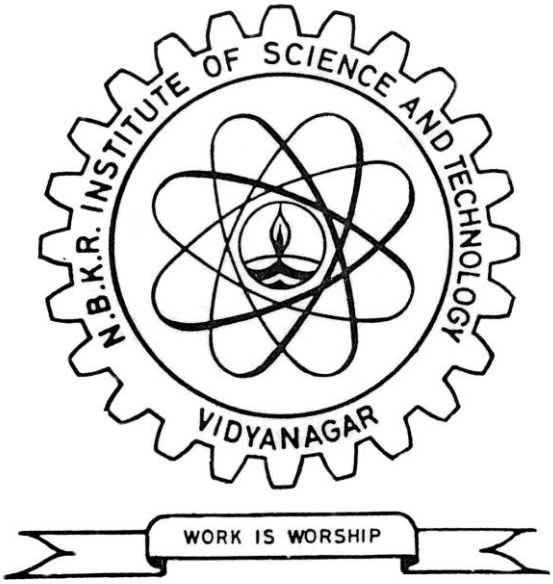
N.B.K.R. INSTITUTE OF SCIENCE & TECHNOLOGY

(AUTONOMOUS)
COLLEGE WITH POTENTIAL FOR EXCELLENCE (CPE)
Affiliated to JNTUA, Anantapuramu
Re-Accredited by NAAC with 'A' Grade
B.Tech. Courses Accredited by NBA under TIER-I



SYLLABUS

I B.TECH.
I & II Semesters

ELECTRICAL AND ELECTRONICS ENGINEERING

(With effect from the batch admitted in the academic year 2017-2018)

VIDYANAGAR - 524413
SPSR Nellore-Dist. Andhra Pradesh

www.nbkrist.org

Vision and Mission of the Institute

Vision:

To emerge as a comprehensive Institute that provides quality technical education and research thereby building up a precious human resource for the industry and society.

Mission:

- To provide a learner-centered environment that challenges individuals to actively participate in the education process.
- To empower the faculty to excel in teaching while engaging in research, creativity and public service.
- To develop effective learning skills enabling students to pick up critical thinking thus crafting them professionally fit and ethically strong.
- To reach out industries, schools and public agencies to partner and share human and academic resources.

Vision and Mission of the Department

Vision:

To impart quality education and research with professional values & ethics to cater the industrial and societal needs.

Mission:

- To enhance student's skills by implementing modern curriculum through collaborative industry institute interaction.
- To provide with modern tools to enhance innovative research.
- To create human resources in electrical engineering to contribute to the nations development and improve the quality of life.
- Imbibe values and ethics for a holistic engineering professional practice.

PROGRAM EDUCATIONAL OBJECTIVES

PEO1: To inculcate basic knowledge in Humanities and Sciences, Fundamentals of Computer Programming besides essential knowledge of electrical and electronics engineering.

PEO2: To apply the principles, concepts and skills of Electrical and Electronics Engineering for research and development.

PEO3: To imbibe professional values, ethics, leadership, teamwork through co-curricular and extracurricular activities for personality development and for effective engineering practice.

PEO4: Engage in continuing professional growth.

PROGRAMME OUTCOMES (POs)

An Engineering Graduate will be able to:

PO1: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

PO6: 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.

PO7: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

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.

PO11: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

NBKR INSTITUTE OF SCIENCE & TECHNOLOGY: VIDYANAGAR (AUTONOMOUS)
(AFFILIATED TO JNTU ANANTAPUR: NELLORE)
SPSR NELLORE DIST
I YEAR OF FOUR YEAR B.TECH DEGREE COURSE – I SEMESTER
ELECTRICAL AND ELECTRONICS ENGINEERING
SCHEME OF INSTRUCTION AND EVALUATION
(With effect from the batch admitted in the academic year 2017-2018)

S.No	Course Code	Course Title	Instruction Hours/Week			Credits	Evaluation									
							Sessional Test-I			Sessional Test-2			Total Sessional Marks (Max. 40)	End Semester Examination		Maximum Total Marks
		THEORY	L	T	D/ P		Test-I (2Hr)	Assign-I	Max. Marks	Test-2 (2Hr)	Assign-2	Max. Marks		Duration In Hours	Max. Marks	
1	17SH1101	Functional English*	3	-	-	3	34	6	40	34	6	40	0.8*Best of two+ 0.2*least of two	3	60	100
2	17SH1102	Engineering Physics #	3	-	-	3	34	6	40	34	6	40		3	60	100
3	17SH1103	Numerical Analysis*	2	2	-	3	34	6	40	34	6	40		3	60	100
4	17CS1101	Basic Computer Engineering #	3	-	-	3	34	6	40	34	6	40		3	60	100
5	17EE1101	Basic Electrical Sciences #	3	2	-	4	34	6	40	34	6	40		3	60	100
		PRACTICALS														
6	17SH11P1	English Language Lab*	-	-	3	2	-		-	-		40	Day to Day Evaluation and a Test (40 Marks)	3	60	100
7	17SH11P2	Engineering Physics Lab#	-	-	3	2	-		-	-		40		3	60	100
8	17ME11P2	Computer Aided Engineering Drawing #	-	-	6	3	-		-	-		40		3	60	100
9	17CS11P1	Basic Computer Engineering Lab #	-	-	2	1	-		-	-		40		3	60	100
		TOTAL				24										

(*: Common to ALL #: Common to ECE, EEE, CSE & IT $: Common to EEE & ECE)

17SH1101- FUNCTIONAL ENGLISH
(Common to all Branches)

Course Category:	Basic Sciences	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practical:**	3-0-0
Pre-requisite:	Basic Level of LSRW skills	**Sessional Evaluation:** **External Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives	Students undergoing this course are expected: 1. To develop their basic communication skills in English. 2. To achieve specific linguistic and communicative competence. 3. To acquire relevant skills and function efficiently in a realistic working context. 4. To inculcate the habit of reading.	
Course Outcomes	On successful completion of this course student will be able to:	
	CO1	Correct the error of the sentence; improve language proficiency and face competitive exams; GATE, GRE, TOEFL, GMAT etc.
	CO2	Comprehend the advanced level of reading comprehensions.
	CO3	Write clear and coherent passages for social and professional contexts.
	CO4	Write proposals, business letters.
	CO5	Acquire considerable flair in using broad range of vocabulary.
	CO6	Drafting Speech-building critical thinking
Course Content	**UNIT –I** **GRAMMAR**: Parts of Speech & Subject- Verb Agreement. **WRITING-PARAGRAPH WRITING:** Expressions of ideas, concepts etc., in unambiguous grammatically acceptable and logically coherent manner (in general items); In particular skills in sentence construction emphasizing on function of word and Basic sentence patterns- framing sentences leading to effective paragraph. **UNIT-II** **GRAMMAR:** Pronoun - Agreement & Usage, Articles: Kinds & Omission of Article. **READING:** Different Reading Strategies: Skimming, Scanning, Inferring, Predicting and Responding to content –Guessing from Context and Vocabulary Extension. **WRITING:** Letter writing - Formal and Informal Writing.	

	UNIT-III **GRAMMAR:** Tenses, Conditional Sentences, Non-Finite Verbs: Kinds of Non-Finite: Infinitives, Gerund & Participle. **WRITING**: Dialogue writing: Communicating and presenting ideas effectively and coherently, Exchanging conversation in a group or between two persons directed towards a particular subject. **UNIT-IV** **GRAMMAR:** Prepositions: Kinds, Position, Adverb usage, Question tags & Transformation of sentences-Degrees of comparison. **Writing**: Telephonic conversations and Etiquettes. **UNIT-V** **GRAMMAR:** Transformation of sentences- Direct- Indirect Speech, Active- Passive Voice & Modifiers. **WRITING:** Story Writing. **UNIT –VI** **GRAMMAR:** Simple, Complex, Compound Sentences – Parallelism. **WRITING:** Drafting of Public Speech**:** Ideas / Content Generation, Structure.
Reference Books	**REFERENCE BOOKS:** 1. Essential English Grammar: Raymond Murphy, Cambridge University Press. 2. Advanced Grammar in Use: Martin Hewings, Cambridge University Press. 3. High School English Grammar: Wren and Martin, S Chand Publications. 4. Effective Technical Communication: Ashraf Rizvi, Tata McGraw Hill Publication.

17SH1102-ENGINEERING PHYSICS
(Common to EEE, ECE, CSE & IT Branches)

Course Category:	Basic Science	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practical:**	3-0-0
Pre-requisite:	Fundamental concepts of Physics	**Sessional Evaluation:** **External Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives	Students undergoing this course are expected to 1. Explain the structure of crystalline solids and their uses in X-ray diffraction techniques. 2. Basic properties of magnetic materials and the uses in Science & Technology. 3. Explain and provide the knowledge about semiconductors and their use in electronic devices. 4. Describe the basic principles of communication system and their uses in communication filed. 5. Describe the characteristics of lasers and their fibers construction and applications in Science & Technology. 6. Understand the behaviour of these nano materials, quantum phenomena and the limitations of basic physical laws.	
Course Outcomes	Upon successful completion of the course, the student will be able to:	
	CO1	Understand the structure of Crystalline solids and their applications in x-ray diffraction.
	CO2	Understand the concept of magnetization and polarization and applications of magnets and dielectric materials in various disciplines.
	CO3	To know the properties of semiconductor materials by projecting the view of energy bands.
	CO4	Understand the concept of communication system with its applications in the field of Science & Technology.
	CO5	Understand the utilization of laser technology in various disciplines and know the concept of optical fiber and its applications.
	CO6	Basic ideas about superconductors and nano materials with their uses in various fields of Science & Technology
	UNIT-I **CRYSTALLOGRAPHY:** Introduction – Space lattice – Unit cell – Lattice parameters – Bravias lattice – Crystal systems – Packing fractions of SC, BCC and FCC – planes in crystals – Miller indices – Interplanar spacing in cubic crystals. **X-RAY DIFFRACTION:** X-ray diffraction in crystals - Bragg's law of diffraction – X-ray diffraction techniques - Laue method - powder method (Debye-Scherer method).	

Course Content	**UNIT-II** **DIELECTRIC PROPERTIES:** Basic definitions, Electronic, Ionic (Quantitative) and Orientation polarizations (Qualitative) – Internal Fields in Solids, Classius – Mossotti Equation. **MAGNETIC MATERIALS:** Introduction and basic definitions – Origin of magnetic moments – Classification of magnetic materials into dia, para, ferro, anti ferro and ferri magnetic materials – Hysteresis – Soft and Hard magnetic materials – Applications of magnetic materials. **UNIT-III** **SEMICONDUCTORS:** Intrinsic and extrinsic semiconductors –Electrical Conductivity in Semiconductors – Drift and diffusion currents – Einstein relations – Hall Effect and its applications – Direct and indirect band gap semiconductors. **PHYSICS OF SEMICONDUCTOR DEVICES:** Formation of PN Junction, I-V Characteristics of PN Junction Diode, LED, Photo Diode, Solar Cell. **UNIT-IV** **COMMUNICATION SYSTEM**– Principles of Basic Communication System – Digital Communication System – Analog Communication System - Basic Steps for Analog/Digital Conversion – Sampling Theorem. System-Signal Bandwidth of signal – Signal impairment – Modulation – Different Types - Demodulation Process. **UNIT-V** **LASERS:** Introduction – Characteristics of lasers – Spontaneous and stimulated emission of radiation – Condition for Population inversion – Ruby Laser - He-Ne Laser – Applications of Lasers. **OPTICAL FIBERS:** Introduction – Construction and working principle of optical fiber – Acceptance angle –Numerical Aperture – Types of optical fibers – Block diagram of optical fiber communication system – Applications of optical fibers. **UNIT VI** **SUPER CONDUCTIVITY:** Introduction – effect of magnetic field – Meissener Effect – Type I and Type II superconductors – Flux quantization – BCS theory (Qualitative treatment) –Applications of superconductors. **PHYSICS OF NANO MATERIALS:** Introduction – Significance of Nano scale and types of Nano materials – Physical properties: Optical, thermal, mechanical and magnetic properties – Synthesis of nano materials by Top down and bottom up approaches: ball mill, chemical vapour deposition and sol gel – Applications of nano materials.
Text Books & Reference Books	**TEXT BOOKS:** 1. Principles of electronics by V.K.Mehtha, Tata McGraw Hill. 2. Solid State Physics by S.O.Pillai, New Age Publications (Labs edition). 3. Introduction to Solid State Physics by Charles Kittel, Wiley India Pvt Ltd, 7th Edition. 4. Engineering Physics by R.K.Gaur & S.L.Gupta, Dhanpat Rai Publications. **REFERENCE BOOKS:** 1. Modern Engineering Physics by Dr. K. Vijaya Kumar, Dr. S. Chandralingam, S.CHAND& COMPANY LTD. 2. Applied Physics by P.K. Palanisamy :Scitech Publishers. Engineering Physics by Dr. K.T. Tyagarajan, V.Rajendran, Tata McGraw-Hill

17SH1103-NUMERICAL ANALYSIS

(Common to all Branches)

Course Category:	Basic Sciences	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practical:**	2-2-0
Pre -requisite:	Intermediate Mathematics	**Sessional Evaluation:** **External Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives	Students undergoing this course are expected to understand: 1. The Bisection, False Position, Iteration and Newton-Raphson Methods. 2. The basic concepts of numerical solutions of simultaneous linear and non-linear algebraic equations. 3. The concepts of Interpolation. 4. The concepts of Numerical Differentiation and Integration. 5. The numerical methods to solve Ordinary Differential Equations by using Taylor's series method, Picard's method, Euler's and Modified Euler's Methods and Runge-Kutta methods of 2^{nd} and 4^{th} order. 6. The concepts of Curve Fitting and Regression Analysis.	
Course Outcomes	After completing the course the students will be able to	
	CO1	Acquire knowledge in solving algebraic and transcendental equations by using the appropriate numerical methods.
	CO2	Develop skills in analyzing the simultaneous linear and non-linear algebraic equations by various numerical methods.
	CO3	Attains skills in analyzing the methods of interpolating the given data.
	CO4	Acquire knowledge in Numerical Differentiation by Newton's formula and in Numerical Integration by Trapezoidal, Simpson's 1/3 and Simpson's 3/8 rules.
	CO5	Apply appropriate numerical methods to solve Ordinary Differential Equations.
	CO6	Develop skills in designing mathematical models for fitting geometrical curves to the given data and also acquire knowledge in Regression Analysis.
Course Content	**UNIT –I** **SOLUTION OF ALGEBRAIC AND TRANSCENDENTAL EQUATIONS:** Bisection - False position- Iteration - Newton-Raphson Methods. **UNIT – II** **SOLUTION OF SIMULTANEOUS LINEAR AND NON-LINEAR ALGEBRAIC EQUATIONS:** Iteration method - Gauss Jordon method - Gauss Elimination with Pivotal condensation method - Triangular Factorization method- Gauss-Seidal method - Newton-Raphson method. **UNIT –III** **INTERPOLATION:** Newton's forward and backward interpolation formula - Lagrange's interpolation - Gauss forward and backward formulae - Stirling's formula.	

	UNIT–IV **NUMERICAL DIFFERENTIATION AND INTEGRATION:** First and Second Order Derivatives at given points by Newton's formula. Trapezoidal rule - Simpson's 1/3 rule and Simpson's 3/8 rule. **UNIT–V** **NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS:** Solution by Taylor's Series - Picard's Method of Successive Approximations - Euler's and Modified Euler's Methods - Runge-Kutta Method of 2^{nd} order and 4^{th} order. **UNIT – VI** **CURVE FITTING:** Introduction-Method of least squares- Linear and Non-linear equations. Correlation coefficient- Lines of regression - Rank correlation coefficient (Spearman's Rank-Correlation).
Text Books & Reference Books	**TEXT BOOKS:** 1. Higher Engineering Mathematics-B.S.Grewal, Kanna Publishers, New Delhi. 2. Mathematical Methods - Dr.T.K.V. Iyengar, Dr.B. Krishna Gandhi, S.Ranganatham, Dr.M.V.S.S.N. Prasad, S.Chand Publication, New Delhi. **REFERENCE BOOKS:** 1. Introductory Methods of Numerical Analysis - S.S. Sastry, Prentice Hall India Learning Private Limited, New Delhi. 2. Numerical Methods - E. Balagurusamy,Tata McGraw-Hill Education Pvt. Ltd, New Delhi. 3. Numerical Methods - E. Balagurusamy,Tata McGraw-Hill Education Pvt. Ltd, New Delhi.

17CS1101 -BASIC COMPUTER ENGINEERING
(Common to CSE, IT, ECE & EEE)

Course Category:	Core	**Credits:**	3
Course Type:	Theory	**Lecture – Tutorial – Practical:**	3-0-0
Pre-requisite:	Basic knowledge and usage of computer	**Sessional Evaluation:** **External Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives	1. Understanding the basics of computer fundamentals, identification of various components of computers and their need. 2. Creating awareness regarding various I/O devices. 3. Gaining knowledge about the working principle of CPU and its advancements. 4. Study of different storage media and operating system basics. 5. Getting fundamental ideas about core concepts of computer domains.	
Course Outcomes	Upon the successful completion of the course, the student will be:	
	CO1	Able to identify Physical components of a computer and their functionalities and to learn and recognize various interactive mechanisms through different devices.
	CO2	Able to understand storage media and strengthen regarding the structure and working principle of CPU.
	CO3	Able to understand the basic software programming and development concepts.
	CO4	Ready to understand the types of different Operating system basics.
	CO5	Able to understand the basics of network and communication services.
	CO6	Gained the basic knowledge in core concepts of computers such as Databases, Internet and Security.
Course Content	**UNIT – I** **INSIDE THE COMPUTER:** Various parts of a Computer System - Software, Hardware, Data and Users, Information processing cycle, Essential Computer hardware - processor, Memory, I/O and Storage, Software and major categories- system software and application software. **I/O DEVICES**: The Keyboard – Layout, types of keys, input from keyboard, The Mouse – Usage, Variants of mouse, Devices for Hand – Pens, Touch Screens, Game controllers, Optical devices – Bar Code readers, Image scanners and OCR, Monitors – Types, CRT monitors, Flat panel Monitors. **UNIT – II** **DATA STORAGE**: Categories of storage devices, Magnetic – How data is stored and organized on disk, How OS access the data, Diskettes, Hard disks, Removable High-Capacity Magnetic disks, Tape Drives, Optical Storage devices – CD-ROM, DVD-ROM, Recordable Optical Technologies, Solid-state storage devices – Flash Memory, Smart Cards, Solid State Disks. **DATA PROCESSING**: How Computers represent data – Number systems, Bits and Bytes, Text Codes, How Computers process data – the CPU, Machine cycles, Memory, Factors affecting processing speed – Registers, Memory and Computing power, The Computer's Internal Clock, The Bus, Cache Memory.	

	UNIT – III **SOFTWARE PROGRAMMING AND DEVELOPMENT:** Definition of a computer program, Hardware/Software Interaction, Planning a computer program, How programs solve problems-Program control flow, Algorithms, Structured and object oriented programming. **PROGRAMMING LANGUAGES AND THE PROGRAMMING PROCESS:** The evolution of programming languages, Categories- Machine, Assembly and Higher level languages, Systems development life cycle for programming. **UNIT – IV** **OS BASICS**: types of Operating Systems – Real Time Operating Systems, Single-user/Single-Tasking OS, Single user/Multitasking OS, Multi-user/Multitasking OS, User interfaces – Graphical User Interfaces, Command-Line Interfaces, Running Programs – Sharing information. **UNIT – V** **NETWORKING BASICS**: The usage of Network – Simultaneous access, Shared peripheral devices, Personal Communications and Easier data backup, Common types of networks – LANs, WANs, Hybrid Networks – CANs, MANs, HANs, Intranets and Extranets, Network topologies – Bus, Ring, Star, Mesh, Tree and Hybrid Topologies. **UNIT – VI** **DATABASE MANAGEMENT SYSTEMS:** Databases and Database management systems, The database, The DBMS, Working with database, Creating database tables. **COMPUTER SECURITY**: Basic Security Concepts – Threats, Degrees of Harm, Countermeasures, and Threats to Users – Identify theft, Loss of Privacy, Online Spying tools, Spam, Computer related injuries, Hardware threats – Power related threats, Theft and Vandalism, Natural Disasters.
Text Books & ReferenceBooks	**TEXT BOOK(S):** 1. Peter Norton "**Introduction to Computers**", McGraw Hill Publishers, 7th Edition , 2011. **REFERENCE BOOKS:** 1. Alex Leon and Mathews Leon "Fundamentals of Information Technology", Vikas Publishers, 2nd Edition, 1999. 2. David Cyganski& John A.Orr "Information Technology-Inside and Outside", Pearson Education, 2002. 3. Marilyn Wolf "Computers as Components", MK publications, 3rd Edition, 2014.
E-Resources	https://nptel.ac.in/courses https://freevideolectures.com/university/iitm

17EE1101-BASIC ELECTRICAL SCIENCES

(Common to EEE, ECE, CSE & IT)

Course category:	Professional core	**Credits:**	4
Course Type:	Theory	**Lecture-Tutorial-Practical:**	3-2-0
Pre-requisite:	Fundamental concepts of Electricity and Electromagnetic induction.	**Sessional Evaluation:** **External Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives	Students undergoing this course are expected to understand: 1. Basic concepts of R, L, C elements and Network Reduction techniques. 2. The concept of form factor, Crest factor and j-notation. 3. The concept of power triangle, series and parallel connection of R, L & C elements with sinusoidal Excitation. 4. Application of Graph theory to Electrical circuits. 5. Application of KCL and KVL. 6. Concept of inductance & mutual inductance, Dot convention and coefficient of coupling. **7.** Concept of Series and parallel resonance and current locus diagrams	
Course Outcomes	After completing the course the student will be able to	
	CO1	Perform the equivalent resistance calculation of electrical circuits.
	CO2	Compute the average, RMS, form factor & crest factor of a periodic waveform.
	CO3	Enumerates real power, reactive power, apparent power and power factor for a given circuit
	CO4	Analyse the given electrical network using network topology, nodal and mesh analysis.
	CO5	Compute the MMF, Reluctance of a magnetic circuit and also equivalent inductance, coefficient of coupling (K) of a coupled coil.
	CO6	Evaluate the resonant frequency, Quality factor, bandwidth and sketch the current locus diagrams for a given electrical circuit.
Course Content	**UNIT- I** **CONCEPT OF ELECTRIC CIRCUITS**: Introduction, Active and passive elements, V-I Characteristics of R, L and C elements, Ideal & Practical Sources, Source transformation, Kirchhoff's laws, Network reduction techniques, Star-Delta transformation. **UNIT – II** **FUNDAMENTALS OF AC CIRCUITS:** R.M.S, Average values , Form factor and Crest factor for different periodic waveforms, Sinusoidal alternating quantities - Phase and Phase difference, Complex and Polar forms of representations, j-Notation. Concept of Reactance, Impedance, Susceptance and Admittance.	

	UNIT – III **SINGLE PHASE AC CIRCUITS:** Concept of Active and reactive power, power factor – power triangle -Examples -Steady state analysis of R, L and C elements(series, parallel and series-parallel combinations) with sinusoidal excitation - Phasor diagrams-Examples. **UNIT – IV** **GRAPH THEORY:** Network topology, Cut set and Tie set matrices – Incident matrices-Application to circuit analysis- Problems - Duality & Dual circuits – Problems. **ANALYSIS OF ELECTRICAL CIRCUITS:** Mesh and Nodal analysis of DC and AC circuits-concept of Super mesh and Super node. **UNIT – V** **MAGNETIC CIRCUITS**: Faraday's Laws of Electromagnetic Induction,-Concept of Self and Mutual Inductance-Dot convention in coupled coils, Coefficient of coupling, Analysis of series and parallel magnetic circuits, MMF Calculations- Composite magnetic circuit. **UNIT – VI** **RESONANCE:** Series and parallel resonance, Half power frequencies, Bandwidth and Q factor, Relation between half power frequencies, Bandwidth & Quality factor. **LOCUS DIAGRAMS:** Series and parallel combinations of R-L, R-C and R-L-C with variation of parameters.
Text Books & Reference Books:	**TEXT BOOKS:** 1. "Engineering Circuit Analysis" by Hayt & Kemmerly, 2nd Edition, TMH publishers 2. "Network Analysis" by M.E Van Valkenburg, Third Edition,PHI learning private Limited, 2006. 3. "Fundamentals of Electric circuits" by Charles k Alexander, Mathew N O Sadiku, Tata McGraw Hill Education private Limited, 6th Edition,2017. **REFERENCE BOOKS:** 1. "Circuits & Networks" by A.Sudhakar and Shyam Mohan , 5th Edition(2015),TMH 2. "Circuit Theory" by A.Chakrabarti, Dhanpat Rai publishers 6th Edition (2014). 3. "Circuits & Systems" by Dr K.M.Soni, S.K.Kataria& sons Publication (2014).
E-Resources:	http://nptel.ac.in/courses http://iete-elan.ac.in http://freevideolectures.com/university/iitm

17SH11P1-ENGLISH LANGUAGE LABORATORY
(Common to all Branches)

Course Category:	Basic Sciences	**Credits:**	2
Course Type:	Practical	**Lecture-Tutorial-Practical:**	0-0-3
Pre-requisite:	Basic Level of LSRW Skills	**Sessional Evaluation:** **External Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives	To develop student's basic skills of communication viz. LSRW in English through which communicative competence can be enhanced and can communicate efficiently in a realistic professional ambience.	
Course Outcomes	**CO1**	These are also helpful in enhancing the language competency and communicative level of confidence. These activities practiced in the laboratory are helpful in comprehending the important language aspects which are useful for the real life situations.
Course Content	**LIST OF EXPERIMENTS** I. Listening Skills: Listening for Pleasure, Listening for Details and Listening for Information II. Speaking Skills: Jam Extempore Presentations Seminars III. Reading Skills: News Paper Reading IV. Writing Skills: Story Writing Description 1. Object 2.Place 3. Person 4.Situation Giving Directions & Instructions	
Reference Books	**REFERENCE BOOKS:** 1. A Manual for English Language Laboratories: Dr. D. SudhaRani , Pearson Publications. 2. Pronunciation Dictionary: Daniel Jones 3. Techniques of Teaching English: A.L. Kohli 4. A Textbook of English Phonetics: For Indian Students: T Balasubramanian., Macmillan India Limited.	

17SH11P2-ENGINEERING PHYSICS LABORATORY

(Common to EEE, ECE, CSE & IT Branches)

Course Category:	Basic Science	**Credits:**	2
Course Type:	Practical	**Lecture-Tutorial-Practical:**	0-0-3
Pre-requisite:	Engineering Physics	**Sessional Evaluation:** **External Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives	To provide student to learn about some important experimental techniques in physics with knowledge in theoretical aspects so that they can excel in that particular field.
Course Outcomes	1. These experiments in the laboratory are helpful in understanding important concepts of physics through involvement in the experiments by applying theoretical knowledge. 2. It helps to recognize where the ideas of the students agree with those accepted by physics and where they do not.
Course Content	Minimum of 8 experiments to be completed out of the following : **LIST OF EXPERIMENTS** 1. Determination of Rigidity modulus of a material – Torsional pendulum. 2. Melde's Experiment – Transverse and Longitudinal modes. 3. Time constant of RC circuit. 4. Resonance in LCR circuit. 5. Magnetic field along the axis of a coil (Stewart-Gees Method). 6. Study of characteristics of LED and LASER Sources. 7. Evaluation of Numerical Aperture of a given fiber. 8. Energy Gap of a material of p-n junction. 9. Diode Characteristics. 10. Transistor Characteristics. 11. Characteristics of Solar cell. 12. Logic Gates. 13. Hall Effect.

17ME11P2- COMPUTER AIDED ENGINEERING DRAWING

(Common to EEE, ECE, CSE & IT)

Course Category:	Basic Engineering Science	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practical:**	0-0-6
Pre-requisite:	Geometrical Construction	**Sessional Evaluation:**	40
		External Exam Evaluation:	60
		Total Marks:	100

Course Objectives	Students undergoing this course are expected to understand: 1. To enable the students with various concepts like dimensioning, construction of conic sections, polygons, cycloids and involutes. 2. To impart and inculcate proper understanding of Auto CAD fundamentals. 3. To apply the knowledge of Auto CAD for the projections of points, lines and solids. 4. To know about sections and development of solids. 5. To improve the visualization skills with isometric projections.	
Course Outcomes	After completing the course the student will be able to	
	CO1	Apply the conventions and the methods of engineering drawing.
	CO2	Create geometric constructions, conics with hand tools to draw lines, polygons, circle, tangencies, conic sections and irregular arcs.
	CO3	Sketch the solutions to the problems on projection.
	CO4	Use the sectioning and developments concepts of solids in actual applications.
	CO5	Visualize the objects that they can apply these skills in developing new products.
Course Content	**UNIT – I** **INTRODUCTION:** Importance of Drawing, Drawing Instruments, Sheet layout, BIS Conventions, Types of lines, Lettering, and dimensioning methods. **GEOMETRICAL CONSTRUCTIONS:** Regular Polygons (Triangle, Square, Pentagon, Hexagon) **CONIC SECTIONS:** Introduction, Construction of Ellipse, Parabola and Hyperbola using Eccentricity method and Rectangular/ Oblong methods. **SPECIAL CURVES:** Introduction, Construction of Cycloids and Involute curves. **UNIT – II** **INTRODUCTION:** Importance of Computer Aided Drawing, software tool environment, drawing size and scale, main menu, tool bar and menus, co-ordinate system, drafting settings. **CREATION AND EDITING:** Points, Lines, Poly lines, Polygons, Splines, circle, ellipse, text, move, copy, off-set, pan, mirror, rotate, trim, extend, break, chamfer, fillet, curves, block, layers, line representations, dimensioning and hatching. **UNIT – III** **PROJECTIONS OF POINTS:** Principles of projections, Planes of projection, Points in four quadrants. **PROJECTIONS OF LINES:** Line inclined to both the principal planes (first angle projection only).	

	UNIT – IV **PROJECTIONS OF PLANES:** Plane (triangle, square, rectangle, pentagon, hexagon and circular) inclined to both the principal planes. **PROJECTIONS OF SOLIDS:** Solids such as Prisms, Pyramids, Cylinders and Cones. **UNIT – V** **SECTIONS OF SOLIDS:** Solids such as Prisms, Pyramids, Cylinders and Cones resting on their bases on HP. **DEVELOPMENT OF SURFACES:** Lateral surfaces of solids such as Prisms, Pyramids, Cylinders and Cones (cut by a plane inclined to HP). **UNIT – VI** **ORTHOGRAPHIC PROJECTIONS:** Conversion of Pictorial views into Orthographic Views,Isometric Projections of simple objects.
Text Books & Reference Books:	**TEXT BOOKS:** 1. Engineering Drawing, N.D. Bhat / Charotar Publishing House,. Gujarat, 53rd edition, 2014. 2. AutoCAD 2013 For Engineers and Designers, Sham Tickoo, Dream tech Press, 2013. **REFERENCE BOOKS** 1. Engineering Drawing And Graphics + Autocad, Venugopal K, New Age International Pvt.Ltd. New Delhi, 2007. 2. Engineering Graphics with Auto CAD, D.M. Kulkarni, A.P. Rastogi and A.K. Sarkar, PHI Learning Private Limited, Revised Edition, August 2010. 3. Engineering Drawing and Graphics Using Autocad, T Jeyapoovan, Vikas Publishing House, 3rd Edition, 2010. 4. A Textbook on Engineering Drawing, P. Kannaiah, K. L. Narayana, K. Venkata Reddy, Radiant Publishing House, 2012.

17CS11P1- BASIC COMPUTER ENGINEERING LABORATORY
(Common to CSE, IT, ECE and EEE)

Course Category:	Program Core	**Credits:**	1
Course Type:	Practical	**Lecture – Tutorial – Practical:**	0-0-2
Pre-requisite:	Basic knowledge about fundamentals of Physical organization of a Computer and aware of its operations.	**Sessional Evaluation:** **External Exam Evaluation:** **Total Marks:**	40 60 100

Course Outcomes	Upon successful completion of the course, the student will be able to:	
	CO1	Identification of physical components of a Computer system, assembly and execution of business problems using application softwares.
Course Content	**LIST OF EXPERIMENTS** 1. To identify the computer hardware parts. (2 Labs) 2. Assembling and disassembling the system hardware components of a personal Computer.(2 Labs) 3. Installation Steps for Windows Operating System.(1 Lab) 4. To Practice on basics of Networking (Wired and Wireless network connections) (1 Lab) 5. To Practice Basic commands of LINUX.(2 Labs) 6. To Practice Basic MS-Word features (like Formatting, Tables, Sorting, Sections etc.,) (1 Lab) 7. Create envelope labels using mail merge.(1 Lab) 8. Spread sheet experiments using EXCEL. (1 Lab) 9. To Practice on MS-Power Point.(1 Lab) 10. To Practice on MS-Access. (1 Lab)	
Text Books & Reference Books:	**TEXT BOOK(S):** 1. Peter Norton "**Introduction to Computers**", McGraw Hill Publishers, 7th Edition 2011. **REFERENCE BOOKS:** 1. Alex Leon and Mathews Leon "Fundamentals of Information Technology", Vikas Publishers, 2nd Edition, 1999. 2. David Cyganski & John A.Orr "Information Technology-Inside and Outside", Pearson Education, 2002. 3. Marilyn Wolf "Computers as Components", MK publications, 3rd Edition, 2014.	
E-Resources	https://nptel.ac.in/courses https://freevideolectures.com/university/iitm	

BKR INSTITUTE OF SCIENCE & TECHNOLOGY: VIDYANAGAR (AUTONOMOUS)
(AFFILIATED TO JNTU ANANTAPUR: NELLORE)
SPSR NELLORE DIST
I YEAR OF FOUR YEAR B.TECH DEGREE COURSE – II SEMESTER
ELECTRICAL AND ELECTRONICS ENGINEERING
SCHEME OF INSTRUCTION AND EVALUATION
(With effect from the batch admitted in the academic year 2017-2018)

S.No	Course Code	Course Title	Instruction Hours/Week			Credits	Evaluation									
							Sessional Test-1			Sessional Test-2			Total Sessional Marks (Max. 40)	End Semester Examination		Maximum Total Marks
		THEORY	L	T	D/P		Test-1 (2Hr)	Assign-1	Max. Marks	Test-2 (2Hr)	Assign-2	Max. Marks		Duration In Hours	Max. Marks	
1	17SH1201	Professional English*****	3	-	-	3	34	6	40	34	6	40	0.8*Best of two+ 0.2*least of two	3	60	100
2	17SH1202	Engineering Chemistry #	3	-	-	3	34	6	40	34	6	40		3	60	100
3	17SH1203	Engineering Mathematics-I *****	3	2	-	4	34	6	40	34	6	40		3	60	100
4	17CS1201	C Programming #	2	2	-	3	34	6	40	34	6	40		3	60	100
5	17EE1201	Circuits & Networks $	2	2	-	3	34	6	40	34	6	40		3	60	100
6	17EC1201	Electronic Devices#	3	-	-	3	34	6	40	34	6	40		3	60	100
		PRACTICALS														
7	17SH12P2	Engineering Chemistry Lab #	-	-	3	2	-		-	-		40	Day to Day Evaluation and a Test (40 Marks)	3	60	100
8	17CS12P1	C Programming Lab #	-	-	3	2	-		-	-		40		3	60	100
9	17ME12P1	Engineering Workshop#	-	-	2	1	-		-	-		40		3	60	100
		TOTAL				24										

(*: Common to ALL #: Common to ECE, EEE, CSE& IT $:Common to EEE & ECE)

17SH1201- PROFESSIONAL ENGLISH
(Common to all Branches)

Course Category:	Basic Sciences	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practical:**	3-0-0
Pre-requisite:	Basic Level of LSRW skills	**Sessional Evaluation:** **External Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives	Students undergoing this course are expected to understand: 1. To develop their basic professional writing skills in English. 2. To achieve specific linguistic and verbal competence. 3. To acquire relevant skills and function efficiently in a realistic professional working environment. 4. To inculcate the habit of reading & writing	
Course Outcomes	Upon successful completion of the course, the student will be able to:	
	CO1	Equip verbal proficiency and face competitive exams; GATE, GRE, TOEFL, GMAT etc.
	CO2	Draft professional writings: email drafting, professional Letters, etc. for social and professional contexts.
	CO3	Write effective book reviews and make effective notes in professional environment.
	CO4	Procure considerable knack in using wide range of vocabulary.
	CO5	Write proposals, business letters, project reports, writing proposals.
	CO6	Acquire skills: Prepare Speeches in analytical and critical procedures.
Course Content	**UNIT –I** **DATA INTERPRETATION:** Interpretation and analysis of the data based on text, tables, graphs (linear), charts- bar, pie etc. **Verbal**: Verbal reasoning- Analogies, Homophones & Homonyms. **UNIT-II** **WRITING:** Email Communication- Writing Effective Business Email. **Verbal**: Idioms and Phrases, One word substitutes. **UNIT-III** **ANALYTICAL WRITING:** Presenting perspective of an issue- Compare & Contrast, Cause and Effect, Analyze an argument. **VERBAL:** Affixes-prefix and suffix, root words, derivatives.	

	UNIT-IV **TECHNICAL WRITING:** Writing Proposals: Significance; Structure, Style and Writing of Project Reports. **VERBAL:** Synonyms and Antonyms **UNIT-V** **WRITING:** Introduction to different kinds of materials: Technical & Non-technical- Note Taking and Note Making- identification of important points and precise the content **Verbal**: Words often confused **UNIT-VI** **BOOK REVIEWS**: Review of a Technical and Non-Technical - a brief written analysis including summary and appreciation **Verbal**: Sentence Completion
Reference Books	**REFERENCE BOOKS:** 1. A Textbook of English for Engineers and Technologists (combined edition, Vol. 1 & 2); Orient Black Swan 2010. 2. Word Power Made Easy by Norman Lewis A Communicative Grammar of English By: Geoffrey Leech

17SH1202-ENGINEERING CHEMISTRY
(Common to EEE, ECE, CSE &IT)

Course Category:	Basic science	**Credits**	3
Course Type:	Theory	**Lecture-Tutorial-Practical:**	3-0-0
Pre-requisite:	Fundamental concepts of Chemistry	**Sessional Evaluation:** **External Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives	Students undergoing this course are expected to understand: 1. To strengthen the fundamentals of Chemistry and then build an interface of theoretical and experimental concepts with their industrial/ engineering applications. 2. The extension of fundamentals of Electrochemistry to energy storage devices such as batteries and fuel cells is one such example. 3. To know the factors effecting the rate of corrosion and its prevention. 4. To design engineering materials and solve problems related to them. 5. To understand various water softening methods. 6. To understand preparation of polymers and their applications.	
Course Outcomes	On successful completion of this course student will be able to:	
	CO1	Understand the electrochemical sources of energy.
	CO2	Identify and investigate means of protecting metal against corrosion.
	CO3	Understand industrially based engineering materials.
	CO4	Understand the classification of fuels and their analysis.
	CO5	Know the disadvantages of hard water and ability to remove hardness by using various methods.
	CO6	Understand the basics of polymers and their preparation and uses in engineering field.
Course content	**UNIT – I** **ELECTRO CHEMISTRY:** Single electrode potential-explanation and measurement Reference electrodes-hydrogen gas electrode-calomel electrode-glass electrode Electrochemical cells: Lead-Acid storage cells. **Batteries**: Li-ion Batteries Fuel Cells: Hydrogen - Oxygen fuel cell Conductometric titration of strong acid and strong base. **UNIT – II** **CORROSION:** Definition-classification- theories of corrosion-factors affecting the corrosion- Prevention methods of corrosion-metallic coatings (Electroplating, cementation) and cathodic protection. **UNIT-III** **CHEMISTRY OF ENGINEERING MATERIALS:** Electrical insulators: Definition-classification-Characteristics- Application of electrical insulating materials (solid, liquid and gaseous insulators). **Refractories:** Classification- properties and applications of refractories. **Lubricants:** Lubricant-Lubrication-classification of lubricants-Properties and applications of lubricating oils.	

	UNIT – IV **FUEL TECHNOLOGY:** Classifications of Fuels - Characteristics of fuels - Calorific value – determination – Bomb calorimeter – Boy's gas calorimeter - Theoretical calculation of calorific value. **SOLID FUELS:** coal-analysis of coal. **LIQUID FUELS:** Petroleum-refining of petroleum - Synthetic petrol – Fischer Tropch's synthesis. **GASEOUS FUEL –** Flue gas analysis by Orsat's apparatus. **UNIT – V** **WATER TREATMENT:** Impurities in water-Hardness of water-Estimation of hardness by EDTA method-Estimation of dissolved oxygen-alkalinity-chlorides in water. **INDUSTRIAL USE OF WATER:** For steam generation-troubles in boilers-scale and sludge-priming and foaming-caustic embrittlement-boiler corrosion. **SOFTENING METHODS OF HARD WATER:** Lime-soda process- Zeolite process-Ion exchange method. **UNIT-VI** **POLYMERS:** Introduction to polymers- Polymerization process-types of polymerization. **ELASTOMERS:** Natural rubber – vulcanization of rubber – compounding of rubber-Synthetic rubbers: preparation, properties and engineering applications of Buna – N, Neoprene, Thiokol and silicon rubbers. **PLASTOMERS:** Thermosetting and thermoplastics- Preparation, properties and engineering applications of PVC, Bakelite, Nylons and Urea-Formaldehyde
Text Books & References	**TEXT BOOKS:** 1. Engineering Chemistry, First Edition, Jayaveera KN, Subba Reddy GV and Ramachandraiah C, McGraw Hill Higher Education, New Delhi, 2013. 2. A Text Book of Engineering Chemistry, 15 th Edition, Jain and Jain, Dhanapat Rai Publications, New Delhi, 2013. **REFERENCE BOOKS:** 1. A Text book of Engineering Chemistry, 12th Edition, SS Dhara, Uma, S. Chand Publications, New Delhi, 2010. 2. Engineering Chemistry, First edition, K.B. Chandra Sekhar, UN.Das and Sujatha Mishra, SCITECH Publications India Pvt Limited, 2010. 3. Engineering Chemistry, First edition, Seshamaheswaramma K and Mridula Chugh, Pearson Education, 2013.

17SH1203-ENGINEERING MATHEMATICS - I
(Common to all Branches)

Course Category:	Basic Sciences	**Credits:**	4
Course Type:	Theory	**Lecture-Tutorial-Practical:**	3-2-0
Pre – requisite:	Intermediate Mathematics	**Sessional Evaluation:** **External Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives	Students undergoing this course are expected to understand: 1. The basic concepts of Matrices. 2. Solving Higher Order Differential Equations with RHS of different types by using analytical techniques. 3. Taylor's and Maclaurin's series, Maxima and Minima of the functions of two and three variables. 4. The concepts of Double and Tripple integrals, Areas and Volumes. 5. The Gradient, Divergence and Curl operators, Solenoidal and Irrotational vectors. 6. The basic concepts of Vector Integration.	
Course Outcomes	After completing the course the student will be able to	
	CO1	Understand effectively the analyzation of the Rank of the matrix, Consistency of system of linear equations, Eigen values and Eigen vectors.
	CO2	Acquire knowledge in solving higher order differential equations by using various types.
	CO3	Attains skills in analyzingthe Taylor's and Maclaurin's series and Maxima and Minima of the functions of two and three variables.
	CO4	Apply Double and Tripple integrals to find Areas and Volumes.
	CO5	Understand effectively Curl, Divergence and Gradient operators, Solenoidal and Irrotational vectors with their applications.
	CO6	Acquire knowledge in analyzing the applications of Green's, Stoke's and Gauss-divergence theorems.
Course Content	**UNIT - I** **MATRICES:** Rank of Matrix - Echelon Form and Normal Form - Consistency of system of linear equations- Eigen values and Eigen vectors. **UNIT–II** **HIGHER ORDER DIFFERENTIAL EQUATIONS:** Homogeneous linear differential equations of second and higher order with constant coefficients with R.H.S. of the type e^{ax}, $\sin ax$ or $\cos ax$, x^n, e^{ax} V and $x^n\, v(x)$.	

	UNIT – III **DIFFERENTIAL CALCULUS:** Taylor's and Maclaurin's series - Maxima and Minima of function of two variables - Lagrangian method of multipliers with three variables only. **UNIT - IV** **MULTIPLE INTEGRALS:** Double and Triple integrals - Change of order of integration - Change to polar coordinates - Area and Volumes by Double integration - Volume by Triple integration. **UNIT - V** **VECTOR DIFFERENTIATION:** Gradient, Divergence, and Curl - Solenoidal and Irrotational vectors. **UNIT - VI** **VECTOR INTEGRATION:** Line, Surface and Volume integrals - Green's, Stoke's and Gauss-divergence theorem (without proof), Applications to theorems.
Text Books & Reference Books	**TEXT BOOKS:** 1. Higher Engineering Mathematics-B.S. Grewal, Khanna Publishers, New Delhi. 2. Engineering Mathematics – B.V. Ramana, Tata McGraw-Hill Education Pvt. Ltd, New Delhi. **REFERENCE BOOKS:** 1. Higher Engineering Mathematics - H.K. Dass, Er. RajnishVerma, S. Chand Publication, New Delhi. 2. Advanced Engineering Mathematics - N.P. Bali & M. Goyal, Lakshmi Publishers, New Delhi. 3. Engineering Mathematics-I& II - Dr.T.K.V. Iyengar, Dr.B. Krishna Gandhi, S. Ranganatham, Dr.M.V.S.S.N. Prasad, S. Chand Publication, New Delhi. 4. Advanced Engineering Mathematics - Erwin Kreyszig, Wiley, India.

17CS1201 - C- PROGRAMMING
(Common to CSE, IT, ECE & EEE)

Course Category:	Program Core	**Credits:**	3
Course Type:	Theory	**Lecture – Tutorial – Practical:**	2-2-0
Pre-requisite:	Basic mathematical knowledge to solve problems in analytical manner and idea on programming methodologies.	**Sessional Evaluation:** **External Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives	Students undergoing this course are expected to understand: 1. Gaining insights of building blocks of C language. 2. Getting fundamental ideas about core concepts of C Programming. 3. Understanding the procedural approach to solve simple problems.	
Course Outcomes	Upon the successful completion of the course, the student will be:	
	CO1	Able to learn the fundamental structure of C program and basic data types.
	CO2	Able to find the different ways of usage of operators in expression evaluation and I/O Statements.
	CO3	Acquire information on various control structures in C programming
	CO4	Study the concept of arrays and strings
	CO5	Able to understand Pointers and Functions
	CO6	Learn the basics of Data Storage on Files and Derived data types
Course Content	**UNIT – I** **INTRODUCTION:** Algorithms, Flow charts, Program development steps. **FUNDAMENTALS OF C:** History, Structure of a C program, Programming rules and execution. Character set, Delimiters, C keywords, Identifiers, Constants, Variables, Rules for defining Variables, Data types, Declaration and Initialization of Variables. **UNIT – II** **OPERATORS AND EXPRESSIONS:** Introduction, Operator Precedence and Associativity, Operator Types **INPUT AND OUTPUT IN C:** Formatted and Unformatted functions, Commonly used library functions. **UNIT – III** **DECISION STATEMENTS:** Introduction, Types of If statements, switch statement, break, continue, go to. **ITERATIVE STATEMENTS**: while, do-while and for loops.	

	UNIT – IV **ARRAYS AND STRINGS**: Definitions, Initialization, Characteristics of an array, Array categories. **STRINGS:** Declaration and Initialization of strings, String handling functions. **STORAGE CLASSES**: Automatic, External, Static and Register Variables. **UNIT – V** **POINTERS:** Fundamentals, Declaration and initialization of Pointers, Arithmetic Operations, Pointers and Arrays. **FUNCTIONS:** Definition, Function Prototypes, Types of functions, Call by Value and Call by Reference, Recursion. **UNIT – VI** **STRUCTURES:** Definition, Declaration and Initialization of Structures. **UNIONS:** Definition, Declaration and Initialization of Union. **FILES:** Introduction, File Types, Basic operations on Files, File I/O, Command Line Arguments.
Text Books & References	**TEXT BOOK(S):** 1. Programming with ANSI & TURBO C by Ashok N.Kamthane, Pearson Education 2007 **REFERENCE BOOKS:** 1. A Book on C by Al Kelley/Ira Pohl, Fourth Edition, Addison-Wesley.1999 2. Let Us C by Yashavant Kanetkar, BPB Publications. 3. Programming in ANSI C by Balaguruswamy 6th Edition, Tata McGraw Hill Education, 2012.
E-Resources	https://nptel.ac.in/courses https://freevideolectures.com/university/iitm

17EE1201-CIRCUITS & NETWORKS
(Common to EEE & ECE)

Course Category:	Professional core	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practical:**	2-2-0
Pre-requisite:	Fundamental concepts of Electricity	**Sessional Evaluation:** **External Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives:	To make the student learn about 1. Network theorems and their applications 2. The analysis of three phase balanced & unbalanced circuits 3. Necessary conditions for driving point function & transfer function 4. Time domain response from pole-zero plots 5. Transient response of RL, RC, RLC series circuit for DC and AC excitation.	
Course Outcomes:	After completing the course the student will be able to	
	CO1	Apply suitable theorems for a given circuit.
	CO2	Analyse three phase balanced & unbalanced circuits and also calculation of power for a given circuit.
	CO3	Evaluate the two port network parameters for the given network.
	CO4	Draw the pole- zero plot and obtain the time domain response for a given transfer function.
	CO5	Find the time constant and transient response of a given circuit with and without D.C excitation.
	CO6	Determine the time constant and transient response of a given circuit with and without A.C excitation.
Course Content:	**UNIT- I** **Network Theorems:** Superposition, Reciprocity, Thevenin's and Norton's theorems, Maximum power transfer theorem, Millman's theorem, Compensation theorem and Tellegen's theorem. Application of these theorems to DC and AC Excitations **UNIT – II** **Three phase A.C circuits:** Advantages of three phase systems - Phase sequence - Star and Delta connection-Relation between line and phase voltages & currents in balanced systems-Analysis of balanced three phase circuits-measurement of Active and Reactive power in Balanced and unbalanced three phase systems. Analysis of three phase Unbalanced circuits-Loop method-Application of Milliman's theorem-Star Delta Transformation Technique. **UNIT – III** **Two port Network Parameters** - Open circuit parameters – Short circuit parameters – Transmission parameters - inverse transmission parameters - Hybrid parameters – Inverse hybrid parameters - Inter-relationships of different parameters-Interconnections of two port networks –Condition for reciprocity and symmetry of networks with different two port parameters - Terminated two port networks – Image parameters.	

	UNIT – IV **Network Functions :** Single port &multi port networks - Immittance functions of two port networks – Necessary conditions for driving point functions & transfer function – Complex frequencies – Poles and zeros – Time domain response from pole zero plots – Restrictions on pole-zero locations. **UNIT – V** **D.C Transient Analysis:** Transient response of R-L, R-C & R-L-C circuits for DC excitations initial conditions-Time constants -solution using Differential equation & Laplace transform methods. **UNIT – VI** **A.C Transient Analysis :** Transient response of R-L, R-C & R-L-C circuits for sinusoidal excitations-initial condition-time constants –Solution using Differential Equation & Laplace transform methods - Tranformed circuits - Transient response of R-L, R-C& R-L-C circuits for other types of signals(step, impulse) using Laplace transform methods.
Text Books & Reference Books:	**TEXT BOOKS:** 1. "Engineering Circuit Analysis" by Hayt & Kemmerly, 2nd Edition,TMH publishers 2. "Network Analysis" by M.E Van Valkenburg, Third Edition, PHI learning private Limited, 2006. 3. "Fundamentals of Electric circuits" by Charles k Alexander, Mathew N O Sadiku, Tata McGraw Hill Education private Limited, 6th Edition,2017. **REFERENCE BOOKS:** 1. "Circuits & Networks" by A.Sudhakar and Shyam Mohan , 5th Edition(2015),TMH 2. "Circuit Theory" by A.Chakrabarti, Dhanpat Rai publishers 6th Edition 2014. 3. "Circuits & Systems" by Dr K.M.Soni, S.K.Kataria & sons Publication(2014).
E-Resources:	http://nptel.ac.in/courses http://iete-elan.ac.in http://freevideolectures.com/university/iitm

17EC1201 – ELECTRONIC DEVICES
(Common to ECE , EEE CSE& IT)

Course Category:	Program core	**Credits:**	3
Course Type:	Theory	**Lecture - Tutorial - Practical:**	3 - 0 – 0
Pre-requisite:	To provide students with the fundamentals of Electronics	**Sessional Evaluation :** **External Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives	Students undergoing this course are expected to understand: 1. The concepts of Solid State Semi-Conductor Theory. 2. The operation of a PN Junction Diode. 3. The Ideal, Practical and Electrical Characteristics of Zener, Varactor, Tunnel and Avalanche Photo Diode. 4. The need for biasing of Transistor. 5. The working of FET and MOSFET. 6. The operation of Thyristors.	
Course Outcomes	Upon successful completion of the course, the student will able to:	
	CO1	Understand the Semiconductor Physics for Intrinsic and Extrinsic materials and theory of operation of Solid State devices.
	CO2	Apply how the properties of semiconductor materials are used for the formation of PN diode.
	CO3	Explain the functioning of various solid-state devices, including several types of diodes including conventional, Zener, Varactor, Tunnel and Avalanche Photo Diode.
	CO4	Design the various Bi-polar Junction Transistor biasing circuits and its usage in applications of amplifiers.
	CO5	Distinguish the constructional features and operation of FET and MOSFET and their applications.
	CO6	Understand the operation with sketch the transfer characteristics of Thyristors.
Course Content	**UNIT-I** **SEMICONDUCTOR DIODES:** Introduction, Classification of Semiconductors, Conductivity of Semiconductor, Energy Distribution of Electrons, Carrier Concentration in Intrinsic Semiconductor, Mass-Action Law, Properties of Intrinsic Semiconductors, Variation in Semiconductor Parameters with Temperature, Drift and Diffusion currents, Carrier Life Time, Continuity Equation. **UNIT – II** **PN JUNCTION DIODE:** Introduction, Energy Band Structure of Open Circuited Diode, Quantitative Theory of Diode Currents, Diode Current Equation, Ideal vs Practical Resistance Levels, Transition Capacitance, Diffusion Capacitance, Temperature Dependence of V-I characteristics, Breakdown in Diodes, Diode as a Circuit Element, Piecewise Linear Diode Model, Applications.	

	UNIT –III **SPECIAL DIODES:** Introduction, Zener Diode, Varactor Diode, Tunnel Diode, Avalanche Photo Diode. **UNIT – IV** **BIPOLAR JUNCTION TRANSISTOR:** Introduction, Construction, Transistor Biasing, Operation of NPN Transistor, Operation of PNP Transistor, Types of Configuration. **UNIT – V** **FIELD EFFECT TRANSISTOR:** Introduction, Construction & Operation of N-Channel JFET, Characteristic Parameters, Saturation Drain Current, Slope of the Transfer Characteristic at I_{DSS}, Comparison of JFET and BJT, Applications, MOSFET, Enhancement MOSFET, Depletion MOSFET, Comparison of MOSFET and JFET. **UNIT – VI** **THYRISTORS:** Introduction, PNPN Diode, SCR, Thyristor Ratings, Rectifier Circuits using SCR, LASER(Light Activated SER), TRIAC(Triode A.C. Switch), DIAC(Diode A.C. Switch).
Text Books & Reference Books:	**TEXT BOOKS:** 1. Electronic Devices & Circuits by Jacob Millman & Christos C. Halkias, McGraw- Hilll 2. Mottershed, "Electronic devices and circuits", PHI. **REFERENCE BOOKS:** 1. Electronic Devices and circuits by S. Salivahanan, N. Suresh Kumar, McGraw- Hill 2. Boylestad, Louis Nashelsky "Electronic devices and circuits" 9ed.., 2008 PE.
E-Resources	https://nptel.ac.in/courses https://iete-elan.ac.in https://freevideolectures.com/university/iitm

17SH12P2-ENGINEERING CHEMISTRY LABORATORY

(Common for ECE, EEE, CSE & IT)

Course Category:	Basic science	**Credits:**	2
Course Type:	Practical	**Lecture-Tutorial-Practical:**	0-0-3
Pre-requisite:	Fundamental concepts of Chemistry	**Sessional Evaluation:** **External Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives	The main objective is to provide students to learn about experimental techniques in chemistry with knowledge in theoretical aspects so that they can excel in that particular field.	
Course Outcomes	**CO1**	These experiments in the laboratory are helpful in understanding key concepts of chemistry through involvement in the experiments by applying theoretical knowledge
	CO2	It helps to recognize where the ideas of the student agree with those accepted by chemistry and where they do not.
Course Content	Minimum of 8 experiments to be completed out of the following: **LIST OF EXPERIMENTS** 1. Determination of total hardness of water by EDTA method. 2. Determination of Copper by EDTA method. 3. Estimation of dissolved oxygen by Winkler's method. 4. Determination of Acidity of water 5. Determination of total alkalinity of water. 6. Estimation of chlorides using potassium chromate indicator. 7. Conductometric titration of strong acid Vs strong base. 8. Determination of pH of unknown solution. 9. Preparation of Bakelite. 10. Determination of viscosity of oils with Redwood viscometer.	
Text Books	**TEXT BOOKS:** 1. Vogel's text books of quantitative chemical analysis, Mendham et all, person publications. 2. Chemistry lab manual – KN Jayaveera, Subbareddy & Chandrasekher. 3. Instrumental methods of chemical analysis – Chatwal & Anand Himalaya publications.	

17CS12P1 - C- PROGRAMMING LABORATORY
(Common for CSE, IT, ECE & EEE)

Course Category:	Program Core	**Credits:**	2
Course Type:	Practical	**Lecture – Tutorial – Practical:**	0-0-3
Pre-requisite:	Basic mathematical knowledge to solve problems in analytical manner and idea on programming Methodologies.	**Sessional Evaluation:** **External Exam Evaluation:** **Total Marks:**	40 60 100

Course Outcomes	Upon successful completion of the course, the students will be able to:
	CO1 Problem solving using C Programming concepts
Course Content	1. Write a C program to evaluate expressions. 2. Write a C program to implement if constructs. 3. Write a C program to implement Switch statement. 4. Write a C program to implement all iterative statements. 5. Write a C program to implement Arrays. 6. Write a C program to implement operations on strings without using library functions. 7. Write a C program to implement arithmetic operations using pointers. 8. Write C programs that use both recursive and non recursive functions. 9. Write a C program to implement parameter passing. 10. Write a C program to implement structures. 11. Write a C program to implement basic file operations.
Text Books & References	**TEXT BOOK(S):** 1. Programming with ANSI & TURBO C by Ashok N.Kamthane, Pearson Education 2007 **REFERENCE BOOKS:** 1. A Book on C by Al Kelley/Ira Pohl, Fourth Edition, Addison-Wesley.1999 2. Let Us C by Yashavant Kanetkar, BPB Publications. 3. Programming in ANSI C by Balaguruswamy 6th Edition, Tata McGraw Hill Education, 2012.
E-Resources	https://nptel.ac.in/courses https://freevideolectures.com/university/iitm

17ME12P1- ENGINEERING WORKSHOP
(Common to EEE, ECE, CSE & IT)

Course Category	Engineering Workshop	**Credits**	1
Course type	Practical	**Lecture- Tutorial-Practical**	0-0- 2
Pre-requisite	-	**Sessional Marks:** **External Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives	• To understand the basic work shop tools and operations such as carpentry, fitting & sheet metal trades. • To understand the basic work tools of house wiring & house wiring connections etc. • To understand the basic joints and manufacturing processes such as foundry and welding.	
Course Outcomes	At the end of the course, the student will be able to	
	CO1	Distinguish between tools of various trades such as carpentry, fitting, sheet metal, welding, foundry & house wiring.
	CO2	Explain the tools & connections pertaining to house wiring, stair case wiring etc.
	CO3	Describe the use of carpentry & fitting joints such as lap, dovetail, mortise, tenon joint, various sheet metal models & manufacturing processes.
Course Content	1. **Carpentry**: Lap joint, Mortise and Tenon joint, Bridle joint . 2. **Fitting:** Square, V, half round and dovetail fittings 3. **Tin-Smithy:** Tray, cylinder, hopper, cone 4. **House-wiring:** One lamp controlled by one switch, Two lamps (bulbs) controlled by two switches, Stair- case connection, Water pump connected with single phase starter. 5. **Foundry**: single-piece pattern, Two- piece pattern **TRADES FOR DEMONSTRATION:** 1. Machine Tools 2. Welding 3. Black Smithy	
Text Books	**TEXT BOOKS:** 1. Engineering Work shop practice for JNTU, V. Ramesh Babu, VRB Publishers Pvt. Ltd,2009 2. Work shop Manual / P.Kannaiah/ K.L.Narayana/ SciTech Publishers,2004 3. Engineering Practices Lab Manual, Jeyapoovan, SaravanaPandian, Vikas publishers,2007.	

NBKR INSTITUTE OF SCIENCE & TECHNOLOGY:: VIDYANAGAR (AUTONOMOUS)
(AFFILIATED TO JNTUA :: ANANTAPUR)
SPSR NELLORE DIST
II YEAR OF FOUR YEAR B.TECH DEGREE COURSE – I SEMESTER
ELECTRICAL AND ELECTRONICS ENGINEERING
SCHEME OF INSTRUCTION AND EVALUATION
(With effect from the academic year 2018-2019)
(For the batch admitted in the academic year 2017-2018)

S.No	Course Code	Course Title	Instruction Hours/Week			Credits	Evaluation									
							Sessional Test-1			Sessional Test-2			Total Sessional Marks (Max. 40)	End Semester Examination		Maximum Total Marks
		THEORY	L	T	D/P		Test-1 (2 Hr)	Assign-1	Max. Marks	Test-2 (2 Hr)	Assign-2	Max. Marks		Duration In Hours	Max. Marks	100
1	17SH2101	Engineering Mathematics – II#	2	2	-	3	34	6	40	34	6	40	0.8*Best of Two + 0.2*Least of Two	3	60	100
2	17EC2101	Signals & Systems$	2	2	-	3	34	6	40	34	6	40		3	60	100
3	17EC2102	Switching Theory & Logic Design$	2	2	-	3	34	6	40	34	6	40		3	60	100
4	17EE2101	Electro Mechanical Energy Conversion-I	3	2	-	4	34	6	40	34	6	40		3	60	100
5	17EE2102	Generation of Electric Power	3	2	-	4	34	6	40	34	6	40		3	60	100
6	17EE2103	Electrical Measurements	2	2	-	3	34	6	40	34	6	40		3	60	100
		PRACTICALS														
7	17EE21P1	Circuits & Networks Lab	-	-	3	2	-		-	-		-	Day to Day Evaluation and a test (40 Marks)	3	60	100
8	17EC21P1	Electronic Devices Lab$	-	-	3	2	-		-	-		-		3	60	100
		TOTAL				24										
		MANDATORY														
9	17MC2101	Environmental Studies#	3	0	-	-	-		40	-		40	0.8*Best of Two + 0.2*Least of Two	3	60	100

(***:** Common to all; **#**: Common to ECE, EEE, CSE & IT; $: Common to ECE & EEE; **@** : Common to ECE,EEE,CE & ME)

17SH2101-ENGINEERING MATHEMATICS -II

(Common to ECE, EEE, CSE and IT)

Course Category:	Basic Sciences	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practical:**	2-2-0
Pre-requisite:	Intermediate Mathematics	**Sessional Evaluation:**	40
		External Evaluation:	60
		Total Marks:	100

Course Objectives	To make the student learn about 1. The concepts of first shifting theorem, change of scale property, laplace transformation of multiplied by t and division by t and transformation of derivatives and integrals. 2. The application of solutions of ordinary differential equations. 3. The determination of fourier coefficients, fourier series, even and odd functions and change of intervals. 4. The concepts of Fourier Transforms. 5. The Properties of Z- Transforms, shifting properties, initial value and final value theorems. 6. The applications of difference equations and to develop the basic mathematical knowledge and computational skills of the students in the areas of applied mathematics.	
Course Outcomes	After completing the course the student will be able to	
	CO1	Acquire basic knowledge in laplace transforms and their applications.
	CO2	Develop analytical skills in solving the ordinary differential equations by using the laplace transform technique.
	CO3	Develop analytical skills in solving the problems involving fourier series.
	CO4	Understand effectively fourier sine and cosine integral, fourier transforms, fourier Sine and cosine transforms.
	CO5	Attains skills in analyzing the Z-Transforms and their applications.
	CO6	Understand effectively Inverse Z- Transforms and applications to difference equations.
Course Content	**UNIT – I** **LAPLACE TRANSFORMATION:** Laplace Transformations of standard functions - First shifting theorem - Change of scale property - Laplace transformation of multiple by t and division by t - Transformation of derivatives and integrals. **UNIT – II** **INVERSE LAPLACE TRANSFORMATION**: Inverse transforms - Method of partial fractions - Shifting property - Inverse Laplace transform of a multiple by s and division by s - Inverse Laplace transform of derivatives and integrals - Convolution theorem - Application to Solutions of ordinary Differential Equations. **UNIT-III** **FOURIER SERIES**: Determination of fourier coefficients - Fourier series - Even and Odd functions - Change of intervals (0,2l).	

	UNIT-IV **FOURIER TRANSFORMS**: Fourier Integral Theorem (Without proof)- Fourier Sine and Cosine integrals - Fourier integral in complex form - Fourier Transforms - Fourier Sine and Cosine transforms. **UNIT-V** **Z-TRANSFORMS**: Z-Transform of some standard functions - Properties of Z-Transforms - Shifting Properties - Initial value theorem and final value theorem. **UNIT-VI** **INVERSE Z- TRANSFORM AND DIFFERENCE EQUATIONS**: Inverse Z-Transform - Convolution theorem-Inversion by partial fractions - Applications to difference equations.
Text Books & Reference Books	**TEXT BOOKS:** 1. Higher Engineering Mathematics - B.S.Grewal, Kanna Publishers, New Delhi. 2. Engineering Mathematics - B.V. Ramana, Tata McGraw-Hill Education Pvt. Ltd, New Delhi. **REFERENCE BOOKS:** 1. Higher Engineering Mathematics - H.K. Dass, Er. RajnishVerma, S.Chand Publication, New Delhi. 2. Advanced Engineering Mathematics - N.P. Bali & M. Goyal, Lakshmi Publishers, New Delhi. 3. Advanced Engineering Mathematics - Erwin Kreyszig, Wiley, India

17EC2101-SIGNALS & SYSTEMS
(Common to EEE & ECE)

Course category:	Program core	**Credits:**	3
Course Type:	Theory	**Lecture - Tutorial - Practical:**	2 - 2 - 0
Pre-requisite:	Knowledge of vectors Trigonometry, Differentiation & Integration	**Sessional Evaluation :** **Univ.Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives	Students undergoing this course are expected to understand:	
	1. The different types of Continuous Time Signals. 2. The Fourier series for periodic signals. 3. The Fourier Transform of various signals. 4. Analysis and Design of different types of Continuous Time Systems. 5. To provide mathematical background of Discrete Time Signals and Systems. 6. The Fourier Transform of discrete time signals and systems.	
Course Outcomes	Upon successful completion of the course , the students will be able to:	
	CO1	Define the signals and systems with examples.
	CO2	Find the Fourier series of various Periodic signals.
	CO3	Define the Fourier Transform and its properties.
	CO4	Explain the inter connections of LTI systems.
	CO5	Explain the operations on discrete time signals and its transformations.
	CO6	Know the difference between FT and HT and applications of those two.
Course Content	**UNIT-I** **CONTINUOUS TIME SIGNALS:** Signal classification, Types of Signals-Dirac delta, unit step, ramp, Signum and Exponential functions, Operations on signals, Analogy between vectors and signals, Orthogonality, Mean square error. **UNIT-II** **FOURIER SERIES**: Definition-Dirichlet's conditions, classification of Fourier Series, properties of Fourier Series.	

	UNIT III **FOURIER TRANSFORM:** Existence of Fourier Transform-Properties of Fourier Transform-Inverse Fourier Transforms, Parseval's Theorem of Energy and Power signals, Energy, Power, Periodicity of signals, Power and Energy Spectral Densities, Auto and Cross correlation of signals. **UNIT-IV** **CONTINUOUS TIME SYSTEMS:** Classification of systems – Linearity and time invariance – Transmission of signals through LTI systems – Convolution – Impulse response – Frequency response of LTI Systems. **UNIT-V** **DISCRETE TIME SIGNALS AND SYSTEMS:** Unit impulse, step, ramp, and exponential signals – Periodicity of signals – Operations on signals – Linear Shift Invariant(LSI) system – Stability – Causality – Convolution and Correlation –Linear constant coefficient difference equation – Impulse response. **UNIT-VI** **DISCRETE TIME FOURIER TRANSFORM:** Definition of Discrete Time Fourier Transform – Properties – Transfer function – System analysis using DTFT. Ideal filters – Distortion less transmission – Bandwidth – Rise time – Hilbert transform – Pre and complex envelopes – Bandpass signals through band pass systems.
Text Books & Reference Books	**TEXT BOOKS:** 1. Signals & Systems : A Anand Kumar – PHI 2. Linear Systems and Signals : B.P.Lathi – Oxford University Press 3. Signals & Systems: P.Ramesh Babu-SP **REFERENCE BOOKS:** 1. Signals &Systems :J.S.Chitode – Technical Publications. 2. Signals &Systems :A.V.Oppenhiem & A.S.Willsky with S.Hamid Nawab - PHI
E- Resources	https://nptel.ac.in/courses https://iete-elan.ac.in https://freevideolectures.com/university/iitm

17EC2102 – SWITCHING THEORY & LOGIC DESIGN

(Common to EEE & ECE)

Course category:	Program core	**Credits:**	3
Course Type:	Theory	**Lecture - Tutorial - Practical:**	2 - 2 - 0
Pre-requisite:	Number systems , Semiconductor device operations, basic arithmetic operations	**Sessional Evaluation :** **Univ.Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives	Students undergoing this course are expected to understand:	
	1. To introduce basic postulates of Boolean algebra and shows the correlation between Boolean expressions. 2. To introduce the methods for simplifying Boolean expressions. 3. To outline the formal procedures for the analysis and design of combinational circuits 4. To illustrate the concept of synchronous and asynchronous sequential circuits 5. To introduce the concept of various counters and Registers 6. To introduce the concept of memories and Memory expansion.	
Course Outcomes	Upon successful completion of the course , the student will able to:	
	CO1	Understanding of the fundamental concepts and techniques used in digital electronics and understand and examine the structure of various number systems and its application in digital design
	CO2	Identify basic requirements for a design application and propose a cost effective solution
	CO3	Understand, analyse and design various combinational circuits
	CO4	Understand, analyse and design various sequential circuits.
	CO5	Identify and prevent various hazards and timing problems in a digital design.
	CO6	Understand the memories

UNIT – I

NUMBER SYSTEMS AND CODES: Number systems, Signed binary numbers, Base conversions, Binary arithmetic, Complements, Binary codes– (BCD, Grey, ASCII).

BOOLEAN ALGEBRA AND LOGIC GATES: Basic definitions and theorems of Boolean algebra, De-Morgan's theorem, Digital logic gates, Universal gates, Multi-level gate circuits.

Course Content	**UNIT – II** **MINIMIZATION OF DIGITAL CIRCUITS:** Standard forms of logical functions, min-term and max-term specifications, Simplification by K-maps, incompletely specified functions, prime implicants, Essential prime implicants, Tabular method, Realization of logic functions using gates. **UNIT -III** **COMBINATIONAL LOGIC CIRCUITS:** Design procedure, Binary adder, Subtractor, Decimal adder, Magnitude comparator, Decoders, Encoders, Multiplexers, Demultiplexers. **UNIT – IV** **SEQUENTIAL CIRCUITS:** Sequential circuits, Storage Elements, (Latches& Flip-flops), Master-slave Flip-flop, Flip-flop conversions, Timing and triggering consideration, Analysis of clocked sequential circuits, State reduction & assignment, Design procedure. **UNIT – V** **REGISTERS AND COUNTERS:** Registers, Shift registers, Ripple counters, Synchronous counters, other counters– Ring and Johnson counters. **UNIT-VI** **MEMORY AND PROGRAMMABLE DEVICES:** Random-Access Memory, Memory Decoding, Error detection and correction, Read-only Memory, Programmable Logic Array, Programmable Array Logic, Sequential programmable devices.
Text Books & Reference Books	**TEXT BOOKS:** 1. Digital design by Morris Mano, Pearson Education Asia 2. Fundamentals of logic design by Roth & Charles,2nd Edition, West Publishing Company, 1979 **REFERENCE BOOKS:** 1. Fundamentals of logic circuits by A. Anand Kumar, PHI Learning 2. Jon M, Yarbrough, "Digital logic - applications and design", Thomson -Brooks India edition.
E- Resources	http://nptel.ac.in/cources https:// iete-elan.ac.in https://freevideolectures.com/university/iitm https://www.youtube.com/watch?v=pJrqIgAM0o4&list=PLnSlSuYL9wG7C7Jk_mbXQ0LC0o7HQRsMD https://www.youtube.com/watch?v=K73N9ES_8nI

17EE2101-ELECTRO MECHANICAL ENERGY CONVERSION -I

(EEE)

Course Category:	Professional core	**Credits:**	4
Course Type:	Theory	**Lecture-Tutorial-Practical:**	3-2-0
Pre-requisite:	Fundamental concepts of Electrical and Magnetic coupled circuits.	**Sessional Evaluation:** **External Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives	To make the student learn about: 1. The conversion principle of electrical and mechanical energy 2. The constructional details, working principles & winding diagrams of DC machines. 3. The characteristics of DC machines & speed control methods of DC motors. 4. Different performance tests on DC machines.	
Course Outcomes	After completing the course the student will be able to	
	CO1	Understand the basics of electromechanical energy conversion.
	CO2	Empathize the working principle of Generator and its winding diagrams.
	CO3	Identify the suitable DC generator for specific applications.
	CO4	Ascertain the suitable DC motor for specific applications.
	CO5	Calculate the efficiency of DC machine and understand the parallel operation of DC generators.
	CO6	Conduct different tests on DC machines.
Course Content	**UNIT- I** **Principles of Electro- Mechanical Energy Conversion**: Introduction, flow of energy in electromechanical devices, Energy in magnetic systems (defining energy and Co-energy), singly excited systems, determination of mechanical force, Mechanical energy, Torque equation, Doubly Excited Systems, Energy stored in Magnetic field, Electromagnetic torque, Generated EMF in machines, torque in machines with cylindrical air gap. **UNIT – II** **DC Generators**: Simple DC Generator working Principle-Constructional details of DC machine -operation - Armature windings - types of armature windings and winding drawings-Problems – Generated EMF equation - Armature reaction - its effects and compensating Methods-Problems. **UNIT – III** **Types of DC Generators:** Characteristics of different types of generators – critical field resistance and critical speed – applications – Problems - commutation - methods of improving commutation - Compensating windings.	

	UNIT – IV **DC Motors:** Working principle – Types of DC motors -Torque and Power developed by armature – characteristics of DC motors – Applications & Problems - Speed control of DC motors –Problems - Starting of DC motors - Constructional details of 3 - Point and 4 - Point starters – problems. **UNIT – V** **Losses and efficiency of DC machine**: Various losses in DC machine and efficiency, condition for maximum Efficiency-Problems **Parallel operation of DC generators**: Parallel operation of DC shunt, series and compound Generators-Problems. **UNIT – VI** **Testing of DC machines**: Brake test - Swinburne's test - Hopkinson's test – Field's test - Retardation test - Separation of iron and friction Losses-Problems.
Text Books & Reference Books	**TEXT BOOKS:** 1. "Theory and performance of Electrical machines" by J.B Gupta - SK Kataria publishers,2013. 2. "Principles of Electrical Machines" by VK Mehta, Rohit Mehta – S.Chand,2006. 3. "Electrical machines" by I.J. Nagarath and D.P. Kothari 4th Edition, Tata McGraw Hill. **REFERENCE BOOKS:** 1. "Electrical Machinery" by P.S Bimbhra - Khanna publishers, 2011. 2. "Performance of DC machines" by M.G. Say, Second Edition, CBS Publishers. 3. "A Textbook of Electrical Technology: Volume 2, AC and DC Machines", by Theraja B. L, Theraja A.K. S. Chand,2006.
E-Resources	http://nptel.ac.in/courses http://iete-elan.ac.in http://freevideolectures.com/university/iitm

17EE2102-GENERATION OF ELECTRIC POWER
(EEE)

Course Category:	Professional core	**Credits:**	4
Course Type:	Theory	**Lecture-Tutorial-Practical:**	3-2-0
Pre-requisite:	Fundamental knowledge of DC power generation, renewable and non renewable sources.	**Sessional Evaluation:** **External Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives	1. This course aims to equip the student with a basic understanding of concepts of the electrical power generation by conventional and nonconventional sources. 2. Learn the principle of renewable energy generation and economic aspects of power generation.	
Course Outcomes	After completing the course the student will be able to	
	CO1	Understand the operation of various components involved in thermal power plant.
	CO2	Gain the knowledge of operation, construction and design of various components of hydro power plant.
	CO3	Know the operation, construction, safety and design of various components of nuclear power plant.
	CO4	Describe the working principle of PV cell and applications of solar energy.
	CO5	Demonstrate knowledge on wind power generation.
	CO6	Evaluate tariffs by different methods and economical aspects of power generation.

Course Content

UNIT-I

Thermal Power Stations (TPS): Introduction, Selection of site for TPS, description of Thermal Power Station showing paths of coal, steam, water, air, ash and flue gases.

Brief description of TPS components: Economisers, Boilers, types of Boilers, Super heaters, steam Turbines, Impulse & Reaction type, Condensers, Jet and surface types of Condensers, Electrostatic precipitator, Chimney and Cooling towers- Advantages & disadvantages of TPS, TPS in India.

UNIT-II

Hydro-Electric Power Plants: Introduction, Selection of site for Hydro – electric Power plants, classification of Hydro – electric plants, Layout of Hydro Electric Power plant, working principle, Description of main components, water power equation, types of turbines - Pelton, Francis & Kaplan turbines, Pumped storage plant, Advantages and disadvantages of hydro power plant - Hydro power plants in India.

UNIT –III

Nuclear Power Stations: Introduction, Nuclear fuels and properties - Nuclear Fission and Chain reaction. - Principle of operation of Nuclear power plant, Nuclear Reactor components and their functions, Moderators, Control rods, Reflectors and Coolants, Radiation hazards, Shielding and Safety precautions, Types of Nuclear reactors and brief description of pressurised Water Reactor (PWR), Boiling Water Reactor (BWR) and Fast Breeder Reactor, Merits and demerits of Nuclear Power Plant.

	UNIT –IV **Renewable Energy sources:** Introduction, solar radiation, solar energy collectors, Flat plate collectors, concentrating collectors, solar thermal power plant, working principle of photo voltaic cell, solar energy storage, solar applications. **UNIT –V** **Wind Energy:** Introduction, power in the wind mills, site selection considerations for installing wind mill, Construction details of the wind mill (Wind Turbine Gear System), working principle of wind mill, variation of power output with wind speed, Betz criterion, Applications. **UNIT –VI** **Economic Aspects of power generation:** Load curve, load duration and integrated load duration curve, number and size of generator units, Connected load, Maximum demand, Load Factor, Demand Factor, Diversity Factor, Plant use factor, Plant Capacity Factor, Utilization Factor - Power Factor, causes of low power factor. **Cost of Electrical Energy:** Cost of generation and their division into fixed, semi fixed and running costs. Tariff, Objectives of tariff, flat rate, block rate, two part, three part and power factor tariff methods. Numerical problems.
Text Books & Reference Books	**TEXT BOOKS:** 1. "A course in electrical Power" by J.B.Gupta S.K. kataria & sons, 11th Edition(Reprint 2014). 2. "Generation of Electrical Energy"- by B.R Gupta-S.Chand Publications,6th Edition(Reprint 2014). 3. "A Text Book on Power System Engineering" by M.L Soni, P.V Gupta, O.S Bhatnagar- Dhanpat Rai & Co, Reprint 2009. **REFERENCE BOOKS:** 1. "Generation, Distribution and Utilization of Electrical Energy" by C.L Wadhwa- New age International Pvt 2015. 2. "Non Conventional Energy Sources" by G.D Roy- Khanna Publishers. 3. "A Course in Power Plant Engineering" by Subhash C. Arora, S.Domkundwar, Dhanpat Rai.
E-Resources	http://nptel.ac.in/courses http://iete-elan.ac.in http://freevideolectures.com/university/iitm

17EE2103-ELECTRICAL MEASUREMENTS
(EEE)

Course Category:	Professional core	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practical:**	2-2-0
Pre-requisite:	Basic electrical sciences, principles of energy conversion.	**Sessional Evaluation:** **External Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives	1. To provide knowledge in the specific area of electrical measuring instruments. 2. To impart knowledge on various potentiometers and bridges (both DC & AC). 3. To learn the working principle of indicating instruments and integrating instruments. 4. To learn knowledge on various instrument transformers, frequency meters and power factor meters and to understand the calibration of various meters.	
Course Outcomes	After completing the course the student will be able to	
	CO1	Understand the basics of measurements.
	CO2	Empathize various types of measurements, requirement of calibrations and instruments with errors in measurement etc.
	CO3	Compare the working principles, merits, demerits and errors of different types of indicating instruments and integrating instruments.
	CO4	Know the working principle of instrument transformers, frequency meters and power factor meters.
	CO5	Understand the working of DC and AC potentiometers.
	CO6	Discriminate different bridges used for measurement of resistance, capacitance and inductance.
Course Content	**UNIT-I** **General theory of instruments:** Accuracy, Precision, Resolution, sensitivity, types of Errors. **Classification of instruments**: Characteristics of measurement system-deflecting, control and damping torques-types of supports. **UNIT-II** **Ammeters and Voltmeters:** PMMC, Moving Iron, rectifier, thermal type instruments – deflecting torque and control torque – Errors and compensations, range extension of ammeter and voltmeter–Ohmmeter. **UNIT-III** **Measurement of power:** Single phase dynamometer wattmeter, expression for deflecting and control torques – errors and compensations –Range extension of wattmeter using instrument transformers – 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. Three phase energy meter – trivector meter.	

	UNIT-IV **Instrument transformers:** CT and PT – Ratio and phase angle errors – design considerations. **Power Factor(P.F) meters:** Type of P.F. Meters – dynamometer and moving iron type – 1-ph and 3-ph P.F meters. **Frequency meters:** Resonance type and Weston type – synchroscopes. **UNIT-V** **Potentiometers:** Principle and operation of D.C. Crompton's potentiometer – standardization – Measurement of unknown resistance, current, voltage. **A.C. Potentiometers:** Polar and co-ordinate types standardization – applications. **UNIT-VI** **Resistance measurement:** Ammeter Voltmeter method – Wheatstone bridge – Kelvin's double bridge – Megger – loss of charge method. **AC bridges:** **Measurement of Inductance:** Maxwell's bridge– Hay's bridge– Anderson's bridge–Owen's bridge. **Measurement of Capacitance:** Desauty bridge–Wien's bridge – Schering Bridge.
Text Books & Reference Books	**TEXT BOOKS:** 1. "Electrical and Electronics Measurements and Instrumentation", Prithwiraj Purkait, Tata McGraw Hill, 2013. 2. "Electrical & Electronic Measurements and Instrumentation", A.K. Sawhney, Dhanpat Rai& Co (P) Ltd, 2004. 3. Electrical Measurements and measuring Instruments – by E.W. Golding and F.C. Widdis, 5th Edition Reem publication,2011. **REFERENCE BOOKS:** 1. "Electrical Measurements and Measuring Instruments", Rajendra Prasad,Khanna publications,1984. 2. "Electrical and Electronics Measurements", R.K.Rajput, S.Chand publications. 3. Electrical Measurements: Fundamentals, Concepts, Applications – by Reissland, M.U, New Age International (P) Limited,2010.
E-Resources	http://nptel.ac.in/courses http://iete-elan.ac.in http://freevideolectures.com/university/iitm

17MC2101-ENVIRONMENTAL STUDIES

(Common to ECE, EEE, CSE & IT)

Course Category:	Professional core	**Credits:**	-
Course Type:	Theory	**Lecture-Tutorial-Practical:**	3-0-0
Pre-requisite:	Basic idea on environment, Environmental pollution causes, effects, and control measures.	**Sessional Evaluation:** **External Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives	Students undergoing this course are expected to understand: 1. To know the importance of Environmental studies and understand the various components of environment components 2. To know the value of natural resources and need to protect them. 3. To know the value of biodiversity and it conservation methods. 4. To design engineering methods and solve problems related to environmental pollution. 5. To understand the social issues and provide plans to minimize the problems. 6. To understand need to protect various environmental acts.	
Course Outcomes	Upon successful completion of the course , the students will able to:	
	CO1	To know the importance of Environmental studies and understand the various components of environment.
	CO2	Understand the value of natural resources
	CO3	Understand the value of biodiversity and need to protect.
	CO4	Understand how the environment is polluted and suggest some control measures.
	CO5	Understands the several environmental problems in India and way to minimize the effects.
	CO6	Knowing the environmental protection laws in our country and understand the need to respect those laws.
Course Content	**UNIT-I** **INTRODUCTION**: Definition, Scope and Importance of Environmental studies, Environmental Components. **UNIT-II** **ENVIRONMENT AND NATURAL RESOURCES MANAGEMENT:** a. Land resources: Importance, Land degradation, Soil erosion and desertification, Effects of modern agriculture (fertilizer and pesticide problems). b. Forest Resources: Use and over-exploitation-Mining and Dams-their effects on forest and tribal people. c. Water Resources: Use and over-utilization of surface and ground water, Floods and droughts, Rainwater harvesting, clouds seeding and watershed management. d. Energy resources: Energy needs - Renewable and non-renewable energy, need to use of alternate energy sources, Impact of energy use on environment.	

	UNIT-III **ECOSYSTEM**: Introduction, types, characteristics and functions of Ecosystems **BIO-DIVERSITY AND ITS CONSERVATION**: Value of bio-diversity- consumptive and productive use, social, ethical, aesthetic and option values - Threats to biodiversity- conservation of biodiversity. **UNIT-IV** **ENVIRONMENTAL POLLUTION:** Causes, Effects and control measures of Air pollution, Water Pollution, Soil pollution, Marine Pollution, Noise pollution, Nature of Thermal pollution and nuclear hazards, Global warming, Acid rain, Ozone depletion. **SOLID WASTE MANAGEMENT**: Composting, Vermiculture - Urban and industrial wastes, recycling and reuse. **UNIT-V** **ENVIRONMENTAL PROBLEMS IN INDIA:** Drinking water, Sanitation and public health -Effects of urbanization, Transportation, Industrialization on the quality of Environment-Social Issues. **ECONOMY AND ENVIRONMENT**: The economy and environment interaction, Sustainability, Environment Impact Assessment. **UNIT-VI** **ENVIRONMENTAL ACTS:** Water (Prevention and control of pollution) Act-Air (Prevention and control of pollution) Act – Environment protection Act, Wildlife protection Act, Forest conservation Act. **CASE STUDIES:** Silent valley project, Madhura Refinery and Taj Mahal, Tehri Dam, Kolleru Lake Aquaculture, Fluorosis in Andhra Pradesh. **FIELD WORK:** Visit to Local Area having river/Forest/grass land/hill/mountain to document and Environmental assets.
Text Books & Reference Books	**TEXT BOOKS:** 1. "Electrical and Electronics Measurements and Instrumentation", Prithwiraj Purkait, Tata McGraw Hill, 2013. 2. "Electrical & Electronic Measurements and Instrumentation", A.K. Sawhney,Dhanpath Rai& Co (P) Ltd, 2004. 3. Electrical Measurements and measuring Instruments – by E.W. Golding and F.C. Widdis, 5th Edition Reem publication,2011. **REFERENCE BOOKS:** 1. "Electrical Measurements and Measuring Instruments", Rajendra Prasad, Khanna publications,1984. 2. "Electrical And Electronics Measurements", R.K.Rajput, S.Chand publications. 3. Electrical Measurements: Fundamentals, Concepts, Applications – by Reissland, M.U, New Age International (P)Limited,2010.
E-Resources	http://nptel.ac.in/courses http://iete-elan.ac.in

17EE21P1-CIRCUITS & NETWORKS LAB

Course Category:	Professional core	**Credits:**	2
Course Type:	Laboratory	**Lecture-Tutorial-Practical:**	0-0-3
Pre-requisite:	Basic concepts of Ohm's Law & Kirchhoff's Laws. Basic knowledge of Network Theorems.	**Sessional Evaluation:** **External Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives	To make the student learn about 1. The design and analysis of basic electric circuits. 2. The Network theorems. 3. Mutual inductance of coupled coils.	
Course Outcomes	After completing the course the student will be able to	
	CO1	Analyse the electric circuits experimentally.
	CO2	Verify the theorems and determine the two port network parameters experimentally.
	CO3	Measure the power in single phase AC circuit
	CO4	Compute the resonance frequency, cut-off frequencies of the given RLC circuit experimentally.
	CO5	Find the step response of electric circuits & draw the locus diagram of the given circuit experimentally.
	CO6	Analyze and calculate the mutual inductance of coupled coils practically.

Minimum of 10 experiments to be conducted out of the following:

List of Experiments

1. Verification of Kirchhoff's laws
2. Verification of Superposition theorem
3. Verification of Reciprocity theorem
4. Verification of Maximum power transfer theorem
5. Determination of Two-Port network parameters
6. Measurement of Mutual inductance
7. Locus diagram of RC series circuit
8. Measurement of Power using Wattmeter
9. Verification of Thevenin's theorem
10. Resonance in RLC series circuit
11. Measurement of Time constant & Rise time in a RC series circuit
12. Measurement of Power using
    a) 3-ammeter method
    b) 3-voltmeter method

17EC21P1-ELECTRONIC DEVICES LAB

Course Category:	Program Core	**Credits:**	2
Course Type:	Practical	**Lecture-Tutorial-Practical:**	0-0-3
Pre-requisite:	Basic Electrical Sciences and Electronic Devices	**Sessional Evaluation:** **External Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives	1. Understand the characteristics of various Electronic Devices. 2. Demonstrates the uses and applications of semiconductor devices. 3. Determine the typical values of various electronic devices. 4. Plot the characteristics of various devices in terms of V & I. 5. Draw their equivalent circuits used in Electronic Circuits.	
Course Outcomes	After completing the course the student will be able to	
	CO1	Understand the concepts of semiconductor devices.
	CO2	Use the devices for various switching applications.
	CO3	Design various electronic circuits using these devices.
	CO4	Apply the equivalent circuits to evaluate the typical parameters.
	CO5	Justify whether the devices are used in different commercial applications or not.

Minimum of 10 experiments to be conducted out of the following:

List of Experiments

1. P-N Junction Diode Characteristics (Ge & Si)
2. Zener Diode Characteristics
3. Bi-Polar Junction Transistor Characteristics (CE Configuration)
4. Junction Field Effect Transistor Characteristics
5. Uni-Junction Transistor Characteristics
6. Light Emitting Diode Characteristics
7. Light Dependent Resistor Characteristics
8. Photo Transistor Characteristics
9. Thermistor Characteristics
10. DIAC Characteristics
11. Bi-Polar Junction Transistor Characteristics (CB Configuration)
12. TRAIC Characteristics

NBKR INSTITUTE OF SCIENCE & TECHNOLOGY:: VIDYANAGAR (AUTONOMOUS)
(AFFILIATED TO JNTUA:: ANANTAPUR)
SPSR NELLORE DIST
II YEAR OF FOUR YEAR B.TECH DEGREE COURSE – II SEMESTER
ELECTRICAL AND ELECTRONICS ENGINEERING
SCHEME OF INSTRUCTION AND EVALUATION
(With effect from the academic year 2018-2019)
(For the batch admitted in the academic year 2017-2018)

S.No	Course Code	Course Title	Instruction Hours/Week			Credits	Evaluation									
							Sessional Test-I			Sessional Test-II			Total Sessional Marks (Max. 40)	End Semester Examination		Maximum Total Marks
		THEORY	L	T	D/P		Test-I (2 Hr)	Assign-I	Max. Marks	Test-I (2 Hr)	Assign-2	Max. Marks		Duration In Hours	Max. Marks	100
1	17SH2201	Engineering Mathematics –III#	2	2	-	3	34	6	40	34	6	40	0.8*Best of Two + 0.2*Least of Two	3	60	100
2	17SH2202	Engineering Economics and Financial Accounting#	3	0	-	3	34	6	40	34	6	40		3	60	100
3	17EC2201	Pulse & Switching Circuits$	2	2	-	3	34	6	40	34	6	40		3	60	100
4	17EE2201	Electromagnetic Fields	2	2	-	3	34	6	40	34	6	40		3	60	100
5	17EE2202	Electro Mechanical Energy Conversion-II	3	2	-	4	34	6	40	34	6	40		3	60	100
6	17EE2203	Power Systems-I	3	2	-	4	34	6	40	34	6	40		3	60	100
		PRACTICALS														
7	17EE22P1	Electro Mechanical Energy Conversion-I Lab	-	-	3	2	-		-	-		-	Day to Day Evaluation and a test (40 Marks)	3	60	100
8	17EC22P4	Pulse & Switching Circuits Lab	-	-	3	2	-		-	-		-		3	60	100
		TOTAL				24										
		MANDATORY														
9	17MC2201	Technical English & Soft Skills#	2	0	2	-	-		40	-		40	0.8*Best of Two + 0.2*Least of Two	3	60	100

(***** : Common to all; **#** : Common to ECE,EEE,CSE&IT; $: Common to ECE&EEE; **@** : Common to ECE,EEE,CE & ME)

17SH2201-ENGINEERING MATHEMATICS -III

(Common to ECE & EEE)

Course Category:	Basic Sciences	**Credits:**	3
Course Type:	Theory	**Lecture -Tutorial-Practical:**	2-2-0
Pre-requisite:	Intermediate Mathematics	**Sessional Evaluation:**	40
		External Evaluation:	60
		Total Marks:	100

Course Objectives	To make the student learn about 1. The concepts of one dimensional Wave equation, One dimensional Heat flow equation and Two dimensional Laplace equations. 2. Legendre and Bessel functions. 3. The concepts of Cauchy - Riemann equations, Construction of Analytic function, Applications to flow problems and Bilinear transformations. 4. Line integral, Cauchy's theorem and Cauchy's integral formula. 5. The concepts of Residues. 6. Random variables, Discrete and Continuous distributions.	
Course Outcomes	After completing the course the student will be able to	
	CO1	Have a sound knowledge in analyzing One-dimensional wave equation, Heat flow equation and Two-dimensional Laplace equations.
	CO2	Attains skills in analyzing the Bessel functions and Legendre functions.
	CO3	Understand effectively the significance of differentiability for complex functions and be familiar with the Cauchy-Riemann equations.
	CO4	Recognize and apply the Cauchy's integral formula and the generalized Cauchy's integral formula.
	CO5	Compute the Taylor and Laurent expansions of simple functions, determining the nature of the singularities and calculating residues.
	CO6	Have a well-founded knowledge of standard distributions (Binomial, Poisson and Normal distributions) which can describe real life phenomena.
Course Content	**UNIT-I** **Applications of Partial Differential Equations**: Methods of Separation of Variables - One dimensional Wave equation - One dimensional Heat flow equation - Two dimensional Laplace equations. **UNIT-II** **Special functions**: Bessel functions – Properties - Recurrence formulae for Bessel function - Generating function for $J_n(x)$ - Orthogonality of Bessel Functions. Legendre functions - Rodrigue's formula - Recurrence relation for Pn(x) - Generating function for Pn(x) - Orthogonality of Legender polynomials.	

	UNIT-III **Complex Analysis-I**: Analytical functions, Cauchy - Riemann equations, Construction of Analytic function - Applications to flow problems - Harmonic and Conjugate harmonic functions - Bilinear transformations. **UNIT-IV** **Complex Analysis-II**: Complex integration - Line integral –Cauchy's theorem - Cauchy's integral formula - Generalized Cauchy's integral formula. **UNIT-V** **Residues**: Taylor's theorem and Laurent's theorem (without proof) – Singularities – Poles - Residues - Residue theorem - Evaluation of real definite integrals. **UNIT-VI** **Probability and Statistics**: Introduction - Random experiments - Random variables - Discrete and Continuous distributions - Binomial distribution - Poisson distribution - Normal distribution.
Text Books & Reference Books	**TEXT BOOKS:** 1. Higher Engineering Mathematics - B.S. Grewal, Kanna Publishers, New Delhi. 2. Engineering Mathematics - B.V. Ramana, Tata Mc Graw-Hill Education Pvt. Ltd, New Delhi. 3. Advanced Engineering Mathematics - Erwin Kreyszig, Wiley, India **REFERENCE BOOKS:** 1. Higher Engineering Mathematics - H.K. Dass, Er. RajnishVerma, S. Chand Publication, New Delhi. 2. Engineering Mathematics -III - Dr.T.K.V. Iyengar, Dr.B. Krishna Gandhi, S.Ranganatham, Dr.M.V.S.S.N. Prasad, S. Chand Publication, New Delhi 3. Special functions and complex variables (Engineering Mathematics-III) – Shahnaz Bathul, PHI, New Delhi.

17SH2202-ENGINEERING ECONOMICS AND FINANCIAL ACCOUNTING

(Common to ECE and EEE)

Course Category:	Humanities	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practical:**	3-0-0
Pre-requisite:	Basics of economics & accountancy.	**Sessional Evaluation:** **External Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives	Students undergoing this course are expected to understand: 1. Causes of economic problems. 2. Behavior of a Consumer while purchasing and consuming various commodities and services. 3. Various production and cost concepts used in managerial decision making process. 4. Formation of different types of business organizations in India. 5. Application of the basic accounting concepts.	
Course Outcomes	Upon successful completion of the course , the students will be	
	CO1	Able to demonstrate an ability to define, analyze and identify the appropriate solution to a business problem using sound economic and accounting principles.
	CO2	Able to know the role of various cost concepts in managerial decisions and the managerial uses of production function.
	CO3	Able to understand to take price and output decisions under various market structures.
	CO4	Able to know in brief formalities to be fulfilled to start a business organization.
	CO5	Able to analyse the firm's financial position with the techniques of economic aspects as well as financial analysis.
	CO6	Able to evaluate and select profitable investment proposals
Course Content	**UNIT – I** **BASIC CONCEPTS OF ECONOMICS**: Definition of Economics and basic micro and macro-economic concepts (including GDP/GNP/NI/Disposable Income). The concept of Demand-Law of demand – Elasticity of Demand: Types and measurement .Consumer's equilibrium: Marginal Utility Analysis. **UNIT – II** **THEORY OF PRODUCTION AND COST**: Production function – Cobb – Douglas production function and its properties – Law of variable proportions – Law of Returns to Scale – Cost concepts – Revenue curves – Break-Even Analysis.	

	UNIT-III **THEORY OF PRICING**: Classification of markets – Pricing under perfect Competition – Pricing under Monopoly – Price discrimination – Monopolistic Competition. **UNIT-IV** **TYPES OF BUSINESS ORGANIZATIONS:** Sole proprietorship, partnership and Joint Stock Company – Shares and debentures. **BANKING SYSTEM**: Central bank, Commercial banks and their functions. Impact of technology in banking sector. **UNIT-V** **FINANCIAL ACCOUNTING**: Concepts and principles, Journal and Ledger, Trial Balance, Final Accounts: Trading account, Profit and Loss account and Balance sheet -Simple problems. **UNIT-VI** **FUNDAMENTAL CONCEPTS OF CAPITAL BUDGETING AND WORKING CAPITAL:** Meaning, process and Methods (Payback period, NPV, ARR & IRR- simple problems), Working Capital: operating cycle, factors and sources.
Text Books & Reference Books	**TEXT BOOKS:** 1. Varshney & Maheswari: Managerial Economics, S. Chand Publishers. 2. Business Organisations: C.B.Gupta , S.Chand Publishers. 3. Managerial Economics and Financial Accounting: A.R.Arya Sri, Tata McGraw Hills publishers. **REFERENCE BOOKS:** 1. Economic Analysis: S.Sankaran, Margham Publications. 2. S.N.Maheswari & S.K. Maheswari, Financial Accounting, Vikas Publishers. 3. S. A. Siddiqui & A. S. Siddiqui, Managerial Economics & Financial Analysis, New age International Space Publications.

17EC2201 – PULSE & SWITCHING CIRCUITS
(Common for EEE & ECE)

Course Category:	Professional core	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practical:**	2-2-0
Pre-requisite:	Knowledge in active & passive components and mathematical representation of different wave shapes.	**Sessional Evaluation:** **External Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives	Students undergoing this course are expected to : 1. Analysis and design of wave shaping circuits. 2. Analysis and design of Switching Circuits. 3. Analysis and design of multi-vibrators. 4. Analysis and design of time base generators. 5. Analysis of Power Amplifiers. 6. Analysis of LC tuned amplifiers.	
Course Outcomes	Upon successful completion of the course , the students will able to:	
	CO1	Design RC circuits for triggering
	CO2	Understand Switching circuits (BJT Inverter, NMOS, PMOS and CMOS Switching circuits)
	CO3	Understand design of Multi-vibrators and Schmitt trigger
	CO4	Understand Voltage/ Current Sweep Circuits
	CO5	Understand Power Amplifiers
	CO6	Understand Tuned amplifiers
Course Content	**UNIT – I** **WAVE SHAPING CIRCUITS**: Types of waveforms, RC low pass and high pass circuits, rise time, tilt, Diode as a switch, Diode clipper and clamper circuits. **UNIT – II** **REVIEW OF SWITCHING CIRCUITS:** BJT Inverter, NMOS, PMOS and CMOS Switching circuits and their implementation (universal gates only). **UNIT-III** **MULTI-VIBRATORS:** BJT switch and switching times, Bi-stable multivibrator & triggering methods, Schmitt-trigger, Mono-stable and Astable multi-vibrators using BJT.	

	UNIT – IV **TIME BASE CIRCUITS:** RC sweep circuits, constant current Miller and Bootstrap time base generators using BJT's, UJT relaxation oscillators, and sampling gates. **UNIT – V** **POWER AMPLIFIERS:** Classification of Power Amplifiers, Class-A, Transformer coupled Class-A, Class-B Push-pull, Complementary Class-B push-pull amplifiers. **UNIT –VI** **TUNED AMPLIFIERS:** Introduction, Q-factor, small signal tuned amplifiers, effect of cascading single tuned amplifier on bandwidth and stagger-tuned amplifiers.
Text Books & Reference Books	**TEXT BOOKS:** 1. "Pulse & Digital switching waveforms" by J.Milliman & H.Taub Mc Graw-Hill,2nd Edition, 2008. 2. Design of analog CMOS Integrated circuits by Behad razhavi, Mc Graw-Hill, 2nd Edition, 2001. **REFERENCE BOOKS:** 1. Solid State pulse circuits, by David A. Bell, PHI.4th Edition 2008. 2. Electronic devices and circuit thoery by Boylestad, Louis Nashelsky, 9ed.,2008, Pearson Education 3. Millman and Halkian "Integrated Electronics", McGraw-Hill.
E-Resources	http://nptel.ac.in/cources https:// iete-elan.ac.in https://freevideolectures.com/university/iitm https://www.youtube.com/watch?v=aO6tA1z933k https://www.youtube.com/watch?v=wN6g_q3KPtw https://www.youtube.com/watch?v=x0BZeUACpK0

17EE2201-ELECTROMAGNETIC FIELDS
(EEE)

Course Category:	Professional core	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practical:**	2-2-0
Pre-requisite:	Knowledge of vector analysis, co-ordinate system, vector calculus, differentiation of scalars and vectors.	**Sessional Evaluation:** **External Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives	1. Learn Electrostatics and Magneto statics concepts. 2.Learn Maxwell's equations and EM Wave Characteristics 3. Learn scientific, mathematical and engineering principles that enable them to understand forces, fields and waves.	
Course Outcomes	After completing the course the student will be able to	
	CO1	Determine electric force and electric field intensity
	CO2	Calculate electric field and potential using Gauss's law.
	CO3	Analyse current densities and boundary conditions of dielectrics.
	CO4	Find magnetic field intensity due to current, the application of ampere's law and the Maxwell's second and third equations.
	CO5	Estimate the magnetic forces and torque produced by currents in magnetic field.
	CO6	Gain knowledge on time varying fields and get ability to calculate induced EMF.
Course Content	**UNIT – I** **Electrostatic Fields-I:** Vector Analysis-Cartesian-Cylindrical-Spherical Co-Ordinate systems, Coulomb's law, Electric field Intensity, Electric flux density. **UNIT – II** **Electrostatic Fields-II:** Gauss's law, Gauss's law in point form, Electrostatic potential, Potential gradient, Energy stored in Electric field, Capacitance. **UNIT-III** **Conductors and Dielectrics:** Current and current density, Continuity equation, Conductors – Ohm's Law, Resistance, Power dissipation and Joule's Law, Dielectrics, Dipole Moment, Polarization, Bound change densities, Boundary conditions .	

	UNIT – IV **Magneto Static Fields:** Lorentz force law, Ampere's circuital law, Ampere's force Law, Biot Savart law, Ampere's circuital law in point form, Magnetic vector potential. **UNIT – V** **Magnetic Field in Materials:** Dipole moment, Magnetization, Bound current densities, Boundary conditions, Magnetic circuits, Inductance, Energy stored in Magnetic field. **UNIT –VI** **Maxwell's Equations:** Faraday's law-Motional and transformer induced E.M.F., Maxwell's equations, Faraday's law, Faraday's law in point form, Displacement current, Wave equation and its general solution for free space conditions.
Text Books & Reference Books	**TEXT BOOKS:** 1. "Engineering Electromagnetics" by William H. Hayt & John. A. Buck McGraw-Hill Companies, 7th Editon.2006 . 2. "Electromagnetic Fields" by Sadiku, Oxford Publications, 3rd Editon.2007. 3. "Field Theory" by K.A.Gangadhar & PM Ramanathan Khanna Publishers New Delhi, 2005, 5th Edition. **REFERENCE BOOKS:** 1. "Electromagnetics" by Joseph A.Edminister, McGraw-Hill 4th Edition,2014. 2. " Electromagnetic waves & Radiating system" by Edward C.Jordan and keith G.Balmain, Prentics-Hall of India Pvt. Ltd. 3. "Engineering electromagnetics:Theory and Problems and applications" by J.P Tewari, Khanna Publishers,2003.
E-Resources	http://nptel.ac.in/courses http://iete-elan.ac.in http://freevideolectures.com/university/iitm

17EE2202-ELECTROMECHANICAL ENERGY CONVERSION - II
(EEE)

Course Category:	Professional core	**Credits:**	4
Course Type:	Theory	**Lecture-Tutorial-Practical:**	3-2-0
Pre-requisite:	Fundamentals of energy conversion and three phase connections	**Sessional Evaluation:** **External Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives	1. Learn the basic fundamentals related to the principle, construction and operation of a Transformer, Induction Motor, Induction Generator and double cage induction motor. 2. To measure the performance of a transformer by conducting transformer tests. 3. Learn the important concepts related to different poly-phase transformer connections. 4. Learn the performance and characteristics of an Induction motor by conducting different tests, starting methods and speed control methods.	
Course Outcomes	After completing the course the student will be able to	
	CO1	Acquire the knowledge of principle, construction and operation of a transformer
	CO2	Understand the working of transformer under no load, loaded conditions and analyse the equivalent circuit of a transformer.
	CO3	Identify different connections of a poly-phase transformer.
	CO4	Understand the principle, construction and operation of Induction Motor.
	CO5	Assess the performance and characteristics of an Induction motor using different testing methods.
	CO6	Know the speed control techniques of an Induction Motor and understand the principles of double cage motor and Induction generator.
Course Content	**UNIT-I** **1- ϕ Transformers:** Constructional details - Principle of operation – EMF Equation - Ideal transformer - Leakage flux - Phasor diagram of ideal and practical transformer on no load and loaded condition. **Autotransformer:** Principle-saving of copper - realization of two winding transformer as auto-transformer. **UNIT-II** **Testing of 1-ϕ Transformers:** Pre-determination of performance from OC and SC tests - Equivalent circuit - determination of parameters of equivalent circuit – Losses, efficiency and regulation – Sumpner's test - separation of hysteresis and eddy current losses - Parallel operation of transformers - equal and unequal voltage ratios- load sharing. **UNIT-III** **Poly-phase transformers:** Poly-phase connections – Star/Delta, Delta/Star, Star/Star, Delta/Delta, Star/zigzag Star, Delta/zigzag Star connections and their Phasor diagrams - Scott connection - Open Delta connection - Testing of three phase transformers (Ratio test, Transformer vector group test, Polarity test and magnetic balance test).	

	UNIT-IV **3-ϕ Induction motor:** Constructional details – types - production of rotating magnetic field - principle of operation - Torque equation - Starting and maximum torques - Maximum output - Slip for maximum output - Torque-slip characteristic - losses and efficiency - phasor diagram - Equivalent circuit. **UNIT-V** **Testing and starting of 3-ϕ Induction motor:** No load and blocked rotor tests - determination of equivalent circuit parameters, Brake test, Pre-determination of performance from no load and blocked rotor tests - circle diagram - Auto transformer, star delta and rotor resistance starters. **UNIT-VI** **Speed control of Induction motors:** Pole changing - cascade connection - injection of EMF into rotor circuit - introduction to V/f control of three phase Induction motor. Double cage induction motor - Construction theory - equivalent circuit - characteristics and applications - Induction generator - Theory, construction, operation, equivalent circuit and applications.
Text Books & Reference Books	**TEXT BOOKS:** 1. "Theory and performance of Electrical machines"-J.B Gupta, SK Kataria publishers, 2013 Reprint. 2. "Electrical Machines" by Ashfaq Hussain , Dhanpat Rai & Co, 3rd Edition,2016. 3. "Principles of Electrical Machines" by VK Mehta, Rohit Mehta – S.Chand, Reprint Edition 2006. **REFERENCE BOOKS:** 1. "Electrical Machinery", by Dr. P.S Bimbhra, Khanna publishers,2011. 2. "Electrical Machines" by I.J.Nagarath and D.P.Kothari 4th Edition, Tata McGraw-Hill, 2010. 3. "Performance & Design of Alternating Current machines" by M. G. Say, CBS publishers, 2012.
E-Resources	http://nptel.ac.in/courses http://iete-elan.ac.in http://freevideolectures.com/university/iitm

17EE2203-POWER SYSTEMS-I
(EEE)

Course Category:	Professional core	**Credits:**	4
Course Type:	Theory	**Lecture-Tutorial-Practical:**	3-2-0
Pre-requisite:	Generation of electric power, Circuits and Networks	**Sessional Evaluation:** **External Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives	1. Learn the fundamental concepts of electrical power distribution, both AC & DC. 2. Learn the different issues related to overhead lines and underground cables. 3. Learn fundamentals in power system concepts required to solve engineering problems. 4. Learn the mechanical design of transmission lines, types of cables and insulators.	
Course Outcomes	After completing the course the student will be able to	
	CO1	Design and evaluate the performance of D.C distribution and A.C distribution
	CO2	Calculate the various Transmission line parameters.
	CO3	Understand various effects governing performance of transmission lines
	CO4	Gain knowledge about the different types of insulators , methods of equalising the potential across the string of insulators
	CO5	Perform the calculations of sag for different cases.
	CO6	Acquire the knowledge on underground cables and estimate the performance of underground cables with grading
Course Content	**UNIT-I** **DC & AC Distribution :** Comparison of single Phase , 3-phase 3 wire and 3 phase 4 wire system, Types of primary distribution systems- Types of Secondary distribution systems-DC distribution fed at one end and at both ends -AC distribution fed at one end and at both ends – Kelvin's law – limitation of Kelvin's law. **UNIT-II** **Transmission Line Parameters:** Inductance and capacitance, Calculation of Transmission line Resistance, Inductance and Capacitance of single phase and three phase lines with symmetrical and unsymmetrical spacing – bundled conductor-effect of earth on capacitance. **UNIT-III** **Various factors governing the performance of Transmission line:** Skin and Proximity effects – Ferranti effect – Charging Current. **Corona** : Description of the phenomenon-Factors affecting corona, critical voltages and power loss, Radio Interference.	

	UNIT- IV **Overhead Line Insulators:** Introduction – Types of Insulators- potential distribution over a string of insulators – Methods of equalizing the potential, string efficiency. **UNIT-V** **Mechanical design of Overhead Transmission Line :** Calculation of sag for equal and unequal supports, loading on the conductors in an overhead line, variation of sag with load and temperature, string chart. **UNIT-VI** **Underground Cables**: Types of Cables, Construction – insulation types – insulating materials for EHV voltage cables –classification of cables- parameters of single core cable - Grading of cables- Capacitance grading- Inter-sheath grading, Capacitance of three core belted cable.
Text Books & Reference Books	**TEXT BOOKS:** 1. "Electrical power system" by C.L Wadhwa-New age International, 6th Edition. 2. "Generation of electrical energy", by B.R. Gupta S.Chand publications, 6th Edition, Reprint 2014. 3. "A Text book on Power System engineering" by M.L. Soni, P.V. Gupta, U.S.Bhatnagar- Dhanpat Rai & Co, 2009. **REFERENCES BOOKS:** 1. "Power System Engineering" by I.J Nagarath& D.P Kothari, TMH Publications, 2nd Edition. 2. "Elements of power system analysis" by William D.Stevenson. Jr McGraw-Hill International publication. 4th Edition. 3. Electric Power Systems by S. A. Nasar, Schaum's outline Series, TMH, 3rd Edition,2008.
E-Resources	http://nptel.ac.in/courses http://iete-elan.ac.in http://freevideolectures.com/university/iitm

17MC2201- TECHNICAL ENGLISH AND SOFT SKILLS

(Common to ECE, EEE, CSE & IT)

Course Category:	Basic Sciences	**Credits:**	-
Course Type:	Theory	**Lecture-Tutorial-Practical:**	2-0-2
Pre-requisite:	Basic Level of LSRW skills	**Sessional Evaluation:** **External Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives	Students undergoing this course are expected to understand: 1. To develop their basic technical writing skills in English. 2. To learn specific technical verbal competence. 3. To acquire soft skills and work efficiently in a realistic professional working environment. 4. To develop soft skills including problem solving skills, working in groups and leadership skills.	
Course Outcomes	Upon successful completion of the course, the students will able to:	
	CO1	Present technical papers and equip technical verbal proficiency.
	CO2	Develop group discussion skills and summarizing skills.
	CO3	Write effective resumes and job applications.
	CO4	Develop soft skills and effective non verbal communication skills.
	CO5	Develop motivational skills and problem solving skills.
	CO6	Develop professionals with idealistic, practical and moral values.
Course Content	**UNIT –I** **Introduction to Technical English:** Writing simple descriptions and explanations on scientific/technical nature - Technical presentations - Communicating technical topics- Jargon **UNIT-II** **Group Discussion:** Dynamics of Group Discussion – Intervention- Summarizing-Modulation of voice - Body Language – Relevance - Fluency and Coherence. **UNIT-III** **Resumes and Job Applications:** Writing resumes – Resume design – Parts of a resume – Resume styles – Cover letter	

	UNIT-IV **Introduction to Soft Skills & Hard Skills**: Non Verbal communication-Haptics–Proxemics-kinesics-Chronemics–Oculesics – Vocalics **UNIT-V** **Personality Development Skills** : Assertiveness - Positive Attitude - Self Confidence- Problem Solving Skills- Leadership Skills **UNIT-VI** **Etiquette & Manners**: Corporate etiquette-Dinning etiquette - Goal Setting- Career Planning -Time Management.
Reference Books	**REFERENCE BOOKS:** 1. A Textbook of English for Engineers and Technologists combined Edition, Vol. 1 & Orient Black Swan 2010. 2. Effective Technical Communication, M. Ashraf Rizvi, Tata Mc Graw- Hill, 2011 3. Soft Skills, Dr K. Alex, S. Chand Publications, New Delhi

17EE22P1-ELECTRO MECHANICAL ENERGY CONVERTION-I LAB

Course Category:	Professional core	**Credits:**	2
Course Type:	Laboratory	**Lecture-Tutorial-Practical:**	0-0-3
Pre-requisite:	Basic concepts of Electro Magnetics, Knowledge of DC machines and Transformers is required.	**Sessional Evaluation:** **External Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives	To make the student learn about 1. Machine principles and speed control. 2. Testing methods and analysis of performance.	
Course Outcomes	After completing the course the student will be able to	
	CO1	Test performance of DC motors and DC generators.
	CO2	Perform load tests on DC motors.
	CO3	Control the speed of DC motor.
	CO4	Separate the losses in a DC motor.
	CO5	Evaluate the performance of single phase Transformers.
	CO6	Know the assessment of DC machines and Transformers.
	Minimum of 10 experiments to be conducted out of the following: **List of Experiments** 1. Excitation Characteristics of a. Separately Excited DC Generator b. Self Excited DC Shunt Generator 2. External Characteristics of DC Shunt Generator. 3. External Characteristics of DC Compound Generator. 4. Swinburne's Test. 5. Brake Test on DC Shunt Motor. 6. Brake Test on DC Series Motor. 7. Speed Control of DC Shunt Motor. 8. Hopkinson's Test. 9. Separation of Losses of DC Shunt Motor. 10. Open Circuit and Short Circuit Test on 1-Φ Transformer. 11. Load Test on 1- Φ Transformer. 12. Sumpner's Test.	

17EC22P4-PULSE & SWITCHING CIRCUITS LAB

Course Category:	Professional core	**Credits:**	2
Course Type:	Laboratory	**Lecture-Tutorial-Practical:**	0-0-3
Pre-requisite:	Basic knowledge on logic circuits & gates, electronic devices.	**Sessional Evaluation:** **External Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives	To make the student learn about 1. Basic understanding of concepts logic circuits and gates. 2. Full adder, subtractor, decoder, ripple counter, multiplexer, synchronous counter, RC differentiator and clampers. 3. Multivibrator and Schmitt trigger circuits.	
Course Outcomes	After completing the course the student will be able to	
	CO1	Implement logic gates using diodes and transistors.
	CO2	Design various decoders and implement using multiplexers.
	CO3	Find out the uses and applications of synchronous and asynchronous counters.
	CO4	Analyze the importance of Pulse and Analog Circuits.
	CO5	Demonstrates how various multivibrators can be used to generate non sinusoidal waveforms.
	Minimum of 10 experiments to be conducted out of the following: **List of Experiments** 1. (a) Logic circuits & logic gates (b) Realisation of all gates using NAND & NOR gates 2. Full adder & full subtractor. 3. Decoder. 4. Divided by N- ripple counter. 5. Multiplexer. 6. Divide by N-synchronous counter. 7. RC differentiator and RC integrator. 8. Diode clippers and clampers. 9. Astable multivibrator. 10. Schmitt trigger. 11. Encoder. 12. Bistable multivibrator.	

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ELECTRICAL AND ELECTRONICS ENGINEERING
SCHEME OF INSTRUCTION AND EVALUATION
(With effect from the academic year 2019-2020)
(For the batch admitted in the academic year 2017-2018)

S.No	Course Code	Course Title	Instruction Hours/Week			Credits	Evaluation									
							Sessional Test-1			Sessional Test-2			Total Sessional Marks (Max. 40)	End Semester Examination		Maximum Total Marks
		THEORY	L	T	D/P		Test-1 (2 Hr)	Assign-1	Max. Marks	Test-2 (2 Hr)	Assign-2	Max. Marks		Duration In Hours	Max. Marks	100
1	17EC3104	Analog IC Applications$	2	2	-	3	34	6	40	34	6	40	0.8*Best of Two + 0.2*Least of Two	3	60	100
2	17EE3101	Electronic Measurements	3	-	-	3	34	6	40	34	6	40		3	60	100
3	17EE3102	Electromechanical Energy conversion-II	3	-	-	3	34	6	40	34	6	40		3	60	100
4	17EE3103	Linear Control Systems$	3	2	-	4	34	6	40	34	6	40		3	60	100
5	17EE3104	Power Systems-II	3	2	-	4	34	6	40	34	6	40		3	60	100
6		Professional Elective-I	3	-	-	3	34	6	40	34	6	40		3	60	100
		PRACTICALS														
7	17EE31P1	Electrical Measurements Lab	-	-	3	2	-	-	-	-		-	Day to Day Evaluation and a test (40 Marks)	3	60	100
8	17EE31P2	Electromechanical Energy conversion-II Lab	-	-	3	2	-	-	-	-		-		3	60	100
9	17EE31AC	Audit Course	2	-	-	-	40	-	40	40	-	40	0.8*Best of Two + 0.2*Least of Two	3	60	100
		TOTAL				24										

(***:** Common to all; **#**: Common to ECE, EEE, CSE&IT; $: Common to ECE&EEE; **@** : Common to ECE,EEE,CE & ME)

17EC3104 – ANALOG IC APPLICATIONS

(Common to ECE and EEE)

Course category:	Professional core	**Credits:**	3
Course Type:	Theory	**Lecture - Tutorial - Practical:**	2 - 2 - 0
Pre-requisite:	Circuit & Networks, Electronic Devices & Circuits, Pulse & Analog Circuits	**Sessional Evaluation :** **External Evaluation:** **Total Marks:**	40 60 100

Course Objectives	Students undergoing this course are expected to learn:	
	1. The basic building blocks of Op-amp & its characteristics. 2. The linear and non-linear applications of operational amplifiers. 3. The design of multivibrators and various filters using op amp. 4. The theory and applications of 555 timer and P.L.L. 5. The design of filters and regulators. 6. The design of A.D.C.s and D.A.C.s.	
Course Outcomes	Upon successful completion of the course, the students will be able to understand:	
	CO1	The various applications of the integrated circuits.
	CO2	The importance of operational amplifier.
	CO3	The generation of different waveforms using multivibrators.
	CO4	The working principles of 555 timer and PLL.
	CO5	The design of filters and regulators.
	CO6	The interfacing of ADCs and DACs.
Course Content:	**UNIT – I** **Operational amplifier :** Introduction to ICs, op-amp ideal characteristics, internal circuit, D.C and A.C characteristics of op-amp, inverting and non-inverting modes of operation, voltage follower, summer, adder-subtractor, integrator and differentiator **UNIT – II** **Operational amplifier applications:** Differential amplifier and its transfer characteristics, derivation of C.M.R.R. & improvement methods of differential amplifier characteristics, instrumentation amplifier, V-I and I-V converters, precision rectifiers, sample and hold circuit, analog computation. **UNIT – III** **Comparators and waveform generators:** Comparator, regenerative comparator, Astable and mono stable multivibrators using op-amp, triangular wave generator, sine wave generators using op-amp (R.C. phase shift).	

	UNIT – IV **IC timers:** 555 Timer, Astable and monostable modes. **Phase locked loops:** Basic principles, lock and capture range, voltage control oscillator (I.C.-566), PLL (I.C.-565) and P.L.L applications. **UNIT – V** **Active filters:** Low-pass, high-pass and band-pass filters, state variable filters. **Voltage regulators:** Series op-amp regulator, IC voltage regulators, IC723 regulator, switching regulators. **UNIT – VI** **Electronic data converters:** Introduction, DAC.s, weighted resistor, R-2R and inverted R-2R. **Types of ADCs:** Parallel comparator type, counter type, successive approximation and dual slope ADCs, specifications of DAC and ADC.
Text books & Reference books	**Text books:** 1.“Linear integrated circuits”, by D. Roy Choudary, Shail B. Jain, New Age International Publishers, 2003. 2.“Design of analog integrated circuits”, by Sergio Franco. **Reference books:** 1."Applications and design with analog integrated circuits", by J. Michael Jacob, PHI, EEE, 1997. 2."Op-amps and linear integrated circuits", by Ramkant A. Gayakwad, LPE, 4th Edition, Pearson Education.
e-Resources	1.http://www.nptel.ac.in 2. http:/www.ebookee.com/linearintegratedcircuits.

17EE3101- ELECTRONIC MEASUREMENTS

(EEE)

Course Category:	Professional core	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-practical:**	3-0-0
Pre-requisite:	Basic Electrical Engineering Electronic Devices and Circuits Electrical Measurements	**Sessional Evaluation:** **Univ.Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives:	Students undergoing this course are expected to : 1. Learn the basics of oscilloscopes 2. Learn the different types of oscilloscopes 3. Learn the working of digital voltmeters, multimeter, tachometer and phase meter. 4. Impart the knowledge on wave analyzers. 5. Impart the knowledge on various transducers and the data acquisition systems. 6. Measure the Physical Parameters.	
Course Outcomes:	After completing the course the student will be able to:	
	CO1	Understand the working of CRO, time base generators and CRO circuits.
	CO2	Understand the different types of oscilloscopes and ability to measure voltage, current, frequency and phase with Oscilloscope.
	CO3	Use Digital voltmeters, multimeter, tachometer and phase meter.
	CO4	Understand the analysis of waveforms using wave analyzers.
	CO5	Understand about different transducers and their working principles.
	CO6	Measure the physical parameters like strain, displacement, Velocity, Angular Velocity, temperature, Pressure and Vacuum.
Course Content:	**UNIT–I** **Cathode Ray Oscilloscope-I:** Block diagram of CRO, CRT, Electrostatic focusing, Electrostatic deflection sensitivity, Time Base generators, Oscilloscope amplifiers– Basic CRO Circuits, Observation of waveform on CRO **UNIT-II** **Cathode Ray Oscilloscope-II:** Principle of operation of Dual beam, Dual trace, Sampling and Storage CROs – Measurements with CRO (voltage, current, frequency, phase angle, lissajous figures). **UNIT-III** **Digital instruments:** Digital voltmeters-Ramp- Dual slope- stair case-successive approximation types- Digital multimeter- universal counter- Digital tachometer- Digital phase meter-Auto ranging- 3,3 $\frac{1}{2}$,3$\frac{3}{4}$Digit display.	

	UNIT- IV **Signal Analyzers:** AF, HF Wave Analyzers. Harmonic Distortion, Heterodyne wave Analyzers, Spectrum Analyzers, Power Analyzers, Potentiometric recorders, Rectifier type instrument- half wave and full wave, true RMS voltmeter, Q-meter. **UNIT-V** **Transducers:** Classification, Strain gauges-Bonded, unbonded; Force and Displacement Transducers, Resistance Thermometers, Thermocouples, LVDT, Piezoelectric Transducers, Variable Capacitance Transducers, Magneto strictive Transducers. **UNIT-VI** **Measurement of Physical Parameters:** Flow Measurement, Liquid level Measurement, Measurement of Humidity and Moisture, Velocity, Pressure - High Pressure, Vacuum level, Data Acquisition Systems.
Text books & Reference books:	**Text books:** 1. "Electrical and Electronic Measurements and Instrumentation", by A.K.Sawhney, Dhanpat Rai & Co. 2. "Electronic Instrumentation", by H.S.Kalsi TMH, 2nd Edition 2004. **Reference books:** 1."Electronic Instrumentation and Measurements", by David A. Bell, Oxford Univ. Press, 1997. 2."Modern Electronic Instrumentation and Measurement Techniques" , by A.D. Helbincs. W.D.Cooper: PHI 5aEdition 2003.
e-Resources:	http://nptel.ac.in/courses http://iete-elan.ac.in http://freevideolectures.com/university/iitm http://instrumentationtoday.com

17EE3102- ELECTROMECHANICAL ENERGY CONVERSION – III

(EEE)

Course Category:	Professional core	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practical:**	3-0-0
Pre-requisite:	Basic electrical sciences, Electromechanical energy conversion-I & II	**Sessional Evaluation:** **Univ.Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives:	To make the student learn about:	
	1. The synchronous generators. 2. The voltage regulation of synchronous generators using different methods. 3. The theory of salient pole machines. 4. The concept of parallel operation of alternators. 5. The comparison between the characteristics of different types of electrical machines and performing various tests on the machines. 6. The various types of electrical machines.	
Course Outcomes:	After completing the course the student will be able to:	
	CO1	Understand the construction and working of different types of alternators.
	CO2	Determine the voltage regulation using different experimental methods and theoretical analysis.
	CO3	Understand the different characteristics of synchronous generators.
	CO4	Understand the principles of synchronization and parallel operation under different operating conditions.
	CO5	Analyse the working and performance of synchronous motor.
	CO6	Understand the construction, operation and starting methods of single phase induction motors and stepper Motor.

Course Content:

UNIT-I

Synchronous generators: Construction, types of alternators, armature windings, EMF equation, armature reaction, leakage flux, synchronous reactance, equivalent circuit, phasor diagram.

UNIT-II

Voltage regulation of synchronous generators: Voltage regulation, pre-determination of regulation by synchronous impedance, ampere turn and Potier triangle methods, SCR and its importance.

UNIT-III

Theory of salient pole machines: Two reaction theory, phasor diagram, determination of X_d and Xq from slip test- expression for power output of cylindrical and salient pole alternators, power angle characteristics.

UNIT-IV

Parallel operation of alternators: Conditions for parallel operation, synchronization, load sharing, synchronizing power, operation on infinite bus bar, effect of change of excitation, effect of change of mechanical input, excitation systems.

	UNIT-V **Synchronous motor:** Theory of operation, phasor diagrams, variation of current and power factor with excitation, hunting and its suppression, determination of V and inverted V curves, methods of starting. **UNIT-VI** **Single phase induction motors:** Principle of operation, double revolving field theory, cross field theory, equivalent circuit, determination of equivalent parameters, starting methods, split phase motors, shaded pole motor, repulsion motor, universal motor and Stepper motor.
Text books & Reference books:	**Text books:** 1."Theory and performance of electrical machines", by J.B Gupta, SK Kataria& sons,3rd Edition,2013. 2."Electrical machines", by Ashfaq Hussain, Dhanpatrai& co (P) Ltd,7th Edition. **Reference books:** 1."Electrical machinery", by Dr. P.S Bimbhra, khanna publishers. 2."Electrical machines", by I.J.Nagarath and D.P.Kothari, 5th Edition, Tata McGraw-Hill.
e-Resources:	http://nptel.ac.in/courses http://iete-elan.ac.in http://freevideolectures.com/university/iitm

17EE3103-LINEAR CONTROL SYSTEMS

(Common for EEE & ECE**)**

Course Category:	Professional core	**Credits:**	4
Course Type:	Theory	**Lecture-Tutorial-Practical:**	3-2-0
Pre-requisite:	Basic knowledge of differentiation, integration and Laplace transform techniques.	**Sessional Evaluation:** **External Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives:	To make the student learn about:	
	1. The various types of control systems and methods to obtain transfer function. 2. The mathematical models of physical systems. 3. The time domain responses of first and second-order systems for different input signals. 4. The stability of a control system using different techniques. 5. The frequency domain techniques to assess the system performance. 6. The different types of compensators for linear systems.	
Course Outcomes:	Upon successful completion of the course , the students will be able to:	
	CO1	Understand the various types of control systems and methods to obtain transfer function.
	CO2	Develop mathematical models of physical systems.
	CO3	Determine the time domain responses of first and second-order systems for different input signals.
	CO4	Evaluate the stability of a control system using different techniques.
	CO5	Apply frequency domain techniques to assess the system performance.
	CO6	Design the different types of compensators for linear systems.
Course Content:	**UNIT –I** **Introduction to classical control systems:** Open loop and closed loop control systems - types of feedback- feedback and its effects- transfer functions- block diagrams and their reduction- signal flow graphs- mason's gain formula. **UNIT-II** **Mathematical modeling of physical systems:** Mathematical modeling and transfer functions of electrical, mechanical and electro-mechanical elements - DC servo motors- two-phase AC servo motors - synchros. **UNIT-III** **Time domain analysis:** Introduction, standard test signals- time response specifications-steady state error constants. **UNIT-IV** **Stability of control systems:** Routh-Hurwitz criterion- root locus- rules for the construction of root loci- introduction to proportional- derivative and integral controllers.	

	UNIT-V **Frequency domain Analysis:** Introduction- frequency domain specifications- polar plots- bode plots- Nyquist stability criterion. **UNIT-VI** **Design of compensators:** Introduction- need for compensators- lag and lead compensators design in frequency domain.
Text books & Reference books:	**Text books:** 1. "Control system engineering", by I.J.Nagrath and M.Gopal, 6th Edition, New age International (P) Ltd. 2. "Control systems", by A.Nagoorkani, 2nd Edition, RBA publishers. 3. "Control systems" by A.Anandkumar, 2nd Edition, PHI publishers. **Reference books:** 1. "Automatic control systems", by B.C.Kuo, 7thEdition, PHI publishers. 2. "Discrete time control systems", by K.Ogata, PHI Publishers. 3. "Control systems engineering", by Norman S Nise, Wiley, 2000.
e-Resources:	http://nptel.ac.in/courses http://iete-elan.ac.in http://freevideolectures.com/university/iitm

17EE3104-POWER SYSTEMS-II

(EEE)

Course Category:	Professional core	**Credits:**	4
Course Type:	Theory	**Lecture-Tutorial-Practical:**	3-2-0
Pre-requisite:	Power system-1	**Sessional Evaluation:** **External Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives:	To make the student learn about: 1.The classification of transmission lines and performance calculation of transmission lines. 2. The reactive power compensation and voltage control. 3. The transients and travelling wave phenomenon on transmission lines. 4. The objective of power system earthing and methods of earthing. 5. The substation equipment and key diagrams of substation. 6. The concept of system modeling and per unit representation.	
Course Outcomes:	After completing the course the student will be able to:	
	CO1	Understand the classification of transmission lines, representation by suitable equivalent circuits and performance calculation of over head transmission lines.
	CO2	Understand about reactive power compensation and voltage control.
	CO3	Understand the transients and travelling wave phenomenon on transmission lines.
	CO4	Understand the objective of power system earthing and methods of earthing.
	CO5	Gain the knowledge on substation equipment and concepts of EHV and HVDC systems
	CO6	Understand the concept of system modeling and per unit representation.
Course Content:	**UNIT- I** **Performance of transmission lines**: Representation of lines-Short transmission lines-Medium transmission lines-Nominal pie and T representation of long lines by distributed parameters-Equivalent T and Pie representation of long transmission lines – Evaluation of ABCD parameters of long lines-Ferranti effect **UNIT – II** **Reactive power and voltage control:** Overview of reactive power control-Power flow through a transmission line-Voltage control and line compensation-introduction-Shunt capacitors-Series capacitors-Synchronous compensation, Receiving end power circle diagrams. **UNIT – III** **Power system transients:** Introduction-Circuit closing transients -Recovery transient due to removal of a short circuit-Travelling waves on transmission line – Surge impedance and wave velocity-Specification of travelling waves-Reflections and refractions of waves-Different types of terminations-Forked line-Successive reflections-Bewley's Lattice diagram-Attenuation and distortion.	

	UNIT – IV **Power system earthing:** Objectives-definitions-Tolerable limits of body currents-Soil resistivity-Earth resistance-Tolerable Step and touch voltages-design of earthing grid-Tower footing resistance-Neutral earthing-Ungrounded and effectively earthed system-Resistance, Reactance, Arc suppression coil earthing and grounding transformers. Arcing grounds-protection against arcing grounds. **UNIT – V** **Substations:** Number and size-Location and installation-the main equipment's in substations- Bus bar arrangements-Key diagram of 66/11KV substation. **Extra High Voltage transmission:** Introduction-Need for EHV and UHV-Environmental aspects in EHV and UHV lines-EHV systems in India. **HVDC transmission:** Introduction-Types of DC links-Advantages of DC transmission-incorporating HVDC into AC systems-HVDC systems in India. **UNIT – VI** **System modeling:** Representation of transmission lines-circuit representation of synchronous machine-two winding and three winding transformers-Per unit representation and advantages-single line diagram representation-impedance and reactance diagrams-changing the base of per unit quantities.
Text books & Reference books:	**Text books:** 1. "Electrical power systems", by C.L.Wadhwa, New Age International (P) Limited, 6th Edition, Reprint 2014. 2. "Power system analysis and Design" by B.R.Gupta S.chand company Pvt. Ltd New Delhi, Reprint-2015. **Reference books:** 1. "Elements of power system analysis", by William D.Stevenson. JrMc GRAW-HILL International publication, 4th Edition. 2. "Power System Engineering", by I.J Nagarath and D.P Kothari, TMH Publications. 3. "A course in power systems", by J.B.Gupta, S.K.Kataria & sons, Reprint-2016.
e-Resources:	http://nptel.ac.in/courses http://iete-elan.ac.in http://freevideolectures.com/university/iitm

PROFESSIONAL ELECTIVE-I

1. Advanced instrumentation (17EE31E1)
2. Digital signal processing (17EC3102)
3. Industrial electrical systems (17EE31E2)
4. Wind & solar energy systems (17EE31E3)

17EE31E1-ADVANCED INSTRUMENTATION SYSTEMS

(EEE)

Course Category:	Professional Elective	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practical:**	3-0-0
Pre-requisite:	Electrical & Electronic Measurements	**Sessional Evaluation:**	40
		External Evaluation:	60
		Total Marks:	100

Course Objectives:	Students undergoing this course are expected to learn:	
	1. The instruments used for measurement of process parameters like level, flow, pressure and temperature. 2. The various types of analyzers used in industrial applications. 3. The concepts of safety standards and risk analysis techniques. 4. The concepts of instrumentation standards. 5. The process flow diagrams and instrument loop diagrams. 6. Instrument hookup diagrams and piping & instrumentation diagrams.	
Course Outcomes:	After completing the course the student will be able to :	
	CO1	Understand the concepts of flow, level, temperature and pressure measurement
	CO2	Acquire basic knowledge on the various types of analyzers used in industries.
	CO3	Understand the role of safety instrumented system in the industry.
	CO4	Understand the standards of instrumentation in hazardous locations.
	CO5	Design, develop and interpret the documents used to define instruments and control system.
	CO6	Design, develop and interpret logic diagrams, hookup diagrams and cable routing diagrams.
Course Content:	**UNIT I** **Measurement of process parameters:** Measurement of temperature-pressure- flow and level-application- selection- calibration methods. **UNIT II** **Instruments for analysis:** Ion selective electrodes- gas &liquid chromatography -oxygen analyzers for gas and liquid –CO-CO_2 -NO and SO analyzers- hydrocarbon and H_2S analyzers-dust-smoke- toxic gas and radiation monitoring. **UNIT III** **Safety instrumentation:** Introduction to safety instrumented systems-hazards and risk-process hazards analysis (PHA)- safety life cycle-control and safety systems-safety instrumented function-safety integrity level (SIL)-selection- verification and validation. **UNIT IV** **Instrumentation standards:** Instrumentation standards-significance of codes and standards- overview of various types- introduction of various instrumentation standards-review- interpretation and significance of specific standards-examples of usage of standards on specific applications.	

	UNIT V **Documentation in process industries-I:** Block diagram of a typical process-instrumentation symbols-abbreviations and identification of instruments- mechanical equipment- electrical equipment- instruments and automation systems- process flow diagram (PFD)-piping and instrumentation diagram (P&ID). **UNIT VI** **Documentation in process industries-II:** Instrument lists and specification- logic diagrams- instrument loop diagrams- instrument hookup diagrams-location plans for instruments - cable routing diagrams-typical control track rooms layout-vendors documents and drawings
Text books & Reference books:	**Text books:** 1. "Instrumentation engineers handbook (Process Measurement & Analysis)", by B.G.Liptak, 4th Edition, Chilton Book Co, CRC Press, 2005 2. "Industrial instrumentation", by Al.Sutko, Jerry.D.Faulk, Delmar publishers, 1996. 3. "Safety instrumented systems: design, analysis, and justification", by Paul Gruhn, P.E., CFSE and Harry Cheddie, P.E., 2nd Edition, ISA,2006. **Reference books:** 1. Safety - ANSI/ISA84.00.01-2004, Part 1: Framework, definitions, system hardware and software requirements; ANSI/ISA84.00.01-2004 Part 2: Functional safety: safety instrumented systems for the process industry sector; ANSI/ISA84.00.01-2004 Part 3: Guidance for the determination of the required safety integrity levels-informative. 2. Standards - ANSI/ISA-75.01.01 -2002 (60534-2-1 Mod): flow equations for sizing control valves ISA84 process safety standards and user resources, 2nd edition, ISA, 2011 ISA88 batch standards and user resources, 4th edition, ISA, 2011.
e-Resources	http://nptel.ac.in/courses http://iete-elan.ac.in http://freevideolectures.com/university/iitm

17EC3102 – DIGITAL SIGNAL PROCESSING

Course category:	Professional Elective	**Credits:**	3
Course Type:	Theory	**Lecture - Tutorial - Practical:**	3 - 0– 0
Pre-requisite:	Signal & System, Fourier transform, Laplace Transform & Z transform	**Sessional Evaluation :**	40
		External Evaluation:	60
		Total Marks:	100

Course Objectives	Students undergoing this course are expected to:	
	1. Learn the basic concepts and analytical methods of Z-transform. 2. Learn to write various DFT & FFT algorithms. 3. Learn to introduce techniques and tools for digital filter structures. 4. Learn the design of FIR filters. 5. Learn about various IIR filters. 6.Learn truncation and rounding errors & quantization noise	
Course Outcomes:	Upon successful completion of the course , the students will be able to:	
	CO1	Understand the concept of Z-transform and its properties.
	CO2	Describe the use of DFT in linear filtering
	CO3	Apply the fast fourier transform algorithm in different applications
	CO4	Design the IIR filters and FIR filters for given specification
	CO5	Design the IIR filters from analog filters for given specification and design the discrete–time systems.
	CO6	Understand the truncation, rounding errors and quantization noise
Course Content:	**UNIT – I** **Review of discrete signals & systems:** Z-transform and Inverse Z-transform-theorems and properties- system function-fourier representation of finite duration sequences. **UNIT – II** **Discrete & Fast Fourier Transform**: DFT, properties of DFT- FFT- FFT algorithms-use of DFT for fast computation of convolution- IDFT. **UNIT – III** **Digital filter structures:** Basic FIR structures, IIR structures, direct form-I-direct form-II-parallel form-cascade form lattice structure-lattice-ladder structures. **UNIT – IV** **Design of IIR filters:** Properties of analog filters- frequency domain filter models-butter- worth-chebyshev and other approximations, filter design data- low pass to high-band pass and band stop transformation-filter response curves.	

	UNIT – V **Design of FIR filters**: Fourier series method- windowing- sampling. **UNIT-VI** **Finite word length effects**: Fixed point and floating point number representations, truncation and rounding errors, quantization noise, coefficient quantization error, product quantization error, overflow error, round-off noise power, limit cycle oscillations due to product round off and overflow errors.
Text books & Reference books:	**Text books:** 1."Digital signal processing", by A.V Oppenheim and R.W. Schafer, Prentice – Hall of India. 2."Digital signal processing", by S. Salivahanam – TMH. 3."Digital signal processing Computer Base Approach", by S.K. Mitra – Tata McGraw-Hill (III) **Reference books :** 1."Digital signal processing", by P. Ramesh Babu, Scitech Publications. 2."Digital signal processing", by John G Proakis and monolokis – Wiley Eastern Economy edition.
e-Resources	1. http://nptel.ac.in/courses 2. https://dspace.mit.edu/handle/1721.1/57007 3. http://dl.acm.org/citation.cfm?id=562622

17EE31E2-INDUSTRIAL ELECTRICAL SYSTEMS

(EEE)

Course Category:	Professional Elective	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practical:**	3-0-0
Pre-requisite:	Electric power systems	**Sessional Evaluation:** **External Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives:	Students undergoing this course are expected :	
	1. To study about electrical system components. 2. To learn the different types of residential and commercial wiring systems. 3. To study the concepts of refrigeration, air conditioning and heating of buildings. 4. To learn about the industrial loads, SLD cable and switchgear selection, KVAR calculations, types of compensation, PCC and MCC panels. 5. To study the DG, UPS systems, elevators, battery banks, sizing and selection. 6. To study the basics of PLC, control system design – SCADA system for distribution automation of industrial electrical systems.	
Course Outcomes:	After completing the course the student will be able to:	
	CO1	Understand the electrical wiring system components and single line diagram
	CO2	Understand the electrical wiring systems for residential and commercial consumers, sizing of wire and protection devices
	CO3	Understand the concepts of refrigeration, air conditioning and heating of buildings
	CO4	Understand various components of industrial electrical systems
	CO5	Analyze and select the proper size of various electrical system components
	CO6	Know the role in automation and PLC based control system design
Course Content:	**UNIT-I** **Electrical system components:** LT system wiring components, selection of cables- wires- switches- distribution box- metering system- tariff structure- protection components-fuse-MCB- MCCB-ELCB-inverse current characteristics- symbols- single line diagram of a wiring system-contactor-isolator- relays- MPCB- electrical shock and electrical safety practices. **UNIT-II** **Residential and commercial electrical systems:** Types of residential and commercial wiring systems- general rules and guidelines for installation- load calculation and sizing of wire- rating of main switch- distribution board and protection devices- earthing system calculations- requirements of commercial installation-deciding lighting scheme and number of lamps-earthing of commercial installation- selection and sizing of components.	

	UNIT-III **Refrigeration**: Refrigeration cycle- different refrigeration systems- domestic refrigerator & different types of water coolers- control of temperature- protection of motors- simple heat load and motor calculations. **Air-conditioning**: Function of complete air conditioning system- types of air conditioning system- types of compressor motor- cool storage - estimation of tonnage capacity and motor power. **Heating of buildings**: Types of heating equipment used for space heating, calculation of rating of electrical equipment. **UNIT- IV** **Industrial electrical systems I:**HT connection- industrial substation- transformer selection- industrial loads- motors- starting of motors- SLD- cable and switchgear selection- lightning protection-, earthing design- power factor correction- kVAR calculations- type of compensation- Introduction to PCC- MCC panels- specifications of LT breakers- MCB and other LT panel components. **UNIT-V** **Industrial electrical systems II:**DG systems- UPS systems- electrical systems for the elevators- battery banks- sizing the DG- UPS and battery banks- selection of UPS and battery banks. **UNIT-VI** **Industrial electrical system automation:** Study of basic PLC- role in automation- advantages of process automation- PLC based control system design- panel metering and introduction to SCADA system for distribution automation.
Text books & Reference books:	**Text books:** 1. "Electrical wiring, estimating &costing", by S. L. Uppal and G.C. Grag, Khanna publishers, 2008. 2. "Electrical design, estimating &costing", by K.B. Raina, New Age International, 2007. 3. "Electrical estimating and costing", by S. Singh and R. D. Singh, DhanpatRai and Co., 1997. **Reference books:** 1. "Residential commercial and industrial systems", by H. Joshi, McGraw Hill Education, 2008. 2."Course in electric power", by M.L.Soni, P.V. Gupta, U.S.Bhatnagar, DhanapatRai & sons publication.
e-Resources	http://nptel.ac.in/courses http://iete-elan.ac.in http://freevideolectures.com/university/iitm

17EE31E3-WIND &SOLAR ENERGY SYSTEMS

(EEE)

Course Category:	Professional Elective	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-practical:**	3-0-0
Pre-requisites:	Generation of electric power	**Sessional Evaluation:** **External Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives:	Students undergoing this course are expected to : 1.Learn about wind power generation 2.Learn about the wind generator technologies 3.Learn the solar resources 4.Learn the design of solar photovoltaic power generating units in various modes. 5. Learn about the solar thermal power generation. 6. Learn about interconnected grid issues.	
Course Outcomes:	After completing the course the student will be able to:	
	CO1	Understand concepts of wind power generation
	CO2	Understand the basic aspects of wind energy topologies.
	CO3	Gain knowledge on working principle of solar energy systems.
	CO4	Carry out basic design of solar energy system (Photovoltaic).
	CO5	Acquire the knowledge about the different technologies used to harness solar energy depending on the temperature of operation.
	CO6	Understand the electronic devices developed for the integration of renewable energies and different challenges faced in power quality during network integration.
Course Content:	**UNIT-I** **Introduction to wind power:** History of wind power, Indian and global statistics, wind physics, Betz limit, tip speed ratio ,stall and pitch control, wind speed statistics, probability distributions, wind speed and power, cumulative distribution functions. **UNIT-II** **Wind generator topologies:** Review of modern wind turbine technologies, fixed and variable speed wind turbines, induction generators, doubly-fed induction generators and their characteristics, permanent magnet synchronous generators, power electronics converters, generator, converter configurations, converter control. **UNIT-III** **The solar resource:** Introduction, solar radiation spectra, solar geometry, earth sun angles, observer sun angles, solar day length, estimation of solar energy availability. **UNIT-IV** **Solar photovoltaic:** Technologies, amorphous, mono crystalline, polycrystalline, V-I characteristics of a PV cell, PV module, array, power electronic converters for solar systems, maximum power point tracking (MPPT) algorithms, converter control. **UNIT-V**	

	Solar thermal power generation: Technologies, parabolic trough, central receivers, parabolic dish, fresnel, solar pond, elementary analysis. **UNIT-VI** **Network integration issues:** Overview of grid code technical requirements, fault ride through for wind farms, real and reactive power regulation, voltage and frequency operating limits, solar PV and wind farm behaviour during grid disturbances, power quality issues, power system interconnection experiences in the world, hybrid and isolated operations of solar PV and wind systems
Text books & Reference books:	**Text books:** 1. "Wind power in power systems", by T. Ackermann, John Wiley and Sons Ltd., 2005. 2. "Renewable and efficient electric power systems", by G. M. Masters, John Wiley and Sons, 2004. 3. "Solar energy: principles of thermal collection and storage", by S. P. Sukhatme, McGraw Hill, 1984. **Reference books:** 1. "Grid integration of wind energy conversion systems", by H. Siegfried and R. Waddington, John Wiley and Sons Ltd., 2006. 2. "Renewable Energy Applications", by G. N. Tiwari and M. K. Ghosal, Narosa Publications, 2004. 3. "Solar Engineering of Thermal Processes", by J. A. Duffie and W. A. Beckman, John Wiley & Sons, 1991.
e-Resources	http://nptel.ac.in/courses http://iete-elan.ac.in http://freevideolectures.com/university/iitm

17EE31P1-ELECTRICAL MEASUREMENTS LAB

Course Category:	Professional core	**Credits:**	2
Course Type:	Laboratory	**Lecture-Tutorial-Practical:**	0-0-3
Pre-requisite:	Electrical measurements & Electronic measurements	**Sessional Evaluation:** **External Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives:	To make the student learn about:	
	1. To analyze the meters and its working. 2. The calibration of different meters. 3. The different types of electrical measuring instruments. 4. Measuring unknown quantity using various instruments. 5. Test different types of electrical measuring instruments. 6. Measurement of non-electrical quantities	
Course Outcomes:	After completing the course the student will be able to:	
	CO1	Analyze the meters and its working.
	CO2	Analyze the calibration techniques for wattmeter, power factor meter, voltmeter, energy meter and current transformer etc.
	CO3	Measure the parameters of choke coil.
	CO4	Measure unknown parameters using different bridges.
	CO5	Verify the characteristics of transducers like RTD, Thermistor, Thermocouple and capacitive transducers.
	CO6	Measure the quantity using the transducers.
Course Content:	Minimum of 10 experiments to be conducted out of the following: **List of Experiments** 1. Calibration of power factor meter. 2. Calibration of dynamometer type wattmeter by phantom loading. 3. Measurement of power by using three voltmeter and three ammeter methods. 4. DC Crompton's potentiometer. 5. Measurement of capacitance using CRO. 6. Measurement of parameters of a choke coil using three voltmeter and three ammeter methods. 7. Calibration of single phase energy meter. 8. Calibration of current transformer. 9. Measurement of capacitance using Schering bridge. 10. Measurement of capacitance using Desauty's bridge. 11. Measurement of inductance using Hay's bridge. 12. Measurement of inductance using Anderson's bridge. 13. Measurement of resistance using Wheatstone's bridge. 14. Measurement of resistance using Kelvin's double bridge. 15. Characteristics of RTD. 16. Characteristics of thermocouple. 17. Characteristics of thermistor. 18. Characteristics of capacitance transducer.	

17EE31P2-ELCTROMECHANICAL ENERGY CONVERSION –II LAB

Course Category:	Professional Core	**Credits:**	2
Course Type:	Laboratory	**Lecture-Tutorial-Practical:**	0-0-3
Pre-requisite:	Electrical machines	**Sessional Evaluation:** **External Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives:	Students undergoing this course are expected:	
	1. To have a basic knowledge of three phase transformers connections. 2. To study the A.C windings. 3. To study the performance characteristics of three phase induction motor. 4. To learn equivalent circuit characteristics of single phase induction motor. 5. To learn the basic knowledge of voltage regulation of alternators. 6. To learn the basic knowledge of synchronous motor.	
Course Outcomes:	Upon successful completion of the course, the students will able to:	
	CO1	Calculate the regulation of alternators by various methods.
	CO2	Know the study of A.C windings
	CO3	Know the performance of A.C motors
	CO4	Measure X_d & X_q parameters
	CO5	Understand the parallel operation of alternators
	CO6	Draw V and Inverted V curves of synchronous motor.
Course Content:	Minimum of 10 experiments to be conducted out of the following: **LIST OF EXPERIMENTS** 1. Scott connection 2. 3-Ø transformer connections 3. Study of A.C windings 4. Circle diagram of 3-Ø induction motors 5. Equivalent circuit of 3-Ø induction motor 6. Load test on 3-Ø induction motor 7. Equivalent circuit of 1-Ø induction motor 8. Voltage regulation of an alternator using synchronous impedance and MMF method 9. Voltage regulation of an alternator using ZPF Method 10. Slip test 11. Parallel operation of two alternators 12. V and inverted V curves of synchronous motor	

NBKR INSTITUTE OF SCIENCE & TECHNOLOGY:: VIDYANAGAR (AUTONOMOUS)
(AFFILIATED TO JNTUA:: ANANTAPUR)
SPSR NELLORE DIST
III YEAR OF FOUR YEAR B.TECH DEGREE COURSE – II SEMESTER
ELECTRICAL AND ELECTRONICS ENGINEERING
SCHEME OF INSTRUCTION AND EVALUATION
(With effect from the academic year 2019-2020)
(For the batch admitted in the academic year 2017-2018)

S.No	Course Code	Course Title	Instruction Hours/Week			Credits	Evaluation									
							Sessional Test-I			Sessional Test-II			Total Sessional Marks (Max. 40)	End Semester Examination		Maximum Total Marks
		THEORY	L	T	D/P		Test-I (2Hr)	Assign-I	Max. Marks	Test-I (2 Hr)	Assign-2	Max. Marks		Duration In Hours	Max. Marks	100
1	17EC3206	Micro Processor & Interfacing$	3	-	-	3	34	6	40	34	6	40	0.8*Best of Two + 0.2*Least of Two	3	60	100
2	17EE3201	Modern Control Theory	3	-	-	3	34	6	40	34	6	40		3	60	100
3	17EE3202	Power Electronics	3	2	-	4	34	6	40	34	6	40		3	60	100
4	17EE3203	Switchgear and Protection	3	2	-	4	34	6	40	34	6	40		3	60	100
5	17EE3204	Utilization of Electric Power	3	-	-	3	34	6	40	34	6	40		3	60	100
6		Professional Elective-II	3	-	-	3	34	6	40	34	6	40		3	60	100
		PRACTICALS														
7	17SH32P1	Advanced communication skills lab	-	-	3	2	-	-	-		-	-	Day to Day Evaluation and a test (40 Marks)	3	60	100
8	17EE32P1	Control systems lab	-	-	3	2	-	-	-	-	-	-		3	60	100
9	17EE32MP	Mini Project	-	-	-	2	-	-	-	-	-	-		-	60	100
		TOTAL				26										

(***** : Common to all; **#** : Common to ECE,EEE,CSE&IT; $: Common to ECE&EEE; **@** : Common to ECE,EEE,CE & ME)

17EC3206- MICROPROCESSORS AND INTERFACING

(Common to ECE and EEE)

Course Category:	Professional core	**Credits:**	3
Course Type:	Theory	**Lecture -Tutorial-Practical:**	3-0-0
Pre-requisite:	Logic circuit design, A/D & D/A converters, fundamental programming skills	**Sessional Evaluation:** **External Evaluation:** **Total Marks:**	40 60 100

Course Objectives:	Students undergoing this course are expected to:	
	1. Learn the internal architecture details, pin configuration and their timing diagrams of 8085. 2. Learn programming and memory interfacing details of 8085 microprocessor. 3. Learn the internal architecture details, pin configuration, interrupts and their timing diagrams of 8086. 4. Learn techniques of interfacing between the processors and peripheral devices. 5. Learn to develop programs to control different hardware's using 8086. 6. Learn about advanced microprocessor 80286.	
Course Outcomes:	Upon successful completion of the course , the students will be able to:	
	CO1	Understand the evolution of different types of microprocessors and internal architecture details of 8085.
	CO2	Write efficient programs in assembly level language of the 8085 family of µp's with the help of instruction set easily.
	CO3	Gain the knowledge on internal architecture of 8086µp (execution unit, bus interfacing unit, queue, and 8086 memory address), programming structure and able to write programs in assembly language of the 8086 family of microprocessors.
	CO4	Know the techniques of interfacing between the processors and peripheral devices so that they themselves can design and develop a complete microprocessor based systems real time projects.
	CO5	Understand the inter connections of different co-processors, hardware knowledge of programmable devices like 8257/8253/8259/8251/8255 with 8086µp and developing hardware applications involving microprocessors.
	CO6	Gain the knowledge on Intel's advanced microprocessor 80286.
Course Content:	**UNIT-I** **Introduction to microprocessors**: Evolution of microprocessors, types of microprocessors, features of 8085 microprocessor, architecture of 8085 microprocessor, pin configuration, register set, instruction cycle, timing diagrams, stack and subroutines. **UNIT-II** **Instruction set of 8085 microprocessor**: Addressing modes, assembly language programs (8085) for addition, subtraction, multiplication, division etc., interrupts of 8085, memory interfacing of 8085 microprocessor.	

	UNIT-III **Architecture of 8086 microprocessor:** Instruction set, addressing modes, interrupt system, minimum mode and maximum mode operations of 8086 and its timing diagrams, assembler directives, assembly language programs (8086), stages of software development. **UNIT- IV** **IO interfacing to 8086:** Programmable interrupt controller (8259) and its interfacing, programmable DMA controller (8257) and its interfacing, programmable interval timer (8253) and its interfacing, programmable communication interface (8251 USART) and its interfacing. **UNIT-V** **Memory interfacing to 8086:** Interfacing various types of RAM and ROM chips, PPI (8255) and its interfacing, ADC and DAC interfacing, waveform generation, traffic light controller, stepper motor control, temperature measurement and control. **UNIT-VI** **80286 microprocessor:** Introduction, features of 80286, architecture, pin descriptions of 80286, register organizations, addressing modes, instruction set of 80286.
Text books & Reference books	**Text books:** 1. "Fundamentals of Microprocessors and Micro controllers", by Ram. B, DhanpatRai publications. 2. "Microprocessors and interfacing: Programming and hardware", by Douglas V. Hall, TMH, 2nd Edition. **Reference books:** 1."Advanced Microprocessors and Peripherals", by A.K. Ray and K.M. Bhurchandi, TMH. 2."Microprocessor Architecture, Programming and Applications with the 8085", by Ramesh S. Gaonkar",Prentice Hall of India.
e-Resources	1.http://www.nptel.ac.in 2. http:/www.ebookee.com/linearintegratedcircuits.

17EE3201-MODERN CONTROL THEORY
(EEE)

Course Category:	Professional core	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practical:**	3-0-0
Pre-requisite:	Control systems, circuits and networks, Mathematics	**Sessional Evaluation:** **Univ.Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives:	Students undergoing this course are expected to :	
	1.To derive mathematical models of typical engineering processes 2. To provide basic knowledge of control system analysis and design tools. 3.To introduce the concepts of controllability and observability 4. To provide knowledge on analysis of non-linear systems using describing function analysis 5. To analyze non-linear systems using liapunov function and design liapunov functions 6. To provide basic knowledge on controllers and compensators design.	
Course Outcomes:	Upon successful completion of the course , the students will be able to:	
	CO1	Design compensators.
	CO2	Design controllers
	CO3	Perform state variable analysis and examine the system stability, controllability and observability
	CO4	Develop state-space models and design state feedback controller and observer.
	CO5	Understand basic idea of non-linearities and stability analysis.
	CO6	Apply different techniques for non-linear systems stability analysis
Course Content:	**UNIT-I** **Linear system design:** Introduction of compensating networks, lead, lag, lead, lag cascade compensation, feedback compensation. **UNIT-II** **Design of controllers:** P, PI and PID controllers design using bode plot and root locus techniques. **UNIT-III** **State variable analysis:** Concepts of state, state variables, state vector, and state space model, system representation in state variable form, phase variable representation, diagonalization, canonical variable representation. **UNIT – IV** **Controllability and observability:** Definition of controllability, controllability tests for continuous time systems, definition of observability, observability tests for continuous time systems. **Time response of linear systems:** Introduction, solution of state equations, state transition matrix, sylvester's expansion theorem, pole placement by state feedback, full order and reduced order observers.	

	UNIT – V **Non-linear systems:** Introduction, common physical non linearities, singular points, basic concepts and derivation of describing functions. stability analysis by describing function method. **UNIT – VI** **Stability:** Introduction, equilibrium points, stability concepts and definitions stability in the sense of liapunov stability of linear system, methods of constructing liapunov functions for non-linear system, krasovskii's method, variable gradient method.
Text books & Reference books:	**Text books:** 1. "Control systems engineering", by I.J.Nagrath and M.Gopal, New age International publishers. 2. "Modern control system theory", by M.Gopal, TMH publishers. 3. "Advanced Control Theory", by A.NagoorKani, 2nd Edition, RBA Publication. **Reference books:** 1."Discrete Time Control Systems", by Ogata. K, 2nd Edition, Pearson Publication. 2. "State functions and linear control systems", by Schultz and Melsa 3. "Control system Engineering", by NISE, Wiley, 2000. 4. "Modern control systems", by Richard. C. Dorfand. R. H. Bishop Addison Wesley longman.
e-Resources:	http://nptel.ac.in/courses http://iete-elan.ac.in http://freevideolectures.com/university/iitm

17EE3202 – POWER ELECTRONICS
(EEE)

Course Category:	Professional core	**Credits:**	4
Course Type:	Theory	**Lecture-Tutorial-Practical:**	3-2-0
Pre-requisite:	Electrical circuit theory, differential &integral calculus.	**Sessional Evaluation:** **External Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives:	Students undergoing this course are expected to :	
	1. Learn about characteristics, specifications, commutation methods and protection of thyristor. 2. Learn about phase controlled converters with their applications. 3. Learn the harmonics presence in source current and THD calculation of phase controlled converters. 4. Learn about choppers with their control techniques and applications. 5. Learn about inverters with their control techniques and applications. 6. Learn about A.C voltage controllers and cyclo-converters with their applications.	
Course Outcomes:	After completing the course the student will be able to	
	CO1	Understand the characteristics, specifications, protection and commutation methods of thyristor.
	CO2	Analyze single phase controlled rectifiers.
	CO3	Analyze three phase controlled rectifiers.
	CO4	Analyze and apply the concepts of D.C-D.C converters in steady state operation.
	CO5	Understand the operation of inverters and voltage control techniques.
	CO6	Understand the operation of single phase A.C voltage controllers and single phase cyclo-converters.
Course Content:	**UNIT-I** **Thyristors:** Silicon controlled rectifier (SCR's)- basic theory of operation of SCR-two transistor analogy- static and dynamic characteristics of SCR-turn on methods - gate characteristics- firing circuits for thyristor- series and parallel operation of SCRs- protection of SCR- snubber circuit- ratings of SCRs - commutation methods. **UNIT-II** **Phase controlled rectifiers:** Phase control technique, single phase half wave Converters with R & RL loads-single phase full wave converters-Midpoint-full controlled bridge-Half controlled bridge converters with R, RL loads-effect of freewheeling diode- effect of source inductance.	

	UNIT-III **Three phase controlled rectifiers:** Three pulse and six pulse converters - midpoint and bridge connections, average load voltage with R and RL loads - effect of source inductance - presence of harmonics in source current -THD calculation. **UNIT-IV** **Choppers:** Step-down and step-up chopper- derivation of output voltage, time ratio control and current limit control strategies - types of choppers - Morgan's chopper- Jones chopper and load commutated chopper, waveforms. **UNIT-V** **Inverters:** Single phase inverter - basic series inverter- basic parallel inverter - waveform - Mc Murray half bridge inverter - basic operation and wave forms of three phase inverters (120^0 conduction and 180^0 conduction)- voltage control techniques for inverters, pulse width modulation techniques- Introduction to CSI- difference between voltage source inverter and current source inverter. **UNIT-VI** **AC voltage controller:** Single phase two SCR's in anti-parallel - with R and RL loads- derivation of RMS load voltage- current and power factor. **Cyclo-converters**: Single phase midpoint and bridge configuration cycle-converters with R and RL loads (step up and step down).
Text books **&** **Reference books:**	**Text books :** 1. *"*Power electronics: circuits, devices and applications*",* by M.H. Rashid, Pearson Education, PHI Third Edition, New Delhi 2004. 2. "Power electronics", by P.S. Bimbra, Khanna Publishers, third Edition, 2003. 3. "Power electronics", by MD Singh and Khanchandani, Second Edition, TMH Publishes. **Reference books:** 1. *"*Power electronics for technology", by Ashfaq Ahmed Pearson Education, Indian reprint, 2003. 2. "Power electronics: converters, applications and design", by Ned Mohan, Tore.M.Undeland, William. P. Robbins, John Wiley and sons, third Edition, 2003. 3. "Elements of power electronics", by Philip T. Krein, Oxford University Press, 2004 Edition.
e-Resources	http://nptel.ac.in/courses http://iete-elan.ac.in http://freevideolectures.com/university/iitm

17EE3203 – SWITCHGEAR AND PROTECTION

(EEE)

Course Category:	Professional core	**Credits:**	4
Course Type:	Theory	**Lecture-Tutorial-Practical:**	3-2-0
Pre-requisite:	Power system equipment, power system Analysis, circuit analysis and field theory.	**Sessional Evaluation:** **External Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives:	Students undergoing this course are expected :	
	1.To learn protection against overvoltage and to insulation co-ordination 2. To learn in detail about switchgear protective equipments. 3. To learn about construction and operation of types of circuit breakers. 4. To learn about types of relay operation. 5. To learn about different relay applications. 6.To learn about zones of protection and equipment protection in the power system.	
Course Outcomes:	After completing the course the student will be able to:	
	CO1	Gain knowledge in the field of over voltage protection.
	CO2	Understand the application and operation of the fuses as well as on Arcing Phenomenon.
	CO3	Gain knowledge in the operation and application of various types of circuit breakers in the real time applications of power system.
	CO4	Understand the operation of different relays.
	CO5	Understand the application of relays in the power system.
	CO6	Understand about zones of protection and equipment of protection in the power system.
Course Content:	**UNIT-I** **Over voltage protection:** Causes of over voltages in the power system, Phenomena of lightning, protection against direct strokes & indirect strokes, lightning arresters, zinc oxide lightning arrester, surge absorbers, surge diverters. **Insulation coordination:** Volt-time curve, basic impulse insulation levels of different equipments, insulation coordination of transformers, lightning arresters, bus bars and transmission lines. **UNIT-II** **Fuses:** Definitions, characteristics, selection of fuses, types of fuses and applications. **Circuit breakers:** Arc phenomena, initiation & maintenance of arc, methods of arc interruption, restriking voltage and recovery voltages, restriking phenomenon, average and max. RRRV, expression for RRRV, resistance switching, single frequency transients, double frequency transients, current chopping, interruption of capacitive currents.	

	UNIT-III **Classification of circuit breakers:** Principle of operation & constructional features of oil, air blast, SF_6 & vacuum CBs, ratings of CBs, testing of CBs, auto reclosures. **UNIT-IV** **Protective relays:** Fundamental requirement of protective relays, primary and backup protection, principle of operation of protective schemes. **Classification of relays:** Types of Electromagnetic relays, over current relays, directional relays and non-directional relays, earth fault relays. **UNIT-V** Distance relays, negative sequence- differential and under frequency relays-applications. **Static relays:** Basic static relays used in protective scheme, classification of static relays, over current, directional, distance, differential relays. comparators, amplitude & phase comparators, duality. **UNIT-VI** **Equipment protection:** Main considerations in equipment protection CTs and PTs and their applications in protection in protection schemes. **Feeder protection:** Transmission line, protection-bus bar protection. **Generator protection:** Protection for stator faults, rotor faults and protection for abnormal conditions. **Transformer protection:** Differential protection schemes-Buchholz relay.
Text books & Reference books:	**Text books:** 1."Power system protection and switchgear", by Badri Ram & D. N. Vishwakarma, Tata-McGraw-Hill, 2nd Edition 2."Electrical power systems", by C.L. Wadhwa, 7th Edition NAI publishers. 3."A Course in power systems", by J.B Gupta, Publisher: S.K. Kataria& Sons*;* 11th Edition. **Reference books:** 1. "Switchgear & protection", by Sunil S Rao, Khanna Publishers. 2. "Power system protection & switchgear" by B. Ravindranath, and N. Chander, Wiley Eastern Limited. 3. "Electrical power", by DrS L Uppal, Khanna Publishers.
e-Resources:	http://nptel.ac.in/courses http://iete-elan.ac.in http://freevideolectures.com/university/iitm.

17EE3204-UTILIZATION OF ELECTRIC POWER
(EEE)

Course Category:	Professional core	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practical:**	3-0-0
Pre-requisite:	Electrical engineering, Kinematics	**Sessional Evaluation:** **Univ.Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives:	Students undergoing this course are expected to :	
	1. Learn about the basic concepts of illumination and design of different lighting schemes. 2. Learn about the concepts of different electric heating techniques. 3. Learn about the concepts of different electric welding techniques. 4. Learn about the concepts of electrical drives, different motor characteristics and load classification. 5. Learn about different traction systems and electrical breaking concepts. 6. Learn about speed-time curves of different train services and calculation of tractive effort.	
Course Outcomes:	After completing the course the student will be able to	
	CO1	Understand the basic concepts of illumination and design of different lighting schemes.
	CO2	Understand the concepts of different electric heating techniques.
	CO3	Understand the concepts of different electric welding techniques.
	CO4	Understand the concepts of electrical drives, different motor characteristics and load classification.
	CO5	Understand different traction systems and electrical breaking concepts.
	CO6	Understand speed-time curves of different train services and calculation of tractive effort.
Course Content:	**UNIT – I** **Illumination:** Introduction, terms used in illumination-laws of illumination- discharge lamps-MV and SV lamps- relative comparison between above methods- basic principles of light control- types and design of lighting schemes- flood lighting-efficient lighting systems-aviation and transport lighting-lighting for displays and signaling-neon signs- LED-LCD displays beacons and lighting for surveillance. **UNIT-II** **Electric heating :** Advantages and methods of electric heating- types and applications of electric heating equipment- resistance ovens-induction heating-dielectric heating-arc furnace **UNIT –III** **Electric welding:** Advantages of electric welding- choice of welding time- electric welding equipment- resistance welding and arc welding techniques-comparison of A.C and D.C welding.	

	UNIT –IV **Electric drives:** Types of Electric drives, choice of motor- starting and running characteristics - speed control- particular applications of electric drives- types of industrial loads-continuous-intermittent and variable loads- load equalization. **UNIT –V** **Electric traction:** Systems of electric traction and track electrification. review of existing electric traction systems in India-special features of traction motors- methods of electric braking- plugging- Rheostatic braking and regenerative braking. **UNIT –VI** **Mechanism of train movement**: Speed-time curves for different services- trapezoidal and quadrilateral speed time curves- calculations of tractive effort- power- specific energy consumption for a given run- effect of varying acceleration and braking retardation- adhesive weight and coefficient of adhesion.
Text books & Reference books:	**Text books:** 1. "Utilization of electric energy", by E.Openshaw Taylor, Orient Longman. 2. "Utilization of electrical power including Electric drives and Electric traction", by N.V.Suryanarayana, New Age International (P) Limited, Publishers, 1996. **Reference books:** 1. "Art & science of utilization of electrical energy", by H.Partab, DhanpatRai&Sons. 2. "Generation distribution and utilization of Electrical energy", by C.L.Wadhwa, New Age International (P) Limited, Publishers, 1997. 3. "A course in power systems", by J.B.Gupta, Kataria& sons, 11th Edition.
e-Resources:	http://nptel.ac.in/courses http://iete-elan.ac.in http://freevideolectures.com/university/iitm

PROFESSIONAL ELECTIVE -II

1. Basics of power system harmonics & electrical insulation (17EE32E1)
2. Electrical energy conservation &auditing (17EE32E2)
3. Electrical machine design(17EE32E3)
4. Neural networks & fuzzy logic(17EE32E4)

17EE32E1-BASICS OF POWER SYSTEM HARMONICS & ELECTRICAL INSULATION

(EEE)

Course Category:	Professional Elective	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practical:**	3-0-0
Pre-requisite:	Basic power system components.	**Sessional Evaluation:** **External Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives:	To make the student learn about: 1.The terms associated with harmonics and the causes for harmonic producing loads. 2.The various effects of harmonics. 3.The concepts of harmonic instrumentation with computer simulation. 4.To select the appropriate insulation material, insulation failures and vacuum insulation. 5.The insulation testing. 6.To acquire knowledge on advanced measuring and testing techniques.	
Course Outcomes:	At the end of the course, student will be able to understand:	
	CO1	The terms associated with harmonics and the causes for harmonic producing loads.
	CO2	The various effects of harmonics.
	CO3	The concepts of harmonic instrumentation with computer simulation
	CO4	Selection of the appropriate insulation material, about insulation failures and vacuum insulation.
	CO5	About insulation testing.
	CO6	Advanced measuring and testing techniques.
Course Content:	**UNIT I** **Sources and generation of harmonics:** Transformer magnetization-machines- fluorescent lamps with magnetic ballasts- power electronics loads such as line, commutated converters- typical current waveforms and THD-switched mode power supplies- typical current waveforms and THD- uncharacteristic and inter harmonics**.** **UNIT II** **Effects of harmonics:** Resonance- nuisance tripping- blown capacitor fuses and capacitor cells degradation of internal capacitance- digital clocks- motor overheating overloading neutrals-telephone interference. **UNIT III** **Investigation of harmonics:** Field measurements-requirements-harmonic symmetrical components-transducers-harmonic instrumentation computer simulation with an example	

	UNIT IV **Insulation materials and failures:** Insulation materials properties-application- causes of insulation degradation- failure modes- recent insulation testing and diagnostic techniques. **Vacuum insulation:** Breakdown electron emission-pre-breakdown conduction- effective condition of electrodes- breakdown mechanism in vacuum- factors affecting breakdown voltage- vacuum circuit breaker-space application. **UNIT V** **Insulation testing:** Classification of testing- procedures and standards-testing automation- partial discharge test-dielectric loss test- insulation testing of equipments- testing of transformer and cable accessories-testing of electrical switchgear and circuit breakers-testing of motor and generators. **UNIT VI** **Advanced measurement and diagnostic technologies**: Digital impulse recorders-digital techniques in testing, testing automation- electric field measurements-electro optic sensors- magneto optic sensors-space charge measurement techniques- electro optical imaging techniques- insulation resistance measuring instruments.
Text books & Reference books:	**Text books:** 1. "Power system harmonics", Arrillaga J. and Watson N. R., Wiley, 2nd Edition, U.S.A, Nov2003. 2. "Understanding power system harmonics", by Prof. Mack Grady, Dept. of electrical & computer engineering university of Texas at Austin, U.S.A, 2012. 3. "High voltage and electrical insulation engineering", by Ravindra Arora, Wolfgang Mosch, IEEEpress series on power Engineering, 2011. 4. "Electrical power equipment maintenance and testing", by Paul Gill, 2nd Edition, CRC Press, Taylor & Francis group, 2009. **Reference books:** 1."Electrical insulation in power systems", by N.H.Malik, A.A.Al-Arainy, M.I.Qureshi, CRC Press, Taylor & Francis group, 1998.
e-Resources:	http://nptel.ac.in/courses http://iete-elan.ac.in http://freevideolectures.com/university/iitm www.ece.utexas.edu/~grady

17EE32E2-ELECTRICAL ENERGY CONSERVATION & AUDITING
(EEE)

Course Category:	Professional Elective	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practical:**	3-0-0
Pre-requisite:	Basics of electrical Circuits and Generation of Electrical Power.	**Sessional Evaluation:** **External Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives:	To make the student learn about: 1. Familiarizing the energy and its management 2. The importance of energy conservation. 3. The fundamentals of product strategy management. 4. The studying methods of energy accounting and energy auditing in energy sector, industry and final consumption. 5. Finding the opportunities to increase the rational use of energy. 6. The energy conservation in industrial application	
Course Outcomes:	After completing the course the student will be able to	
	CO1	Understand the current global energy scenario
	CO2	Understand the importance of energy conservation.
	CO3	Understand the concepts of energy management.
	CO4	Understand the concepts of energy auditing.
	CO5	Understand the methods of improving energy efficiency in lighting systems.
	CO6	Understand the methods of improving energy efficiency in heating and air conditioning.
Course Content:	**UNIT- I** **Energy scenario:** Global & Indian energy scenario- classification of energy sources, energy needs of growing economy- energy sector reform-energy and environment, global environmental concerns- basics of energy and its various forms. **UNIT – II** **Energy conservation:** Power factor and energy instruments- Power factor - methods of improvement- location of capacitors- power factor with non linear loads effect of harmonics on power factor- numerical problems, energy instruments- watt-hour meter- data loggers- thermocouples- pyrometers- lux meters- tong testers- power analyzer. **UNIT – III** **Electric energy management:** Principles of electric energy management- energy management control systems-energy systems maintenance -energy management in water and waste water treatment- solid waste treatment- electricity act-energy conservation act.	

	UNIT – IV **Energy audit:** Types of energy audit- energy management (audit) approach, understanding energy costs- bench marking- energy performance-matching energy use to requirement, maximizing system efficiencies, optimizing the input energy requirements, fuel and energy substitution, energy audit instruments. **UNIT – V** **Energy efficiency in lighting systems:** Lighting modification of existing systems, replacement of existing systems, definition of terms and units-luminous efficiency, polar curve, calculation of illumination level, illumination of inclined surface to beam, luminance or brightness, types of lamps, types of lighting, electric lighting fittings (luminaries), flood lighting, white light LED and conducting polymers, energy conservation measures. **UNIT – VI** **Energy efficiency in heating and air conditioning** : Space heating and ventilation, air conditioning (HVAC) and water heating-introduction- heating of buildings- transfer of heat- space heating methods- ventilation and air-conditioning-insulation- cooling load- electric water heating systems-energy conservation methods.
Text books & Reference books:	**Text books:** 1. "Energy management", by W.R. Murphy & G. Mckay Butter worth, Elsevier publications, 2012. 2. "Energy efficient electric motors", by John .C. Andreas, Marcel Dekker Inc Ltd 2nd Edition, 1995 3. "General aspects of energy management and audit", National Productivity Council of India, chennai (course material-national certification examination for energy management) **Reference books:** 1. "Electric Energy Utilization and Conservation", by S C Tripathy, Tata McGraw hill publishing company Ltd. New Delhi. 2. "Energy Management Handbook", by W.C. Turner, Marcel Dekker, Inc, New York, 5th Edition, 2005. 3. "Guide to Energy Management", by B. L. Capehart, W. C. Turner, W. J. Kennedy, CRC Press, New York, 2005.
e-resources	http://nptel.ac.in/courses http://iete-elan.ac.in http://freevideolectures.com/university/iitm

17EE32E3-ELECTRICAL MACHINE DESIGN
(EEE)

Course Category:	Professional Elective	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practical:**	3-0-0
Pre-requisite:	Electrical Machines	**Sessional Evaluation:**	40
		External Exam Evaluation:	60
		Total Marks:	100

Course Objectives:	Students undergoing this course are expected :	
	1. To develop knowledge on principles of design of static and rotating machines. 2. To design armature and field systems for D.C machines 3. To design stator and rotor of induction machines. 4. To design stator and rotor of synchronous machines and study their thermal behavior. 5. To design core, yoke, windings and cooling systems of transformers. 6. To know the modes of heat dissipation and cooling methods.	
Course Outcomes:	After completing the course the student will be able to	
	CO1	Understand the importance of design of machines based on their applications.
	CO2	Understand the design of various parts of D.C machines and solve the problems of design.
	CO3	Understand the design concepts of induction motors.
	CO4	Understand the design concepts of synchronous machines and solve the problems related to design
	CO5	Understand the design concepts of three phase transformer.
	CO6	Understand the modes of heat dissipation and cooling methods
Course Content:	**UNIT I** **Basic considerations:** Basic concept of design, limitation in design, standardization, modern trends in design and manufacturing techniques, classification of insulating materials, general concepts in designing rotating machines. **UNIT II** **Design of DC machines:** Output equation, choice of specific loading and choice of number of poles, design of main dimensions of D.C machines, design of armature slot dimensions, commutator and brushes, magnetic circuit, estimation of ampere turns, design of yoke and poles, main and inter poles, field windings, shunt, series and inter poles **UNIT III** **Design of induction motors:** Output equation, choice of specific loadings, main dimensions of three phase induction motor, stator winding design, choice of length of the air gap, estimation of number of slots for the squirrel cage rotor, design of rotor bars and end ring, design of slip ring induction motor, estimation of no load current and leakage reactance and circle diagram.	

	UNIT IV **Design of synchronous machines:** Output equation, choice of specific loadings-short circuit ratio, design of main dimensions, armature slots and windings, slot details for the stator of salient and non- salient pole synchronous machines, design of rotor of salient pole synchronous machines, magnetic circuits, dimensions of the pole body, design of the field winding, and design of rotor of non- salient pole machine, introduction to computer aided design. **UNIT V** **Design of transformers:** Output equation for single phase, choice of specific loadings, expression for volts/turn, determination of main dimensions of the core, types of windings and estimation of number of number of turns and conductor cross sectional area of primary and secondary windings, estimation of no load current, expression for leakage reactance and voltage regulation, design of tank and cooling tubes (round and rectangular). **UNIT VI** **Heating and cooling**: Modes of heat dissipation & temperature rise time curves, methods of cooling ventilation (induced & forced, radial & axial), direct cooling& quantity of cooling medium calculation of total MMF and magnetizing current, specific permeance and leakage reactance.
Text books & Reference books:	**Text books:** 1."A course in electrical machine design", by A.K. Sawhney, DhanpatRai& Sons. 2."Design of electrical machines", by V.N. Mittle, 4th Edition. **Reference books:** 1."Performance and design of A.C machines", by M.G. Say,CBS publishers and Distributors Pvt ltd. 2."Design data handbook", by A.Shanmugasundarm, G,Gangadharam, R.Palani, Wiley Eastern Ltd.
e-Resources:	http://nptel.ac.in/courses http://iete-elan.ac.in http://freevideolectures.com/university/iitm

17EE32E4-NEURAL NETWORKS AND FUZZY LOGIC

(EEE)

Course Category:	Professional Elective	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practical:**	3-0-0
Pre-requisite:	Basic knowledge of Coding, Matrix operations and Probability theory.	**Sessional Evaluation:** **External Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives	Students undergoing this course are expected to :	
	1. Learn the basics of Neural Networks. 2. Learn learning rules 3. Learn fuzzification and defuzzification 4. Learn about Fuzzy sets and Fuzzy Logic theory. 5. Learn about the applications in Electrical Engineering. 6. Learn design of fuzzy systems.	
Course Outcomes	After completing the course the student will be able to:	
	CO1	Understand the principles of neural networks and fuzzy Logic fundamentals.
	CO2	Understand the learning rules.
	CO3	Acquire knowledge in supervised learning.
	CO4	Understand about unsupervised learning rules.
	CO5	Understand concept of classical and fuzzy sets, fuzzification and defuzzification.
	CO6	Design the fuzzy systems
Course Content:	**UNIT-I** **Artificial neural networks**: Introduction to neural networks, biological neurons, artificial neurons, Mc-culloch, pitts model, neuron modeling for artificial neural systems, feed forward network, feedback network, perceptron network, supervised and unsupervised Learning. **UNIT-II** **Learning Rules**: Hebbain learning rule, perceptron learning rule, delta learning, winner take all learning rule, ouster learning rule. **UNIT-III** **Supervised Learning:** Preceptors, exclusive OR problem, single layer preceptor network **Multilayer feed forward networks:** linearly non-separable pattern classification, delta learning rule for multi preceptor layer, error back propagation algorithm, training errors, ADALINE, introduction to Radial basis function networks (RBFN) **UNIT- IV** **Unsupervised Learning:** Hamming net, Max net, Winner take all learning, counter propagation network, feature mapping, self organizing feature maps. applications of neural algorithms, elementary aspects of applications of character recognition, neural network control applications, process identification.	

	UNIT-V **Fundamentals of Fuzzy Logic And Fuzzy Sets**: Definition of fuzzy set, fuzzy set cardinality, operations of fuzzy sets, union, intersection, complement, cartesian product, algebraic sum, definition of fuzzy relation, properties of fuzzy relations, fuzzy composition. **UNIT-VI** **Design of Fuzzy Systems:** Components of fuzzy systems, functions of fuzzification, rule base patterns, inference mechanisms. **Methods of defuzzification:** Centre of gravity method, mean of maxima method, weighted average method, height method. Design of fuzzy systems for temperature setting of storage water heater, fuzzy system for control of air conditioner.
Text books & Reference books:	**Text books:** 1."Introduction to artificial neural systems", by KacelM.Jurada, Jaico Publications,1st Edition,1992. 2. "Fuzzy set theory and its applications", by Zimmerman K.J. Kluwer Academic Publishers, 4th Edition, 2001. **Reference books:** 1. "Fuzzy logic with engineering applications", by Timothy Ross, Wiley publishers, 4th Edition, 2016. 2. "Foundations of neural networks, Fuzzy Systems, and Knowledge Engineering", by Nikola K. Kasabov, MIT press, Cambridge, London, 2nd Edition, 1996.
e-Resources	http://nptel.ac.in/courses http://iete-elan.ac.in http://freevideolectures.com/university/iitm

17SH32P1 - ADVANCED COMMUNICATION SKILLS LAB

(Common for EEE& ECE)

Course Category:	Basic Sciences	**Credits:**	2
Course Type:	Laboratory	**Lecture-Tutorial-Practical:**	0-0-3
Pre-requisite:	Basic Level of LSRW skills	**Sessional Evaluation:** **External Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives:	To make the student learn about: 1.To improve verbal proficiency 2.The group discussion skills viz verbal and nonverbal 3.To writing a standard résumé. 4.To improve analytical abilities to think on a particular given topic. 5.To interview skills 6.To acquire soft skills and use them effectively in a realistic professional work places.	
Course Outcomes:	Upon successful completion of the course, the students will able to:	
	CO1	Understand verbal proficiency and face competitive exams; GATE, GRE, TOEFL, GMAT
	CO2	Develop group discussion skills viz verbal and nonverbal
	CO3	Develop intrapersonal and interpersonal relationship skills
	CO4	Prepare effective résumés and job applications.
	CO5	Face all types of interviews successfully and get jobs in different companies
	CO6	Improve personal and professional grooming, business dressing and telephonic skills.
Course Content:	**LIST OF EXPERIMENTS** **1.Vocabulary building:** Synonyms and antonyms, word roots, one word substitutes, prefixes and suffixes, study of word origin, analogy, idioms and phrases **2.Group discussion**: Dynamics of group discussion, intervention, summarizing, voice modulation , body language, relevance, fluency and coherence **3.Intrapersonal & interpersonal relationship skills:** Intrapersonal & interpersonal relationship skills, to be an effective team player **4.Résuméwriting:** Structure and presentation, planning, defining the career objective, projecting ones strengths and skill, sets, summary, formats and styles, cover letter. **5. Interview skills:** Concept and process, pre-interview planning, opening strategies, answering strategies, interview through tele and video conferencing **6.Corporate etiquettes:** Dressing etiquettes, dining etiquettes, nonverbal communication, proximity of place	

Reference books:	**Reference books:** 1. "Effective technical communication", by M. Ashraf Rizvi, Tata Mc. Graw-Hill Publishing Company Ltd. 2."A Course in english communication", by Madhavi Apte, Prentice-Hall of India, 2007. 3. "Communication skills", by Leena Sen, Prentice-Hall of India, 2005. 4. "Academic writing- A Practical guide for students, Stephen Bailey, Rontledge Falmer, London & New York, 2004. 5."English language communication**:** A Reader cum Lab Manual"**,** by Dr A Ramakrishna Rao, Dr G Natanam& Prof SA Sankaranarayanan, Anuradha Publications, Chennai 6."Body language- Your success mantra", by Dr. ShaliniVerma, S. Chand, 2006. 7. "Soft skills", by Dr K. Alex, S. Chand Publications, New Delhi.

17EE32P1-CONTROL SYSTEMS LAB

Course Category:	Professional core	**Credits:**	2
Course Type:	Laboratory	**Lecture-Tutorial-Practical:**	0-0-3
Pre-requisite:	Linear control systems, Electrical Machines, Microprocessors and MATLAB Software	**Sessional Evaluation:** **External Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives	To make the student learn about:	
	1. The design and analysis of compensators. 2. The frequency & time domain specifications of network. 3. The Speed control of various DC & AC motors. 4.The characteristics of synchros 5.The design of controllers using MATLAB 6.Writing the programme to find frequency & time domain specifications of network using MATLAB	
Course Outcomes	After completing the course the student will be able to:	
	CO1	Analyse the compensator circuits experimentally.
	CO2	Analyse time and frequency specifications of network
	CO3	Analyse characteristics of various motors
	CO4	Analyse the speed control of various motors using microprocessors.
	CO5	Analyse the usage of MATLAB in control system.
	CO6	Design the controllers.
Course Content:	Minimum of 10 experiments to be conducted out of the following: **LIST OF EXPERIMENTS** 1. Characteristics of Lag and Lead compensator 2. Characteristics of Lead and Lag compensator 3. Frequency response Specifications 4. Frequency response characteristics 5. Time response of second order System 6. Characteristics of Synchros 7. Speed control of Stepper Motor 8. Speed control of DC Servo Motor 9. Root Locus & Bode plot from a Transfer Function 10. Design & simulation of P, PI and PID Controllers 11. AC Servo motor speed-torque characteristics 12. Time response of first and second order System 13. Temperature controller System.	

NBKR INSTITUTE OF SCIENCE & TECHNOLOGY:: VIDYANAGAR (AUTONOMOUS)
(AFFILIATED TO JNTUA :: ANANTAPUR)
SPSR NELLORE DIST
IV YEAR OF FOUR YEAR B.TECH DEGREE COURSE – I SEMESTER
ELECTRICAL AND ELECTRONICS ENGINEERING
SCHEME OF INSTRUCTION AND EVALUATION
(With effect from the academic year 2020-2021)
(For the batch admitted in the academic year 2017-2018)

S.No	Course Code	Course Title	Instruction Hours/Week			Credits	Evaluation									
							Sessional Test-1			Sessional Test-2			Total Sessional Marks (Max. 40)	End Semester Examination		Maximum Total Marks
		THEORY	L	T	D/P		Test-1 (2 Hr)	Assign-1	Max. Marks	Test-2 (2 Hr)	Assign-2	Max. Marks		Duration In Hours	Max. Marks	100
1	17SH4102	Management Science#	3	-	-	3	34	6	40	34	6	40	0.8*Best of Two + 0.2*Least of Two	3	60	100
2	17EE4101	Power System Analysis	3	-	-	3	34	6	40	34	6	40		3	60	100
3	17EE4102	Power Semiconductor Drives	3	-	-	3	34	6	40	34	6	40		3	60	100
4	17EE4103	Power System Operation & Control	3	-	-	3	34	6	40	34	6	40		3	60	100
5		Professional Elective-III	3	-	-	3	34	6	40	34	6	40		3	60	100
6		Open Elective-I	3	-	-	3	34	6	40	34	6	40		3	60	100
		PRACTICALS														
7	17EE41P1	Power Electronics lab	-	-	3	2	-	-	-			-	Day to day evaluation and a test (40 Marks)	3	60	100
8	17EE41P2	Power systems Lab	-	-	3	2	-	-	-			-		3	60	100
9	17EC41P4	Microprocessor & Interfacing Lab	-	-	3	2	-	-	-			-		3	60	100
		TOTAL				24										

(***:** Common to all; **#**: Common to ECE, EEE, CSE & IT; $: Common to ECE & EEE; **@** : Common to ECE,EEE,CE & ME)

17SH4102-MANAGEMENT SCIENCE

(Common to EEE, ECE, CSE&IT)

Course Category:	Basic sciences	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practical:**	3-0-0
Pre-requisite:	NIL	**Sessional Evaluation:** **External Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives:	Students undergoing this course are expected to :	
	1. Learn the disciplines of management science and manager's role in business and other decision-making. 2. Gain an overview of the process of developing and using quantitative techniques in decision making and planning. 3. Aware of the ethical dilemmas faced by managers and the social responsibilities of business. 4. Know the significance of strategic management in competitive and dynamic global economy. 5. Learn marketing strategies based on product, price, place and promotion objectives. 6.Learn to determine activity times	
Course Outcomes:	Upon successful completion of the course , the students will be able:	
	CO1	To explain the concepts of management, ethical and social responsibilities.
	CO2	To describe various locations and layouts of plants.
	CO3	To apply work study techniques for increased productivity.
	CO4	To manage human resources efficiently and effectively with best HR practices.
	CO5	To develop marketing strategies based on product, price, place and promotion objectives.
	CO6	To determine activity times (early start, early finish, late start, late finish, total float, and free float) and schedule the project using the CPM and PERT.
Course Content:	**UNIT-I** **Introduction to management**: Concept of management, functions of management, evolution of management thought, Taylor's scientific management theory, Fayal's principles of management, maslow's theory of hierarchy of human needs, Douglas McGregor's theory X and theory Y, hertz-berg two factor theory of motivation . **UNIT-II** **Design of organization:** Principles of organization, organization process, types of organization structures: line, line and staff organization, function, committee, matrix, virtual, cellular, team organization, boundary less organization, inverted pyramid structure, lean and flat organization, managerial objectives and social responsibilities.	

	UNIT-III **Strategic management**: Corporate planning, mission, objectives, programmes, SWOT analysis, strategy formulation and implementation. **Marketing management**: Functions of marketing, marketing mix, marketing strategies based on product life cycle and channels of distribution. **UNIT-IV** **Human resources management**: Basic functions of human resources management, manpower planning, job evaluation and merit rating, incentive plans. **UNIT-V** **Production and operations management**: Plant location and plant layout concepts, types of production (job, batch & mass), production planning and control, work study, basic procedure involved in method study, work measurement. **UNIT-VI** **Project management (PERT/ CPM):** Network analysis, programme evaluation and review technique (PERT), critical path method (CPM), identifying critical path, probability of completing the project, Project cost analysis, project crashing (simple problems).
Text books & Reference books:	**Text books:** 1. "Applied management science and operations research", by Dr. T.P. Singh, Er. Arvind Kumar UDH publishers and Distributors Pvt Ltd. 2. "Management science", by A.R. Aryasri Mc Graw Higher Ed 4th Edition. 3. "Industrial engineering and management", by O.P.Kanna, Dhanpat Rai Publications. **Reference books:** 1."Business organizations and management", by C.B.Gupta 2."Industrial engineering and management (Including Production Management)", by T.R.Banga, S.C.Sharma
e-Resources:	http://nptel.ac.in/courses http://iete-elan.ac.in http://freevideolectures.com/university/iitm

17EE4101-POWER SYSTEM ANALYSIS

(EEE)

Course Category:	Professional core	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practical:**	3-0-0
Pre-requisite:	Basics of Power Systems, Circuits & Networks	**Sessional Evaluation:** **External Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives:	Students undergoing this course are expected to :	
	1. Learn the steady-state analysis for a balanced three-phase power system. 2. Lear modeling of the networks in terms of symmetrical components and sequence network. 3. Learn the functioning of a synchronous machine and its representation. 4. Learn multi-node power systems using an admittance matrix or impedance matrix representation. 5.Learn the solution of the power flow problem and power system stability 6. Learn the different numerical integration methods and factors influencing stability.	
Course Outcomes:	After completing the course the student will be able to	
	CO1	Analyze a network under symmetrical faults condition
	CO2	Model the networks in terms of symmetrical components and sequence networks.
	CO3	Analyze various types of short circuit faults and calculate the fault currents and voltages in power system.
	CO4	Explain different methods of power flow solutions.
	CO5	Solve optimal power flow problem using different methods of power flow solutions.
	CO6	Demonstrate different numerical integration methods and factors influencing stability.
Course Content:	**UNIT-I** **Symmetrical fault analysis:** Introduction, transients on transmission line, short circuit of a synchronous machine, on no load-short circuit of a loaded synchronous machine-selection of circuit breakers, algorithm for short circuit studies-Z bus formulation. **UNIT-II** **Symmetrical components:** Introduction, symmetrical component transformation, phase shift in star-delta transformers, sequence impedances of transmission lines, sequence impedance and sequence network of power system, synchronous machine, transmission line and transformers-construction of sequence network of a power system.	

	UNIT-III **Unsymmetrical fault analysis:** Introduction, symmetrical component analysis of unsymmetrical faults, single-line-to-ground (LG) fault, line-to-line (LL) fault, double line-to-ground (LLG) fault, open conductor faults, bus impedance matrix method for analysis of unsymmetrical shunt faults. **UNIT-IV** **Power flow Studies-I:** Necessity of power flow studies, data for power flow studies, derivation of static load flow equations, load flow solutions using gauss seidel method, acceleration factor, load flow solution with and without PV buses, algorithm and flowchart, numerical load flow solution for simple power systems (max. 3-buses), determination of bus voltages, injected active and reactive powers (sample one iteration only) and finding line flows/losses for the given bus voltages. **UNIT-V** **Power flow studies-II:** Newton Raphson method in rectangular and polar co-ordinates form, power flow solution with & without PV buses-derivation of jacobian elements, algorithm and flow chart, decoupled and fast decoupled methods, comparison of different power flow methods, D.C load flow. **UNIT-VI** **Power system stability:** Introduction, dynamics of a synchronous machine, power angle equation, node elimination techniques, simple systems, steady state stability, transient stability, equal area criterion, numerical solution of swing equation, some factors affecting transient stability, small signal stability analysis.
Text books & Reference books:	**Text books:** 1. "Modern power system analysis", by D.P Kothari and I J Nagarath.TMH, 4th Edition. 2. "Power system analysis and design", by B.R.Gupta Wheelers publishing, 6th Edition. **Reference books:** 1. "Elements of power system analysis", by John J. Grainger and William D.Stevenson ,Jr TMH. 2. "Electrical power system", by C.L.Wadhwa New Age publications, 6th Edition.
e-Resources	http://nptel.ac.in/courses http://iete-elan.ac.in http://freevideolectures.com/university/iitm

17EE4102-POWER SEMICONDUCTOR DRIVES
(EEE)

Course Category:	Professional core	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-practical:**	3-0-0
Pre-requisite:	Fundamentals of electrical circuits and networks, Power Electronics and Electrical Motors(A.C and D.C motor)	**Sessional Evaluation:** **Univ.Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives:	Students undergoing this course are expected to learn:	
	1. The importance of electrical drives. 2. The control of D.C motor by single phase and three phase converters. 3. The control of D.C motor by three phase converters and dual Converters. 4. The control of induction motor in four quadrants by controllers. 5. The losses and importance of energy conservation in electric drives. 6. The control of synchronous motor using voltage & current source inverters.	
Course Outcomes:	After completing the course the student will be able to	
	CO1	Understand the importance of electrical drives.
	CO2	Gain knowledge on D.C motor control by Single phase and three phase converters.
	CO3	Gain knowledge on D.C motor control by three phase converters and dual converters.
	CO4	Gain knowledge on Induction motor control in four quadrants by controllers.
	CO5	Understand the importance of energy conservation in electric drives.
	CO6	Gain knowledge on synchronous motor control using voltage and current source inverters.
Course Content:	**UNIT-I** **Electric drives:** Concept of electric drive, classification, advantages and choice of electric drives, parts of electric drives, electric motor, power modulators, sources and control unit, steady state speed and torque expressions of various D.C motors, speed, torque characteristics. **UNIT-II** **Converter controlled D.C drives:** Single phase semi and fully controlled converters connected to D.C separately excited, continuous and discontinuous current operation **DC motor Drives:** Introduction to four quadrant operation, motoring operations, electric braking, plugging, dynamic and regenerative braking operations, four quadrant operation of D.C motors.	

	UNIT-III **Converter controlled D.C drives:** Three phase semi and fully controlled converters connected to D.C separately excited motor, single quadrant. **Chopper controlled D.C drives:** Two quadrant and four quadrant chopper fed DC separately excited and series excited motors, continuous current operation, speed torque expressions, speed torque characteristics. **UNIT –IV** **Induction motor drives:** Speed torque characteristics, variable voltage characteristics, control of induction motor by A.C voltage controllers .variable frequency characteristics, variable frequency control of induction motor by voltage source and current source inverter and cyclo converters, PWM control, comparison of VSI and CSI operations, closed loop operation of induction motor drives (block diagram only). **UNIT-V** **Slip power recovery schemes:** Static Scherbius drive, static kramer drive, their performance and speed torque characteristics, advantages applications, problems. **UNIT-VI** **Synchronous motor drives:** Speed-torque characteristics, separate control and self-control of synchronous motors, operation of self-controlled synchronous motors by VSI and CSI cycloconverters, load commutated CSI fed closed loop control operation, variable frequency control using cycloconverter.
Text books **&** **Reference books:**	**Text books:** 1. "Fundamentals of electric drives", by G K Dubey,Narosa Publications. 2. "Power electronic circuits, devices and applications", by M.H.Rashid, PHI. **Reference books:** 1. "Power electronic", by MD Singh and K B Khanchandani, Tata – McGraw-Hill Publishing company,1998 2. "Modern power electronics and A.C drives", by B.K.Bose, PHI publishers. 3. "Thyristor control of electric drives", by Vedam Subramanyam, Tata McGraw Hill Publications. 4. "A First course on Electrical Drives", by S K Pillai, New Age International(Pvt.) Ltd. 2nd Edition.
e-Resources:	http://nptel.ac.in/courses http://iete-elan.ac.in http://freevideolectures.com/university/iitm

17EE4103-POWER SYSTEM OPERATION AND CONTROL
(EEE)

Course Category:	Professional core	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practical:**	3-0-0
Pre-requisite:	Generation of electric power, power systems, control systems, & electrical machines	**Sessional Evaluation:** **External Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives:	Students undergoing this course are expected to :	
	1. Learn the basics of power system control. 2. Study the analytical methods of arriving at the optimal operating strategies which must meet the minimum standards of reliability. 3. Learn about hydro thermal scheduling and unit commitment. 4. Study the modeling of synchronous generator and exciters. 5. Learn the importance of frequency control, automatic load frequency control mechanism of single area and two area systems. 6. Control the operation of a power system using SCADA system.	
Course Outcomes:	After completing the course the student will be able :	
	CO1	To understand the economic load dispatch problems and solution methods.
	CO2	To solve problems by posing different problem models related to economic load dispatch.
	CO3	To acquire knowledge on forecasting of base load and unit commitment using different methods.
	CO4	To design the modeling of synchronous generator and exciters.
	CO5	To understand the design of automatic load frequency controller.
	CO6	To control the operation of a power system using SCADA system.
Course Content:	**UNIT-I** **Economic operation of power systems –I :** Optimal operation of generators in thermal power stations, statement of economic dispatch problem, heat rate curve, cost curve, incremental fuel and production costs, input- output characteristics, optimal operations of generators on a bus bar without losses. **UNIT –II** **Economic operation of power systems –II :** Optimum generation allocation including the effect of transmission line losses, loss coefficients, derivation of transmission loss formula. **UNIT-III** **Hydrothermal scheduling**: Introduction, hydroelectric power plant model, scheduling problems, short term hydrothermal scheduling problem. **Unit commitment**: Need for unit commitment, constraints on unit commitment problem, solution methods for unit commitment problems, priority lists method, dynamic programming method.	

	UNIT-IV **Reactive power and voltage control**: Basic generator control loops, introduction to D.C and A.C excitation systems, types of exciters , exciter modeling, generator modeling, static performance of AVR loop, generation and absorption of reactive power, relation between voltage, power and reactive power at a node, single machine infinite bus systems, methods of reactive power control. **UNIT-V** **Automatic load frequency control (ALFC)**: Automatic load frequency control of single area systems, model of turbine speed governing system, turbine model, generator load model, block diagram representation of ALFC of an isolated power system, steady state analysis, and dynamic response, concept of control area, integral control, two area load frequency control concept and block diagram. **UNIT- VI** **Computer control of power systems**: Definition of SCADA, SCADA systems, applications, functions, layout of the SCADA, SCADA configurations, energy management systems, system operating states.
Text books & Reference books:	**Text books**: 1."Modern power system analysis", by I.J.Nagrath & D.P.Kothari Tata Mc Graw – Hill Publishing Company Ltd, 4th Edition. 2."Electrical power systems", by C.L.Wadhwa, Newage International, 3rd Edition 3 "Power system analysis", by Hadi Saadat – TMH Edition. 4. "A text book on power system engineering", by M.L. Soni, P.V. Gupta, U.S. Bhatnagar- Dhanpat Rai&co 5. "Switch gear and protection", by Sunil S. Rao, Khanna Publishers, New Delhi. **Reference books:** 1. "Power generation, operation and control", by Allen J Wood &Woollenberg. John Wiley and Sons. 2. "Electrical energy systems theory", by O.J Elgerd. 3. "Power system analysis, operation and control", by Abhijit Chakrabarti and Sunita Halder, PHI. 4. "Electric power systems", by B.M.Weedy and B.J. Cory.
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PROFESSIONAL ELECTIVE -III

1. Digital control systems (17EE41E1)
2. Electrical & hybrid Vehicles (17EE41E2)
3. Embedded systems (17EC41E5)
4. High voltage engineering (17EE41E3)

17EE41E1- DIGITAL CONTROL SYSTEMS
(EEE)

Course Category:	Professional Elective	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practical:**	3-0-0
Pre-requisite:	Control Systems, Signals & Systems, Laplace Transforms and Z Transforms.	**Sessional Evaluation:** **External Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives:	Students undergoing this course are expected to :	
	1. Learn the concepts of digital control systems. 2. Learn the theory of z–transformations and application for the mathematical analysis of digital control systems. 3. Learn to represent the discrete–time systems in state–space model and evaluation of state transition matrix. 4. Learn to examine the stability of the system using different tests. 5. Learn the conventional method of analyzing digital control systems in the w–plane. 6. Learn the design of state feedback control by "the pole placement method.	
Course Outcomes:	After completing the course the student will be able to:	
	CO1	Understand discrete time control systems and the "knowhow" of various associated accessories.
	CO2	Understand Z–transformations and their role in the mathematical analysis of different systems.
	CO3	Design the state feedback control by the pole placement method.
	CO4	Apply the stability criterion for digital systems and methods adopted for testing.
	CO5	Represent the discrete–time systems in state–space model and evaluation of state transition matrix.
	CO6	Understand the conventional and state space methods of design.
Course Content:	**UNIT-I** **Introduction and signal processing:** Introduction to analog and digital control systems, advantages of digital systems, typical examples, signals and processing, sample and hold devices, sampling theorem and signal reconstruction, frequency domain characteristics of zero order hold. **UNIT-II** **Z–transformations:** Z–Transforms, theorems, finding inverse Z–transforms, formulation of difference equations and solving, block diagram representation, pulse transfer functions and finding open loop and closed loop responses.	

	UNIT-III **State space analysis and the concepts of controllability and observability :** State space representation of discrete time systems, state transition matrix and methods of evaluation, discretization of continuous, time state equations, concepts of controllability and observability, tests(without proof). **UNIT- IV** **Stability analysis:** Mapping between the s-plane and the Z-plane –, primary strips and complementary strips, stability criterion, modified routh's stability criterion and jury's stability test. **UNIT-V** **Design of digital control system:** Design of discrete PID controller, design of discrete state feedback controller, design of set, point tracker, design of discrete observer for LTI system, design of discrete compensator. **UNIT-VI** **Discrete output feedback control:** Design of discrete output feedback control, fast output sampling (FOS) and periodic output feedback controller design for discrete time systems.
Text books & Reference books:	**Text books:** 1."Discrete–time control systems", by K. Ogata, Pearson Education/PHI, 2nd Edition. 2. "Digital control engineering", M. Gopal, Wiley Eastern, 2nd Edition. 3."Digital control of dynamic systems", by G. F. Franklin, J. D. Powell and M. L. Workman, Addison-Wesley, 3rd Edition. **Reference books:** 1."Digital control engineering", by M. Sami Fadali Antonio Visioli, Elsevier Limited, Oxford, 2nd Edition, 2012. 2."Digital Control and State Variable Methods", by M.Gopal, TMH, 4th Edition. 3."Digital Control System", by B.C. Kuo, Holt, Rinehart and Winston, 2nd Edition.
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17EE41E2-ELECTRICAL AND HYBRID VEHICLES
(EEE)

Course Category:	Professional Elective	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practical:**	3-0-0
Pre-requisite:	Basics of Electrical engineering	**Sessional Evaluation:** **External Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives:	To make the student learn about: 1. The importance of electric vehicle systems 2. The basics of electric vehicle components and storage 3. The basics of battery technology 4. The various charging types and comfort 5. The safety methods in hybrid vehicle 6. The application of electric vehicle in smart grid	
Course Outcomes:	Upon successful completion of the course , the students will be able to:	
	CO1	Understand the importance of electric vehicle systems
	CO2	Understand the basics of electric vehicle components and storage
	CO3	Understand the basics of battery technology
	CO4	Understand the various charging types and comfort
	CO5	Understand the safety methods in hybrid vehicle
	CO6	Understand the application of electric vehicle in Smart grid
Course Content:	**UNIT –I** **Electric vehicles**: History of modern transportation, importance of different transportation development strategies to future oil supply, introduction to electric vehicles, history of hybrid and electric vehicles, social, environmental importance and key challenges of hybrid and electric vehicles, specifications of PHEVs, BEVs, EVs, plug-in hybrid vehicle characteristics, the future of electric vehicles . **UNIT-II** **Energy storage:** Introduction to energy storage requirements in hybrid and electric vehicles, battery based energy storage and its analysis, fuel cell based energy storage and its analysis, super capacitor based energy storage and its analysis, flywheel based energy storage and its analysis. **UNIT-III** **Battery technology:** Types of batteries, properties of batteries, working principle and construction of lead-acid, nickel cadmium, nickel metal hydride, lithium ion batteries, maintenance and charging of batteries, diagnosing lead-acid battery faults, advanced battery technology, developments in electrical storage.	

	UNIT-IV **Charging and starting systems:** Requirements of the charging system, charging system principles, alternators and charging circuits, diagnosing charging system faults, advanced charging system technology, new developments in charging systems, requirements of the starting system, starter motors and circuits, types of starter motor, diagnosing starting system faults starting system technology, new developments in starting systems. **UNIT-V** **Hybrid electric vehicle drive train and safety:** Requirement of drive train, architecture of hybrid drive train, sizing of components, series configuration, parallel configuration, parallel and series configuration, security-airbags and belt tensioners, diagnosing comfort and safety system faults, advanced comfort and safety systems technology, new developments in comfort and safety systems. **UNIT-VI** **Emerging technologies**: Introduction electric vehicle supply equipments, smart vehicles in smart grid, vehicle-to-grid technologies, unidirectional and bidirectional, need of charging station selection (CSS) server, smart grid technologies, applications / benefits, smart meter, smart charger, purpose and benefits.
Text books & Reference books:	**Text books:** 1. "Modern electric, hybrid electric and fuel cell vehicles: fundamentals, theory, and design", by M. Ehsani, Y. Gao, and A. Emadi, 2nd Edition, CRC Press, Aug. 2009. 2. "Automobile electrical and electronic systems", by Tom Denton, Elsevier Butterworth-Heinemann, 3rd Edition, 2004. 3."Advanced electric drive vehicles", by A. Emadi , CRC Press, 1st Edition Oct. 2014. 4. "Hybrid electric vehicles: principles and applications with practical perspectives", by Chris Mi, M. Abul Masrur, 2nd Edition, November 2017, John Wiley & Sons Ltd. **Reference books:** 1."Electric & hybrid vehicles – design fundamentals", by Iqbal Hussain, 2nd Edition, CRC Press, 2011. 2."Electric vehicle technology explained", by James Larminie, John Wiley & Sons, 2003. 3."Smart Grid: technology and applications", by Janaka Ekanayake, Nick Jenkins, Kithsiri Liyanage, Jianzhong Wu, Akihiko Yokoyama, John Wiley & sons inc, 2012.
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17EC41E5-EMBEDDED SYSTEMS

(ECE)

Course category:	Professional Elective	**Credits:**	3
Course Type:	Theory	**Lecture - Tutorial - Practical:**	3 - 0 - 0
Pre-requisite:	Digital Electronics, Microprocessors & Microcontrollers.	**Sessional Evaluation :** **External Evaluation:** **Total Marks:**	40 60 100

Course Objectives:	Students undergoing this course are expected to learn: 1. The basic idea regarding the nature of embedded systems 2. The hardware aspects of modern microcontrollers. 3. The basic microcontroller programming. 4. The serial communication protocols. 5. Control analog devices in embedded systems. 6. The IOT working principles.	
Course Outcomes:	Upon successful completion of the course, the students will be able to:	
	CO1	Understand embedded system architects, programmers or researchers in the fields of e.g., automotive industry, robotics, telecom, industrial process control and consumer electronics etc
	CO2	Understand fundamental embedded systems design paradigms, architectures, possibilities and challenges, with respect to both software and hardware.
	CO3	Analyze a system both as whole and in the included parts, to understand how these parts interact in the functionality and properties of the system.
	CO4	Practically apply gained theoretical knowledge in order to design, analyse and implement embedded systems.
	CO5	Apply formal method, testing, verification, validation and simulation techniques and tools in order to engineer reliable and safe embedded systems.
	CO6	Demonstrate the electronics and physical principles used for embedded biomedical measuring systems.
Course Content:	**UNIT-I** **Introduction to embedded systems:** Embedded system overview and applications, features and architecture considerations, ROM, RAM, timers, data and address bus, memory and I/O interfacing concepts, memory mapped I/O, CISC vs RISC design philosophy, von-neumann Vs harvard architecture, instruction set, instruction formats, and various addressing modes of 32-bit, fixed point and floating point arithmetic operations. **UNIT – II** **Introduction to advanced microcontrollers:** Introduction ARM architecture and Cortex – M series, introduction to the tiva family viz. TM4C123x & TM4C129x and its targeted applications, tiva block diagram, address space, on-chip peripherals (analog and digital) register sets, addressing modes and instruction set basics.	

	UNIT – III **Microcontroller fundamentals for basic programming:** I/O pin multiplexing, pull up/down registers, GPIO control, memory mapped peripherals, programming System registers, watchdog timer, need of low power for embedded systems, system clocks and control, hibernation module on tiva, active Vs standby current consumption, introduction to interrupts, interrupt vector table, interrupt programming. **UNIT – IV** **Timers, PWM and mixed signals processing:** Timer, basic timer, real time clock (RTC), timing generation and measurements, analog interfacing and data acquisition, ADC, analog comparators, DMA, motion control peripherals, PWM module & quadrature encoder interface (QEI). **UNIT – V** **Communication protocols and interfacing with external devices:** Synchronous/asynchronous interfaces (like UART, SPI, I2C, USB), serial communication basics, baud rate concepts, Interfacing digital and analog external device, I2C protocol, SPI protocol & UART protocol, implementing and programming I2C, SPI & UART, CAN & USB interfaces. **UNIT-VI** **Embedded networking and internet of things:** Embedded networking fundamentals, ethernet, TCP/IP introduction IoT overview and architecture, overview of wireless sensor networks and design examples, various wireless protocols and its applications, NFC, zigbee, bluetooth, bluetooth low energy, Wi-Fi.
Text books & Reference books:	**Text books :** 1.“Introduction to embedded systems”, by Shibu K.V, Tata McGraw Hill, 2009. 2.“An introduction to the design of small-scale embedded systems”, by Tim Wilmshurst, Palgrave, 2001. **Reference books :** 1.Device data sheets of ARM/PSoC/MSP430
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17EE41E3-HIGH VOLTAGE ENGINEERING
(EEE)

Course Category:	Professional Elective	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practical:**	3-0-0
Pre-requisite:	Electrical Measurements	**Sessional Evaluation:** **Univ. Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives:	Students undergoing this course are expected to :	
	1. Learn about different types of high voltage generation. 2. Learn about different types of impulse voltage and current generation. 3.Learn about different methods of high voltages and currents 4. Learn about high voltage testing methods and propose suitable testing instruments. 5. Learn about different insulation parameters. 6.Learn the detailed analysis of breakdown occurs in gaseous, liquids and solid dielectric.	
	After completing the course the student will be:	
Course Outcomes:	**CO1**	Able to understand different types of high voltage generation.
	CO2	Able to understand different types of impulse voltage and current generation
	CO3	Able to explore different methods of high voltages and currents.
	CO4	Able to understand high voltage testing methods and propose Suitable testing instruments.
	CO5	Able to estimate different insulation parameters.
	CO6	Able to understand the behaviour of gas, liquid and solids when they are used as insulation.
Course Content:	**UNIT –I** **Generation of high voltages:** Half wave rectifier circuit, cockroft walton voltage multiplier circuit, electrostatic generator, generation of high A.C voltages by cascaded transformer, series resonant circuit. **UNIT-II** **Generation of impulse voltages and currents:** Definitions, impulse voltage generator circuits-single stage generator circuits, multiple impulse generator circuits, triggering and synchronization of the impulse generator, impulse current generator. **UNIT-III** **Measurement of high voltages and currents**: Introduction, sphere gap, uniform field spark gap, rod gap, electrostatic voltmeter, Chubb-Fortescue method, measurement of high D.C, A.C and impulse currents.	

	UNIT-IV **High voltage testing of electrical equipment:** Testing of overhead line insulator, testing of cables, testing of bushings, testing of power capacitor, testing of power transformer, testing of circuit breaker. **UNIT-V** **Non-destructive insulation techniques:** Measurement of resistivity, measurement of dielectric constant and loss factor, high voltage Schering bridge measurement of large capacitances, partial discharges. **UNIT-VI** **Breakdown mechanism:** Gases, liquid and solid insulating materials, mechanism of breakdown of gases, townsend's first ionization coefficient, townsend's second ionization coefficient, townsend's breakdown mechanism, paschen's law, principles of breakdown of solid and liquid dielectrics **.**
Text books & Reference books:	**Text books:** 1."High voltage engineering", by C.L.Wadhwa, New Age International publishers 2."High voltage engineering", by M. S.Naidu & Kamaraju, 3rd Edition, Tata Mc-Graw- Hill Publishers. **Reference books:** 1."High voltage Engineering Fundamentals", by E.Kuffel & W.S.Zaengl, Second Edition, Newens publishers. 2. "An introduction to high voltage Engineering", by Subir Ray, PHI Learning Pvt. Ltd
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OPEN ELECTIVE-I

1. Database management systems (17CS41O2)
2. ROBOTICS(17ME41O2)
3. Nanotechnology(17SH41O1)
4. VLSI design(17EC4101)

17CS41O2 - DATABASE MANAGEMENT SYSTEMS
(CSE)

Course Category:	Open Elective	**Credits:**	3
Course Type:	Theory	**Lecture – Tutorial – Practical:**	2-2-0
Pre-requisite:	Basic foundations in mathematics and preliminary fundamentals of data and information	**Sessional Evaluation:** **Univ. Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives:	Students undergoing this course are expected to:	
	1.Learn the areas of databases and composition of queries using structured query language 2.Study various database design models for building applications 3.Evaluate a business situation while designing a database system 4. Learn the SQL to create simple databases. 5. Learn the basic issues of normalization and exposure on relational database design. 6. Study the transaction management and recovery.	
Course Outcomes:	Upon successful completion of the course, the students will be able to:	
	CO1	Master the basic concepts and their applicability
	CO2	Understand relational model and the relational algebraic operations.
	CO3	Learn ER model and its usage in applications.
	CO4	Familiar with SQL to create simple databases
	CO5	Identify the basic issues of normalization and exposure on relational database design.
	CO6	Acquire knowledge in transaction management and recovery.
Course Content:	**UNIT – I** **Introduction**: Database system applications, purpose of database systems, view of data, database languages, relational databases, data storage and querying, transaction management, database architecture, database users and administrators. **UNIT – II** **Relational model**: Structure of relational databases, fundamental relational algebra operations, additional relational algebra operations, extended relational algebra operations, null values, modification of the database. **UNIT – III** **Database design and the E-R model**: Overview of the design process, the entity-relationship model, constraints, entity- relationship diagrams, entity-relationship design issues, weak entity sets, extended E-R features, reduction to relational schemas, other aspects of database design. **UNIT – IV** **SQL:** Data definition, SQL data types and schemas, integrity constraints, basic structure of SQL queries, set operations, aggregate functions, null values, nested sub queries, complex queries, views, modification of the database, joined relations.	

	UNIT – V **Relational database design:** Features of good relational design, atomic domains and first normal form, decomposition using functional dependencies, functional dependency theory, algorithms for functional dependencies, decomposition using multivalued dependencies ,more normal form, database-design process . **UNIT – VI** **Transaction management and recovery**: Lock based and timestamp based protocols, multiple granularity, multiversion schemes, deadlock handling, weak levels of consistency, recovery and atomicity, recovery algorithm, buffer management, remote backup systems.
Text books & Reference books:	**Text books:** 1. "Database System Concepts", by Silberschatz, Korth, Sudarshan, McGrawHill, 6th Edition, 2011. **Reference books:** 1. "Fundamentals of Database Systems", by Ramez Elmasri and Shamkant Navathe, Durvasula V L N Somayajulu, Shyam K Gupta, Pearson Education, 2006. 2."Database Systems – A Practical Approach to Design, Implementation and Management", by Thomas Connolly, Carolyn Begg, Pearson Education, 3rd Edition, 2002. 3."Database Management Systems", by Raghu ramakrishnan Publisher: McGraw Hill, Third Edition.
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17ME41O2- ROBOTICS

(ME)

Course Category:	Open Elective	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practical:**	3-0-0
Pre-requisite:	Physics, Differential Equations, Matrices and basic Geometry. Computer Simulation skills using Matlab	**Sessional Evaluation:** **External Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives:	To make the student learn about:	
	1. The robotics as an integrated engineering field, classification of robotic manipulators and related technologies. 2. The skills associated with robot control 3. The skills associated with sensors and machine vision systems to robot control 4. The skills in performing kinematics analysis of robot systems 5. The skills in write a robot programme. 6. The skills and interactive applications of industrial robots	
Course Outcomes:	After completing the course the student will be able to	
	CO1	Understand the importance of robotics in today and future and robot configuration and subsystems
	CO2	Gain the knowledge about Control systems for motion control
	CO3	Gain the knowledge about sensors and machine vision.
	CO4	Gain the knowledge about skills in kinematics of robot motion
	CO5	Gain the competence in Design and implementation programming of robot systems.
	CO6	Gain the knowledge about Industrial robots applications.
Course Content:	**UNIT –I** **Introduction**: Need, anatomy of robot, types of joints, types of constructions- degree of freedom, coordinate system workspace/work volume, robot specification. **End-effectors**: Types- mechanical, magnetic, pneumatic **UNIT –II** **Actuators**: Introduction, actuators, characteristics, types, comparison, hydraulic, pneumatic, electric- D.C, A.C, servo, stepper. **Motion control systems**: Introduction, basic components and terminology, transfer function, open loop, feed-forward and closed-loop. microprocessor control of electric motor. **UNIT-III** **Sensors**: Introduction, characteristics, Types - position, velocity, acceleration, force and pressure, torque, proximity, micro switches, touch and tactile, range finders. **Machine vision**: Introduction to machine vision, the sensing and digitizing function in machine vision, image processing and analysis-training the vision system, robotic applications.	

	UNIT-IV **Kinematics of robots:** Introduction, reference frames, robots as mechanisms, matrix representation, transformations, forward and inverse kinematics of 2R and 3R robots, DH representation, degeneracy and dexterity. **UNIT-V** **Robot programming**: Methods of robot programming, a robot program as a path in space motion interpolation wait signal and delay commands branching **Robot languages:** Introduction, generation of robot programming languages, robot language structure, operating systems, robot language elements and functions **UNIT-VI** **Robot applications**: Manufacturing, material transfer and machine loading and unloading, processing operations, welding, other processing operations, assembly and inspection, robotic assembly, parts presentation methods, inspection automation
Text books & Reference books:	**Text books:** 1."Industrial Robotics", by M.P Groover 2nd Edition, McGraw-Hill Education (SIE). 2."Introduction to Robotics: Analysis,Control,Applications", by Saeed B Niku , 2nd Edition Wiley publishers. **Reference books:** 1."Introduction to Robotics", by Subir Kumar Saha Tata McGraw-Hill Education. 2."Robotics: Fundamental Concepts And Analysis", by Ashitava Ghosal oxford university press 3."Introduction to Robotics: Mechanics and Control", by Craig John J, 3rd Edition, Prentice-Hall, 2005. 4."Vision and Control", by P. Corke. Robotics, Springer Verlag, 2011.
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17SH41O1- NANOTECHNOLOGY

Course Category:	Open Elective	**Credits:**	3
Course Type:	Theory	**Lecture -Tutorial-Practical:**	2-2-0
Pre-requisite:	Basics of semiconductors	**Sessional Evaluation:** **External Evaluation:** **Total Marks:**	40 60 100

Course Objectives	Students undergoing this course are expected to:	
	1. Learn the basic concepts of semiconductor nano devices. 2. Learn about types of photonic and molecular materials 3. Develop & design thermal and gas sensors 4. Learn about bio sensors and DNA based bio sensors 5. Learn about criteria for the choice of materials 6. Learn about protein based biosensors	
Course Outcomes	Upon successful completion of the course, the students will be able to:	
	CO1	Understand various types of nano devices and nano mechanics
	CO2	Develop nano technology based LED,LASER…etc
	CO3	Develop the electroluminescent organic materials
	CO4	Develop the different thermal sensors
	CO5	Evaluate the response various materials
	CO6	Design different types of bio sensors

Course Content:

UNIT –I

Semiconductor nanodevices-I: Single electron devices, nano scale MOSFET, resonant tunneling transistor, single-electron transistors, single-electron dynamics, nanorobotics and nano manipulation.

UNIT-II

Semiconductor nanodevices -II: Mechanical molecular nano devices, nano computers- theoretical models, optical fibers for nano devices, photochemical molecular devices,DNA, based nano devices, gas-based nano devices, micro and nano mechanics.

UNIT-III

Electronic and photonic molecular materials: Preparation, electroluminescent organic materials, laser diodes, quantum well lasers, quantum cascade lasers, cascade surface, emitting photonic crystal laser, quantum dotlasers, quantum wire lasers, white LEDs, LEDs based on nanowires, LEDs based on nanotubes, LEDs based on nanorods high efficiency materials for OLEDs, high efficiency materials for OLEDs, quantum well infrared photo detectors.

	UNIT-IV **Thermal sensors**: Thermal energy sensors, temperature sensors, heat sensors, electromagnetic sensors electrical resistance sensors, electrical current sensors, electrical voltage sensors, electrical power sensors, magnetism sensors, mechanical sensors, pressure sensors, gas and liquid flow sensors, position sensors, chemical sensors, optical and radiation sensors. **UNIT-V** **Gas sensor materials:** Criteria for the choice of materials, experimental aspects, materials, properties, measurement of gas sensing property, sensitivity, discussion of sensors for various gases, gas sensors based on semiconductor devices. **UNIT-VI** **Biosensors:** Principles, DNA based biosensors, protein based biosensors, materials for bio sensor applications, fabrication of biosensors, future potential.
Text books & Reference books:	**Text books:** 1. "Nano Electronics and Information Technology", by W. Ranier, Wiley, (2003). 2. "Nano systems ", by K.E. Drexler, Wiley, (1992). **Reference books:** 1. "Introduction to Molecular Electronics", by M.C. Petty,1995.

17EC4101-VLSI DESIGN
(ECE)

Course category:	Open Elective	**Credits:**	3
Course Type:	Theory	**Lecture - Tutorial - Practical:**	3 - 0- 0
Pre-requisite:	Electronic Devices & Circuits, Linear & Digital ICs and Basics of IC fabrication	**Sessional Evaluation :** **External Evaluation:** **Total Marks:**	40 60 100

Course Objectives:	Students undergoing this course are expected:	
	1. To learn the fundamental structures of VLSI Systems at the lowest levels of System abstraction. 2. To learn the basic electrical properties of MOS & BI-CMOS circuits 3. To learn the basic circuit concepts and design process of VLSI circuits and also to introduce the fundamental principles of VLSI circuit design. 4. To learn the gate level design and physical design by considering partioning, floor planning, placement and routing. 5. To bring both circuits and system views on design together by considering circuit Subsystems and VLSI Design styles. 6. To learn the design of complex digital VLSI circuits, computer aided simulation and synthesis tool for hardware design	
Course Outcomes:	Upon successful completion of the course , the students will be able to:	
	CO1	Understand the trends in semiconductor technology, and its impacts scaling and performance.
	CO2	Understand the basic electrical properties of MOS & BI-CMOS circuits.
	CO3	Understand layout, stick diagrams, fabrication steps, static and switching characteristics of inverters.
	CO4	Compute terminal voltage and current characteristics for MOS transistors under a variety of conditions.
	CO5	Understand MOS transistor as a switch and its capacitance.
	CO6	Understand design digital systems using MOS circuits synthesis of digital VLSI systems from register-transfer or higher-level descriptions in hardware design languages.
Course Content:	**UNIT-I** **Introduction:** IC fabrication, MOS, PMOS, NMOS, CMOS & Bi-CMOS technologies, oxidation, lithography, diffusion, ion implantation, metallization, encapsulation, probe testing, integrated resistors and capacitors. **UNIT-II** **Basic electrical properties of MOS & Bi-CMOS circuits:** I_{ds}-V_{ds} relationships, MOSFET threshold voltage, g_m, g_{ds}, W_o, Pass transistor, NMOS Inverter, various pull ups, CMOS inverter analysis and design bi-CMOS inverters.	

	UNIT-III **Basic circuit concepts:** Sheet resistance R_s and its concepts to MOS, area capacitance calculations, inverter delays, driving large capacitive loads, wiring capacitances, fan-in and fan-out. **VLSI circuit design processes:** VLSI design flow, MOS layers, stick diagrams, design rules and layout, 2µm CMOS design rules for wires, contacts and transistors, layout diagram's for NMOS and CMOS inverters and gates, scaling of MOS circuits, limitation of scaling. **UNIT-IV** **Gate level design:** Logic gates and other complex gates, switch logic, alternate gate circuits. **Physical design:** Floor- planning, placement, routing, power delay estimation, clock and power routing **UNIT-V** **Subsystem design:** Shifters, adders, ALUs, multipliers, parity generators, comparators, counters, high density memory elements. **VLSI design styles:** Full-custom, standard cells, gate-arrays, FPGAs and CPLDs and design approach for full custom and semi-custom devices. **UNIT-VI** **VHDL synthesis:** VHDL synthesis, circuit design flow, circuit synthesis, simulation, layout, design capture tools, design verification tools. **Test and testability:** Fault-modelling and simulation, test generation, design for testability, built-in self-test.
Text books & Reference books:	**Text books:** 1."Essentials of VLSI circuits and Systems", by Kamran Eshraghian, Eshraghian Douglas and A. Pucknell, PHI, 2005 edition. 2."Linear Integrated circuits", by D. Roy Chowdhury, New Age International Edition(2003) 3.ASIC Design Flow by Smith. **Reference books:** 1."Principles of CMOS VLSI Design", by Weste and Eshraghian, Pearson Education, 1999. 2. "Modern VLSI Design", Wayne Wolf, Pearson Education, 3rd Edition 1997. 3."Introduction to VLSI Circuits and Systems", by John. P. Uyemura. John Wiley, 2003. 4."Digital Integrated Circuits", by John M. Rabaey, PHI.
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17EE41P1-POWER ELECTRONICS LAB

Course Category:	Professional core	**Credits:**	2
Course Type:	Laboratory	**Lecture-Tutorial-Practical:**	0-0-3
Pre-requisite:	Power Electronics	**Sessional Evaluation:**	40
		External Exam Evaluation:	60
		Total Marks:	100

Course Objectives:	To make the student learn about:	
	1.The design of triggering circuits of SCR. 2. The commutation circuits of SCR. 3. The characteristics of SCR, TRIAC, IGBT and MOSFET. 4. The performance of various converters. 5. The chopper circuits. 6. The induction motor drive.	
Course Outcomes:	After completing the course the student will be able to	
	CO1	Analyze the thyristor turn-on by R, RC, UJT triggering experimentally.
	CO2	Verify the power rectification from 1- Φ A.C to D.C.
	CO3	Verify the power conversion from 1- Φ A.C to A.C.
	CO4	Analyze the forced commutation of thyristor.
	CO5	Verify the power conversion from DC to1-ph A.C .
	CO6	Analyze the performance of induction motor by controllers.
Course Content:	Minimum of 10 experiments to be conducted out of the following: **List of Experiments** 1) V-I characteristics of SCR, MOSFET & IGBT. 2) Power control with SCR using R & RC triggering. 3) Power control with SCR using UJT triggering. 4) Thyristor forced commutation. 5) Series inverter 6) Parallel inverter. 7)Morgan's chopper 8) Simulation of single phase half wave and full wave converter. 9) Simulation of power control with TRIAC & DIAC. 10) Simulation of speed control of single phase induction motor. 11) Simulation of D.C Jones chopper. 12) Simulation of 1-Ø to 1- Ø cyclo converter. 13) Simulation of semi and full wave converters. 14) Simulation of 1-Φ A.C voltage controller	

17EE41P2-POWER SYSTEMS LAB

Course Category:	Professional core	**Credits:**	2
Course Type:	Laboratory	**Lecture-Tutorial-Practical:**	0-0-3
Pre-requisite:	Power system Analysis, Switchgear and Protection	**Sessional Evaluation:** **Univ.Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives:	Students undergoing this course are expected to:	
	1. Learn about various system studies and different techniques used for system planning. 2.Learn about the dynamic analysis of power system 3. Present problem oriented knowledge of power system analysis methods. 4. Learn to analyze the performance of relays. 5. Learn about the characteristics of the fuses. 6. Learn to measure the earth resistance and breakdown voltage of the transformer oil.	
Course Outcomes:	After completing the course the student will be able	
	CO1	Understand inverse over current, differential over current and percentage differential relay characteristics
	CO2	Understand the fuse characteristics
	CO3	Understand modeling of transmission lines
	CO4	To measure the earth resistance and oil testing
	CO5	Understand load flow studies by using G-S method
	CO6	Understand load frequency dynamics of single and two area power systems
Course Content:	Minimum of 10 experiments to be conducted out of the following: **LIST OF EXPERIMENTS** 1. Voltage distribution in a string of insulators 2. Inverse over current relay characteristics 3. Directional over current relay characteristics 4. Percentage differential relay characteristics 5. Fuse characteristics 6. ABCD parameters of a transmission line. 7. Sequence impedance of synchronous machine 8. Characteristics of a typical power system load 9. Measurement of earth resistance 10. Oil testing 11. Computation of parameter & modelling of transmission lines 12. Formation of Y_{bus} & Z_{bus} 13. Solution of power flow using G-S method 14. Economic dispatch in power systems 15. DVR with & without stabilizer using Matlab program and simulation 16. Load-frequency dynamics of single and two area power systems 17. Numerical solution of the swing equation	

17EC41P4 – MICROPROCESSOR & INTERFACING LAB
(ECE)

Course Category:	Professional Core	**Credits:**	2
Course Type:	Laboratory	**Lecture-Tutorial- Practice:**	0 - 0 - 3
Pre-requisite:	Basic knowledge in programming C, Microprocessors and programming	**Sessional Evaluation:** **External Evaluation :** **Total Marks:**	40 60 100

Course Objectives:	Students undergoing this course are expected to learn:	
	1. The features of the software tool – T.A.S.A.M. simulator. 2. The arithmetic and data transfer instructions of 8086. 3. To design the high speed communication circuits using serial bus connection 4. To write the assembly language programs for counters and code conversions. 5. Interfacing knowledge with microprocessor kit 6. To develop the ALP for simple logical and arithmetic operations.	
Course Outcomes:	Upon successful completion of the course , the students will be able to:	
	CO1	Design the home appliances and toys using microcontroller chips.
	CO2	Design computers like desktops and laptops using various processors
	CO3	Design the high speed communication circuits using serial bus connection
	CO4	Use a commercial C.P.U.(s) as realistic vehicles to demonstrate these concepts by introducing students to C.P.U. instructions and internal register structures
	CO5	Understand the full internal workings of a typical simple C.P.U. including the utilization of the various hardware resources during the execution of instructions.
	CO6	Write the assembly language programs for counters and code converters.

Course Content:

List of experiments

1. Summation & block Transfer of Data
   a) Write and execute 8086 to add the given series of B.C.D. numbers and show the result.
   b) Write and execute 8086 A.L.P. to transfer a Block of data from one memory area to another memory area.
2. Multiplication & Division
   a) Write and execute 8086 A.L.P. to perform the following multiplications.
      1) Repeated addition
      2) Using SHIFT and ADD instruction
   b) Write and execute 8086 A.L.P. to perform the following.
      1) Binary division
      2) B.C.D. division
3. Searching & sorting data
   a) Write and execute 8086 A.L.P. to find the minimum and maximum number from a given data array

	b) Write and execute 8086 A.L.P. to arrange the given data array in ascending order and descending order 4. Evaluation of Mathematical Expression Mathematical expressions a) a*b- c/d + e b) $\sum_{i=1}^{n} xi\ yi$ 5. Code conversion a) Write and execute 8086 A.L.P. to convert H.E.X. to B.C.D. number b) Write and execute 8086 A.L.P. to convert B.C.D. to H.E.X. number c) Write and execute 8086 A.L.P. to convert H.E.X. to A.S.C.I.I. number d) Write and execute 8086 A.L.P. to convert A.S.C.I.I. to H.E.X. number 6. Logic controller module Write and execute 8086 A.L.P. to design the logical expression using logic controller interface module 7. Stepper motor module Write and execute 8086 A.L.P. to rotate a stepper motor either in clockwise direction or in anticlockwise direction and to control the speed of rotation 8. Serial input display unit module(S.I.D.U.) Write and execute 8086 A.L.P. to display the desired word in a display of serial input display unit interface module 9. Parallel input display unit module (P.I.D.U.) Write and execute 8086 A.L.P. to design an up and down counter using P.I.D.U. Interface module 10. Digital to Analog Converter Interface Module Write and execute 8086 A.L.P. to generate given waveform through C.R.O. using D.A.C.

NBKR INSTITUTE OF SCIENCE & TECHNOLOGY:: VIDYANAGAR (AUTONOMOUS)
(AFFILIATED TO JNTUA:: ANANTAPUR)
SPSR NELLORE DIST
IV YEAR OF FOUR YEAR B.TECH DEGREE COURSE – II SEMESTER
ELECTRICAL AND ELECTRONICS ENGINEERING
SCHEME OF INSTRUCTION AND EVALUATION
(With effect from the academic year 2020-2021)
(For the batch admitted in the academic year 2017-2018)

S.No	Course Code	Course Title	Instruction Hours/Week			Credits	Evaluation									
							Sessional Test-I			Sessional Test-II			Total Sessional Marks (Max. 40)	End Semester Examination		Maximum Total Marks
		THEORY	L	T	D/P		Test-I (2Hr)	Assign-I	Max. Marks	Test-I (2 Hr)	Assign-2	Max. Marks	0.8*Best of Two + 0.2*Least of Two	Duration In Hours	Max. Marks	100
1		Professional Elective-IV	3	-	-	3	34	6	40	34	6	40		3	60	100
2		Open Elective-II	3	-	-	3	34	6	40	34	6	40		3	60	100
		PROJECT														
3	17EE42PW	Project Work	-	-	22	11	-	-	-	-	-	-	Day to Day Evaluation (80 Marks)	3	120	200
4	17EE42MO	MOOC's	-	-	-	3	-	-	-	-	-	-	-	-	-	-
5	17EE42IS	Internship	-	-	-	2	-	-	-	-	-	-	-	-	-	-
		TOTAL				22										

(***** : Common to all; **#** : Common to ECE,EEE,CSE&IT; $: Common to ECE&EEE; **@** : Common to ECE,EEE,CE & ME)

PROFESSIONAL ELECTIVE-IV

1. Electrical Distribution Systems(17EE42E1)
2. HVDC transmission systems (17EE42E2)
3. Power quality and FACTS (17EE42E3)
4. Smart grid technology (17EE42E4)

17EE42E1-ELECTRICAL DISTRIBUTION SYSTEMS
(EEE)

Course Category:	Professional elective	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-practical:**	3-0-0
Pre-requisite:	Fundamentals of power system transmission and distribution, electric power generation and Basic circuit analysis	**Sessional Evaluation:** **Univ.Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives:	Students undergoing this course are expected to learn:	
	1. The different load characteristics, modelling and analysis of different factors 2. The types of feeder, feeder voltage levels and its loading. 3. The benefits of optimal location of substations. 4. The power loss, voltage drop, efficiency for transmission lines. 5. The different protective devices operations, applications and co-ordination procedure. 6. The voltage improvement by using different types of power capacitors and optimum capacitor location.	
Course Outcomes:	After completing the course the student will be able to:	
	CO1	Understand different load characteristics, modeling and analysis of different factors.
	CO2	Understand types of feeder, feeder voltage levels and its loading.
	CO3	Analyze benefits of optimal location of substations.
	CO4	Calculate power loss, voltage drop and efficiency of transmission lines.
	CO5	Understand different protective devices operations, applications and co-ordination procedure.
	CO6	Analyze voltage improvement by using different types of power capacitors and optimum capacitor location.
Course Content:	**UNIT–I** **Introduction to distributed systems:** Introduction, classification of loads (residential, commercial, and agricultural & industrial) and their characteristics, an overview of rate of computers in distributed system planning, load modeling and characteristics, coincidence factor contribution factor and loss factor. **UNIT–II** **Design of distributed networks:** Distribution feedback & substation, design considerations of distribution feeders, radial &loop types of primary feeders, voltage levels, feeder loading.	

	UNIT–III **Location of substations:** Rating of distribution substations, service area with 'n' primary feeders, benefits of optimal location of substations. **UNIT–IV** **Distribution system analysis:** Voltage drop & power loss calculations, derivation of voltage drop & power loss in lines, manual methods of solution for radial networks, 3ϕ balanced primary lines. **UNIT–V** **Protective devices & co-ordination:** Objectives of distribution system protection, types of common faults and procedure for fault calculations, protective devices, principles of operation of fuses, circuit breakers, general co-ordination procedure. **UNIT–VI** **Power factor & voltage control improvement:** Capacitive compensation for power factor control, different types of power capacitors, shunt & series capacitors, power factor correction, procedure to determine best capacitor location and equipment for voltage control.
Text books & Reference books:	**Text books:** 1."Electrical power distribution system engineering", by Turan Gonen, 3rd Edition, CRC press, Taylor & Francis group. 2."Electric power distribution", by A.S. Pabla, Tata McGraw Hill Company, 4th Edition. **Reference books:** 1."Guide to electrical power distribution systems", by Anthony J. Pansini, Fairmont Pr; 6th Edition (October 2004) 2."Electrical power systems quality", by Dugan Roger C, Mc Granaghan M F, Santoso S and Beaty H Wayne, 2nd Edition, McGraw-Hill, 2003.
e-Resources:	http://nptel.ac.in/courses http://iete-elan.ac.in http://freevideolectures.com/university/iitm

17EE42E2-HIGH VOLTAGE DIRECT CURRENT TRANSMISSION SYSTEMS (EEE)

Course category:	Professional Elective	**Credits:**	3
Course Type:	Theory	**Lecture - Tutorial - Practical:**	3 - 0 - 0
Pre-requisite:	Power Electronics, Converters and Power Systems	**Sessional Evaluation :** **Univ.Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives:	Students undergoing this course are expected to:	
	1. Learn the concept of HVDC Transmission system. 2.Learn the HVDC converters 3. Learn converter system control. 4.Learn about D.C line and fault prevention 5. Learn about the importance of reactive power. 6. Learn the harmonics in the system and their prevention..	
Course Outcomes:	Upon successful completion of the course, the students will be able to:	
	CO1	Develop the knowledge of HVDC transmission over conventional A.C transmission
	CO2	Analyze different converters viz.3,6 and 12 pulse converter.
	CO3	Understand different control schemes as well as starting and stopping of D.C links
	CO4	Understand the nature of faults happening on both the A.C and D.C sides of the converters and formulate protection schemes for the same.
	CO5	Analyse about reactive power requirement.
	CO6	Analyze the different harmonics generated by the converters and their variation with the change in firing angles.
Course Content:	**UNIT-I** **D.C power transmission technology:** Introduction, comparison of A.C & D.C transmission, application of D.C transmission, description of D.C transmission system, planning of HVDC transmission, modern trends in HVDC technology. **UNIT-II** **Analysis of HVDC converters:** Pulse number, choice of converter configuration, simplified analysis of graetz circuit, converter bridge characteristics, characteristics of twelve pulse converter, detailed analysis of six pulse converter. **UNIT-III** **Converter and HVDC system control:** Principles of D.C link control, converter control characteristics, system control hierarchy, firing angle control, current and excitation angle control, starting and stopping of D.C link, power control, higher level controllers.	

	UNIT-IV **Converter faults and protection:** Protection against over currents, over voltages in a converter station, surge arresters, protection against over voltages. **Smoothing reactor and D.C Line:** Smoothing reactors, D.C line, transient over voltages in D.C line, protection of D.C line, D.C breakers, monopolar operation. **UNIT-V** **Reactive Power Control:** Reactive power requirements in steady state, Sources of reactive power, Static VAR systems, Reactive power control during transients. **UNIT – VI** **Harmonics and Filters:** Generation of harmonics, design of AC filters, DC filters, active filters, carrier frequency and RI noise.
Text books & Reference books:	**Text books:** 1. "HVDC Power Transmission System", by K.R Padiyar, New academic science Ltd publication, 3rd Edition. 2. "EHV-AC &HVDC Transmission Engineering & Practice", by S. Rao, Khanna publication, 3rd Edition,. **Reference books:** 1. "Direct current Transmission", by Edward Wilson Kimbark, Wiley Inter science, Volume-I. 2. "HVDC Power Transmission", by S.Kamakshaiah &V.Kamaraju, Tata Mcgraw Hill publishers.
e-Resources:	http://nptel.ac.in/courses http://iete-elan.ac.in http://freevideolectures.com/university/iitm

17EE42E3-POWER QUALITY AND FACTS

(EEE)

Course Category:	Professional elective	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practical:**	3-0-0
Pre-requisite:	Circuit analysis, Field theory, Power system -I, Power system-II and Power electronics	**Sessional Evaluation:** **External Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives:	Students undergoing this course are expected to:	
	1. Acquire knowledge about the basic concepts of power quality. 2. Learn the concept of Flexible A.C transmission and the associated problems. 3. Learn the working principles of FACTS devices (STATCOM) and their operating characteristics. 4. Learn the working principles of FACTS devices (SSSC) and their operating characteristics. 5. Acquire knowledge about FACTS device for power quality improvement. 6. Initiate research to develop/design new schemes and techniques for power quality enhancement.	
Course Outcomes:	After completing the course the student will be able to:	
	CO1	Understand the basic concepts of power quality.
	CO2	Gain knowledge about flexible A.C transmission system and its controllers.
	CO3	Analyze voltage stability issues in high voltage electrical systems using static VAR compensators.
	CO4	Understand about static series compensation technique to increase power flow capability.
	CO5	Understand combination of static shunt and series compensation techniques used to increase power flow capability.
	CO6	Understand the working principles of devices to improve power quality.
Course Content:	**UNIT-I** **Introduction to power quality:** Terms and definitions, overloading, under voltage, over voltage, concepts of transients, short duration variations such as interruption, long duration variation such as sustained interruption , sags and swells, voltage sag, voltage swell, voltage imbalance , voltage fluctuation, power frequency variations, international standards of power quality, power quality improvement techniques. **UNIT-II** **FACTS concept:** Introduction to FACTS power flow in an A.C system, loading capability limits, dynamic stability considerations, importance of controllable parameters, basic types of FACTS controllers, operation of facts controllers, benefits from FACTS controllers.	

	UNIT-III **Static shunt compensation:** Expression for real and reactive power flow with mid-point voltage regulation, variable impedance type static VAR generators, V-I characteristics and control schemes of TCR, TSR, TSC. switching converter type VAR generators, V-I characteristics and control schemes of STATCOM. **UNIT-IV** **Static series compensation:** Expression for real and reactive power flow with series line compensation, **Variable impedance type series compensators**: V-I characteristics and control schemes of GCSC, TSSC, TCSC, modes of operation, **Switching converter type series compensator:** V-I characteristics, internal and external control schemes of SSSC. **UNIT-V** **Unified power flow controllers:** Principle, expression for real and reactive power between two nodes of UPFC, independent real and reactive power flow control using UPFC, control schemes of UPFC. **UNIT-VI** **Dynamic voltage restorer and unified power quality conditioner:** Voltage sag/swell mitigation, dynamic voltage restorer, working principle and control strategies, series active filtering, unified power quality conditioner (UPQC), working principle, capabilities and control strategies.
Text books & Reference books:	**Text books:** 1. "Understanding FACTS", by Narain G,Hingorani, LarsloGyugi, Standard publishers 2001. 2."FACTS controllers", by K.R.Padiyar, New age international publication 3. "Electrical power systems quality", by Roger C. Dugan, Mark F. McGranaghan, Surya Santoso and H. Wayne Beaty, 3rd Edition, TATA Mc Graw Hill, 2010. **Reference books:** 1. "Thyristor – based facts controllers for electrical transmission systems", by Mohan Mathur, R, Rajiv. K. Varma, IEEE press and John Wiley & Sons, Inc. 2. "Flexible A.C transmission system", by A.T.John, Institution of Electrical and Electronic Engineers (IEEE), 1999. 3. "Understanding power quality problems: voltage sags and interruptions", by Math H J Bollen, Wiley, 2010.
e-Resources:	http://nptel.ac.in/courses http://iete-elan.ac.in http://freevideolectures.com/university/iitm

17EE42E4-SMART GRID TECHNOLOGY

(EEE)

Course Category:	Professional Elective	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practical:**	3-0-0
Pre-requisite:	Power systems, Power system analysis & switchgear and protection.	**Sessional Evaluation:** **External Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives:	Students undergoing this course are able to :	
	1. Learn introduction to Smart Grid 2. Learn necessity of smart grid 3. Learn operation and construction of measuring the smart grid signals 4. Learn automation technologies of smart grid 5. Learn Island, protection and applications of smart grid 6. Learn Distributed Energy Resources	
Course Outcomes:	After completing the course the student will be able to	
	CO1	Gain the knowledge on introduction to smart grid.
	CO2	Gain the knowledge on necessity of smart grid.
	CO3	Know the operation and construction of measuring the smart grid signals.
	CO4	Understand the automation technologies of smart grid
	CO5	Gain knowledge on island, protection and applications of smart grid.
	CO6	Understand the concepts on distributed energy resources
Course Content:	**UNIT-I** **Introduction to smart grid:** Introduction to smart grid- Electricity network-Local energy networks- General considerations for a smart grid, characteristics of smart grids, elements in smart grids. Electric transportation- Low carbon central generation-Attributes of the smart grid- Alternate views of a smart grid. **UNIT-II** **Smart grid to evolve a perfect power system:** Introduction- Overview of the perfect power system configurations- Device level power system-Building integrated power systems- Distributed power systems- Fully integrated power system-Nodes of innovation. **UNIT –III** **Smart electric grid:** Smart electric grid: generation Distributed energy resources: Renewable energy, energy storage, solar energy, wind energy, biomass, hydro power, geothermal and fuel cell, effect of electric vehicles(EV's), transmission, distribution, and end-user; Basic concepts of power, load models, load flow analysis.	

	UNIT –IV **Measurement technologies:** Wide area monitoring system (WAMS), advanced metering infrastructure (AMI), phasor measurement units. **UNIT –V** **Communication & networking technology:** Architectures, standards and adaptation of power line communication (PLC), zigbee, GSM, and more; machine to-machine communication models for the smart grid; Home area networks (HAN) and neighborhood area networks (NAN) **UNIT-VI** **Energy management in smart grids:** Aspects of energy management in the smart grid; SCADA; micro grids; demonstration projects; case studies. Policy and economic drives of the smart grid; environmental implications; sustainability issues; state of smart grid implementation.
Text books & Reference books:	**Text books:** 1."The smart grid: Enabling energy efficiency and demand response", by Clark W. Gellings, - CRC Press. 2."Smart grid: technology and applications", by Janaka Ekanayake, N. Jenkins, K. Liyanage, J. Wu, Akihiko Yokoyama - Wiley. **Reference books:** 1."Smart grids", by Jean Claude Sabonnadiere, Nouredine Hadjsaid – Wiley Blackwell. 2."Securing the smart grid" by Tony Flick and Justin Morehouse- Elsevier Inc. 3."Smart power: climate change, the smart grid, and the future of electric utilities", by Peter S. Fox-Penner - Island Press. 4."SMART GRID: Fundamentals of design and analysis", by James Momoh - IEEE press, A John Wiley & Sons, Inc., Publication.
e-Resources	http://nptel.ac.in/courses http://iete-elan.ac.in http://freevideolectures.com/university/iitm

OPEN ELECTIVE-II

1. Building planning and construction techniques (17CE42O1)
2. Computer organization (17EC4204)
3. Internet of Things (17EC42O1)
4. Python programming (17CS42O1)

17CE42O1– BUILDING PLANNING AND CONSTRUCTION TECHNIQUES
(CE)

Course Category:	Open Elective	**Credits:**	3
Course Type:	Theory	**Lecture - Tutorial - Practical:**	3 - 0 - 0
Pre-requisite:	Building materials	**Sessional Evaluation :** **Univ. Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives:	Students undergoing this course are expected to: 1. Study about the basic building materials, properties and their applications. 2. Study the various cementitious materials. 3. Learn the different types of smart construction materials and their applications. 4. Learn the various types of the building components. 5. Learn the techniques of damp proofing and finishing works of the building. 6. Learn the various factors considered in planning and construction of buildings.	
Course Outcomes:	**CO1**	Understand various types of stones and methods of manufacturing of bricks and tiles.
	CO2	Identify the importance of ingredients of lime, cement and concrete.
	CO3	Identify the properties of smart construction materials alternative for cement and also be able to understand various types of masonry construction.
	CO4	Understand various building components and their various types.
	CO5	Understand the techniques and importance of damp proofing and finishing works of the building.
	CO6	Identify the factors to be considered in planning and construction of buildings and Plan a building following the bye-laws
Course Content:	**UNIT – I** **Building materials -I:** **Stones:** Properties of building stones, relation to their structural requirements, classification of stones. **Bricks:** composition of good brick earth, various types of bricks. **Tile**: characteristics of good tile and types of tiles. **UNIT – II** **Building materials–II:** **Lime:** Various ingredients of lime, constituents of lime stone, classification of lime. **Cement:** Portland cement, chemical composition, hydration, setting and fineness of cement, various types of cement and their properties, various field and laboratory tests for cement, various ingredients of cement concrete and their importance – Various tests for concrete.	

	UNIT – III **Wood:** Introduction, classification of timber (IS: 399), characteristics of good timber, defects in timber, types and uses of ply-wood and engineered wood, uses of materials like aluminium, gypsum, glass and bituminous materials. **Smart construction materials:** Overview and use of Fly ash, silica fume, carbon fibers, self-healing materials and fiber reinforced plastics, benefits of Nanotechnology in construction industry. **Building structures–I:** **Masonry:** Types of masonry, english and flemish bonds, cavity, partition and shear walls. **UNIT – IV** **Building structures–II:** **Building Components:** Lintels, arches, vaults, stair cases. **Floors:** Different types of floors, concrete, mosaic and terrazzo floors. **Roofs:** Pitched roofs, lean to roof, coupled roofs, trussed roofs, king and queen post trusses, flat roofs, R.C.C roofs, doors and windows. **UNIT – V** **Building finishes:** Damp proofing and water proofing materials and uses, plastering, pointing, white washing and distempering. **Paints:** Constituents of paint, types of paints, painting of new/old wood, varnish. **UNIT – VI** **Building planning :** Terms used in building drawing as per NBC, factors affecting in selection of site, functional requirements of a residential building, minimum size requirements as per NBC, standard sizes of door, windows and ventilators. **Planning:** Principles of planning, factors to be considered in planning, planning of residential, buildings, preliminaries of vaastu, municipal bye – law, list of documents to be submitted for building plan approval.
Text books & Reference books:	**Textbooks:** 1. "Engineering materials" , by S.C. Rangwala. 2. "Building construction", by B.C. Punmia. 3."Building planning and drawing", by Dr. N. Kumara Swamy & A. Kameswara Rao. **Reference books:** 1. "Building materials", by S.K. Duggal. 2. "A text book of building construction", by S.K. Sharma &B.K.Kaul. 3. "Building construction", by Sushil Kumar. 4. "Indian standard institution, national building code of India", ISI, 1984, New Delhi

17EC4204-COMPUTER ORGANIZATION
(ECE)

Course Category:	Open Elective	**Credits:**	3
Course Type:	Theory	**Lecture - Tutorial - Practical:**	2 - 2 – 0
Pre-requisite:	Switching theory & logic design, Basics of digital design	**Sessional Evaluation :** **External Evaluation:** **Total Marks:**	40 60 100

Course Objectives:	Students undergoing this course are expected to learn:	
	1.The register transfer and micro operations 2. The instruction cycle and various interrupts. 3. Machine language, assembly language and micro programmed control. 4. General register, stack organization, program control, pipeline and vector processing. 5. Detailed information of I/O devices and their interface, data transfer and its modes, priority interrupt and D.M.A. 6. Types and organization of memory, multiprocessor characteristics and inter processor communication.	
Course Outcome:	Upon successful completion of the course , the students will be able to:	
	CO1	Understand the architecture of modern computer, register transfer and micro operations
	CO2	Analyze types of instructions, timing & control
	CO3	Compare different control mechanisms in programming.
	CO4	Understand different blocks of central processing unit.
	CO5	Understand various input-output devices
	CO6	Understand how cache mapping occurs in a computer and solve various problems
Course Content:	**UNIT-I** **Register transfer and micro operations:** Register transfer, bus and memory transfers, arithmetic micro operations, logic micro operations, shift micro operations, arithmetic logic shift units. **UNIT-II** **Basic computer organization and design:** Instruction codes, computer registers and instructions, timing and control, instruction cycles, memory reference instructions, input-output and interrupt. **UNIT-III** **Programming the basic control:** Machine language, Assembly language, the assembler, programming arithmetic and logic operations, subroutines. **Micro programmed control:** Control memory, address sequencing, micro program example, design of control unit.	

	UNIT-IV **Central processing unit:** General register organization, stack organization, Instruction formats, addressing modes, program control, R.I.S.C., parallel processing, pipelining, arithmetic pipe-line, instruction pipe-line. **UNIT-V** **Input-output organization:** Peripheral devices, input-output interface, Asynchronous data transfer, modes of transfer, priority interrupt, D.M.A.,input - output processor, serial communication. **UNIT-VI** **Memory organization:** Memory hierarchy, main memory, auxiliary memory, associative memory, cache memory, virtual memory, characteristics of multi processors, inter processor arbitration, inter processor communication and synchronization and cache coherence.
Text books & Reference books:	**Text books:** 1.”Computer system architechture”, by M. Moris Mano, 3/e PHI-I. 2.“Computer organization”, by V.C. Hemacher, Z.G. Vranesic and others Mc-Graw-Hill. **Reference books:** 1.“Computer architecture and organization” , by Hays& Briggs –P.H.I. 2.“Computer Organization”, by William stallings PHI.
e-Resources	1. http://nptel.ac.in/courses/106105085/4 2. http://nptel.ac.in/courses/106108052/1

17EC42O1-INTERNET OF THINGS
(ECE)

Course category:	Open Elective	**Credits:**	3
Course Type:	Theory	**Lecture - Tutorial - Practical:**	2 - 2 – 0
Pre-requisite:	Objective Oriented Programming, Embedded Systems, Microcontrollers and Microprocessors, Computer Networks.	**Sessional Evaluation :** **External Evaluation:** **Total Marks:**	40 60 100

Course Objectives:	Students undergoing this course are expected to: 1. Learn the basics of IOT concepts. 2. Learn the various applications of IOT. 3. Learn the various applications of M2M. 4. Learn the basics of Cloud Computing. 5. Develop IOT using Python. 6. Learn the various IOT devices.	
Course Outcomes:	Upon successful completion of the course , the students will be able to:	
	CO1	Understand the application areas of IOT
	CO2	Realize the revolution of internet in mobile devices, cloud & sensor networks
	CO3	Understand building blocks of internet of things and characteristics.
	CO4	Design various IOT applications using Python.
	CO5	Understand cloud computing concepts.
	CO6	Design IOT applications on different microcontrollers.
Course Content:	**UNIT-I** **Introduction & concepts:** Introduction to internet of things, physical design of IOT, logical design of IOT, IOT enabling technologies, IOT Levels. **UNIT – II** **Domain specific IOTS:** Home automation, cities, environment, energy, retail, logistics, agriculture, industry, health & life style. **UNIT – III** **M2M:** M2M, Difference between IOT and M2M, SDN and NFV for IOT, software defined networking, network function virtualization, need for IOT systems management, simple network management protocol, limitations of SNMP, and network operator requirements. **UNIT – IV** **Cloud computing basics:** Cloud computing basics, terminology, characteristics, services, cloud deployment, public, private environments, secure communication, cloud security.	

	UNIT – V **Developing internet of things & logical design using python:** Introduction, IOT design methodology, installing python, python data types & data structures, control flow, functions, modules, packages, file handling, date/ time operations, classes, python packages. **UNIT-VI** **IOT physical devices & endpoints:** What is an IOT device, exemplary device, board, linux on raspberry pi, interfaces, and programming& IOT devices.
Text books & Reference books:	**Text books :** 1."Internet of Things a hands-on-approach", by Vijay Madisetti, Arshdeep Bagha,", 2014, ISBN:978-1-118-43062-0 **Reference books :** **1.**"Designing the Internet of Things", by Adrian McEwen, Wiley Publishers. 2."The silent intelligence: The Internet of Things", by Daniel Kellmereit.
e-Resources	nptel.ac.in/courses.

17CS42O1–PYTHON PROGRAMMING
(CSE)

Course Category:	Open Elective	**Credits:**	3
Course Type:	Theory	**Lecture – Tutorial – Practical:**	2-2-0
Pre-requisite:	Require the fundamental concepts of computers and any programming basics	**Sessional Evaluation:** **Univ.Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives:	Students undergoing this course are expected to:	
	1.Learn object oriented programming using an easy to use language 2. Use iterators and generators. 3. Learn to test objects and handle changing requirements. 4. Test cases and handle refactoring to identify its advantages. 5. Exposed to programming over the web to develop various applications. 6.Learn to create and utilize the advantages of packages	
Course Outcomes:	Upon successful completion of the course, the students will be able to:	
	CO1	Understand the concepts of object oriented programming in python.
	CO2	Compose a group of characters and utilization of strings into various applications
	CO3	Use generators and iterators to develop different applications
	CO4	Develop test cases and handle refactoring to identify its advantages.
	CO5	Use serializing objects to program over the web.
	CO6	Understand to create and utilize the advantages of packages.
Course Content:	**UNIT-I** **Introduction:** Function declaration, import, objects, indenting as requirement, exceptions, unbound variables, case sensitive, scripts, native data types, booleans numbers, Lists: tuples, sets, dictionaries, Comprehensions: list comprehensions, dictionary comprehensions, set comprehensions. **UNIT-II** **Strings**: Strings, unicode, formatting, string methods, bytes, encoding, regular expressions verbose, case studies **UNIT-III** **Classes**: Closures, list of functions, list of patterns, file of patterns, generators, defining classes, instantiating classes, instance variables, iterators, assert, generator expressions	

	UNIT-IV **Files**: Reading and writing text files, binary files, stream objects, standard input, output and error. **UNIT-V** **XML and serialization**: XML, atom feed, parsing HTML, searching for nodes, html, generation, serializing objects, pickle files, versions, debugging, serializing to JSON. **UNIT-VI** **Packaging python libraries**: Directory structure, writing your setup script, classifying your package, examples of good package classifiers, checking your setup script for errors, creating a source distribution, creating a graphical installer, building installable packages for other operating systems, adding your software to the python package index, the many possible futures of python packaging.
Text books & Reference books:	**Text books:** 1. "Dive into Python 3", by Mark Pilgrim, Apress, 2009. 2. "How to think like a computer scientist - learning with python", by Allen Downey, Jeffrey Elkner, Chris Meyers, Green Tea Press, 2002. **Reference books:** 1. "Introduction to computation and programming using python", by John V. Guttag, Prentice Hall of India, 2014 2. "Learning python: Powerful object-oriented programming", by Mark Lutz, 5th Edition, O'Reilly, Shroff Publishers and Distributors, 2013
e-Resources	1.https://nptel.ac.in/courses 2.https://freevideolectures.com/university/iitm

17EE42PW-PROJECT WORK

Course Category:	Professional core	**Credits:**	11
Course Type:	Project	**Lecture-Tutorial-Practical:**	0-0-22
Pre-requisite:	Power system Analysis, Switchgear and Protection, Power Electronics & Machines	**Sessional Evaluation:** **Univ.Exam Evaluation:** **Total Marks:**	80 120 200

Course Objectives:	Students undergoing this course are expected to :	
	1. Explore a problem or issue of particular personal or professional interest. 2. Explore to address the problem or issue through focused study and applied research. 3. Synthesize and apply the knowledge and skills acquired in his/her academic program to real-world issues and problems. 4. Affirms ability to think critically and creatively. 5. Solve practical problems and to make reasoned 6. Take ethical decisions, and to communicate effectively.	
Course Outcomes:	After completing the course the student will be able:	
	CO1	To provide with the opportunity to apply the knowledge and skills acquired in their courses to a specific problem or issue.
	CO2	To extend their academic experience into areas of personal interest, working with new ideas, issues, organizations and individuals.
	CO3	To think critically and creatively about academic, professional, or social issues.
	CO4	To develop their analytical and ethical leadership skills necessary to address and help to solve these issues.
	CO5	To provide opportunity to refine research skills and demonstrate their proficiency in written and/or oral communication skills.
	CO6	To take on the challenges of teamwork, prepare a presentation in a professional manner and document all aspects of design work.