference Books:

REFERENCES:

1. Kumar Neeraj Jha, Construction Project Management Theory & Practice, Pearson Education Ltd., 2014.
2. Chitkara.K.K., Construction Project Management Planning Scheduling and Controlling, TataMcGraw-Hill, 2014

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3. Project Planning And Control With PERT And CPM By Dr.B.C.Punmia, K.K.Khandelwal, Lakshmi Publications New Delhi.
4. Total Project Management, The Indian Context- By : P.K.JOY- Mac Millan Publishers India Limited.

Additional Readings:
1. John M Nicholas, Project Management for Business and Technology: Principles and Practice, Prentice Hall,
India, 2002.
2. N. J. Smith (Ed), Project Management, Blackwell Publishing, 2002.
3. Robert K. Wysocki, Robert Back Jr. and David B. Crane, Effective Project Management, John Wiley, 2002.
4. Jack R Meredith and Samuel J Mantel, Project Management: A Managerial Approach, John Wiley, 2000.

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Year: II Semester: I Branch of Study: Power Systems, EEE

Course Code	Course Title	L	T	P	Credits
19DOE9004	Composite Materials	3	0	0	3

Course Outcomes:

CO: 1 Understanding of basic concepts and charactestics of geometric and physical applications of composites.
CO: 2 Explain different reinforcements and their properties.
CO: 3 Study of micromechanics and properties of composite material.
CO: 4 Study of coordinate transformations of stress and strain laws.
CO: 5 Study of elastic behaviour of unidirectional composites; Joining Methods and Failure Theories

UNIT-I

Introduction: Definitions, Composites, Reinforcements and matrices, Types of reinforcements,Types of matrices, Types of composites, Carbon Fibre composites, Properties of composites in comparison with standard materials,
Reinforcements: Fibres- Glass, Silica, Kevlar, carbon, boron, silicon carbide, and born carbide fibres. Particulate composites, Polymer composites, Thermoplastics, Thermosetts, Metal matrix and ceramic composites.

UNIT-II

Manufacturing methods :
Hand and spray lay - up, injection molding, resin injection, filament winding, pultrusion, centrifugal casting and prepregs. Fibre/Matrix Interface, mechanical.
Measurement of interface strength. Characterization of systems; carbon fibre/epoxy, glass fibre/polyester, etc.

UNIT-III

Micromechanics: Unidirectional composites, constituent materials and properties, elastic properties of a lamina, properties of typical composite materials, laminate characteristics and configurations. Characterization of composite properties.
Mechanical Testing: Determination of stiffness and strengths of unidirectional composites; tension, compression, flexure and shear.

UNIT-IV

Coordinate transformations: Hooke"s law for different types of materials, Hooke"s law for two dimensional unidirectional lamina, Transformation of stress and strain, Numerical examples of stress strain transformation, Graphic interpretation of stress – strain relations. Off - axis, stiffness modulus, off - axis compliance.

UNIT-V

Elastic behavior of unidirectional composites: Elastic constants of lamina, relationship between engineering constants and reduced stiffness and compliances, analysis of laminated composites, constitutive relations
Joining Methods and Failure Theories: Joining –Advantages and disadvantages of adhesive and mechanically fastened joints. Typical bond strengths and test procedures.

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Text Books:

1. Chawla, Krishan K, Composite Materials Science and Engineering, Springer, 3rd Edition 2012.
2. R. M. Jones, Mechanics of Composite Materials, Mc Graw Hill Company, New York, 1975.

References:

1. B. D. Agarwal and L. J. Broutman, Analysis and performance of fibre Composites, Wiley-Interscience, New York, 1980.
2. L. R. Calcote, Analysis of Laminated Composite Structures, Van Nostrand Rainfold, New York, 1969.
3. Engineering Mechanics of Composite Materials by Isaac and M.Daniel, Oxford University Press, 1994

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Year: II **Semester: I** **Branch of Study: Power Systems, EEE**

Course Code	Course Title	L	T	P	Credits
19DOE2001	Waste to Energy	3	0	0	3

Course Outcomes: At the end of the course, students will be able to

1. Able to classify types of wastes
2. Understand the method of pyrolysis
3. Understand the use and application of Biomass gasifiers
4. Design biomass combustors
5. Analyze the properties of Biogas

Unit-I:

Introduction to Energy from Waste: Classification of waste as fuel – Agro based, Forest residue, Industrial waste - MSW – Conversion devices – Incinerators, gasifiers, digestors

Unit-II:

Biomass Pyrolysis: Pyrolysis – Types, slow fast – Manufacture of charcoal – Methods - Yields and application – Manufacture of pyrolytic oils and gases, yields and applications.

Unit-III:

Biomass Gasification: Gasifiers – Fixed bed system – Downdraft and updraft gasifiers – Fluidized bed gasifiers – Design, construction and operation – Gasifier burner arrangement for thermal heating – Gasifier engine arrangement and electrical power – Equilibrium and kinetic consideration in gasifier operation.

Unit-IV:

Biomass Combustion: Biomass stoves – Improved chullahs, types, some exotic designs, Fixed bed combustors, Types, inclined grate combustors, Fluidized bed combustors, Design, construction and operation - Operation of all the above biomass combustors.

Unit-V:

Biogas: Properties of biogas (Calorific value and composition) - Biogas plant technology and status - Bio energy system - Design and constructional features - Biomass resources and their classification - Biomass conversion processes - Thermo chemical conversion - Direct combustion - biomass gasification - pyrolysis and liquefaction - biochemical conversion - anaerobic digestion - Types of biogas Plants – Applications - Alcohol production from biomass - Bio diesel production - Urban waste to energy conversion - Biomass energy programme in India.

REFERENCES:

1. Non Conventional Energy, Desai, Ashok V., Wiley Eastern Ltd., 1990.
2. Biogas Technology - A Practical Hand Book - Khandelwal, K. C. and Mahdi, S. S., Vol. I & II, Tata McGraw Hill Publishing Co. Ltd., 1983.
3. Food, Feed and Fuel from Biomass, Challal, D. S., IBH Publishing Co. Pvt. Ltd., 1991.
4. Biomass Conversion and Technology, C. Y. WereKo-Brobby and E. B. Hagan, John Wiley & Sons, 1996.

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