KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY
(AUTONOMOUS)
(Approved by AICTE, New Delhi &Permanently Affiliated to JNTUK, Kakinada)
NH- 5, Chowdavaram, Guntur-522 019
Accredited by NBA & NAAC with 'A' Grade
CGPA:3.2
Department of Electrical and Electronics Engineering

COURSE STRUCTURE AND SYLLABUS
for

B. TECH ELECTRICAL AND ELECTRONICS ENGINEERING
(Applicable for batches admitted from 2023-24)

R23

KALLAM HARANADHAREDDY INSTITUTE OF TCHNOLOGY
NH- 5, Chowdavaram, Guntur-522 019

B.TECH. – I SEMESTER

S.No	Course code	Course Title	Contact hours/week			Credits	Scheme of Valuation		
			L	T	P		CIE	SEE	Total
Theory Courses									
1	R231101	Linear Algebra & Calculus	3	0	0	3	30	70	100
2	R231102	Engineering Physics	3	0	0	3	30	70	100
3	R231103	Communicative English	2	0	0	2	30	70	100
4	R231104	Basic Civil & Mechanical Engineering	3	0	0	3	30	70	100
5	R231105	Basic Electrical and Electronics Engineering	3	0	0	3	30	70	100
Laboratory Courses									
6	R231106L	Engineering Physics Lab	0	0	2	1	30	70	100
7	R231107L	Communicative English Lab	0	0	2	1	30	70	100
8	R231108L	Electrical and Electronics Engineering Workshop	0	0	3	1.5	30	70	100
9	R231109L	Engineering Workshop	0	0	3	1.5	30	70	100
10	R2311010L	Health and wellness, Yoga and sports	0	0	1	0.5	30	70	100
Total			14	0	11	19.5	300	700	1000

B.TECH. – II SEMESTER

S.No	Course code	Course Title	Contact hours/week			Credits	Scheme of Valuation		
			L	T	P		CIE	SEE	Total
Theory Courses									
1	R231201	Differential Equations & Vector Calculus	3	0	0	3	30	70	100
2	R231204	Introduction to Programming	3	0	0	3	30	70	100
3	R231205	Engineering Graphics	1	0	4	3	30	70	100
4	R231211	Chemistry	3	0	0	3	30	70	100
5	R231212	Electrical Circuit Analysis -I	3	0	0	3	30	70	100
Laboratory Courses									
6	R231208L	Computer Programming Lab	0	0	3	1.5	30	70	100
7	R231209L	IT Workshop	0	0	2	1	30	70	100
8	R231210L	NSS/NCC/Scouts & Guides/Community Service	0	0	1	0.5	30	70	100
9	R231213L	Chemistry Lab	0	0	2	1	30	70	100
10	R231214L	Electrical Circuits Lab	0	0	3	1.5	30	70	100
Total			13	0	15	20.5	300	700	1000

B.TECH. – III SEMESTER

S.No	Course code	Course Title	Contact hours/week			Credits	Scheme of Valuation		
			L	T	P		CIE	SEE	Total
Theory Courses									
1	R232101	Managerial Economics & Financial Analysis	2	0	0	2	30	70	100
2	R232110	Analog Circuits	3	0	0	3	30	70	100
3	R232111	Electromagnetic Field Theory	3	0	0	3	30	70	100
4	R232112	Electrical Circuit Analysis-II	3	0	0	3	30	70	100
5	R232113	DC Machines and Transformers	3	0	0	3	30	70	100
6	R232114L	Electrical Circuit Analysis-II and Simulation Lab	0	0	3	1.5	30	70	100
7	R232115L	DC Machines and Transformers Lab	0	0	3	1.5	30	70	100
8	R232108	Python Programming Lab	0	1	2	2	-	100	100
9	R232109	Environmental Science	2	0	0	-	30	-	30
Total			16	1	8	19	240	590	830

B.TECH. – IV SEMESTER

S.No	Course code	Course Title	Contact hours/week			Credits	Scheme of Valuation		
			L	T	P		CIE	SEE	Total
Theory Courses									
1	R232211	Complex Variables & Numerical Methods	3	0	0	3	30	70	100
2	R232202	Universal human values - understanding harmony and Ethical human conduct	2	1	0	3	30	70	100
3	R232212	Power Systems-I	3	0	0	3	30	70	100
4	R232213	Induction and Synchronous Machines	3	0	0	3	30	70	100
5	R232214	Control Systems	3	0	0	3	30	70	100
6	R232215L	Induction and Synchronous Machines Lab	0	0	3	1.5	30	70	100
7	R232216L	Control Systems Lab	0	0	3	1.5	30	70	100
8	R232208	Data Structure Lab	0	1	2	2	30	70	100
9	R232209	Design Thinking & Innovation	1	0	2	2	-	100	100
Total			15	2	10	22	240	660	1000

Annexure I: **B. TECH - V SEMESTER**

S. No	Course code	Course Title	Contact hours/week			Credits	Scheme of Valuation		
			L	T	P		CIE	SEE	Total
Theory Courses									
1	23PCXXXXX	Power Electronics	3	0	0	3	30	70	100
2	23PCXXXXX	Digital Circuits	3	0	0	3	30	70	100
3	23PCXXXXX	Power Systems-II	3	0	0	3	30	70	100
4	**PROFESSIONAL ELECTIVE – I**		3	0	0	3	30	70	100
	23PEXXXXX	Renewable and Distributed Energy Technologies							
	23PEXXXXX	Computer Architecture and Organization							
	23PEXXXXX	Communication systems							
	23PEXXXXX	12 Week MOOCS SWAYAM NPTEL Course recommended by BOS							
5	**OPEN ELECTIVE – I**		3	0	0	3	30	70	100
	23OEXXXXX	Renewable Energy Sources							
	23OEXXXXX	Concepts of Energy Auditing & Management							
	23OEXXXXX	Concepts of Control Systems							
Laboratory Courses									
6	23PCXXXXX	Power Electronics Lab	0	0	3	1.5	30	70	100
7	23PCXXXXX	Analog and Digital Circuits Lab	0	0	3	1.5	30	70	100
8	23PCXXXXX	Soft skills (**21st Century Employability Skills)***	0	1	2	2	0	100	100
9	23PCXXXXX	Tinkering Lab	0	0	2	1	30	70	100
10	23PCXXXXX	Evaluation of Community Service Internship	-	-	-	2	0	100	100
Total			**15**	**1**	**10**	**23**	**240**	**760**	**1000**

Annexure II: **B. TECH - VI SEMESTER**

S. No	Course code	Course Title	Contact hours/week			Credits	Scheme of Valuation		
			L	T	P		CIE	SEE	Total
Theory Courses									
1	23PCXXXXX	Electrical Measurements and Instrumentation	3	0	0	3	30	70	100
2	23PCXXXXX	Microprocessors and Microcontrollers	3	0	0	3	30	70	100
3	23PCXXXXX	Power System Analysis	3	0	0	3	30	70	100
4	**PROFESSIONAL ELECTIVE – II**		3	0	0	3	30	70	100
	23PEXXXXX	Switchgear and Protection							
	23PEXXXXX	Advanced Control Systems							
	23PEXXXXX	Signals and Systems							
	23PEXXXXX	12 Week MOOCS SWAYAM NPTEL Course recommended by BOS							
5	**PROFESSIONAL ELECTIVE – III**		3	0	0	3	30	70	100
	23PEXXXXX	Electric Drives							
	23PEXXXXX	Digital Signal Processing							
	23PEXXXXX	High Voltage Engineering							
	23PEXXXXX	12 Week MOOCS SWAYAM NPTEL Course recommended by BOS							
6	**OPEN ELECTIVE – II**		3	0	0	3	30	70	100
	23OEXXXXX	Fundamentals of Electric Vehicles							
	23OEXXXXX	Electrical Wiring Estimation and Costing							
	23OEXXXXX	Safety Engineering							
Laboratory Courses									
7	23PEXXXXX	Electrical Measurements and Instrumentation Lab	0	0	3	1.5	30	70	100
8	23PEXXXXX	Microprocessors and Microcontrollers Lab	0	0	3	1.5	30	70	100
9	23PEXXXXX	IoT Applications of Electrical Engineering Lab	0	1	2	2	0	100	100
10	23PEXXXXX	Research Methodology	2	0	0	-	30	70	100
Total			**20**	**1**	**8**	**23**	**270**	**730**	**1000**

Annexure III: List of courses in the Professional Electives (PE) under R23 Regulations

Professional Electives	PE-1	PE-2	PE-3	PE-4	PE-5
Pool-1	Renewable and Distributed Energy Technologies	Switchgear and Protection	Electric Drives	EHVAC & HVDC Transmission Systems	Electric Vehicles
Pool-2	Computer Architecture and Organization	Advanced Control Systems	Digital Signal Processing	Programmable Logic Controllers	Switched Mode Power Conversion
Pool-3	Communicatio n systems	Signals and Systems	High Voltage Engineering	Electrical Distribution System	Design of PV systems
Pool-4	12 Week MOOCS SWAYAM NPTEL Course recommended by BOS	12 Week MOOCS SWAYAM NPTEL Course recommended by BOS	12 Week MOOCS SWAYAM NPTEL Course recommended by BOS	12 Week MOOCS SWAYAM NPTEL Course recommended by BOS	12 Week MOOCS SWAYAM NPTEL Course recommend ed by BOS

Annexure IV: List of courses in the Open Electives (OE) under R23 Regulations

	Category	Title
1	Open Elective-I (III-I)	1. Renewable Energy Sources 2. Concepts of Energy Auditing & Management 3. Concepts of Control Systems
2	Open Elective – II (III-II)	1. Fundamentals of Electric Vehicles 2. Electrical Wiring Estimation and Costing 3. Safety Engineering
3	Open Elective – III (IV-I)	1. Battery Management Systems and Charging Stations 2. Concepts of Smart Grid Technologies 3. Advanced Control Systems
4	Open Elective-IV (IV-I)	1. Concepts of Power Quality 2. Intelligent Control Systems 3. Instrumentation

***Minor Engineering Courses offered by EEE Department for Other Branches (Except EEE Branch)**

S.No.	Course	Title	L	T	P	C
1	I	Concepts of Control Systems	3	0	0	3
2	II	Fundamentals of Electrical Measurements and Instrumentation	3	0	0	3
3	III	Concepts of Power System Engineering	3	0	0	3
4	IV	Fundamentals of Power Electronics	3	0	0	3
5	V	Basics of Electric Drives and applications	3	0	0	3
6	VI	Fundamentals of utilization of Electrical Energy	3	0	0	3
Total			**18**	**0**	**0**	**18**

B.TECH. - VII SEMESTER

S. No	Course code	Course Title	Contact hours/week			Credits	Scheme of Valuation		
			L	T	P		CIE	SEE	Total
Theory Courses									
1	23PCC41XX	Power System Operation and Control	3	0	0	3	30	70	100
2	23PCC41XX	Energy Management & Auditing	2	0	0	2	30	70	100
3	**PROFESSIONAL ELECTIVE – IV**		3	0	0	3	30	70	100
	23PEXXXXX	EHVAC & HVDC Transmission Systems							
	23PEXXXXX	Programmable Logic Controllers							
	23PEXXXXX	Electrical Distribution System							
	23PEXXXXX	12 Week MOOCS SWAYAM NPTEL Course recommended by BOS							
4	**PROFESSIONAL ELECTIVE – V**		3	0	0	3	30	70	100
	23PEXXXXX	Electric Vehicles							
	23PEXXXXX	Switched Mode Power Conversion							
	23PEXXXXX	Design of PV systems							
	23PEXXXXX	12 Week MOOCS SWAYAM NPTEL Course recommended by BOS							
5	**OPEN ELECTIVE – III**		3	0	0	3	30	70	100
	23OEXXXXX	Battery Management Systems and Charging Stations							
	23OEXXXXX	Concepts of Smart Grid Technologies							
	23OEXXXXX	Advanced Control Systems							
6	**OPEN ELECTIVE – IV**		3	0	0	3	30	70	100
	23OEXXXXX	Concepts of Power Quality							
	23OEXXXXX	Intelligent Control Systems							
	23OEXXXXX	Instrumentation							
Laboratory Courses									
7	23SEC41XX	Power Systems Simulation Lab	0	0	4	2	30	70	100

Audit Course									
8	23AC41XX	Constitution of India	2	0	0	0	30	70	100
Internship									
9	23XXXXX	Evaluation of Industry Internship	0	0	0	2	30	70	100
Total			**19**	**0**	**4**	**21**	**270**	**730**	**900**

B.TECH. IV YEAR-II SEMESTER
(VIII SEMESTER)

S.No	Course code	Course Title	Contact hours/week			Credits	Scheme of Valuation		
			L	T	P		CIE	SEE	Total
1	23PROJ42XX	Internship & Project Work	0	0	24	12	50	100	150

KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY
(AUTONOMOUS)

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK Kakinada

Department of Electrical and Electronics Engineering

		L	T	P	Cr.
B.Tech. (I Sem.)	**LINEAR ALGEBRA & CALCULUS**				
	Course Code: R231101 **(Common to All Branches of Engineering)**	3	0	0	3

Pre-requisites: Basic knowledge in Mathematics from +2Level.

Course Objectives:

- To familiarize the students with the theory of matrices and quadratic forms.
- To explain the series expansions using mean value theorems.
- To teach basic concepts of partial derivatives.
- To demonstrate the evaluation and applications of double and triple integrals.

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

C101.1	:	Apply matrix techniques to solve system of linear equations.
C101.2	:	Compute various powers of a matrix and identify the nature of the quadratic form
C101.3	:	Apply the concepts of mean value theorems.
C101.4	:	Calculate total derivative, Jacobian and maxima/minima of function of two variables.
C101.5	:	Find areas and volumes using double and triple integrals.

UNIT – I 10 hrs

Matrices:

Rank of a matrix by echelon form, normal form. Cauchy–Bi net formulae (without proof). Inverse of Non-singular matrices by Gauss-Jordan method, System of linear equations: Solving system of Homogeneous and Non-Homogeneous equations by Gauss elimination method, Jacobi and Gauss Seidel Iteration Methods.

UNIT – II 10 hrs

Eigen values, Eigenvectors and Orthogonal Transformation:

Eigen values, Eigen vectors and their properties, Diagonalization of a matrix, Cayley-Hamilton Theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton Theorem, Quadratic forms and Nature of the Quadratic Forms, Reduction of Quadratic form to canonical forms by Orthogonal Transformation.

UNIT – III 10 hrs

Calculus:

	Mean Value Theorems: Rolle's Theorem, Lagrange's mean value theorem with their geometrical interpretation, Cauchy's mean value theorem, Taylor's and Maclaurin theorems with remainders (without proof), Problems and applications on the above theorems			
	UNIT – IV		10	hrs
	Partial differentiation and Applications (Multivariable calculus): Functions of several variables: Continuity and Differentiability, Partial derivatives, total derivatives, chain rule, Taylor's and Maclaurin's series expansion of functions of two variables. Jacobians, Functional dependence, maxima and minima of functions of two variables, method of Lagrange multipliers.			
	UNIT – V		10	hrs
	Multiple Integrals (Multivariable Calculus): Double integrals, triple integrals, change of order of integration, change of variables to polar, cylindrical and spherical coordinates. Finding areas (by double integrals) and volumes (by double integrals and triple integrals).			
	Text Books			
	1	Higher Engineering Mathematics, B.S. Grewal, Khanna Publishers, 2017, 44thEdition.		
	2	Advanced Engineering Mathematics, Erwin Kreyszig, John Wiley& Sons, 2018, 10thEdition.		
	Reference Books			
	1	Thomas Calculus, George Thomas, Maurice D. Weirand Joel Hass, Pearson Publishers,2018, 14th Edition.		
	2	Advanced Engineering Mathematics, Dennis G.Zilland Warren S.Wright, Jones and Bartlett,2018		
	3	Advanced Modern Engineering Mathematics, GlynJames, Pearson publishers, 2018, 5th Edition.		
	4	Advanced Engineering Mathematics, R.K. Jain and S.R.K. Iyengar, Alpha Science International Ltd., 20215thEdition (9th reprint).		
	5	Higher Engineering Mathematics, B.V. Ramana, McGraw HillEducation,2017		
	E-RESOURCES:			
	1	https://archive.nptel.ac.in/courses/111/104/111104137/		
	2	https://archive.nptel.ac.in/courses/111/107/111107108/		

CO-PO/PSO Mapping Matrix																
	CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO2**	**PSO3**
	C101.1	3	2													
	C101.2	3	2													
	C101.3	3	2													
	C101.4	3	2													
	C101.5	3	2													
	Avg.	**3**	**2**													

KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY
(AUTONOMOUS)

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK Kakinada

Department of Electrical and Electronics Engineering

			L	T	P	Cr.
B.Tech. (I Sem.)		**ENGINEERING PHYSICS**				
		Course Code: R231102 (Common to **CE, EEE, ME, ECE & CSE**)	3	0	0	3

Pre-requisites: Knowledge of theoretical and experimental Physics from +2 Level.

Course Objectives:

- Impart knowledge of wave optics phenomena like interference, diffraction and polarization required to design instruments with higher resolution.
- Study the crystal structures, properties and their relationship exhibited by solid state materials.
- Explore the knowledge of magnetic and dielectric materials and their utility in appliances.
- Impart the fundamental concepts of quantum mechanics and free electron theory.
- Understand the physics of semi conductorsand their working mechanism for their utility in Engineering applications.

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

C102.1	:	Analyze the intensity variation of light due to interference, diffraction and polarization.
C102.2	:	Familiarize with the basics of crystal structures and structure determination techniques.
C102.3	:	Summarize various types of polarization of dielectrics and classify the magnetic materials.
C102.4	:	Explain the basic concepts of Quantummechanics and the free electron theory of solids.
C102.5	:	Understand the physics of semiconductors and the mechanisms of current flow in semiconductors.

UNIT – I		10	hrs

Wave Optics

Interference: Principle of superposition –Interference of light – Interference in thin films (Reflection Geometry) & applications – Colours in thin films- Newton's Rings- Determination of wavelength and refractive index.

Diffraction: Introduction – Fresnel and Fraunhofer diffractions – Fraunhofer diffraction due to single slit, double slit & N-slits (Qualitative) – Difraction Grating – Dispersive power and resolving power of Grating (Qualitative).

Polarization: Introduction-Types of polarization - Polarization by reflection, refraction and Double refraction - Nicol's Prism -Half wave and Quarter wave plates.

UNIT – II		08	hrs

Crystallography: Space lattice, Basis, Unit Cell and lattice parameters – Bravais Lattices –crystal systems (3D) – coordination number - packing fraction of SC, BCC & FCC – Miller indices– separation between successive(hkl) planes.

X- Ray diffraction: Bragg's law- X-ray Diffractometer–crystal structure determination by Laue's and powder methods.

UNIT – III		10	hrs

Dielectric and Magnetic Materials

Dielectric Materials: Introduction-Dielectric polarization - Dielectric polarizability, Susceptibility, Dielectric constant and Displacement Vector – Relation between the electric vectors -Types of polarizations-Electronic (Quantitative), Ionic(Quantitative) and Orientation polarizations (Qualitative) - Lorentz internal field - Clausius- Mossotti equation – complex dielectric constant – Frequency dependence of polarization– dielectric loss.

Magnetic Materials: Introduction - Magnetic dipole moment - Magnetization-Magnetic susceptibility and permeability – Atomic origin of magnetism - Classification of magnetic materials: Dia, Para, Ferro, Anti-ferro&Ferri magnetic materials - Domain concept for Ferromagnetism & Domain walls (Qualitative) - Hysteresis-soft and hard magnetic materials.

UNIT – IV		10	hrs

Quantum Mechanics and Free Electron Theory

Quantum Mechanics: Dual nature of matter – Heisenberg's Uncertainty Principle –Significance and properties of wave function – Schrodinger's time independent and dependent wave equations– Particle in a one - dimensional infinite potential well.

Free Electron Theory: Classical free electron theory (Qualitative with discussion of merits and demerits) – Quantum free electron theory – electrical conductivity based on quantum free electron theory - Fermi-Dirac distribution –Density of states -Fermi energy.

UNIT – V		08	hrs

Semiconductors:

Semiconductors: Formation of energy bands – classification of crystalline solids – Intrinsic semiconductors: Density of charge carriers – Electrical conductivity – Fermi level – Extrinsic semiconductors: density of charge carriers–dependence of Fermi energy on carrier concentration and temperature – Drift and diffusion currents–Einstein's equation – Hall effect and its

	applications.	
	Text Books	
	1	A Text book of Engineering Physics, M. N. Avadhanulu, P.G. Kshirsagar& TVS Arun Murthy, S. Chand Publications, 11th Edition 2019.
	2	Engineering Physics - D.K. Bhattacharya and Poonam Tandon, Oxford press(2015)
	Reference Books	
	1	Engineering Physics -B.K. Pandey and S. Chaturvedi, Cengage Learning 2021.
	2	Engineering Physics – Shatendra Sharma, Jyotsna Sharma, Pearson Education, 2018.
	3	Engineering Physics-Sanjay D.Jain, D. Sahasrabudhe and Girish, University Press, 2010.
	4	Engineering Physics -M.R. Srinivasan, New Age international publishers (2009).
	5	Fundamentals of Physics – Halliday, Resnick and Walker, 10th edition, John Wiley & Sons, 2013.
	E-RESOURCES:	
	1	https://www.loc.gov/rr/scitech/selected-internet/physics.html
	2	NPTEL: https://www.youtube.com/watch?v=s57qWFlt_fw
	3	NPTEL: https://www.youtube.com/watch?v=3RZZQvEVrEA
	4	NPTEL: http://youtu.be/OTDVov_kw6A
	5	NPTEL: https://slideplayer.com / slide / 3866455 / 64 / video / CHAPTER + 3%3A +CRYSTAL+STRUCTURES+%26 amp%3 B+PROPERTIES.mp4
	6	NPTEL: https://youtu.be/na6mYwzIuhM
	7	NPTEL: https://youtu.be/DocyilQj8yE
	8	https://nptel.ac.in/courses/113106032/15%20%20Magnetic%20Properties.pdf
	9	http://www.nptelvideos.in/2012/11/quantum-mechanics-and-applications.html
	10	https://nptel.ac.in/courses/122/106/122106034/

CO-PO/PSO Mapping Matrix

	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
	C102.1	3	2													
	C102.2	3	2													
	C102.3	3	2													
	C102.4	3	2													
	C102.5	3	2													
	Avg.	**3**	**2**													

KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY (AUTONOMOUS)

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK Kakinada

Department of Electrical and Electronics Engineering

		L	T	P	Cr.
B. Tech (I Sem)	**COMMUNICATIVE ENGLISH**				
	Course Code: **R231103** (Common to CE, EEE, ME, ECE, IT, CSM, CSD& CAD)	2	0	0	2

Pre-requisites: Basic English Knowledge

Course Objectives:

- The main objective of introducing this course, Communicative English, is to facilitate effective listening, Reading, Speaking and Writing skills among the students.
- It enhances the same in their comprehending abilities, oral presentations, reporting useful information and providing knowledge of grammatical structures and vocabulary.
- This course helps the students to make them effective in speaking and writing skills and to make them industry ready.

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

C103.1	:	Hone human and ethical values and develop language proficiency.
C103.2	:	Improve word power and rudiments of grammar along with verbal techniques.
C103.3	:	Narrate the biographies of eminent personalities and their contributions to society.
C103.4	:	Apply grammatical structures and develop confidence levels through inspirational stories.
C103.5	:	Develop language competence with a special emphasis on intrapersonal skills.

UNIT – I		10	hrs

HUMANVALUES: Gift of Magi **(Short Story):**

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

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

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

Writing: Mechanics of Writing-Capitalization, Spellings, Punctuation-Parts of Sentences.

Grammar: Parts of Speech, Basic Sentence Structures-forming questions

Vocabulary: Synonyms, Antonyms, Affixes (Prefixes/Suffixes), Root words

	UNIT – II		10	hrs
	NATURE: The Brook by Alfred Tennyson (Poem): **Listening:** Answeringaseriesofquestionsaboutmainideasandsupportingideasafterlisteningto audio texts. **Speaking:** Discussion in pairs/small groups on specific topics followed by short structure talks. **Reading:** Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together. **Writing:** Structure of a paragraph - Paragraph writing (specific topics) **Grammar:** Cohesive devices linkers, use of articles and zero article; prepositions. **Vocabulary:** Homonyms, Homophones, Homographs.			
	UNIT – III		10	hrs
	BIOGRAPHY: Elon Musk: **Listening:** Listening for global comprehension and summarizing what is listened to. **Speaking:** Discussingspecifictopicsinpairsorsmallgroupsandreportingwhatisdiscussed **Reading:** Reading a text in detail by making basic inferences recognizing and interpreting specific context clues; strategies to use text clues for comprehension. **Writing:** Summarizing, Note-making, paraphrasing **Grammar:** Verbs- tenses; subject- verb agreement; Compound words, Collocations **Vocabulary:** Compound words, Collocations			
	UNIT – IV		10	hrs
	INSPIRATION: The Toys of Peace by Saki: **Listening:** Making predictions while listening to conversations/transactional dialogues without video; listening with video. **Speaking:** Role plays for practice of conversational English in academic contexts (formal and informal)-asking for and giving information/directions. **Reading:** Studying the use of graphic elements in texts to convey information, reveal trends/patterns/relationships, communicate processes or display complicated data. **Writing:** Letter Writing: Official Letters, Resumes **Grammar:** Reporting verbs, Direct &Indirect speech, Active &Passive Voice **Vocabulary:** Words often confused, Jargons			
	UNIT – V		10	hrs

MOTIVATION: The Power of Intra personal Communication (An Essay):

Listening: Identifying key terms, understanding concepts and answering a series of relevant questions that test comprehension.

Speaking: Formal oral presentations on topics from academic contexts

Reading: Reading comprehension.

Writing: Writing structured essays on specific topics.

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

Vocabulary: Technical Jargons.

Text Books

1	Pathfinder: Communicative English for Undergraduate Students, 1st Edition, Orient Black Swan, 2023 (Units1,2 & 3)
2	Empowering with Language by Cengage Publications, 2023(Units4 &5)

Reference Books

1.	Dubey, Sham Ji &Co. English for Engineers, Vikas Publishers, 2020
2.	Bailey, Stephen. Academic writing: A Handbook for International Students. Routledge, 2014.
3.	Murphy, Raymond. English Grammar in Use, Fourth Edition, Cambridge University Press, 2019.
4.	Lewis, Norman. Word Power Made Easy-The Complete Hand book for Building a Superior Vocabulary. Anchor, 2014.

e-resources

1.	www.bbc.co.uk/learningenglish
2.	https://dictionary.cambridge.org/grammar/british-grammar/
3.	www.eslpod.com/index.html

CO-PO/PSO Mapping Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
C103.1						2				3		2			
C103.2						2				3		2			
C103.3						2				3		2			
C103.4						2				3		2			
C103.5						2				3		2			
Avg.						**2**				**3**		**2**			

KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY
(AUTONOMOUS)

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK Kakinada

Department of Electrical and Electronics Engineering

			L	T	P	Cr.
B. Tech (I Sem)		**BASIC CIVIL & MECHANICALENGINEERING**				
		Course Code: R231104 (Common to CE, EEE, ME, ECE, CSE)	3	0	0	3
		PART-A: BASIC CIVIL ENGINEERING				

Pre-requisites: Thermodynamics, Basic Knowledge on Mechanical Systems.

Course Objectives:

- To get familiarized with the scope and importance of Civil Engineering sub-divisions.
- To understand the preliminary concepts of surveying.
- To acquire preliminary knowledge on Transportation and its importance in nation's economy.
- To get familiarized with the importance of quality, conveyance, and storage of water.To get the knowledge on basic civil engineering materials and construction techniques.
- To get familiarized with the scope and importance of Mechanical Engineering in different sectors and industries.
- To impart the knowledge on different engineering materials and manufacturing processes
- To provide an overview of different thermal and mechanical transmission systems and introduce basics of robotics and its applications.

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

C104.1	:	Understand various sub-divisions of Civil Engineering and to appreciate their role in ensuring better society. Know the concepts of surveying and to understand the measurement of distances, angles, and levels through surveying.
C104.2	:	Realize the importance of Transportation in nation's economy and the engineering measures related to Transportation. Understand the importance of Water Storage and Conveyance Structures so that the social responsibilities of water conservation will be appreciated.
C104.3	:	Understand the basic characteristics of Civil Engineering Materials and attain knowledge on prefabricated technology.
C104.4	:	Understand the different types of engineering materials.
C104.5	:	Explain the different types of manufacturing processes, basics of thermal engineering and its applications.
C104.6	:	Describe the working of different mechanical power transmission systems, power plants and the basics of robotics & its applications.

UNIT – I	.	10	hrs

	Basics of Civil Engineering: Role of Civil Engineers in Society- Various Disciplines of Civil Engineering- Structural Engineering- Geo-technical Engineering- Transportation Engineering - Hydraulics and Water Resources Engineering - Environmental Engineering-Scope of each discipline - Building Construction and Planning- Construction Materials-Cement - Aggregate - Bricks- Cement concrete- Steel. Introduction to Prefabricated construction Techniques.			
	UNIT –II		10	hrs
	Surveying: Objectives of Surveying- Horizontal Measurements- Angular Measurements. Introduction to Bearings Levelling instruments used for levelling -Simple problems on levelling and bearings-Contour mapping.			
	UNIT-III		8	hrs
	Transportation Engineering Importance of Transportation in Nation's economic development- Types of Highway Pavements- Flexible Pavements and Rigid Pavements - Simple Differences. Basics of Harbour, Tunnel, Airport, and Railway Engineering. **Water Resources and Environmental Engineering**: Introduction, Sources of water- Quality of water- Specifications- Introduction to Hydrology–Rainwater Harvesting-Water Storage and Conveyance Structures (Simple introduction to Dams and Reservoirs).			
	PART-B: Basic Mechanical Engineering			
	UNIT – IV	.	10	hrs
	Introduction to Mechanical Engineering: Role of Mechanical Engineering in Industries and Society- Technologies in different sectors such as Energy, Manufacturing, Automotive, Aerospace, and Marine sectors. **Engineering Materials -** Metals-Ferrous and Non-ferrous, Ceramics, Composites, Smart materials			
	UNIT –V		10	hrs
	Manufacturing Processes: Principles of Casting**,** Forming, joining processes, Machining, Introduction to CNC machines, 3D printing, and Smart manufacturing. **Thermal Engineering** – working principle of Boilers, Otto cycle, Diesel cycle, Refrigeration and air-conditioning cycles, IC engines, 2-Stroke and 4-Stroke engines, SI/CI Engines, Components of Electric and Hybrid Vehicles.			
	UNIT– VI		10	hrs
	Power plants – working principle of Steam, Diesel, Hydro, Nuclear power plants. **Mechanical Power Transmission -** Belt Drives, Chain, Rope drives, Gear Drives, and their applications. **Introduction to Robotics -** Joints & links, configurations, and applications of robotics. (**Note**: The subject covers only the basic principles of Civil and Mechanical Engineering systems. The evaluation shall be intended to test only the fundamentals of the subject)			
	Text Books			
	1.	Basic Civil Engineering, M.S.Palanisamy, Tata Mcgraw Hill publications (India) Pvt.Ltd. Fourth Edition.		
	2.	Introduction to Civil Engineering, S.S. Bhavikatti, New Age International Publishers.2022. First Edition.		

	3.	Basic Civil Engineering, Satheesh Gopi, Pearson Publications, 2009, First Edition.
	4	Internal Combustion Engines by V.Ganesan, By Tata McGraw Hill publications (India) Pvt. Ltd.
	5	A Tear book of Theory of Machines by S.S. Rattan, Tata McGraw Hill Publications, (India) Pvt. Ltd.
	6	An introduction to Mechanical Engg by Jonathan Wicker and Kemper Lewis, Cengage learning India Pvt. Ltd.

	Reference Books	
	1.	Surveying, Vol- I and Vol-II, S.K. Duggal, Tata McGraw Hill Publishers 2019. FifthEdition.
	2.	Hydrology and Water Resources Engineering, Santosh Kumar Garg, KhannaPublishers, Delhi. 2016
	3.	Irrigation Engineering and Hydraulic Structures - Santosh Kumar Garg, KhannaPublishers, Delhi 2023. 38th Edition.
	4.	Highway Engineering, S.K.Khanna, C.E.G. Justo and Veeraraghavan, NemchandandBrothers Publications 2019. 10th Edition.
	5.	Indian Standard DRINKING WATER — SPECIFICATION IS 10500-2012.
	6.	AppuuKuttan KK, Robotics, I.K. International Publishing House Pvt. Ltd. Volume-I.
	7.	3D printing & Additive Manufacturing Technology- L. Jyothish Kumar, Pulak M Pandey, Springer publications.
	8.	Thermal Engineering by Mahesh M Rathore Tata McGraw Hill publications (India) Pvt. Ltd.
	9.	G. Shanmugam and M. S. Palanisamy, Basic Civil and the Mechanical Engineering, Tata McGraw Hill publications (India) Pvt. Ltd.

CO-PO/PSO Mapping Matrix

	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
	C104.1	3	2													
	C104.2	3	2													
	C104.3	3	2													
	C104.4	3	2													
	C104.5	3	2													
	C104.6	3	2													
	Avg.	**3**	**2**													

KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY (AUTONOMOUS)

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK Kakinada

Department of Electrical and Electronics Engineering

		L	T	P	Cr.
B. Tech (I Sem)	**BASIC ELECTRICAL & ELECTRONICS ENGINEERING**				
	Course code: R231105 (Common to All branches of Engineering)	3	0	0	3

Pre-requisites: Basic knowledge on mathematics, physics.

Course Objectives:

- To expose to the field of electrical & electronics engineering, laws and principles of electrical/ electronic engineering and to acquire fundamental knowledge in the relevant field.
- To teach the fundamentals of semiconductor devices and its applications, principles of digital electronics.

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

C105.1	:	Understand the elements of electrical DC & AC networks.
C105.2	:	Understand the Performance of DC machines, AC machines and Measuring Instruments.
C105.3	:	Apply mathematical tools to electricity bill calculations and fundamental concepts of safety measures in electrical power systems.
C105.4	:	Understand the Characteristics of Electronic Devices.
C105.5	:	Analyze various Electronic Circuits.
C105.6	:	Analyze different Logic gates & combinational circuits

PART A: BASIC ELECTRICAL ENGINEERING

UNIT – I — 10 Hrs

DC & AC CIRCUITS:

DC Circuits: Electrical circuit elements (R, L and C), Ohm's Law and its limitations, KCL & KVL, series, parallel, series-parallel circuits, Super Position theorem, Simple numerical problems.

AC Circuits: A.C. Fundamentals: Equation of AC Voltage and current, waveform, time period, frequency, amplitude, phase, phase difference, average value, RMS value, form factor, peak factor, Voltage and current relationship with phasor diagrams in R, L, and C circuits, Concept of Impedance, Active power, reactive power and apparent power, Concept of power factor (Simple Numerical problems).

	UNIT – II		10	Hrs
	MACHINES AND MEASURING INSTRUMENTS: **Machines:** Construction, principle and operation of (i) DC Motor, (ii) DC Generator, (iii) Single Phase Transformer, (iv) Three Phase Induction Motor and (v) Alternator, Applications of electrical machines. **Measuring Instruments:** Construction and working principle of Permanent Magnet Moving Coil (PMMC), Moving Iron (MI) Instruments and Wheat Stone bridge.			
	UNIT – III		10	hrs
	ENERGY RESOURCES, ELECTRICITY BILL & SAFETY MEASURES: **Energy Resources:** Conventional and non-conventional energy resources; Layout and operation of various Power Generation systems: Hydel, Nuclear, Solar & Wind power generation. **Electricity bill:** Power rating of household appliances including air conditioners, PCs, Laptops, Printers, etc. Definition of "unit" used for consumption of electrical energy, two-part electricity tariff, calculation of electricity bill for domestic consumers. **Equipment Safety Measures:** Working principle of Fuse and Miniature circuit breaker (MCB), merits and demerits. Personal safety measures: Electric Shock, Earthing and its types, Safety Precautions to avoid shock.			
	PART B: BASIC ELECTRONICS ENGINEERING			
	UNIT – I		10	hrs
	SEMICONDUCTOR DEVICES: Introduction-Evolution of electronics–Vacuum tubes to nano electronics –Characteristics of PN Junction Diode — Zener Effect — Zener Diode and its Characteristics. Bipolar Junction Transistor — CB, CE, CC Configurations and Characteristics — Elementary Treatment of Small Signal CE Amplifier.			
	UNIT – II		10	hrs
	BASICELECTRONICCIRCUITSAND INSTRUMENTTAION: Rectifiers and power supplies: Block diagram description of a dc power supply, working of a full wave bridge rectifier, capacitor filter (no analysis), working of simple zener voltage regulator. Amplifiers: Block diagram of Public Address system, Circuit diagram and working of common emitter (RC coupled) amplifier with its frequency response. Electronic Instrumentation: Block diagram of an electronic instrumentation system.			
	UNITIII		8	hrs
	DIGITAL ELECTRONICS: Overview of Number Systems, Logic gates including Universal Gates, BCD codes, Excess-3 code, Graycode, Hamming code. Boolean Algebra, Basic Theorems and properties of Boolean Algebra, Truth Tables and Functionality of Logic Gates –NOT, OR, AND, NOR, NAND, XOR			

and XNOR. Simple combinational circuits–Half and Full Adders. Introduction to sequential circuits, Flip flops, Registers and counters (Elementary Treatment only)

Text Books

1. R. L. Boylestad & Louis Nashlesky, Electronic Devices& Circuit Theory, Pearson Education, 2021.
2. R. P. Jain, Modern Digital Electronics, 4th Edition, Tata McGrawHill,2009
3. Basic Electrical Engineering, D. C. Kulshreshtha, Tata McGraw Hill, 2019, First Edition
4. Power System Engineering, P.V. Gupta, M.L. Soni, U.S. Bhatnagar and A. Chakrabarti, Dhanpat Rai & Co, 2013
5. Fundamentals of Electrical Engineering, Rajendra Prasad, PHI publishers, 2014, Third Edition

Reference Books

1. Basic Electrical Engineering, D. P. Kothari and I. J. Nagrath, Mc Graw Hill, 2019, Fourth Edition.
2. Principles of Power Systems, V.K. Mehtha, S.Chand Technical Publishers, 2020
3. Basic Electrical Engineering, T. K. Nagsarkar and M. S. Sukhija, Oxford University Press, 2017.
4. Basic Electrical and Electronics Engineering, S. K. Bhatacharya, Person Publications, 2018, Second Edition.

e-resources

1. https://nptel.ac.in/courses/108105053
2. https://nptel.ac.in/courses/108108076

CO-PO/PSO Mapping Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
C105.1	3	2													
C105.2	3	2													
C105.3	3	2													
C105.4	3	2													
C105.5	3	2													
C105.6	3	2													
Avg.	**3**	**2**													

KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY
(AUTONOMOUS)

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK Kakinada

Department of Electrical and Electronics Engineering

			L	T	P	Cr.
B.Tech. (I Sem.)		**ENGINEERING PHYSICS LAB**				
		Course Code: **R231106L** (Common to **CE, EEE, ME, ECE & CSE**)	0	0	2	1

Pre-requisites: Knowledge of intermediate experimental Physics from +2Level.

Course Objectives:

- To gain practical knowledge by applying the experimental methods to correlate with the theoretical studies.
- To learn the usage of electrical and optical systems for various measurements.
- Apply the analytical techniques and graphical analysis to the experimental data.
- To achieve perfectness in experimental skills and the study of practical applications.
- To develop intellectual communication skills and discuss the basic principles of scientific concepts in a group.

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

C106.1	:	Compile the data, organize and analyze it for discussion and report the findings and observations from experimental learning activities in the laboratory.
C106.2	:	Build holistic development and pleasing disposition by reviewing and correcting the performance to become independent and autonomous thinker.
C106.3	:	Determine the optical parameters based on interference and diffraction.
C106.4	:	Find the mechanical, electrical and magnetic properties of materials.

List of Experiments

(Any of the TEN experiments are required to be conducted)
(8 from physical Lab & 2 from virtual Lab)

1.	Determination of radius of curvature of a given Plano-convex lens by Newton's rings
2.	Determination of wavelengths of different spectral lines in mercury spectrum using diffraction grating in normal incidence configuration.
3.	Determination of wavelength of Laser light using diffraction grating.

4.	Determination of energy gap of a semiconductor using p-n junction diode.
5.	Magnetic field along the axis of a current carrying circular coil by Stewart Gee's Method
6.	Determination of temperature coefficients of a thermistor
7.	Determination of acceleration due to gravity and radius of Gyration by using a compound pendulum.
8.	Determination of rigidity modulus of the material of the given wire using Torsional pendulum
9.	Sonometer: Verification of laws of stretched string.
10	Determination of Frequency of electrically maintained tuning fork by Melde's experiment.
11	Verification of Brewster's law
12	Determination of dielectric constant using charging and discharging method
13	Determination of magnetic susceptibility by Kundt's tube method
	Virtual Lab Experiments
14	Study the variation of B versus H by magnetizing the magnetic material (B-H curve).
15	Estimation of Planck's constant using photoelectric effect
16	Determination of Hall voltage and Hall coefficient of a given semiconductor using Hall effect.
17	Determination of young's modulus for the given material of wooden scale by non-uniform bending (or double cantilever) method.
18	Determination of the resistivity of semiconductors by four probe methods
19	Study various crystal structures

	Reference Books	
	1	A Text book of Practical Physics- S. Balasubramanian, M.N. Srinivasan, S. Chand Publishers, 2017.
	2	College customized Engineering Physics Lab Manual.
	E-RESOURCES:	
	1.	www.vlab.co.in
	2.	https://vlab.amrita.edu
	3.	https://phet.colorado.edu/en/simulations/filter?subjects=physics&type=html,prototype

CO-PO/PSO Mapping Matrix																
	CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO2**	**PSO3**
	C106.1									3	2					
	C106.2								2	3	2					
	C106.3				3					3						
	C106.4				3					3						
	Avg.				**3**				**2**	**3**	**2**					

KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY
(AUTONOMOUS)

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK Kakinada

Department of Electrical and Electronics Engineering

		L	T	P	Cr.
B. Tech. (I Sem.)	**COMMUNICATIVE ENGLISH LAB**				
	Course Code: R231107L (Common to CE, EEE, ME, ECE, IT, CSM, CSD& CAD)	0	0	2	1

Pre-requisites: Basic English knowledge.

Course Objectives:

- The main objective of introducing this course, Communicative English Laboratory, is to expose the students to a variety of self-instructional, learner friendly modes of language learning.
- The students will get trained in basic communication skills and also make them ready to face job interviews.

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

C107.1	:	Compile the data, organize and analyse it for discussion and report the findings and observations from experimental learning activities in the laboratory.
C107.2	:	Build holistic development and pleasing disposition by reviewing and correcting the performance to become independent and autonomous thinker.
C107.3	:	Use accentual patterns effectively in an accurate manner and develop language proficiency by practicing LSRW skills.
C107.4	:	Apply the techniques of group discussion and debating methods, make presentations effectively with confidence and face the interviews dexterously

	List of Experiments (All the experiments are required to be conducted)
1	Vowels & Consonants
2	Neutralization/ Accent Rules
3	Communication Skills &JAM
4	Role Play or Conversational Practice
5	E-mail Writing
6	Resume Writing, Cover letter, SOP

	7	Group Discussions- methods &practice
	8	Debates-Methods &Practice
	9	PPT Presentations/Poster Presentation
	10	Interviews Skills
	Reference Books:	
	1	Raman Meenakshi, Sangeeta-Sharma. Technical Communication. Oxford Press. 2018.
	2	Taylor Grant: English Conversation Practice, Tata McGraw-Hill Education India, 2016.
	3.	Hewing's, Martin. Cambridge Academic English (B2). CUP, 2012.
	4	J. Sethi& P.V. Dhamija. A Course in Phonetics and Spoken English, (2ndEd), Kindle, 2013
	Web Resources:	
	1	www.esl-lab.com
	2	www.englishmedialab.com
	3	www.englishinteractive.net

CO-PO/PSO Mapping Matrix

	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
	C107.1									3	2					
	C107.2								2	3	2					
	C107.3					2				2	3					
	C107.4					2				2	3					
	Avg.					**2**			**2**	**2.5**	**2.5**					

KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY (AUTONOMOUS)

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK Kakinada

Department of Electrical and Electronics Engineering

			L	T	P	Cr.
B.Tech. (I Sem.)		**ELECTRICAL & ELECTRONICS ENGINEERING WORKSHOP**				
		Course Code: R231108L (Common to All branches of Engineering)	0	0	3	1.5

Pre-requisites: Basic knowledge on mathematics, physics.

Course Objectives:

- To impart knowledge on the fundamental laws & theorems of electrical circuits, functions of electrical machines and energy calculations.

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

C108.1	:	Compile the data organize and analyze it for discussion and report the findings and observations from experimental learning activities in the laboratory.
C108.2	:	Build holistic development and pleasing disposition by reviewing and correcting the performance to become independent and autonomous thinker.
C108.3	:	Analyze various characteristics of electrical circuits, electrical machines and measuring instruments.
C108.4		To understand the characteristics of PN, Zener diode, design rectifiers with and without filters, BJT

Activities:

1. Familiarization of commonly used Electrical & Electronic Workshop Tools: Bread board, Solder, cables, relays, switches, connectors, fuses, Cutter, plier, screwdriver set, wire stripper, flux, knife/blade, soldering iron, de-soldering pump etc.

• Provide some exercises so that hardware tools and instruments are learned to be used by the students.

2. Familiarization of Measuring Instruments like Voltmeters, Ammeters, multimeter, LCR-Q meter, Power Supplies, CRO, DSO, Function Generator, Frequency counter.

• Provide some exercises so that measuring instruments are learned to be used by the students.

3. Components:

• Familiarization/Identification of components (Resistors, Capacitors, Inductors, Diodes, transistors,

IC's etc.) – Functionality, type, size, colour coding package, symbol, cost etc. Testing of components like Resistor, Capacitor, Diode, Transistor, ICs etc. - Compare values of components like resistors, inductors, capacitors etc with the measured values by using instruments	
PART A: ELECTRICAL ENGINEERING LAB	
List of Experiments	
1	Verification of KCL and KVL
2	Verification of Superposition theorem
3	Measurement of Resistance using Wheat stone bridge
4	Magnetization Characteristics of DC shunt Generator
5	Measurement of Power and Power factor using Single-phase wattmeter
6	Measurement of Earth Resistance using Megger
7	Calculation of Electrical Energy for Domestic Premises
	PART B: ELECTRONICS ENGINEERING LAB
	List of Experiments (Any of the 6 experiments are required to be conducted)
1	P.N Junction Diode Characteristics Silicon Diode &Germanium Diode (Forward bias& Reverse bias)
2	Zener Diode Characteristics
3	Rectifiers (without and with c-filter) Part A: Half-wave Rectifier Part B: Full-wave Rectifier
4	BJT Characteristics (CE Configuration) Part A: Input Characteristics Part B: output Characteristics
5	Verification of truth tables of Logic gates: Two input (i) OR (ii) AND (iii) NOR (iv) NAND (v) Exclusive OR (vi) Exclusive NOR
6	Design a simple combinational circuit and obtain minimal SOP expression and verify the truth table using Digital Trainer Kit
7	Verification of functional table of 3-to-8-line Decoder / De-multiplexer
8	4 variable logic function verification using 8 to 1 multiplexer
9	Design full adder circuit and verify its functional table.
10	Design full Subtractor circuit and verify its functional table
11	Design a four-bit ring counter using D Flip – Flops / JK Flip Flop and verify output
12	Design a four-bit Johnson's counter using D Flip-Flops / JK Flip Flops and verify output

Reference Books

1. Electronic Devices and Circuits- J. Millman, C.Halkias, Tata Mc-Graw Hill, 2nd Edition,2010
2. Digital Design by Morris Mano, Prentice Hall India, 5th Edition.

CO-PO/PSO Mapping Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
C108.1									3	2					
C108.2								2	3	2					
C108.3				3					3						
C108.4				3					3						
Avg.				**3**				**2**	**3**	**2**					

KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY
(AUTONOMOUS)

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK Kakinada

Department of Electrical and Electronics Engineering

		L	T	P	Cr.
B.Tech. (I Sem.)	**ENGINEERING WORKSHOP**				
	Course Code: R231109L (Common to CE, EEE, ME, ECE, CSE)	0	0	3	1.5

Pre-requisites:
Awareness on Machine Tools, Basic Engineering Drawing, Knowledge on units & measurements.

Course Objectives:

- To familiarize with the basic manufacturing processes.
- To study the various tools and equipment used.
- To impart hands-on practice on basic workshop trades and skills.

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

C109.1	Compile the data, organize and analyse it for discussion and report the findings and observations from experimental learning activities in the laboratory.
C109.2	Build holistic development and pleasing disposition by reviewing and correcting the performance to become independent and autonomous thinker.
C109.3	Identify workshop tools and practice on manufacturing of components using workshop trades including fitting, carpentry, Tin smithy, foundry, and welding.
C109.4	Apply fitting operations in various applications and apply basic electrical engineering knowledge for House Wiring Practice

List of Experiments

1	**Demonstration**: Safety practices and precautions to be observed in workshop.
2	**Wood Working:** Familiarity with different types of woods and tools used in wood working and make following joints. a) Half – Lap joint b) Mortise and Tenon joint c) Corner Dovetail joint or Bridle joint
3	**Sheet Metal Working**: Familiarity with different types of tools used in sheet metal working, Developments of following sheet metal job from GI sheets. a) Tapered tray b) Conical funnel c) Elbow pipe d) Brazing
4	**Fitting:** Familiarity with different types of tools used in fitting and do the following fitting

		exercises. a) V-fit b) Dovetail fit c) Semi-circular fit d) Bicycle tire puncture and change of two-wheeler tyre
	5	**Electrical Wiring**: Familiarity with different types of basic electrical circuits and make the following connections. a) Parallel and series b) Two-way switch c) Godown lighting d) Tube light e) Three phase motor f) Soldering of wires
	6	**Foundry Trade:** Demonstration and practice on Moulding tools and processes, Preparation of Green Sand Moulds for given Patterns.
	7	**Welding Shop**: Demonstration and practice on Arc Welding and Gas welding. Preparation of Lap joint and Butt joint
	8	**Plumbing:** Demonstration and practice of Plumbing tools, Preparation of Pipe joints with coupling for same diameter and with reducer for different diameters.
	Text Books:	
	1	Basic Workshop Technology: Manufacturing Process, Felix W.; Independently Published, 2019. Workshop Processes, Practices and Materials; Bruce J. Black, Routledge publishers, 5th Edn. 2015.
	2	A Course in Workshop Technology Vol I. & II, B.S. Raghuwanshi, Dhanpath Rai & Co., 2015 & 2017.
	Reference Books:	
	1	Elements of Workshop Technology, Vol. I by S. K. Hajra Choudhury & Others, Media Promoters and Publishers, Mumbai. 2007, 14th edition
	2	Workshop Practice by H. S. Bawa, Tata-McGraw Hill, 2004.
	3	Wiring Estimating, Costing and Contracting; Soni P.M. &Upadhyay P.A.; AtulPrakashan, 2021-22

CO-PO/PSO Mapping Matrix																
	CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO2**	**PSO3**
	C109.1									3	2					
	C109.2								2	3	2					
	C109.3				3					3						
	C109.4				3					3						
	Avg.				**3**				**2**	**3**	**2**					

KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY
(AUTONOMOUS)

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK Kakinada

Department of Electrical and Electronics Engineering

		L	T	P	Cr.
B. Tech. (I Sem.)	**HEALTH AND WELLNESS, YOGA AND SPORTS**				
	Course Code: R2311010L (Common to ALL BRANCHES)	0	0	1	0.5

Pre-requisites: Basic English knowledge

Course Objectives:

- The main objective of introducing this course is to make the students maintain their mental and physical wellness by balancing emotions in their life.
- It mainly enhances the essential traits required for the development of the personality.

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

C110.1	:	Understand the importance of discipline, character and service motto
C110.2	:	Solve some societal issues by applying acquired knowledge, facts, and techniques
C110.3	:	Explore human relationships by analyzing social problems.

UNIT-I

Concept of health and fitness, Nutrition and Balanced diet, basic concept of immunity Relationship between diet and fitness, Globalization and its impact on health, Body Mass Index (BMI) of all age groups.

Activities:

i) Organizing health awareness programmes in community
ii) Preparation of health profile
iii) Preparation of chart for balance diet for all age groups

UNIT- II

Concept of yoga, need for and importance of yoga, origin and history of yoga in Indian context, classification of yoga, Physiological effects of Asanas- Pranayama and meditation, stress management and yoga, Mental health and yoga practice.

Activities:

Yoga practices–Asana, Kriya, Mudra, Bandha, Dhyana, Surya Namaskar

UNIT - III	

Concept of Sports and fitness, importance, fitness components, history of sports, Ancient and Modern Olympics, Asiangames and Commonwealth games.

Activities:

i) Participation in one major game and one individual sport viz., Athletics, Volleyball, Basketball, Handball, Football, Badminton, Kabaddi, Kho-kho, Table tennis, Cricket etc.
Practicing general and specific warmup, aerobics

ii) Practicing cardio respiratory fitness, treadmill, runtest, 9 minwalk, skipping and running.

Reference Books:

1	Gordon Edlin, Eric Golanty. Health and Wellness, 14th Edn.Jones&BartlettLearning,202
2	T.K.V. Desi kachar. The Heart of Yoga: Developing a Personal Practice
3	Archie J. Bahm. Yoga Sutras of Patanjali, Jain Publishing Company,1993

CO-PO/PSO Mapping Matrix

	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
	C110.1						3		2				2			
	C110.2						3		2				2			
	C110.3						3		2				2			
	Avg.						**3**		**2**				**2**			

KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY
(AUTONOMOUS)

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK Kakinada

Department of Electrical and Electronics Engineering

		L	T	P	Cr.
B.Tech.(II Sem.)	**DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS**				
	Course Code: R231201 (Common to All Branches of Engineering)	3	0	0	3

Pre-requisites: Basic knowledge in Mathematicsfrom +2 Level.

Course Objectives:

- To familiarize the student in the concepts of linear differential equations.
- To demonstrate the concepts of partial differential equations.
- To explain the concepts of vector differentiation and integration.

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

C111.1	:	Identify whether the given differential equation of first order is linear, exact or not.
C111.2	:	Solve linear ordinary differential equations of higher order and its applications
C111.3	:	Find a solution of linear and non-linear PDEs
C111.4	:	Calculate gradient of a scalar function, divergence and curl of a vector function.
C111.5	:	Apply Green's, Stokes and Gauss divergence theorem in evaluation of line, surface and volume integrals.

UNIT – I		10	hrs

Differential equations of first order and first degree

Linear differential equations – Bernoulli's equations- Exact equations and equations reducible to exact form. Applications: Newton's Law of cooling – Law of natural growth and decay - Electrical circuits

UNIT – II		10	hrs

Linear differential equations of higher order (Constant Coefficients)

Definitions, homogenous and non-homogenous, complimentary function, general solution, particular integral, Wronskian, Method of variation of parameters. Simultaneous linear equations, Applications to L-C-R Circuit problems and Simple Harmonic motion.

UNIT – III		10	hrs

Partial Differential Equations

Introduction and formation of Partial Differential Equations by elimination of arbitrary constants and arbitrary functions, solutions of first order linear equations using Lagrange's method. Homogeneous Linear Partial differential equations with constant coefficients.

	UNIT – IV		10	hrs
	Vector differentiation Scalar and vector point functions, vector operator Del, Del applies to scalar point functions-Gradient, Directional derivative, del applied to vector point functions-Divergence and Curl, vector identities.			
	UNIT – V		10	hrs
	Vector integration Line integral-circulation-work done, surface integral-flux,Green's theorem in the plane (without proof), Stoke's theorem (without proof) volume integral, Divergence theorem (without proof) and related problems			
	Text Books			
	1	Higher Engineering Mathematics, B.S. Grewal, Khanna Publishers, 2017, 44thEdition.		
	2	Advanced Engineering Mathematics, Erwin Kreyszig, John Wiley& Sons, 2018,10th Edition.		
	Reference Books			
	1	Thomas Calculus, George Thomas, Maurice D. Weirand Joel Hass, Pearson Publishers, 2018, 14th Edition.		
	2	Advanced Engineering Mathematics, Dennis G.Zilland Warren S.Wright, Jones and Bartlett,2018		
	3	Advanced Modern Engineering Mathematics, GlynJames, Pearson publishers, 2018, 5th Edition.		
	4	Advanced Engineering Mathematics, R.K. Jain and S.R.K. Iyengar, Alpha Science International Ltd., 20215thEdition (9th reprint).		
	5	Higher Engineering Mathematics, B.V. Ramana, McGraw HillEducation,2017		
	E-RESOURCES:			
	1	https://archive.nptel.ac.in/courses/111/106/111106100/		
	2	https://archive.nptel.ac.in/courses/111/105/111105122/		

CO-PO/PSO Mapping Matrix

	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
	C111.1	3	2													
	C111.2	3	2													
	C111.3	3	2													
	C111.4	3	2													
	C111.5	3	2													
	Avg.	**3**	**2**													

KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY
(AUTONOMOUS)

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK Kakinada

Department of Electrical and Electronics Engineering

		L	T	P	Cr.
B.Tech.(II Sem.)	**INTRODUCTION TO PROGRAMMING**				
	Course Code: R231204 (Common to CE, EEE, ME, ECE, CSE, IT and AI&ML)	3	0	0	3

Pre-requisites: Basic Engineering Science

Course Objectives:

- To introduce students to the fundamentals of computer programming.
- To provide hands-on experience with coding and debugging.
- To foster logical thinking and problem-solving skills using programming.
- To familiarize students with programming concepts such as data types, control structures, functions, and arrays.
- To encourage collaborative learning and teamwork in coding projects

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

C112.1	:	Understand basics of computers, the concept of algorithm and algorithmic thinking.
C112.2	:	Analyze a problem and develop an algorithm to solve it.
C112.3	:	Implement various algorithms using the C programming language using C -language.
C112.4	:	Understand more advanced features of C language.
C112.5	:	Develop problem-solving skills and the ability to debug and optimize the code.

UNIT – I — 12 hrs

Introduction to Programming and Problem Solving:
History of Computers, Basic organization of a computer: ALU, input-output units, memory, program counter, Introduction to Programming Languages, Basics of a Computer Program Algorithms, flowcharts (Using Dia Tool), pseudo code. Introduction to Compilation and Execution, Primitive Data Types, Variables, and Constants, Basic Input and Output, Operations, Type Conversion, and Casting.
Problem solving techniques: Algorithmic approach, characteristics of algorithm, Problem solving strategies: Top-down approach, Bottom-up approach, Time and space complexities of algorithms.

UNIT – II — 10 hrs

Control Structures:
Simple sequential programs Conditional Statements (if, if-else, switch), Loops (for, while, dowhile) Break and Continue

	UNIT – III		12	hrs
	Arrays and Strings: Arrays indexing, memory model, programs with array of integers, two dimensional arrays, Introduction to Strings.			
	UNIT – IV		10	hrs
	Pointers & User Defined Data types: Pointers, dereferencing and address operators, pointer and address arithmetic, array manipulation using pointers, User-defined data types-Structures and Unions.			
	UNIT – V		12	hrs
	Functions & File Handling: Introduction to Functions, Function Declaration and Definition, Function call Return Types and Arguments, modifying parameters inside functions using pointers, arrays as parameters. Scope and Lifetime of Variables, Basics of File Handling			

Text Books

1	"The C Programming Language", Brian W. Kernighan and Dennis M. Ritchie, PrenticeHall, 1988.
2	Schaum's Outline of Programming with C, Byron S Gottfried, McGraw-Hill Education, 1996

Reference Books

1	Computing fundamentals and C Programming, Balagurusamy, E., McGraw-Hill Education,2008.
2	Programming in C, RemaTheraja, Oxford, 2016, 2nd edition.
3	C Programming, A Problem Solving Approach, Forouzan, Gilberg, Prasad, CENGAGE, 3rd Edition.

CO-PO/PSO Mapping Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
C112.1	3	2													
C112.2	3	2													
C112.3	3	2													
C112.4	3	2													
C112.5	3	2													
Avg.	**3**	**2**													

KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY
(AUTONOMOUS)

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK Kakinada

Department of Electrical and Electronics Engineering

		L	T	P	Cr.
B.Tech. (II Sem.)	**ENGINEERING GRAPHICS**				
	Course Code: R231205 (Common to All Branches)	1	0	4	3

Pre-requisites: Mathematics at +2Level.

Course Objectives:

- To enable the students with various concepts like dimensioning, conventions and standards related to Engineering Drawing
- To impart knowledge on the projection of points, lines, and plane surfaces
- To improve the visualization skills for better understanding of projection of solids
- To develop the imaginative skills of the students required to understand Section of solids and Developments of surfaces.
- To make the students understand the viewing perception of a solid object in Isometric and Perspective projections.

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

C113.1	:	Understand the principles of engineering drawing and construct the polygons, engineering curves, scales.
C113.2	:	Draw and interpret orthographic projections of points, lines and planes in front, top an side views.
C113.3	:	Understand and draw projection of solids in various positions in first quadrant.
C113.4	:	Draw the sectional views and explain principles behind development of surfaces.
C113.5	:	Convert the isometric views into orthographic views & vice versa and create 2D, 3D objects using Auto CAD.

UNIT – I	10	hrs

Introduction: Lines, Lettering and Dimensioning, Geometrical Constructions and Constructing regular polygons by general methods.
Curves: construction of ellipse, parabola, and hyperbola by general, Cycloids, Involutes, Normal and tangent to Curves.
Scales: Plain scales, diagonal scales and vernier scales

UNIT – II	10	hrs

Orthographic Projections: Reference plane, importance of reference lines or Plane, Projections of a

point situated in any one of the four quadrants.

Projections of Straight Lines: Projections of straight lines parallel to both reference planes, perpendicular to one reference plane and parallel to other reference plane, inclined to one reference plane and parallel to the other reference plane. Projections of Straight Line Inclined to both the reference planes

Projections of Planes: regular planes Perpendicular to both reference planes, parallel to one reference plane and inclined to the other reference plane; plane inclined to both the reference planes.

UNIT – III 10 hrs

Projections of Solids: Types of solids: Polyhedral and Solids of revolution. Projections of solids in simple positions: Axis perpendicular to horizontal plane, Axis perpendicular to vertical plane and Axis parallel to both the reference planes, Projection of Solids with axis inclined to one reference plane and parallel to another plane.

UNIT – IV 10 hrs

Sections of Solids: Perpendicular and inclined section planes, Sectional views and True shape of section, Sections of solids in simple position only.

Development of Surfaces: Methods of Development: Parallel line development and radial line development. Development of a cube, prism, cylinder, pyramid and cone.

UNIT – V 10 hrs

Conversion of Views: Conversion of isometric views to orthographic views; Conversion of orthographic views to isometric views.

Computer graphics: Creating 2D&3D drawings of objects including PCB and Transformations using Auto CAD (*Not for end examination*).

Text Books:

1. N. D. Bhatt, Engineering Drawing, Charotar Publishing House, 2016.

Reference Books:

1. Engineering Drawing, K.L. Narayana, and P. Kannaiah, Tata McGraw Hill, 2013.
2. Engineering Drawing, M. B. Shah and B.C. Rana, Pearson Education Inc,2009.

CO-PO/PSO Mapping Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
C113.1	2	3													
C113.2	2	3													
C113.3	2	3													
C113.4	2	3													
C113.5	2	3													
Avg.	**2**	**3**													

KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY
(AUTONOMOUS)

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK Kakinada

Department of Electrical and Electronics Engineering

		L	T	P	Cr
B.Tech.(II Sem.)	**CHEMISTRY**				
	Course Code: R231211 (Common to EEE, ECE & CSE)	3	0	0	3

Pre-requisites: Knowledge of theoretical and experimental Chemistry from +2Level.

Course Objectives:

- To familiarize engineering chemistry and its applications.
- To train the students on the principles and applications of electrochemistry and polymers.
- To introduce instrumental methods.

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

C114.1	:	Apply the concepts of quantum mechanics and chemical bonding to understand the behavior of electrons and molecular orbital diagrams.
C114.2	:	Comprehend engineering applications of semiconductors, super conductors, graphene and nano-materials.
C114.3	:	Apply the concepts of electrochemistry to conductometric, potentiometric titrations and electrochemical sensors.
C114.4	:	Enumerate the uses of polymeric materials.
C114.5	:	Explain principles and applications of UV-Visible, IR spectroscopy and chromatographic techniques.

UNIT – I 10 hrs

STRUCTURE AND BONDING MODELS

Fundamentals of Quantum mechanics, Schrodinger Wave equation, significance of Ψ and Ψ^2, particle in one dimensional box, molecular orbital theory– bonding in homo-and heteronuclear diatomic molecules – energy level diagrams of O_2 and CO, etc. π-molecular orbitals of butadiene and benzene, calculation of bond order.

UNIT – II 10 hrs

MODERN ENGINEERING MATERIALS

Semiconductors – Introduction, basic concept, application Superconductors-Introduction basic concept, applications. Super capacitors: Introduction, Basic Concept-Classification–Applications. Nano materials: Introduction, classification, properties and applications of Fullerenes, carbon nano tubes and Graphines nanoparticles.

	UNIT – III		10	hrs
	ELECTRO CHEMISTRY AND APPLICATIONS Electrochemical cell, Nernst equation, cell potential calculations and numerical problems, potentiometry- potentiometric titrations (redox titrations), concept of conductivity, conductivity cell, conductometric titrations (acid-base titrations). Electrochemical sensors– potentiometric sensors with examples, amperometric sensors with examples. Primary cells–Zinc-air battery, Secondary cells–lithium-ion batteries-working of the batteries including cell reactions; Fuel cells, hydrogen-oxygen fuel cell– working of the cells. Polymer Electrolyte Membrane Fuel cells (PEMFC).			
	UNIT – IV		14	hrs
	POLYMER CHEMISTRY Introduction to polymers, functionality of monomers, chain growth and step growth polymerization, coordination polymerization, with specific examples and mechanisms of polymer formation. Plastics –Thermo and Thermosetting plastics, Preparation, properties and applications of – PVC, Teflon, Bakelite, Nylon-6,6, carbon fibres. Elastomers–Buna-S, Buna-N–preparation, properties and applications. Conducting polymers–polyacetylene, polyaniline, – mechanism of conduction and applications. Bio-Degradable Polymers-Poly Glycolic Acid (PGA), Poly Lactic Acid (PLA).			
	UNIT – V		10	hrs
	INSTRUMENTAL METHODS AND APPLICATIONS Electromagnetic spectrum. Absorption of radiation: Beer-Lambert's law. UV-Visible Spectroscopy, electronic transition, Instrumentation, IR spectroscopies, fundamental modes and selection rules, Instrumentation. Chromatography-Basic Principle, Classification- HPLC: Principle, Instrumentation and Applications.			
	Text Books			
	1	Jain and Jain, Engineering Chemistry,16/e, Dhanpat Rai, 2013.		
	2	Peter Atkins' Physical Chemistry, 10/e, Oxford University Press, 2010.		
	Reference Books			
	1	Skoog and West, Principles of Instrumental Analysis, 6/e, Thomson, 2007		
	2	J.D.Lee, Concise Inorganic Chemistry, 5th Edition, Wiley Publications, Feb.2008		
	3	Textbook of Polymer Science, Fred W. Billmayer Jr, 3rdEdition		
	E-RESOURCES:			
	1	https://nptel.ac.in/courses/104101130		
	2	https://archive.nptel.ac.in/courses/122/101/122101001/		

CO-PO/PSO Mapping Matrix																
	CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO2**	**PSO3**
	C114.1	3	2													
	C114.2	3	2					2								
	C114.3	3	2													
	C114.4	3	2					2								
	C114.5	3	2					2								
	Avg.	**3**	**2**					**2**								

KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY
(AUTONOMOUS)

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK Kakinada

Department of Electrical and Electronics Engineering

			L	T	P	Cr.
B.Tech.(II Sem.)		**ELECTRICAL CIRCUIT ANALYSIS –I**				
		Course Code: R231212	3	0	0	3

Pre-requisites: Basic knowledge on mathematics, physics.

Course Objectives:

- To develop an understanding of the fundamental laws, elements of electrical circuits and to apply circuit analysis to DC and AC circuits.

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

C115.1	:	Analyze various electrical networks in presence of active and passive elements.
C115.2	:	Analyze magnetic circuit with and without dot conventions.
C115.3	:	Explain R, L, C network with sinusoidal excitation.
C115.4	:	Analyze R, L, C network with variation of any one of the parameters.
C115.5	:	State and apply network theorems to electrical networks

UNIT – I 10 hrs

INTRODUCTION TO ELECTRICAL CIRCUITS:

Basic Concepts of passive elements of R, L, C and their V-I relations, Sources (dependent and independent), Kirchoff's laws, Network reduction techniques (series, parallel, series - parallel, star-to-delta and delta-to-star transformation), source transformation technique, nodal analysis and mesh analysis to DC networks with dependent and independent voltage and current sources, node and mesh analysis.

UNIT – II 10 hrs

MAGNETIC CIRCUITS:

Basic definition of MMF, flux and reluctance, analogy between electrical and magnetic circuits, Faraday's laws of electromagnetic induction – concept of self and mutual inductance, Dot convention – coefficient of coupling and composite magnetic circuit, analysis of series and parallel magnetic circuits.

UNIT – III 10 hrs

SINGLE PHASE CIRCUITS:

Characteristics of periodic functions, Average value, R.M.S. value, form factor, representation of a sine function, concept of phasor, phasor diagrams, node and mesh analysis. Steady state analysis of R, L and C circuits to sinusoidal excitations-response of pure resistance, inductance,

	capacitance, series RL circuit, series RC circuit, series RLC circuit, parallel RL circuit, parallel RC circuit.			
	UNIT – IV		14	hrs
	RESONANCE AND LOCUS DIAGRAMS: Series Resonance: Characteristics of a series resonant circuit, Q-factor, selectivity and bandwidth, expression for half power frequencies; Parallel resonance: Q-factor, selectivity and bandwidth; Locus diagram: RL, RC, RLC with R, L and C variables.			
	UNIT – V		10	hrs
	NETWORK THEOREMS (DC & AC EXCITATIONS): Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum Power Transfer theorem, Reciprocity theorem, Millman's theorem and compensation theorem			
	Text Books			
	1	Engineering Circuits Analysis, Jack Kemmerly, William Hayt and Steven Durbin, Tata Mc Graw Hill Education, 2005, sixth edition.		
	2	Network Analysis, M. E. Van Valkenburg, Pearson Education, 2019, Revised Third Edition		
	Reference Books			
	1	Fundamentals of Electrical Circuits, Charles K. Alexander and Mathew N.O. Sadiku, Mc Graw Hill Education (India), 2013, Fifth Edition		
	2	Electric Circuits (Schaum's outline Series), Mahmood Nahvi, Joseph Edminister, and K. Rao, Mc Graw Hill Education, 2017, Fifth Edition.		
	3	Electric Circuits, David A. Bell, Oxford University Press, 2009, Seventh Edition.		
	E-RESOURCES:			
	1	https://onlinecourses.nptel.ac.in/noc23_ee81/preview		
	2	https://nptel.ac.in/courses/108104139		
	3	https://nptel.ac.in/courses/108106172		
	4	https://nptel.ac.in/courses/117106108		

CO-PO/PSO Mapping Matrix

	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
	C115.1	3	2											3		
	C115.2	3	2											3		
	C115.3	3	2											3		
	C115.4	3	2											3		
	C115.5	3	2											3		
	Avg.	**3**	**2**											**3**		

KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY
(AUTONOMOUS)

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK Kakinada

Department of Electrical and Electronics Engineering

		L	T	P	Cr.
B.Tech.(II Sem.)	**COMPUTER PROGRAMMING LAB**				
	Course Code: R231208L (Common to CE, EEE, ME, ECE, CSE, IT and AI&ML)	0	0	3	1.5

Pre-requisites: Basic Engineering Science

Course Objectives:

- The course aims to give students hands – on experience and train them on the concepts of the C- programming language.

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

C116.1	Compile the data, organize and analyze it for discussion and report the findings and observations from experimental learning activities in the laboratory.
C116.2	Build holistic development and pleasing disposition by reviewing and correcting the performance to become independent and autonomous thinker.
C116.3	Develop C programs which utilize memory efficiently using programming constructs like pointers.
C116.4	Develop, Debug and Execute programs to demonstrate the applications of arrays, functions, basic concepts of pointers in C.

List of Experiments

1	**WEEK 1** **Objective:** Getting familiar with the programming environment on the computer and writing the first program. **Suggested Experiments/Activities:** **Tutorial 1:** Problem-solving using Computers. **Lab1:** Familiarization with programming environment i) Basic Linux environment and its editors like Vi, Vim &Emacs etc. ii) ii) Exposure to Turbo C, gcc iii) iii) Writing simple programs using printf(), scanf()
2	**WEEK 2** **Objective:** Getting familiar with how to formally describe a solution to a problem in a series of finite steps both using textual notation and graphic notation **Suggested Experiments/Activities:** **Tutorial 2**: problems- solving using Algorithms and flow chats

		Lab 2: Converting algorithms/flow charts into C source code Developing the algorithms/flowcharts for the following sample programs i) Sum and average of 3 numbers ii) Conversion of Fahrenheit to Celsius and vice versa iii) Simple interest calculation
	3	**WEEK 3** **Objective**: Leam how to define variables with the desired data-type, initialize them with appropriate values and how arithmetic operators can be used with variables and constants. Suggested Experiments/Activities: **Tutorial 3**: Variable types and type conversions: **Lab 3**: Simple computational problems using arithmetic expressions. i) Finding the square root of a given number ii) Finding compound interest iii) Area of a triangle using heron's formulae iv) Distance travelled by an object
	4	**WEEK 4** **Objective:** Explore the full scope of expressions, type-compatibility of variables & constants and operators used in the expression and how operator precedence works. **Suggested Experiments/Activities:** **Tutorial4:** Operators and the precedence and as associativity **Lab4:** Simple computational problems using the operator' precedence and associativity i) Evaluate the following expressions. a) A+B*C+(D*E) + F*G b) A/B*C-B+A*D/3 c) A+++B-A d) J= (i++) + (++i) ii) Find the maximum of three numbers using conditional operator iii) Take marks of 5 subjects in integers, and find the total, average in float
	5	**WEEK 5** **Objective**: Explore the full scope of different variants of "if construct" namely if-else, nullelse, if-else if-else, switch and nested-if including in what scenario each one of them can be used and how to use them. Explore all relational and logical operators while writing conditionals for "if construct" **Suggested Experiments/Activities:** **Tutorial 5:** Branching and logical expressions: **Lab 5:** Problems involving if-then-else structures. i) Write a C program to find the max and min of four numbers using if-else ii) Write a C program to generate electricity bill. iii) Find the roots of the quadratic equation. iv) write a C program to simulate a calculator using switch case. v) Write a C program to find the given year is a leap year or not

	6	**WEEK 6** **Objective:** Explore the full scope of iterative constructs namely while loop, do-while loop and for loop in addition to structured jump constructs like break and continue including when each of these statements is more appropriate to use. **Suggested Experiments/Activities.** **Tutorial 6**: Loops, while and for loops **Lab 6:** Iterative problems., the sum of series i) Find the factorial of given number using any loo ii) Find the given number is a prime or not. iii) Compute sine and cos series iv) Checking a number palindrome v) Construct a pyramid of numbers.
	7	**WEEK 7:** **Objective**: Explore the full scope of Arrays construct namely defining and initializing 1-D and 2-D and more generically n-D arrays and referencing individual array elements from the defined array. Using integer 1-D arrays, explore search solution linear search. **Suggested Experiments/Activities:** **Tutorial 7:** 1 D Arrays: searching **Lab 7**: 1D Array manipulation, linear search 1) Find the min and max of a 1-D integer array. i) Perform linear search on 1D array. ii) The reverse of a 1D integer array iii) Find 2's complement of the given binary number. iv) Eliminate duplicate elements in an array.
	8	**WEEK 8:** **Objective:** Explore the difference between other arrays and character arrays that can be used as Strings by using null character and get comfortable with string by doing experiments that will reverse a string and concatenate two strings. Explore sorting solution bubble sort using integer arrays **Suggested Experiments/Activities.** **Tutorial 8:** 2 D arrays, sorting and Strings. **Lab 8:** Matrix problems, String operations, Bubble sort i) Addition of two matrices ii) Multiplication two matrices iii) Sort array elements using bubble sort iv) Concatenate two strings without built-in functions v) Reverse a string using built-in and without built-in string functions
	9	**WEEK 9:** **Objective**: Explore pointers to manage a dynamic array of integers, including memory allocation &amp, value initialization, resizing changing and reordering the contents of an array and memory de-allocation using malloc (), calloc (), realloc () and free () functions. Gain experience processing command-line arguments received by C

		Suggested Experiments/Activities: **Tutorial 9:** Pointers, structures and dynamic memory allocation **Lab 9:** Pointers and structures, memory dereference. i) Write a C program to find the sum of a 1D array using malloc () ii) Write a C program to find the total, average of n students using structures iii) Enter n students data using calloc () and display failed students list iv) Read student name and marks from the command line and display the student details along with the total. v) Write a C program to implement realloc ()
	10	**WEEK 10:** **Objective:** Experiment with C Structures, Unions, bit fields and self-referential structures (Singly linked lists) and nested structures **Suggested Experiments/Activities:** **Tutorial 10:** Bitfields, Self-Referential Structures, Linked lists **Lab10:** Bitfields, linked lists Read and print a date using dd/mm/yyyy format using bit-fields and differentiate the same without using bit-fields i) Create and display a singly linked list using self-referential structure. ii) Demonstrate the differences between structures and unions using a C Program. iii) Write a C program to shift/rotate using bitfields. iv) Write a C program to copy one structure variable to another structure of the same type.
	11	**WEEK 11:** **Objective:** Explore the Functions, sub-routines, scope and extent of variables, doing some experiments by parameter passing using call by value. Basic methods of numerical integration **Suggested Experiments/Activities:** **Tutorial 11:** Functions, call by value, scope and extent, **Lab 11:** Simple functions using call by value, solving differential equations using Eulers theorem i) Write a C function to calculate NCR value ii) Write a C function to find the length of a string iii) Write a C function to transpose of a matrix. iv) Write a C function to demonstrate numerical integration of differential equations using Euler's method
	12	**WEEK 12:** **Objective:** Explore how recursive solutions can be programmed by writing recursive functions that can be invoked from the main by programming at least five distinct problems that have naturally recursive solutions **Suggested Experiments/Activities** **Tutorial 12:** Recursion, the structure of recursive calls **Lab 12:** Recursive functions i) Write a recursive function to generate Fibonacci series. ii) Write a recursive function to find the LCM of two numbers.

		iii) Wnte a recursive function to find the factorial of a number. iv) Write a C Program to implement Ackermann function using recursion. **v)** Wnte a recursive function to find the sum of series.
	13	**WEEK 13:** **Objective:** Explore the basic difference between normal and pointer variables, Arithmetic operations using pointers and passing variables to functions using pointers Suggested Experiments/Activities: **Tutorial 13:** Call by reference, dangling pointers **Lab 13:** Simple functions using Call by reference, Dangling pointers. i) Wnte a C program to swap two numbers using call by reference. ii) Demonstrate Dangling pointer problem using a C program. iii) Wnte a C program to copy one string into another using pointer. iv) Write a C program to find no of lowercase, uppercase, digits and other characters using pointers.
	14	**WEEK14:** **Objective**: To understand data files and file handling with various file I/O functions Explore the differences between text and binary files. **Suggested Experiments/Activities:** **Tutorial 14**: File handling Lab 14: File operations i) Write a C program to write and read text into a file. ii) Write a C program to write and read text into a binary file using fread () and fwrite (). iii) Copy the contents of one file to another file. iv) Write a C program to merge two files into the third file using command-line arguments. v) Find no of lines, words and characters in a file. vi) Write a C program to print last a character of a given file.
	Text Books	
	1	Ajay Mittal, Programming in C: A practical approach, Pearson.
	2	Byron Gottfried, Schaum' s Outline of Programming with C, McGraw Hill

CO-PO/PSO Mapping Matrix

	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
	C116.1									3	2					
	C116.2								2	3	2					
	C116.3	3	2		3					3						
	C116.4	3	2		3					3						
	Avg.	**3**	**2**		**3**				**2**	**3**	**2**					

KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY
(AUTONOMOUS)

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK Kakinada

Department of Electrical and Electronics Engineering

		L	T	P	Cr.
B. Tech. (II Sem.)	**IT WORKSHOP**				
	Course Code: R231209L (Common to ALL BRANCHES)	0	0	2	1

Pre-requisites: Basic computer knowledge

Course Objectives:

- To introduce the internal parts of a computer, peripherals, I/Oports, connecting cables
- To demonstrate configuring the system as Dualboot both Windows and other Operating Systems Viz. Linux, BOSS
- To teach basic command line interface commands on Linux.
- To teach the usage of Internet for productivity and self-paced life-long learning
- To introduce Compression, Multimedia and Antivirus tools and Office Tools such as Word processors, Spreadsheets and Presentation tools.

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

C117.1	:	Perform Hardware troubleshooting
C117.2	:	Understand Hardware components and their inter dependencies.
C117.3	:	Safeguard computer systems from viruses/worms.
C117.4		Document / Presentation preparation. Perform calculations using spreadsheets.

PC Hardware & Software Installation

Task 1: Identify the peripherals of a computer, components in a CPU and its functions. Draw the block diagram of the CPU along with the configuration of each peripheral and submit to your instructor.

Task2: Every student should disassemble and assemble the PC back to working condition. Lab instructors should verify the work and follow it up with a Viva. Also students need to go through the video which shows the process of assembling a PC. A video would be given as part of the course content.

Task 3: Every student should individually install MS windows on the personal computer. Lab instructor should verify the installation and follow it up with a Viva.

Task 4: Every student should install Linux on the computer. This computer should have windows installed. The system should be configured as dual boot (VMW are) with both Windows and Linux. Lab instructors should verify the installation and follow it up with a Viva

	Task5: Every student should install BOSS on the computer. The system should be configured as dual boot (VMW are) with both Windows and BOSS. Lab instructors should verify the installation and follow it up with a Viva
	Internet & World Wide Web **Task1:** Orientation & Connectivity Boot Camp: Students should get connected to their Local Area Network and access the Internet. In the process they configure the TCP/IP setting. Finally students should demonstrate, to the instructor, how to access the websites and email. If there is no internet connectivity preparations need to be made by the instructors to simulate the WWW on the LAN. **Task2:** Web Browsers, Surfing the Web: Students customize their web browsers with the LAN proxy settings, bookmarks, search toolbars and popup blockers. Also, plug-ins like Macromedia Flash and JRE for app lets should be configured. **Task3**: Search Engines & Netiquette: Students should know what search engines are and how to use the search engines. A few topics would be given to the students for which they need to search on Google. This should be demonstrated to the instructors by the student. **Task 4:** Cyber Hygiene: Students would be exposed to the various threats on the internet and would be asked to configure their computer to be safe on the internet. They need to customize their browsers to block pop ups, block active x downloads issues.
	La TeX and WORD **Task 1 –** Word Orientation: The mentor needs to give an overview of La TeX and Microsoft(MS) office or equivalent(FOSS) tool word: Importance of La TeX and MS office or equivalent(FOSS) tool Word as word Processors, Details of the four tasks and features that would be covered in each, Using La TeX and word Accessing, overview of tool bars, saving files, Using help and resources, rulers, format painter in word. **Task 2:** Using La TeX and Word to create a project certificate. Features to be covered:- Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time option in both La TeX and Word. **Task 3:** Creating project abstract Features to be covered:-Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes. **Task 4:** Creating a Newsletter: Features to be covered:- Table of Content, News paper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Text boxes, Paragraphs and Mail Merge in word.
	EXCEL

	Excel Orientation: The mentor needs to tell the importance of MSoffice or equivalent(FOSS) tool Excel as a Spreadsheet tool, give the details of the four tasks and features that would be covered in each. Using Excel–Accessing, overview of toolbars, saving excel files, Using help and resources. **Task 1:** Creating a Scheduler - Features to be covered: Gridlines, Format Cells, Summation, auto fill, Formatting Text **Task 2:** Calculating GPA -. Features to be covered:- Cell Referencing, Formulae in excel –average, std. deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function.	
	LOOKUP/VLOOKUP **Task 3**: Split cells, freeze panes, group and outline, Sorting, Boolean and logical operators, Conditional formatting	
	POWERPOINT **Task 1:** Students will be working on basic power point utilities and tools which help them create basic power point presentations. PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows in PowerPoint. **Task 2:** Interactive presentations - Hyperlinks, Inserting –Images, Clip Art, Audio, Video, Objects, Tables and Charts. **Task 3:** Master Layouts (slide, template, and notes), Types of views (basic, presentation, slideslotter, notes etc) and Inserting –Background, textures, Design Templates, Hidden slides.	
	AITOOLS – Chat GPT **Task 1:** Prompt Engineering: Experiment with different types of prompts to see how the model responds. Try asking questions, starting conversations or even providing in complete sentences to see how the model completes them. • Ex: Prompt: "You are a knowledgeable AI. Please answer the following question: What is the capital of France?" **Task 2:** Creative Writing: Use the model as a writing assistant. Provide the beginning of a story or a description of a scene, and let the model generate the rest of the content. This can be a fun way to brainstorm creative ideas • Ex: Prompt: "In a world where gravity suddenly stopped working, people started floating upwards. Write a story about how society adapted to this new reality." **Task 3:** Language Translation: Experiment with translation tasks by providing a sentence in one language and asking the model to translate it into another language. Compare the output to see how accurate and fluent the translations are. • Ex: Prompt: "Translate the following English sentence to French: 'Hello, how are you doing today?'"	
	Reference Books:	
	1.	Comdex Information Technology course toolkit, Vikas Gupta, WILEY Dreamtech,2003

	2.	The Complete Computer upgrade and repair book, Cheryl A Schmidt, WILEY Dream tech, 2013, 3rd edition
	3.	Introduction to Information Technology, ITL Education Solutions limited, Pearson Education, 2012, 2nd edition
	4.	PC Hardware- A Handbook, Kate J. Chase, PHI(Microsoft)
	5.	La TeX Companion, Leslie Lamport, PHI/Pearson
	6.	IT Essentials PC Hardware and Software Companion Guide, David Anfinson and KenQuamme.– CISCO Press, Pearson Education,3rd edition
	7.	IT Essentials PC Hardware and Software Labs and Study Guide, Patrick Regan– CISCO Press, Pearson Education,3rd edition

CO-PO/PSO Mapping Matrix

	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
	C117.1						3		2				2			
	C117.2						3		3				2			
	C117.3						3		3				3			
	C117.4						3		3				3			
	Avg.						**3**		**2.7**				**2.3**			

KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY (AUTONOMOUS)

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK Kakinada

Department of Electrical and Electronics Engineering

		L	T	P	Cr.
B. Tech. (II Sem.)	**NSS/NCC/SCOUTS&GUIDES/COMMUNITY SERVICE**				
	Course Code: R231210L (Common to ALL BRANCHES)	0	0	1	0.5

Pre-requisites: Basic English knowledge

Course Objectives:

- The objective of introducing this course is to impart discipline, character, fraternity, teamwork, social consciousness among the students and engaging them in selfless service.

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

C118.1	:	Understand the importance of discipline, character and service motto
C118.2	:	Determine to extend their help for the fellow beings and downtrodden people.
C118.3	:	Develop leadership skills and civic responsibilities.

UNIT I

Orientation:

General Orientation on NSS/ NCC/ Scouts & Guides/ Community Service activities, career guidance.

Activities:

i) Conducting–ice breaking sessions-expectations from the course-knowing personal talents and skills
ii) Conducting orientations programs for the students–future plans-activities-releasing road map etc.
iii) Displaying success stories –motivational bio-pics- award winning movies on societal issues etc.
iv) Conducting talent show in singing patriotic songs-paintings-any other contribution.

UNIT II

Nature & Care Activities:

i) Best out of waste competition.
ii) Poster and signs making competition to spread environmental awareness.

iii) Recycling and environmental pollution article writing competition.
iv) Organizing Zero-waste day.
v) DigitalEnvironmentalawarenessactivityviavarioussocialmediaplatforms.
vi) Virtual demonstration of different eco-friendly approaches for sustainable living.
vii) Write a summary on any book related to environmental issues.

Nature & Care Activities:

i) Best out of waste competition.
ii) Poster and signs making competition to spread environmental awareness.
iii) Recycling and environmental pollution article writing competition.
iv) Organizing Zero-waste day.
v) DigitalEnvironmentalawarenessactivityviavarioussocialmediaplatforms.
vi) Virtual demonstration of different eco-friendly approaches for sustainable living.
vii) Write a summary on any book related to environmental issues.

UNIT III

Community Service Activities:

Conducting One Day Special Campin a village contacting village –area leaders –Survey in the village, identification of problems- helping them to solve via media- authorities-experts-etc.

i) Conducting awareness programs on Health-related issues such as General Health, Mental health, Spiritual Health, HIV/AIDS,
ii) Conducting consumer Awareness. Explaining various legal provisions etc.
iii) Women Empowerment Programmes –Sexual Abuse, Adolescent Health and Population Education.
iv) Any other programmes in collaboration with local charities, NGOs etc.

Reference Books:

1.	Nirmalya Kumar Sinha & Surajit Majumder, A Text Book of National Service Scheme Vol; I, Vidya Kutir Publication, 2021 (ISBN978-81-952368-8-6)
2.	Red Book-National Cadet Corps–Standing Instructions Vol I &II, Directorate General of NCC, Ministry of Defence, New Delhi
3.	Davis M. L. and Cornwell D. A., "Introduction to Environmental Engineering", McGraw Hill, New York4/e 2008

CO-PO/PSO Mapping Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
C118.1						3		3				3			
C118.2						3		3				3			
C118.3						3		3				3			
Avg.						**3**		**3**				**3**			

KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY
(AUTONOMOUS)

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK Kakinada

Department of Electrical and Electronics Engineering

		L	T	P	Cr
B.Tech.(II Sem.)	**CHEMISTRY LABORATORY**				
	Course Code: R231213L (Common to EEE, ECE & CSE)	0	0	2	1

Pre-requisites: Knowledge of experimental Chemistry from +2Level.

Course Objectives:

- Verify the fundamental concepts with experiments.

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

C119.1	:	Compile the data, organize and analyze it for discussion and report the findings and observations from experimental learning activities in the laboratory
C119.2	:	Build holistic development and pleasing disposition by reviewing and correcting the performance to become independent and autonomous thinker
C119.3	:	Determine the strength of unknown solutions by using different types of volumetric titrations like acid base, redox and complexometric titrations.
C119.4	:	Apply the acquired knowledge of electro chemistry to conduct experiments like conductometric, potentiometric and P^H metric titrations.

List of Experiments
(Any ten experiments from the following list)

1	Measurement of 10Dq by spectro photometric method.
2	Conductometric titration of strong acid vs. strong base.
3	Conductometric titration of weak acid vs. strong base.
4	Potentiometry- determination of redox potentials and emfs.
5	Determination of cell constant and conductance of solutions.
6	Determination of Strength of an acid in Pb-Acid battery.

	7	Preparation of Bakelite
	8	Verify Lambert-Beer's law.
	9	Wavelength measurement of sample through UV-Visible Spectroscopy
	10	Identification of simple organic compounds by IR.
	11	Preparation of nano-materials by precipitation method.
	12	Estimation of Ferrous Iron by Dichrometry.
	13	Estimation of Sodium Hydroxide by using standard Hydrochloric acid.
	14	Estimation of amount of copper by using EDTA method.
	15	Estimation of strength of acetic acid by using pH meter (pH metry method)

Text Books

1	N.K Bhasin and Sudha Rani "Laboratory Manual on Engineering Chemistry" 3/e, Dhanpat Rai Publishing Company (2007).
2	Mendham J, Denney RC, Barnes JD, Thosmas M and Sivasankar B "Vogel's Quantitative Chemical Analysis" 6/e, Pearson publishers (2000).

Reference Books

1	Sudharani, "Lab manual on Engineering Chemistry" Dhanpat Rai Publications, Co., New Delhi. (2009).

E-RESOURCES:

1	https://vlab.amrita.edu/index.php?sub=2&brch=190

CO-PO/PSO Mapping Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
C119.1									3	2					
C119.2								2	3	2					
C119.3				3					3						
C119.4				3					3						
Avg.				**3**				**2**	**3**	**2**					

KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY
(AUTONOMOUS)

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK Kakinada

Department of Electrical and Electronics Engineering

			L	T	P	Cr.
B.Tech.(II Sem.)		**ELECTRICAL CIRCUITS LAB**				
		R231214L (EEE & allied branches)	0	0	3	1.5

Pre-requisites: Knowledge on electrical circuits.

Course Objectives:

- To impart hands on experience in verification of circuit laws and theorems, measurement of circuit parameters, study of circuit characteristics.
- It also gives practical exposure to the usage of different circuits with different conditions.

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

C120.1	:	Compile the data organize and analyze it for discussion and report the findings and observations from experimental learning activities in the laboratory.
C120.2	:	Build holistic development and pleasing disposition by reviewing and correcting the performance to become independent and autonomous thinker.
C120.3	:	Analyze various characteristics of electrical circuits with the help of fundamental laws.
C120.4	:	Apply various theorems to compare practical results obtained with theoretical calculations.

List of Experiments
(Any ten experiments from the following list)

1	Verification of Kirchhoff's circuit laws
2	Verification of node and mesh analysis.
3	Verification of network reduction techniques
4	Determination of cold and hot resistance of an electric lamp
5	Determination of Parameters of a choke coil.

	6	Determination of self, mutual inductances, and coefficient of coupling
	7	Series and parallel resonance
	8	Locus diagrams of R-L (L Variable) and R-C (C Variable) series circuits
	9	Verification of Superposition theorem.
	10	Verification of Thevenin's and Norton's Theorems
	11	Verification of Maximum power transfer theorem.
	12	Verification of Compensation theorem.
	13	Verification of Reciprocity and Millman's Theorems.

Reference Books

1. Engineering Circuits Analysis, Jack Kemmerly, William Hayt and Steven Durbin, Tata Mc Graw Hill Education, 2005, sixth edition.
2. Network Analysis, M. E. Van Valkenburg, Pearson Education, 2019, Revised Third Edition

CO-PO/PSO Mapping Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
C120.1									3	2					3
C120.2								2	3	2					3
C120.3				3					3						3
C120.4				3					3						3
Avg.				**3**				**2**	**3**	**2**					**3**

KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY (AUTONOMOUS)

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK Kakinada

Department of Electrical and Electronics Engineering

		L	T	P	Cr.
B.Tech. (III sem.)	**MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS**				
	Course Code: R232101 (Common to ECE, EEE, & ME)	2	0	0	2

Pre-requisites: Basic knowledge of economics and finance

Course Objectives:

- To inculcate the basic knowledge of micro economics and financial accounting
- To make the students learn how demand is estimated for different products, input- output relationship for optimizing production and cost
- To Know the Various types of market structure and pricing methods and strategy
- To give an overview on investment appraisal methods to promote the students to learn how to plan long-term investment decisions.
- To provide fundamental skills on accounting and to explain the process of preparing financial statements.

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

C201.1	:	Define the concepts related to Managerial Economics, financial accounting and management(L2)
C201.2	:	Understand the fundamentals of Economics viz., Demand, Production, cost, revenue and markets (L2).
C201.3	:	Apply the Concept of Production cost and revenues for effective Business decision (L3)
C201.4	:	Analyze how to invest their capital and maximize returns (L4), Evaluate the capital budgeting techniques. (L5)
C201.5	:	Develop the accounting statements and evaluate the financial performance of business entity (L5)

UNIT – I	**13**	**hrs**

Managerial Economics:

Introduction – Nature, meaning, significance, functions, and advantages. Demand - Concept, Function, Law of Demand - Demand Elasticity- Types – Measurement. Demand Forecasting- Factors governing Forecasting, Methods. Managerial Economics and Financial Accounting and Management.

	UNIT – II		**13**	**hrs**
	Production and Cost Analysis: Introduction–Nature, meaning, significance functions and advantages. Production Function–Least-cost combination–Short run and long run Production Function- Iso quant's and Is costs, Cost & Break-Even Analysis - Cost concepts and Cost behavior- Break-Even Analysis (BEA) - Determination of Break-Even Point (Simple Problems).			
	UNIT– III		**13**	**hrs**
	Business Organizations and Markets: Introduction– Forms of Business Organizations – Sole Proprietary- Partnership- JointStock Companies-Public Sector Enterprises. Types of Markets-Perfect and Imperfect Competition-Features of Perfect Competition Monopoly-Monopolistic Oligopoly-Price-Output Determination - Pricing Methods and Strategies			
	UNIT – IV		**12**	**hrs**
	Capital Budgeting: Introduction–Nature, meaning, significance. Types of Working Capital, Sources of Short-term and Long-term Capital, Estimating Working capital Components, requirements. Capital Budgeting–Features,Proposals, Methods and Evaluation. Projects–Pay Back Method, Accounting Rate of Return (ARR) Net Present Value (NPV) Internal Rate Return (IRR) Method (sample problems)			
	UNIT – V		**13**	**hrs**
	Financial Accounting and Analysis: Introduction – Concepts and Conventions- Double-Entry Bookkeeping, Journal, Ledger, Trial Balance- Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments). Introduction to Financial Analysis - Analysis and Interpretation of Liquidity Ratios, Activity Ratios, and Capital structure Ratios and Profitability.			
	Text Books			
	1	Varshney Maheswari: Managerial Economics, Sultan Chand.		
	2	Aryasri: Business Economics and Financial Analysis,4/e, MGH.		
	Reference Books			
	1	Ahuja Hl Managerial economics Sc hand.		
	2	S.A. Siddiqui and A.S. Siddiqui: Managerial Economics and Financial Analysis, New Age International.		
	3	Joseph G. Nellis and David Parker:Principles of BusinessEconomics,Pearson,2/e, New Delhi.		
	4	Domnick Salvatore: Managerial Economics in a Global Economy, Cengage.		
	e-resources	**If any**		
	1	https://nptel.ac.in/courses/110/105/110105075/		
	2	https://www.slideshare.net/123ps/managerial-economics-ppt		
	3	https://www.slideshare.net/rossanz/production-and-cost-45827016		
	4	https://www.slideshare.net/darkyla/business-organizations-19917607		
	5	https://www.slideshare.net/balarajbl/market-and-classification-of-market		

	6	https://www.slideshare.net/ruchi101/capital-budgeting-ppt-59565396
	7	https://www.slideshare.net/ashu1983/financial-accounting

CO-PO/PSO Mapping Matrix

	CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO2**	**PSO3**
	C201.1										2	3	2			
	C201.2										2	3	2			
	C201.3									2	2	3	3			
	C201.4										2	3	2			
	C201.5										2	3	1			
	Avg.									**2**	**2**	**3**	**2**			

KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY
(AUTONOMOUS)

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK Kakinada

Department of Electrical and Electronics Engineering

		L	T	P	Cr.
B.Tech. (III sem.)	**ANALOG CIRCUITS**				
	Course Code: R232110 (Common to ECE, EEE, & ME)	3	0	0	3

Pre-requisites: knowledge of electronic components and semiconductor devices, Analog system Amplifiers and oscillators ,555 timer Applications.

Course Objectives:

- To learn the fundamental differences between analog and digital signals.
- To acquire basic amplifier circuits using BJTs and MOSFETs.
- To know Applications Using 555 timers and PLL circuits
- To understand ADC s and DACs Applications

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

C202.1	:	Analyze diode clipping and clamping circuits, understand different types of biasing circuits of a Transistor.
C202.2	:	Use small signal modelling for transistor circuit analysis and illustrate the operation of feedback Amplifiers
C202.3	:	Understand operation of oscillators, operational Amplifier and Applications
C202.4	:	Use 555 timers in multivibrators, Schmitt trigger and PLL Applications
C202.5	:	Describe the operation of different ADCs and DACs

UNIT – I 13 hrs

Diode clipping and clamping circuits: Diode clippers, clipping at two independent levels, clamping circuit operation.

DC biasing of BJTs: Loadlines, Operating Point, Bias Stability, Collector-to-Base Bias, Self-Bias, Stabilization against Variations in V_{BE} and β for the Self-Bias Circuit.

UNIT – II 13 hrs

Small Signals Modelling of BJT: Analysis of a Transistor Amplifier Circuit using h-parameters, Simplified CE Hybrid Model, Analysis of CE, CC, CB Configuration using approximate Model.

Feedback Amplifiers: Classification of Amplifiers, the Feedback Concept, General Characteristics of Negative-Feedback Amplifiers, Effect of Negative Feedback up on Output and Input Resistances.

UNIT – III 13 hrs

Oscillator Circuits: Barkhausen Criterion of oscillation, Oscillator operation, R-C phase shift

oscillator, Wien bridge Oscillator, Crystal Oscillator.

Operational Amplifiers: Introduction, Basic information of Op-Amp, Ideal Operational Amplifier, Block Diagram Representation of Typical Op-Amp, OP-Amps Characteristics: Introduction, DC and AC characteristics, 741 op-amp & its features.

UNIT – IV 12 hrs

OP-AMPS Applications: Introduction, Basic Op-Amp Applications, Instrumentation Amplifier, AC Amplifier, V to I and I to V Converter, Sample and Hold Circuit, Log and Antilog Amplifier, Multiplier and Divider, Differentiator, integrator.

Comparators and Waveform Generators: Introduction, Comparator, Square Wave Generator, Mono stable Multivibrator.

UNIT – V 13 hrs

Timers and Phase Locked Loop: Introduction to 555 timer, functional diagram, Mono stable and A stable operations and applications, Schmitt Trigger, PLL block schematic, principles and description of individual blocks, 565 PLL.

Digital to Analog and Analog to Digital Converters: Introduction, basic DAC techniques, weighted resistor DAC, R-2R ladder DAC, inverted R-2R DAC, A-D Converters – parallel Comparator type ADC, counter type ADC, successive approximation ADC and dual slopeADC, DAC and ADC Specifications.

Text Books

1. Electronic Devices and Circuits-J. Millman, C. Halkias, TataMc-GrawHill,2nd Edition, 2010.
2. Linear Integrated Circuits – D. Roy Choudhury, New Age International (p) Ltd, 2nd Edition, 2003.

Reference Books

1. ElectronicDevicesandCircuitTheory–RobertL.BoylestadandLowisNashelsky, Pearson Edition, 2021.
2. Electronic Devices and Circuits–G. K. Mithal, Khanna Publisher,23rdEdition,2017.

CO-PO/PSO Mapping Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
C202.1		2													
C202.2	3	2													
C202.3	3	2													
C202.4		2													
C202.5	3	2													
Avg.	**3**	**2**													

KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY
(AUTONOMOUS)

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK Kakinada

Department of Electrical and Electronics Engineering

		L	T	P	Cr.
B.Tech. (III sem.)	**ELECTROMAGNETIC FIELD THEORY**				
	Course Code: R232111	3	0	0	3

Pre-requisites: Concepts of Differential Equations, Vector Calculus and Electrical Circuit Analysis.

Course Objectives:

- To study the production of electric field and potentials due to different configurations of static charges.
- To study the properties of conductors and dielectrics, calculate the capacitance of different configurations. Understand the concept of conduction and convection current densities.
- To study the magnetic fields produced by currents in different configurations, application of Ampere's law and the Maxwell's second and third equations.
- To study the magnetic force and torque through Lorentz force equation in magnetic field environment like conductors and other current loops.
- To develop the concept of self and mutual inductances and the energy stored.
- To study time varying and Maxwell's equations in different forms and Maxwell's fourth equation for the induced EMF.

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

C203.1	**:**	Determine electric fields and potentials using guass's law and solving various electric charge distributions.
C203.2	**:**	Determine capacitance and understanding the effect of Electric Dipole.
C203.3	**:**	Calculate the magnetic field intensity by using current, application of Ampere's law and the Maxwell's equations.
C203.4	**:**	Determine self, mutual inductances and the energy stored in the magnetic field.
C203.5	**:**	Explain time varying fields, displacement current and apply Poynting theorem.

UNIT – I **13 hrs**

Vector Analysis:

Vector Algebra: Scalars and Vectors, Unit vector, Vector addition and subtraction, Position and distance vectors, Vector multiplication, Components of a vector.

Coordinate Systems: Rectangular, Cylindrical and Spherical coordinate systems.

Vector Calculus: Differential length, Area and Volume. Del operator, Gradient of a scalar,

Divergence of a vector and Divergence theorem (definition only). Curl of a vector and Stoke's theorem (definition only), Laplacian of a scalar.

Electrostatics: Coulomb's law and Electric field intensity (EFI) – EFI due to Continuous charge distributions (line and surface charge), Electric flux density, Gauss's law (Maxwell's first equation, $\nabla . \bar{D} = \rho v$), Applications of Gauss's law, Electric Potential, Work done in moving a point charge in an electrostatic field (second Maxwell's equation for static electric fields, $\nabla \times \bar{E} = 0$), Potential gradient, Laplace's and Poison's equations.

UNIT – II		**13**	**hrs**

Conductors–Dielectrics and Capacitance:

Behavior of conductor in Electric field, Electric dipole and dipole moment –Potential and EFI due to an electric dipole, Torque on an Electric dipole placed in an electric field, Current density-conduction and convection current densities, Ohm's law in point form, Behaviour of conductors in an electric field,Polarization,dielectricconstantandstrength,Continuityequation and relaxation time, Boundary conditions between conductor to dielectric, dielectric to dielectric and conductor to free space, Capacitance of parallel plate, coaxial and spherical capacitors, Energys to red and density in a static electric field.

UNIT – III		**13**	**hrs**

Magneto statics, Ampere's Law and Force in magnetic fields:

Biot-Savart's law and its applications viz. Straight current carrying filament, circular, square, rectangle and solenoid current carrying wire – Magnetic flux density and Maxwell's second Equation($\nabla . \bar{B} = 0$), Ampere's circuital law and its applications viz. MFI due to an infinite sheet, long filament, solenoid, toroidal current carrying conductor, point form of Ampere's circuital law, Maxwell's third equation ($\nabla \times \bar{H} = \bar{J}$).

Magnetic force, moving charges in a magnetic field –Lorentz force equation, force on a current element in a magnetic field, force on a straight and along current carrying conductor in a magnetic field, force between two straight long and parallel current carrying conductors, Magnetic dipole, Magnetic torque, and moment.

UNIT – IV		**12**	**hrs**

Self and mutual inductance:

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

UNIT – V		**13**	**hrs**

Time Varying Fields:

Faraday's laws of electromagnetic induction, Maxwell's fourth equation($\nabla \times \bar{E} = -6\bar{B}$), 6tntegral and point forms of Maxwell's equations, statically and dynamically induced EMF, Displacement current, Modification of Maxwell's equations for time varying fields, Poynting theorem and Poynting vector.

Text Books

1	"Elements of Electro magnetics" by Matthew NO Sadiku, Oxford Publications, 7th edition, 2018.
2	"Engineering Electromagnetics" by William H. Hayt & John. A. Buck Mc. Graw-Hill,7th

		Editon.2006.
	Reference Books	
	1	"Introduction to Electro Dynamics" by D J Griffiths, Prentice-Hall of India Pvt. Ltd,2nd edition.
	2	"Electromagnetic Field Theory" by Yaduvir Singh, Pearson India,1st edition,2011.
	3	"Fundamentals of Engineering Electromagnetics" by Sunil Bhooshan, Oxford University Press,2012.
	4	Schaum's Outline of Electromagnetics by Joseph A. Edminister, Mahamood Navi,4thEdition,2014.

	e-resources	**If any**
	1	https://archive.nptel.ac.in/courses/108/106/108106073/
	2	https://nptel.ac.in/courses/117103065/

CO-PO/PSO Mapping Matrix

	CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO2**	**PSO3**
	C203.1	2	3											3		
	C203.2	2	3											3		
	C203.3	2	3											3		
	C203.4	2	3											3		
	C203.5	2	3											3		
	Avg.	**2**	**3**											**3**		

KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY
(AUTONOMOUS)

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK Kakinada

Department of Electrical and Electronics Engineering

			L	T	P	Cr.
B.Tech. (III sem.)		**ELECTRICAL CIRCUIT ANALYSIS-II**				
		Course Code: R232112	3	0	0	3

Pre-requisites: Analysis of DC and Single-phase AC Circuits, Concepts of differentiation and integration.

Course Objectives:

- To understand three phase circuits
- To analyze transients in electrical systems
- To evaluate network parameters of given electrical network
- To apply Fourier analysis to electrical systems
- To understand graph theory for circuit analysis and to understand the behavior of filters

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

C204.1	:	Understand the balanced and unbalanced 3phase circuits for power calculations.
C204.2	:	Apply the transient behavior of electrical networks in different domains.
C204.3	:	Estimate various Network parameters.
C204.4	:	Apply the concept of Fourier series to electrical systems.
C204.5	:	Analyze the filter circuit for electrical circuits.

UNIT – I 13 hrs

Analysis of Three Phase Balanced Circuits:
Phase Sequence, Star and Delta Connection of Sources and Loads, Relation Between Line and Phase Quantities, Analysis of Balanced Three Phase Circuits, Measurement of Active and Reactive Power.

Analysis of Three Phase Unbalanced Circuits:
Loop method, Star-Delta transformation technique, two-wattmeter method for measurement of three phase power.

UNIT – II 13 hrs

Laplace transforms– Definition and Laplace transforms of standard functions–Shifting theorem– Transforms of derivatives and integrals, Inverse Laplace transforms and applications.

Transient Analysis: Transient response of R-L, R-C and R-L-C circuits (Series and parallel combinations) for D.C. and sinusoidal excitations– Initial conditions -Solution using differential equation approach and Laplace transform approach.

UNIT – III 13 hrs

	Network Parameters: Impedance parameters, Admittance parameters, Hybrid parameters, Transmission (ABCD) parameters, conversion of Parameters from one form to other, Conditions for Reciprocity and Symmetry, Interconnection of Two Port networks in Series, Parallel and Cascaded configurations-problems			
	UNIT – IV		12	hrs
	Analysis of Electric Circuits with Periodic Excitation: Fourier series and evaluation of Fourier coefficients, Trigonometric and complex Fourier series for periodic waveforms, Application to Electrical Systems– Effective value and average value of non-sinusoidal periodic waveforms, power factor, effect of harmonics			
	UNIT – V		13	hrs
	Filters: Classification of filters-Low pass, High pass, Band pass and Band Elimination filters, Constant-k filters-Low pass and High Pass, Design of Filters.			

	Text Books	
	1	Engineering Circuit Analysis, William Hayt and Jack E. Kemmerly, 8th EditionMcGraw-Hill,2013
	2	"Fundamentals of Electric Circuits, Charles K. Alexander, Mathew N. O. Sadiku,3rd Edition, Tata McGraw-Hill,2019
	Reference Books	
	1	"Network Analysis, M.E. VanValkenburg,3rd Edition, PHI,2019.
	2	Network Theory, N.C. JaganandC.Lakshminarayana,1stEdition, B. S. Publications,2012.
	3	Circuits and Networks Analysis and Synthesis, A. Sudhakar, Shyam Mohan S. Palli,5th Edition, Tata McGraw-Hill,2017.
	4	Engineering Network Analysis and Filter Design (Including Synthesis of One Port Networks)-Durgesh C. Kulshreshtha Gopal G. Bhise, Prem R. Chadha, UmeshPublications2012.
	5	Circuit Theory: Analysis and Synthesis, A. Chakrabarti, Dhanpat Rai & Co., 2018, 7th Revised Edition.

	e-resources	If any
	1	https://archive.nptel.ac.in/courses/117/106/117106108/
	2	https://archive.nptel.ac.in/courses/108/105/108105159/

CO-PO/PSO Mapping Matrix

	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
	C204.1	2	3											3		
	C204.2	2	3											3		
	C204.3	2	3											3		
	C204.4	2	3											3		
	C204.5	2	3											3		
	Avg.	**2**	**3**											**3**		

KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY
(AUTONOMOUS)

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK Kakinada

Department of Electrical and Electronics Engineering

		L	T	P	Cr.
B.Tech.(III Sem.)	**DC MACHINES & TRANSFORMERS**				
	Course Code: R232113	3	0	0	3

Pre-requisites: Principles of Electro mechanical Energy Conversion, Electromagnetic fields and Electrical Circuit Analysis.

Course Objectives: Students will get exposure to

- Understand the characteristics and applications of DC Machines.
- Develop problem solving skills about the starting, speed control and testing of DC Machines.
- Understand the concepts of efficiency and regulation of a transformer by obtaining equivalent circuit.
- Analyze the performance of single-phase transformers and to understand the connection diagrams of three-phase transformers.

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

C205. 1	:	Understand the process of voltage build-up in DC generators and characteristics.
C205.2	:	Understand the process of torque production, starting and speed control of DC motors and illustrate their characteristics.
C205.3	:	Obtain the equivalent circuit of single-phase transformer and determine its efficiency & regulation.
C205.4	:	Apply various tests of single-phase transformers to obtain performance.
C205.5	:	Understand various configurations of three-phase transformers.

UNIT – I		13	hrs

DC Generators:
Construction and principle of operation of DC machines– EMF equation for generator– Excitation techniques–characteristics of DC generators–applications of DC Generators, Back-e.m.f and torque equations of DC motor–Armature reaction and commutation.

UNIT – II		13	Hrs

Starting, Speed Control and Testing of DC Machines:
Characteristics of DC motors– losses and efficiency–applications of DC motors. Necessity of a starter – starting by 3-point and 4-point starters – speed control by armature voltage and field current control – testing of DC machines – brake test, Swinburne's test –Hopkinson's test–Field Test.

UNIT – III		13	hrs

Single-phase Transformers:

Introduction to single-phase Transformers (Construction and principle of operation)–emf equation–operation on no-load and on load–lagging, leading and unity power factors loads–phasor diagrams–equivalent circuit–regulation –losses and efficiency –effect of variation of frequency and supply voltage on losses–all-day efficiency.

UNIT – IV		12	hrs

Testing of Transformers:

Open Circuit and Short Circuit tests– Sumpner's test– separation of losses—Parallel operation with equal and unequal voltage ratios–auto transformer–equivalent circuit–comparison with two winding transformers.

UNIT – V		13	hrs

Three-Phase Transformers:

Poly phase connections- Y/Y, Y/Δ, Δ/Y, Δ/Δ, open Δ and Vector groups – third harmonics in phase voltages– Parallel operation–three winding transformers-transients in switching –off load and on load tap changers–Scott connection.

Text Books

1	ElectricalMachinerybyDr.PSBimbhra,7th edition, Khanna Publishers, NewDelhi,1995.
2	Performance and analysis of AC machines by M. G. Say, CBS, 2002.

Reference Books

1	Electrical Machines by D. P. Kothari, I. J. Nagarth, Mc Graw Hill Publications, 5thedition
2	Electrical Machinery Fundamentals by Stephen JC hapman Mc Graw Hill education2011.
3	Generalized Theory of Electrical Machines by Dr. P S Bimbhra, 7th Edition, Khanna Publishers, 2021.
4	Theory & Performance of Electrical Machines by J. B. Gupta, S. K. Kataria & Sons,2007.

e-resources	If any
1	nptel.ac.in/courses/108/105/108105112
2	nptel.ac.in/courses/108/105/108105155

CO-PO/PSO Mapping Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3.
C205.1	2	3											3		
C205.2	2	3											3		
C205.3	2	3											3		
C205.4	2	3											3		
C205.5	2	3											3		
Avg.	**2**	**3**											**3**		

KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY
(AUTONOMOUS)

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK Kakinada

Department of Electrical and Electronics Engineering

		L	T	P	Cr.
B. Tech. (III Sem.)	**ELECTRICAL CIRCUIT ANALYSIS-II AND SIMULATION LAB**				
	Course Code: R232114L	0	0	3	1.5

Pre-requisites: Basic electric circuit knowledge.

Course Objectives:

- To measure three phase Active and Reactive power
- To analyze transient behavior of circuits
- To determine 2-port network parameters
- To analyze electrical circuits using simulation tools

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

C206.1	:	Compile the data, Organize and analyze it for discussion and report the findings and observations form experimental learning activities in the laboratory
C206.2	:	Build holistic development and pleasing disposition by reviewing and correcting the performance to become independent and autonomous thinker
C206.3	:	Understand the power calculations in three phase circuits, time response of given network and evaluate two port network parameters.
C206.4	:	Simulate and draw the responses of different electrical and power electronic converters using PSPICE software.

List of Experiments

Any 10 of the following experiments are to be conducted:

1	Measurement of Active Power and Reactive Power for balanced loads.
2	Measurement of Active Power and Reactive Power for unbalanced loads
3	Determination of Z and Y parameters.
4	Determination of ABCD and hybrid parameters
5	Verification of Kirchhoff's current law and voltage law using simulation tools.
6	Verification of mesh and nodal analysis using simulation tools.
7	Verification of super position and maximum power transfer theorems using simulation tools.
8	Verification of Reciprocity and Compensation theorems using simulation tools.
9	Verification of Thevenin's and Norton's theorems using simulation tools.
10	Verification of series and parallel resonance using simulation tools.

	11	Simulation and analysis of transient response of RL, RC, and RLC circuits
	12	Verification of self inductance and mutual inductance by using simulation tools

References

	1	"Network Analysis, M. E. VanValkenburg, 3rd Edition, PHI, 2019.
	2	Network Theory, N. C. Jagan and C. Lakshminarayana,1st Edition, B. S. Publications, 2012.

CO-PO/PSO Mapping Matrix

	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
	C206.1									3	2					3
	C206.2								2	3	2					3
	C206.3	2			3					3						3
	C206.4	2			3					3						3
	Avg.	**2**			**3**				**2**	**3**	**2**					**3**

KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY
(AUTONOMOUS)

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK Kakinada

Department of Electrical and Electronics Engineering

		L	T	P	Cr.
B. Tech. (III Sem.)	**DC MACHINES & TRANSFORMERS LAB**				
	Course Code: R232115L	0	0	3	1.5

Pre-requisites:

Course Objectives:

- To conduct the experiment and plot the characteristics and applications of DC machines.
- To perform the starting, speed control and testing methods of DC Machines.
- To determine/Predetermine efficiency and regulation of the transformer through equivalent circuit.

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

C207.1	:	Compile the data, Organize and analyze it for discussion and report the findings and observations form experimental learning activities in the laboratory
C207.2		Build holistic development and pleasing disposition by reviewing and correcting the performance to become independent and autonomous thinker
C207.3	:	Demonstrate starting and speed control methods of DC Machines.
C207.4	:	Determine the performance characteristics of DC machines and single-phase transformer

List of Experiments

Any10ofthefollowingexperimentsaretobeconducted:

1	Speed control of DC shunt motor by Field Current and Armature Voltage Control.
2	Brake test on DC shunt motor- Determination of performance curves
3	Swinburne'stest-PredeterminationofefficienciesasDCGeneratorandMotor
4	Hopkinson's test on DC shunt Machines.
5	Load test on DC compound generator- Determination of characteristics
6	Load test on DC shunt generator-Determination of characteristics
7	Fields test on DC series machines- Determination of efficiency
8	Brake test on DC compound motor-Determination of performance curves
9	OC&SC tests on single phase transformer
10	Sumpner's test on single phase transformer
11	Scott connection of transformers.
12	Parallel operation of Single-phase Transformers
13	Separation of core losses of a single-phase transformer

	Reference Books:	
	1	Electrical Machines by D. P. Kothari, I. J. Nagarth, Mc Graw Hill Publications, 5thedition
	2	Electrical Machinery Fundamentals by Stephen J Chapman McGraw Hill education2011.

CO-PO/PSO Mapping Matrix

	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
	C207.1									3	2					3
	C207.2								2	3	2					3
	C207.3	2			3					3						3
	C207.4	2			3					3						3
	Avg.	**2**			**3**				**2**	**3**	**2**					**3**

KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY
(AUTONOMOUS)

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK Kakinada

Department of Electrical and Electronics Engineering

		L	T	P	Cr.
B.Tech. (III_ Sem.)	**PYTHON PROGRAMMING LAB**				
	Course Code: 232108 (Common to CSE, IT, CSE-AIML, EEE)	0	1	2	2

Pre-requisites: Basic Mathematics Knowledge

Course Objectives:

- To acquire knowledge of Programming in core Python.
- To acquire understanding on Object Oriented programming in Python.
- To develop the ability of designing Graphical User Interface in Python.
- To develop ability to write Python programs for various data structures.
- To learn the concepts of Exception handling and File Input and Output.

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

C208.1	Compile the data, organize and analyze it for discussion and report the findings and observations from experimental learning activities in the laboratory.
C208.2	Build holistic development and pleasing disposition by reviewing and correcting the performance to become independent and autonomous thinker.
C208.3	Build various python programs using data structures, loops and operators of python
C208.4	Develop python programs by using File I/O and OOPs concepts.

List of Experiments

(Any of the 10 experiments are required to be conducted)

1	a) Running instructions in Interactive interpreter and a Python Script b) Write a program to purposefully raise Indentation Error and Correct it
2	a) Write a program to compute distance between two points taking input from the user (Pythagorean Theorem) b) Write a program add.py that takes 2 numbers as command line arguments and prints its sum.
3	a) Write a Program for checking whether the given number is a even number or not. b) Using a for loop, write a program that prints out the decimal equivalents of 1/2, 1/3, 1/4, . . . , 1/10

		c) Write a program using a for loop that loops over a sequence. What is sequence ? d) Write a program using a while loop that asks the user for a number, and prints a countdown from that number to zero.
	4	a) Find the sum of all the primes below two million. b) Each new term in the Fibonacci sequence is generated by adding the previous two terms. By starting with 1 and 2, the first 10 terms will be: c) 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, ... d) By considering the terms in the Fibonacci sequence whose values do not exceed four million, find the sum of the even-valued terms.
	5	a) Write a program to count the numbers of characters in the string and store them in a dictionary data structure b) Write a program to use split and join methods in the string and trace a birthday with a dictionary data structure.
	6	a) Write a program combine lists that combines these lists into a dictionary. b) Write a program to count frequency of characters in a given file. Can you use character frequency to tell whether the given file is a Python program file, C program file or a text file?
	7	a) Write a program to print each line of a file in reverse order. b) Write a program to compute the number of characters, words and lines in a file.
	8	a) Write a function ball collide that takes two balls as parameters and computes if they are colliding. Your function should return a Boolean representing whether or not the balls are colliding. Hint: Represent a ball on a plane as a tuple of (x, y, r), r being the radius If (distance between two balls centers) <= (sum of their radii) then (they are colliding) b) Find mean, median, mode for the given set of numbers in a list.
	9	a) Write a function nearly_equal to test whether two strings are nearly equal. Two strings a and b are nearly equal when a can be generated by a single mutation on b. b) Write a function dups to find all duplicates in the list. c) Write a function unique to find all the unique elements of a list.
	10	a) Write a function cumulative_product to compute cumulative product of a list of numbers. b) Write a function reverse to reverse a list. Without using the reverse function. c) Write function to compute gcd, lcm of two numbers. Each function shouldn't exceed one line.
	11	a) Write a program that defines a matrix and prints b) Write a program to perform addition of two square matrices

		c) Write a program to perform multiplication of two square matrices
	12	a) Install packages requests, flask and explore them. using (pip). b) Write a script that imports requests and fetch content from the page. Eg. (Wiki) c) Write a simple script that serves a simple HTTP Response and a simple HTML Page
	13	a) Class variables and instance variable and illustration of the self variable i) Robot ii) ATM Machine
	14	a) Write a GUI for an Expression Calculator using tk b) Write a program to implement the following figures using turtle
	15	a) Write a test-case to check the function even numbers which return True on passing a list of all even numbers b) Write a test-case to check the function reverse string which returns the reversed string
	16	a) Build any one classical data structure. b) Write a program to solve knapsack problem.
	Reference Books:	
	1	Fundamentals of Python First Programs, 3rd Edition Kenneth. A. Lambert, Cengage
	2	Python Programming: A Modern Approach, Vamsi Kurama, Pearson 2018

CO-PO/PSO Mapping Matrix

	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
	C208.1									3	2					
	C208.2								2	3	2					
	C208.3				3					3						
	C208.4				3					3						
	Avg.				**3**				**2**	**3**	**2**					

KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY
(AUTONOMOUS)

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK Kakinada

Department of Electrical and Electronics Engineering

			L	T	P	Cr.
B.Tech. (III_ Sem.)		**ENVIRONMENTAL SCIENCE**				
		Course Code: 232109 (Common to CSE, AIML, IT & EEE)	2	0	0	0

Pre-requisites: Basic Knowledge in Environment and protection.

Course Objectives:

- Overall understanding of the natural resources
- Basic understanding of the ecosystem and its diversity.
- Acquaintance on various environmental challenges induced due to unplanned anthropogenic activities
- An understanding of the environmental impact of developmental activities.
- Awareness on the social issues, environmental legislation and global treaties.

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

C209.1	:	Describe the scope, importance of sustainability, structure and function of Eco system.
C209.2	:	Explain the importance of Natural Resources for the sustenance of life and conservation of Natural resources.
C209.3	:	Describe how biodiversity is in extinction in India and the need of conservation practices
C209.4	:	Illustrate the adverse effects of pollution and remedial solutions
C209.5	:	Analyze issues both in rural and urban environment and assess the possible steps to be taken to combat the challenges

UNIT – I		10	hrs

Multidisciplinary nature of Environmental Studies:

Definition, Scope and Importance –Sustainability: Stockholm and Rio Summit–Global Environmental Challenges: Global warming and climate change, acid rains, ozone layer depletion, population growth and explosion, effects. Role of information technology in environment and human health. Ecosystems: Concept of an ecosystem. -Structure and function of an ecosystem; Producers, consumers and decomposers. -Energy flow in the ecosystem -Ecological succession. -Food chains, food webs and ecological pyramids; Introduction, types, characteristic features, structure and function of Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic

	ecosystems.			
	UNIT – II		10	hrs
	Natural resources and associated problems: Forest resources: Use and over –exploitation, deforestation –Timber extraction –Mining, dams and other effects on forest and tribal people. Water resources: Use and over utilization of surface and ground water –Floods, drought, conflicts over water, dams –benefits and problems. Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources. Food resources: World food problems, changes caused by non-agriculture activities-effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity. Energy resources: Growing energy needs, renewable and non-renewable energy sources use of alternate energy sources. Land resources: Land as a resource, land degradation, Wasteland reclamation, man induced landslides, soil erosion and desertification; Role of an individual in conservation of natural resources; Equitable use of resources for sustainable lifestyles.			
	UNIT – III		10	hrs
	Biodiversity and its conservation: Definition: genetic, species and ecosystem diversity-classification -Value of biodiversity: consumptive use, productive use, social-Biodiversity at national and local levels. India as mega-diversity nation -Hot-sports of biodiversity -Threats to biodiversity: habitat loss, man-wildlife conflicts. -Endangered and endemic species of India –Conservation of biodiversity: conservation of biodiversity.			
	UNIT – IV		10	hrs
	Environmental Pollution: Definition, Cause, effects and control measures of Air pollution, Water pollution, Soil pollution, Noise pollution, Nuclear hazards. Role of an individual in prevention of pollution. -Pollution case studies, Sustainable Life Studies. Impact of Fire Crackers on Men and his well being. Solid Waste Management: Sources, Classification, effects and control measures of urban and industrial solid wastes. Consumerism and waste products, Biomedical, Hazardous and e –waste management.			
	UNIT – V		10	hrs
	Social Issues and the Environment: Urban problems related to energy -Water conservation, rain water harvesting-Resettlement and rehabilitation of people; its problems and concerns. Environmental ethics: Issues and possible solutions. Environmental Protection Act -Air (Prevention and Control of Pollution) Act. –Water (Prevention and control of Pollution) Act -Wildlife Protection Act -Forest Conservation Act-Issues involved in enforcement of environmental legislation. -Public awareness. Environmental Management: Impact Assessment and its significance various stages of EIA, preparation of EMP and EIS, Environmental audit. Ecotourism, Green Campus –Green business and Green politics. The student should Visit an Industry / Ecosystem and submit a report individually on any issues related to Environmental Studies course and make a power point presentation.			
	Text Books			
	1	Environmental studies by Anubha Kaushik and C.P.Kaushik.		
	2	Environmental Studies by P.N. Palanisamy, P. Manikandan, A. Geetha, and K. Manjula Rani;		

		Pearson Education,Chennai
	Reference Books	
	1	Text Book of Environmental Studies by Deeshita Dave & P. UdayaBhaskar, Cengage learning.
	2	Glimpses of Environment by K.V.S.G. Murali Krishna Published by Environmental Protection Society, Kakinada, A.P.

CO-PO/PSO Mapping Matrix

	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
	C209.1	3					2	3	2							
	C209.2	3					2	3	2							
	C209.3	3					2	3	2							
	C209.4	3					2	3	2							
	C209.5	3					2	3	2							
	Avg.	**3**					**2**	**3**	**2**							

KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY
(AUTONOMOUS)

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK Kakinada

Department of Electrical and Electronics Engineering

		L	T	P	Cr.
B.Tech. (IV Sem.)	**COMPLEX VARIABLES AND NUMERICAL METHODS**				
	Course Code: R232211	3	0	0	3

Pre-requisites: Basic knowledge in Mathematics.

Course Objectives:

- To elucidate the different numerical methods to solve nonlinear algebraic equations
- To disseminate the use of different numerical techniques for carrying out numerical integration.
- To familiarize the complex variables.
- To equip the students to solve application problems in their disciplines.

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

C210.1	:	Apply numerical methods to find the solution of equations and interpolate the polynomials.
C210.2	:	Apply numerical methods to find the solution to initial value problems and integrations.
C210.3	:	Find the continuity, analyticity of functions of complex variables and different types of complex integrals.
C210.4	:	Evaluate the Taylor's and Laurent series expansions, residues for complex functions.
C210.5	:	Explain the properties of various types of conformal mappings.

UNIT – I		10	hrs

Iterative Methods:

Introduction – Solutions of algebraic and transcendental equations: Bisection method – Secant method – Method of false position – General Iteration method – Newton-Raphson method (Simultaneous Equations)

Interpolation: Newton's forward and backward formulae for interpolation – with unequal intervals – Lagrange's interpolation formula

UNIT – II		10	hrs

Numerical integration, Solution of ordinary differential equations with initial conditions:

Trapezoidal rule– Simpson's $1/3^{rd}$ and $3/8^{th}$ rule– Solution of initial value problems by Taylor's series– Picard's method of successive approximations– Euler's method –Runge- Kutta method (second and fourth order) – Milne's Predictor and Corrector Method.

	UNIT – III		10	hrs
	Functions of a complex variable and Complex integration: Introduction – Continuity – Differentiability – Analyticity –Cauchy-Riemann equations in Cartesian and polar coordinates – Harmonic and conjugate harmonic functions – Milne – Thompson method. Complex integration: Line integral – Cauchy's integral theorem – Cauchy's integral formula – Generalized integral formula (all without proofs) and problems on above theorems.			
	UNIT – IV		10	hrs
	Series expansions and Residue Theorem: Radius of convergence – Expansion of function in Taylor's series, Maclaurin's series and Laurent series. Types of Singularities: Isolated – Essential singularities –Pole of order m– Residues – Residue theorem (without proof) – Evaluation of real integral of the types $\int_{-\infty}^{\infty} f(x)dx$ and $\int_{c}^{c+2\pi} f(\cos\theta, \sin\theta)d\theta$			
	UNIT – V		10	hrs
	Conformal mapping: Transformation by $e^z, \log z, z^2, z^n (n$ is positive integer), $\sin z, \cos z, z + a/z$ Translation, rotation, inversion and bilinear transformation – fixed point – cross ratio –properties –invariance of circles and cross ratio –determination of bilinear transformation mapping 3 given points.			
	Text Books			
	1	**B. S. Grewal,** Higher Engineering Mathematics,44thEdition, Khanna Publishers.		
	2	**S S Sastry**, Introductory Methods of Numerical Analysis, PHI Learning Private Limited.		
	Reference Books			
	1	Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 2018, 10th Edition.		
	2	B. V. Ramana, Higher Engineering Mathematics, by McGraw Hill publishers		
	3	R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, Alpha Science International Ltd.,2021 5th Edition (9th reprint)		
	E-RESOURCES:			
	1	https://swayam.gov.in/nd1_noc19_ma21/preview		
	2	https://onlinecourses.nptel.ac.in/noc20_ge20/preview		
	3	https://archive.nptel.ac.in/courses/111/103/111103070		
	4	https://onlinecourses.nptel.ac.in/noc20_ma50/preview		

CO-PO/PSO Mapping Matrix																
	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
	C210.1	3	2													
	C210.2	3	2													
	C210.3	3	2													
	C210.4	3	2													
	C210.5	3	2													
	Avg.	**3**	**2**													

KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY (AUTONOMOUS)

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK Kakinada

Department of Electrical and Electronics Engineering

		L	T	P	Cr.
B. Tech (IV Sem)	**UNIVERSAL HUMAN VALUES-UNDERSTANDING HARMONY & ETHICAL HUMAN CONDUCT**				
	Course Code: R232202 (Common to ECE, EEE, ME, CE, CSE (AIDS, DS)	2	1	0	3

Pre-requisites:

Course Objectives:

- To help the students appreciate the essential complementary between 'VALUES' and 'SKILLS'toensuresustainedhappinessandprosperitywhicharethecoreaspirations of all human beings.
- TofacilitatethedevelopmentofaHolisticperspectiveamongstudentstowardslife and profession as well as towards happiness and prosperity based on a correct understandingoftheHumanrealityandtherestofexistence.Suchholistic perspectiveformsthebasisofUniversalHumanValuesandmovementtowards value-based living in a natural way.
- TohighlightplausibleimplicationsofsuchaHolisticunderstandingintermsof ethical human conduct, trustful and mutually fulfilling human behavior and mutually enriching interaction with Nature.

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

C211.1	:	Define the terms like Natural Acceptance, Happiness and Prosperity
C211.2	:	Identify one's self, and one's surroundings (family, society nature)
C211.3	:	Applywhattheyhavelearnttotheirownselfindifferentday-to-daysettingsin real life
C211.4	:	Relate human values with human relationship and human society.
C211.5	:	Justify the need for universal human values and harmonious existence.

UNIT – I		10	hrs

Introduction to Value Education (6lecturesand3tutorialsforpractice session)

Lecture1: Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education)

Lecture2: Understanding Value Education

Tutorial 1: Practice Session PS1 Sharing about One self

Tutorial 2: Practice Session PS2 Exploring Human Consciousness

	Tutorial 3: Practice Session PS3 Exploring Natural Acceptance Lecture 3: self-exploration as the Process for Value Education Lecture4: Continuous Happiness and Prosperity–the Basic Human Aspirations Lecture5: Happiness and Prosperity– Current Scenario Lecture 6: Method to Fulfill the Basic Human Aspirations			
	UNIT – II		10	hrs
	Harmony in the Human Being (6 lectures and 3 tutorials for practice session. Lecture7: Understanding Human being as the Co-existence of the self and the body. Lecture8: Distinguishing between the Needs of the self and the body Tutorial 4: Practice Session PS4 Exploring the difference of Needs of self and body Lecture 9: The body as an Instrument of the self Lecture 10: Understanding Harmony in the self Tutorial 5: Practice Session PS5 Exploring Sources of Imagination in the self Lecture 11: Harmony of the self with the body Lecture12: Programme to ensure self-regulation and Health Tutorial6: Practice Session PS6 Exploring Harmony of self with the body.			
	UNIT – III		10	hrs
	Harmony in the Family and Society (6lecturesand3tutorialsforpractice session) Lecture 13: Harmony in the Family – the Basic Unit of Human Interaction Lecture 14: 'Trust' – the Foundational Value in Relationship Tutorial 7: Practice Session PS7 Exploring the Feeling of Trust Lecture 15: 'Respect' – as the Right Evaluation Tutorial 8: Practice Session PS8 Exploring the Feeling of Respect Lecture 16: Other Feelings, Justice in Human-to-Human Relationship Lecture 17: Understanding Harmony in the Society Lecture18: Vision for the Universal Human Order Tutorial9:PracticeSessionPS9ExploringSystemstofulfilHumanGoal			
	UNIT – IV		08	hrs
	Harmony in the Nature/Existence (4lecturesand2tutorialsforpractice session) Lecture19: Understanding Harmony in the Nature Lecture 20: Interconnectedness, self-regulation and Mutual Fulfillment among the Four Orders of Nature Tutorial 10: Practice Session PS10 Exploring the Four Orders of Nature Lecture 21: Realizing Existence as Co-existence at All Levels Lecture22: The Holistic Perception of Harmony in Existence Tutorial11:PracticeSessionPS11ExploringCo-existenceinExistence.			
		UNIT – V	08	hrs
	Implications of the Holistic Understanding –a Look at Professional Ethics (6 lectures and 3 tutorials for practice session) Lecture 23: Natural Acceptance of Human Values Lecture 24: Definitiveness of (Ethical) Human Conduct			

		Tutorial12:PracticeSessionPS12ExploringEthicalHumanConduct Lecture25: A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order Lecture26: Competence in Professional Ethics Tutorial 13: Practice Session PS13 Exploring Humanistic Models in Education Lecture 27: Holistic Technologies, Production Systems and Management Models-Typical Case Studies Lecture 28: Strategies for Transition towards Value-based Life and Profession Tutorial14:PracticeSessionPS14ExploringStepsofTransitiontowardsUniversal Human Order
	Text Books	
	1	The Text book RR Gaur, R Asthana, GP Bagaria, *A Foundation Course in Human Values and Professional Ethics*, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1
	2	The Teacher's Manual R R Gaur, R Asthana, G P Bagaria, *Teachers' Manual for A Foundation Course in Human Values and Professional Ethics,* 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN978-93-87034-53-2
	Reference Books	
	1.	*Jeevan Vidya: E k Parichaya,* A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999
	2.	*Human Values*, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004. *The Story of Stuff* (Book)
	3.	*The Story of My Experiments with Truth*-by Mohandas Karamchand Gandhi
	4.	*Small is Beautiful*-E. F Schumacher
	e-resources	
	1.	https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%201-Introduction%20to%20Value%20Education.pdf
	2.	https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%202-Harmony%20in%20the%20Human%20Being.pdf
	3.	https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%203-Harmony%20in%20the%20Family.pdf

CO-PO/PSO Mapping Matrix																
	CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO2**	**PSO3**
	C211.1							2	3	2			2			
	C211.2							2	3	2			2			
	C211.3							2	3	2			2			
	C211.4							2	3	2			2			
	C211.5							2	3	2			2			
	Avg.							**2**	**3**	**2**			**2**			

KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY
(AUTONOMOUS)

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK Kakinada

Department of Electrical and Electronics Engineering

		L	T	P	Cr
B.Tech. (IV Sem.)	**POWER SYSTEMS – I**				
	Course Code: R232212	3	0	0	3

Pre-requisites: Electrical Circuit Analysis.

Course Objectives:

- To study the principle of operation of different components of a thermal power stations.
- To study the principle of operation of different components of a Nuclear power stations.
- To study the constructional and operation of different components of an Air and Gas Insulated substations.
- To study the constructional details of different types of cables.
- To study different types of load curves and tariffs applicable to consumers.

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

C212.1	:	Explain the operation of hydroelectric power plant and thermal power plant.
C212.2	:	Describe the operation of nuclear Power plant.
C212.3	:	Compare the air and gas insulated substations.
C212.4	:	Explain the Construction of cables and describe distribution systems.
C212.5	:	Illustrate the Economical aspects of power generation.

UNIT – I 10 hrs

Hydroelectric Power Stations:
Selection of site, general layout of a hydroelectric power plant with brief description of major components and principle of operation

Thermal Power Stations:
Selection of site, general layout of a thermal power plant. Brief description of components: boilers, super heaters, economizers and electrostatic precipitators, steam turbines: impulse and reaction turbines, condensers, feed water circuit, cooling towers and chimney.

UNIT – II 10 hrs

Nuclear Power Stations:
Location of nuclear power plant, working principle, nuclear fission, nuclear fuels, nuclear chain reaction, nuclear reactor components: moderators, control rods, reflectors and coolants, types of nuclear reactors and brief description of PWR, BWR and FBR. Radiation: radiation hazards and shielding, nuclear waste disposal.

	UNIT – III		10	hrs
	Substations: Air Insulated Substations – indoor & outdoor substations, substations layouts of 33/11 kV showing the location of all the substation equipment. Bus bar arrangements in the sub-stations: simple arrangements like single bus bar, sectionalized single bus bar, double bus bar with one and two circuit breakers, main and transfer bus bar system with relevant diagrams. **Gas Insulated Substations (GIS)** – advantages of gas insulated substations, constructional aspects of GIS, installation and maintenance of GIS, comparison of air insulated substations and gas insulated substations.			
	UNIT – IV		14	hrs
	Underground Cables: Types of cables, construction, types of insulating materials, calculation of insulation resistance, stress in insulation and power factor of cable. Capacitance of single and 3-Core belted Cables: Grading of cables – capacitance grading and inter sheath grading. **Distribution Systems:** Classification of Distribution systems, A.C Distribution, overhead versus Underground system, connection schemes of Distribution system, Requirements of Distribution system, requirements of a Distribution system, Design considerations in Distribution system.			
	UNIT – V		10	hrs
	Economic Aspects of Power Generation & Tariff: **Economic Aspects** –load curve, load duration and integrated load duration curves, discussion on economic aspects: connected load, maximum demand, demand factor, load factor, diversity factor, power capacity factor and plant use factor, base and peak load plants. **Tariff Methods**– costs of generation and their division into fixed, semi-fixed and running costs, desirable characteristics of a tariff method, tariff methods: simple rate, flat rate, block-rate, two part, three–part, and power factor tariff methods.			
	Text Books			
	1	A Text Book on Power System Engineering by M.L.Soni, P.V.Gupta, U.S.Bhatnagar and A. Chakrabarti, Dhanpat Rai & Co. Pvt. Ltd.		
	2	Generation, Distribution and Utilization of Electric Energy by C.L.Wadhawa New age International (P) Limited, Publishers.		
	Reference Books			
	1	Electrical Power Distribution Systems by V. Kamaraju, Tata Mc Graw Hill, New Delhi.		
	2	Elements of Electrical Power Station Design by M V Deshpande, PHI, New Delhi.		

CO-PO/PSO Mapping Matrix																
	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
	C212.1	2	3											3		
	C212.2	2	3											3		
	C212.3	2	3											3		
	C212.4	2	3											3		
	C212.5	2	3											3		
	Avg.	**2**	**3**											**3**		

KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY
(AUTONOMOUS)

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK Kakinada

Department of Electrical and Electronics Engineering

		L	T	P	Cr.
B.Tech.(IV Sem.)	**INDUCTION AND SYNCHRONOUS MACHINES**				
	Course Code: R232213	3	0	0	3

Pre-requisites:
Principles of Electromechanical Energy Conversion, and Electrical Circuit Analysis.

Course Objectives:

- Characteristics, starting and testing methods of Induction Motor
- Torque production and performance of Induction Motor.
- In determining the performance parameters of Induction Motor.
- working of synchronous machines

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

C213.1	:	Illustrate of ac motors and dissect performance of three phase induction motors.
C213.2	:	Evaluate torque-speed characteristics of induction motor.
C213.3	:	Determine the testing performance of single-phase induction motor.
C213.4	:	Analyze the performance of synchronous generators.
C213.5	:	Analyze the performance of synchronous motor.

UNIT – I		10	hrs

Three - phase induction motors:
Construction details of cage and wound rotor machines – production of rotating magnetic field – principle of operation – rotor emf and rotor frequency – rotor current and power factor at standstill and during running conditions – rotor power input, rotor copper loss and mechanical power developed and their interrelationship – equivalent circuit – phasor diagram

UNIT – II		10	hrs

Performance of Three-Phase induction motors:
Torque equation – expressions for maximum torque and starting torque – torque slip characteristic –double cage and deep bar rotors – crawling and cogging – speed control of induction motor with V/f control method –no load and blocked rotor tests – circle diagram for predetermination of performance – methods of starting –starting current and torque calculations – induction generator operation.

UNIT – III		8	hrs

Single Phase Motors:

Single phase induction motors – constructional features and –double revolving field theory, Cross field theory - equivalent circuit, starting methods: capacitor start capacitor run, capacitor start induction run, split phase & shaded pole, AC series motor

UNIT – IV 12 hrs

Synchronous Generator:

Constructional features of non-salient and salient pole type armature windings – distributed and concentrated windings – distribution, pitch and winding factors – E.M.F equation – improvements of waveform and armature reaction – voltage regulation by synchronous impedance method – MMF method and Potier triangle method – phasor diagrams – two reaction analysis of salient pole machines and phasor diagram - methods of synchronization- Slip test – Parallel operation of alternators.

UNIT – V 8 hrs

Synchronous motor:

Synchronous motor principle and theory of operation – Effect of excitation on current and power factor– synchronous condenser - expression for power developed –hunting and its suppression – methods of starting.

Text Books

1	Electrical Machines by P.S. Bhimbra, Khanna Publishers
2	Electric Machinery by A. E. Fitzgerald, Charles kingsley, Stephen D. Umans, TMH

Reference Books

1	Electrical Machines by D. P. Kothari, I. J. Nagarth, Mc Graw Hill Publications, 4th edition
2	Electrical Machines by R. K. Rajput, Lakshmi publications,5th edition
3	Electrical Machinery by Abijith Chakrabarthi and Sudhipta Debnath, Mc Graw Hill education 2015
4	Electrical Machinery Fundamentals by Stephen J Chapman Mc Graw Hill education 2010

CO-PO/PSO Mapping Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
C213.1	2	3											3		
C213.2	2	3											3		
C213.3	2	3											3		
C213.4	2	3											3		
C213.5	2	3											3		
Avg.	**2**	**3**											**3**		

KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY
(AUTONOMOUS)

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK Kakinada

Department of Electrical and Electronics Engineering

			L	T	P	Cr.
B.Tech. (IV Sem.)		**CONTROL SYSTEMS**				
		Course Code: R232214	3	0	0	3

Pre-requisites: Basic Engineering Mathematics

Course Objectives:

- To obtain the mathematical models of physical systems and
- To determine the time response of systems and analyse system stability.
- To analyse system stability using frequency response methods.
- To design compensators using Bode diagrams.

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

C214.1	:	Derive the transfer function of physical systems and determine the overall transfer function using block diagram algebra and signal flow graphs.
C214.2	:	Obtain the time response of first and specifications of second order systems and determine error constants. Analyze the absolute and relative stability of LTI systems using Routh's stability criterion and root locus method.
C214.3	:	Analyze the stability of LTI systems using frequency response methods.
C214.4	:	Design Lag, Lead, Lag-Lead compensators to improve system Performance from Bode diagrams.
C214.5	:	Apply state space analysis concepts to represent physical systems as state models, derive transfer function and determine the response. Understand the concepts of controllability and observability.

UNIT – I 10 hrs

Mathematical Modeling of Control Systems:
Classification of control systems, open loop and closed loop control systems and their differences, Feedback characteristics, transfer function of linear system, differential equations of electrical networks, translational and rotational mechanical systems, transfer function of DC servo motor – AC servo motor – synchro, transmitter and receiver – block diagram algebra – representation by signal flow graph – reduction using Mason's gain formula.

UNIT – II 10 hrs

Time Response Analysis
Standard test signals – time response of first and second order systems – time domain specifications, steady state errors and error constants, effects of proportional (P) - proportional

integral (PI) - proportional derivative (PD) proportional integral derivative (PID) systems.

Stability and Root Locus Technique:

The concept of stability – Routh's stability criterion –limitations of Routh's stability, Root locus concept – construction of root loci (simple problems). Effect of addition of poles and zeros to the transfer function.

UNIT – III		10	hrs

Frequency Response Analysis:

Introduction to frequency domain specifications – Bode diagrams – transfer function from the Bode diagram – Polar plots, Nyquist stability criterion– stability analysis from Bode plots (phase margin and gain margin).

UNIT – IV		8	hrs

Classical Control Design Techniques:

Lag, lead, lag-lead compensators- physical realization- design of compensators using Bode plots.

UNIT – V		8	hrs

State Space Analysis of LTI Systems:

Concepts of state, state variables and state model, state space representation of transfer function: Controllable Canonical Form- Observable Canonical Form- Diagonal Canonical Form- diagonalization using linear transformation, solving the time invariant state equations, State Transition Matrix and it's Properties, concepts of controllability and observability.

Text Books

1	Modern Control Engineering by Kotsuhiko Ogata, Prentice Hall of India.
2	Automatic control systems by Benjamin C. Kuo, Prentice Hall of India,2nd Edition.

Reference Books

1	Control Systems principles and design by M.Gopal, Tata Mc Graw Hill education Pvt Ltd., 4th Edition
2	Control Systems by Manik Dhanesh N, Cengage publications.
3	Control Systems Engineering by I. J. Nagarath and M. Gopal, Newage International Publications, 5th Edition.
4	Control Systems Engineering by S. Palani, Tata Mc Graw Hill Publications
5	Control Systems principles and design by M. Gopal, Tata Mc Graw Hill education Pvt Ltd., 4th Edition

E-RESOURCES:

1	https://archive.nptel.ac.in/courses/107/106/107106081/
2	https://archive.nptel.ac.in/courses/108/106/108106098/
3	https://nptelvideos.com/video.php?id=1423&c=14

CO-PO/PSO Mapping Matrix																
	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
	C214.1	2	3											3		
	C214.2	2	3											3		
	C214.3	2	3											3		
	C214.4	2	3											3		
	C214.5	2	3											3		
	Avg.	**2**	**3**											**3**		

KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY (AUTONOMOUS)

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK Kakinada

Department of Electrical and Electronics Engineering

		L	T	P	Cr.
B.Tech. (IV Sem.)	**INDUCTION AND SYNCHRONOUS MACHINES LABORATORY**				
	Course Code: R232215L	0	0	3	1.5

Pre-requisites: Electrical Machines-II

Course Objectives:

- To control the speed of three phase induction motors.
- To determine /predetermine the performance three phase and single-phase induction motors.
- To improve the power factor of single-phase induction motor.
- To predetermine the regulation of three–phase alternator by various methods, find Xd/ Xq ratio of alternator and asses the performance of three–phase synchronous motor.

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

C215.1	:	Compile the data, organize and analyze it for discussion and report the findings and observations from experimental learning activities in the laboratory.
C215.2	:	Build holistic development and pleasing disposition by reviewing and correcting the performance to become independent and autonomous thinker.
C215.3	:	Draw the performance characteristics of three phase & single-phase induction motors by conducting suitable tests.
C215.4	:	Pre-determine the regulation of three–phase alternator by various methods.

LIST OF EXPERIMENTS

Any 10 of the following experiments are to be conducted:

1	Brake test on three phase Induction Motor.
2	Circle diagram of three phase induction motor.
3	Regulation of a three –phase alternator by synchronous impedance & M.M.F. Methods
4	Regulation of three–phase alternator by Potier triangle method
5	V and Inverted V curves of a three—phase synchronous motor
6	Determination of Xd, Xq & Regulation of a of a salient pole synchronous generator
7	Equivalent circuit of single-phase induction motor

	8	Speed control of induction motor by V/f method.
	9	Determination of efficiency of three-phase alternator by loading with three phase induction motor.
	10	Power factor improvement of single-phase induction motor by using capacitors and load test on single-phase induction motor.
	11	Parallel operation of three-phase alternator under no- load and load conditions.
	12	Determination of efficiency of a single -phase AC series Motor by conducting Brake test
	13	Load test on single phase induction motor.
	E-RESOURCES:	
	1	https://em-coep.vlabs.ac.in/List%20of%20experiments.html

CO-PO/PSO Mapping Matrix

	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
	C215.1									3	2					3
	C215.2								2	3	2					3
	C215.3									3						3
	C215.4	3			3					3						3
	C215.5	3			3					3						3
	Avg.	**3**			**3**				**2**	**3**	**2**					**3**

KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY (AUTONOMOUS)

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK Kakinada

Department of Electrical and Electronics Engineering

			L	T	P	Cr.
B.Tech.(IV Sem.)		**CONTROL SYSTEMS LABORATORY**				
		Course Code: R232216L	0	0	3	1.5

Pre-requisites: Control Systems

Course Objectives:

- To impart hands on experience to understand the performance of basic control system components such as magnetic amplifiers, D.C. servo motors, A.C. Servo motors and Synchros.
- To understand time and frequency responses of control system with and without controllers and compensators.
- To know the different logic gates and Boolean expressions using PLC.

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

C216.1	:	Compile the data, organize and analyze it for discussion and report the findings and observations from experimental learning activities in the laboratory.
C216.2	:	Build holistic development and pleasing disposition by reviewing and correcting the performance to become independent and autonomous thinker.
C216.3	:	Demonstrate the performance of basic control system components such as magnetic amplifiers, D.C. servo motors, A.C. Servo motors, stepper motor and potentiometer and examine the truth table of logic gates using PLC.
C216.4	:	Analyze time and frequency responses of control system with and without controller's design of PID controller and compensator.

LIST OF EXPERIMENTS

Any 10 of the following experiments are to be conducted:

1	Analysis of Second order system in time domain.
2	Characteristics of Synchros
3	Effect of P, PD, PI, PID Controller on a second order systems
4	Design of Lag and lead compensation – Magnitude and phase plot
5	Transfer function of DC motor
6	Bode Plot, Root locus, Nyquist Plots for the transfer functions of systems up to 5th order using MATLAB.

	7	Kalman's test of Controllability and Observability Test using MAT LAB.
	8	Temperature controller using PID
	9	Characteristics of magnetic amplifiers
	10	Characteristics of AC servo motor
	11	Characteristics of DC servo motor
	12	Study and verify the truth table of logic gates and simple Boolean expressions using PLC

CO-PO/PSO Mapping Matrix

	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
	C216.1									3	2					3
	C216.2								2	3	2					3
	C216.3									3						3
	C216.4				3					3						3
	C216.5				3					3						3
	Avg.				**3**				**2**	**3**	**2**					**3**

KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY (AUTONOMOUS)

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK Kakinada

Department of Electrical and Electronics Engineering

		L	T	P	Cr.
B.Tech. (IV Sem.)	**DATA STRUCTURES LAB**				
	Course Code: R232208	0	1	2	2

Pre-requisites: Basic Engineering Science

Course Objectives:

- The course aims to strengthen the ability of the students to identify and apply the suitable data structure for the given real-world problem.
- It enables them to gain knowledge in practical applications of data structures.

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

C217.1	:	Compile the data, organize and analyze it for discussion and report the findings and observations from experimental learning activities in the laboratory.
C217.2	:	Build holistic development and pleasing disposition by reviewing and correcting the performance to become independent and autonomous thinker.
C217.3	:	Develop C programs using stacks to handle recursive algorithms, manage program states, and solve related problems
C217.4	:	Apply queue-based algorithms for efficient task scheduling and breadth-first traversal in graphs; distinguish between deques, priority queues, and hashing, and apply them appropriately to solve data management challenges and design hash-based solutions for specific problems.

List of Experiments

1	**Exercise 1**: **Array Manipulation** i) Write a program to reverse an array. ii) C Programs to implement the Searching Techniques – Linear & Binary Search ii) C Programs to implement Sorting Techniques – Bubble, Selection and Insertion Sort
2	**Exercise 2: Linked list Implementation** i) Implement a singly linked list and perform insertion and deletion operations. ii) Develop a program to reverse a linked list iteratively and recursively. iii)Solve problems involving linked list traversal and manipulation.
3	**Exercise 3: Linked List Applications** i) Create a program to detect and remove duplicates from a linked list. ii) Implement a linked list to represent polynomials and perform addition.

		iii) Implement a double-ended queue (deque) with essential operations.
	4	**Exercise 4: Double Linked List Implementation** i) Implement a doubly linked list and perform various operations to understand its properties and applications. ii) Implement a circular linked list and perform insertion, deletion, and traversal.
	5	**Exercise 5: Stack Operations** i) Implement a stack using arrays and linked lists. ii) Write a program to evaluate a postfix expression using a stack. iii) Implement a program to check for balanced parentheses using a stack.
	6	**Exercise 6: Queue Operations** i) Implement a queue using arrays and linked lists. ii) Develop a program to simulate a simple printer queue system. iii) Solve problems involving circular queues.
	7	**Exercise 7: Stack and Queue Applications** i) Use a stack to evaluate an infix expression and convert it to postfix. ii) Create a program to determine whether a given string is a palindrome or not. iii) Implement a stack or queue to perform comparison and check for symmetry.
	8	**Exercise 8: Binary Search Tree** i) Implementing a BST using Linked List. ii) Traversing of BST.
	9	**Exercise 9: Hashing** i) Implement a hash table with collision resolution techniques. ii) Write a program to implement a simple cache using hashing.
	Text Books	
	1	Data Structures and algorithm analysis in C, Mark Allen Weiss, Pearson, 2nd Edition.
	2	Fundamentals of data structures in C, Ellis Horowitz, SartajSahni, Susan Anderson Freed, Silicon Press, 2008

CO-PO/PSO Mapping Matrix

	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
	C217.1									3	2					
	C217.2								2	3	2					
	C217.3	2	2		3					3						
	C217.4	2	2		3					3						
	Avg.	**2**	**2**		**3**				**2**	**3**	**2**					

KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY
(AUTONOMOUS)

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK Kakinada

Department of Electrical and Electronics Engineering

		L	T	P	Cr.
B.Tech. (IV_ Sem.)	**DESIGN THINKING AND INNOVATION**				
	Course Code: R232209	1	0	2	2

Pre-requisites: Basic Knowledge of Design thinking and Innovation

Course Objectives:

- To explain the basics of design and design thinking
- To bring awareness on design thinking process and new product development
- To familiarize the role of innovation and creativity
- To train how to identify the needs of society and convert into product
- To introduce how design thinking applied in business & strategic innovation to build start-ups

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

C218.1	:	Understand the importance of Design Thinking
C218.2	:	Understand and apply the process of Design Thinking in developing a product
C218.3	:	Learn the importance of innovation and creativity in designing a product
C218.4	:	Acquire and apply the knowledge of principles of product development in designing a new product.
C218.5	:	Apply the knowledge of design thinking in analyzing business ideas and strategic innovation to develop Start-ups

UNIT – I 10 hrs

Introduction to elements and principles of Design, basics of design-dot, line, shape, form as fundamental design components. Principles of design. Introduction to design thinking, history of Design Thinking, New materials in Industry.

UNIT – II 13 hrs

Design thinking process (empathize, analyze, idea & prototype), implementing the process in driving inventions, design thinking in social innovations. Tools of design thinking - person, costumer, journey map, brainstorming, product development

Activity: Every student presents their idea in three minutes, every student can present design process in the form of flow diagram or flow chart etc. Every student should explain about product development.

UNIT – III 13 hrs

Art of innovation, Difference between innovation and creativity, role of creativity and innovation in

	organizations. Creativity to Innovation. Teams for innovation, Measuring the impact and value of creativity. Activity: Debate on innovation and creativity, Flow and planning from idea to innovation, Debate on value-based innovation.			
	UNIT – IV		13	hrs
	Problem formation, introduction to product design, Product strategies, Product value, Product planning, product specifications. Innovation towards product design Case studies. Activity: Importance of modeling, how to set specifications, Explaining their own product design.			
	UNIT – V		15	hrs
	Design Thinking applied in Business & Strategic Innovation, Design Thinking principles that redefine business – Business challenges: Growth, Predictability, Change, Maintaining Relevance, Extreme competition, Standardization. Design thinking to meet corporate needs. Design thinking for Startups. Defining and testing Business Models and Business Cases. Developing & testing prototypes. Activity: How to market our own product, about maintenance, Reliability and plan for startup.			
	Text Books			
	1	Tim Brown, Change by design, 1/e, Harper Bollins, 2009.		
	2	Idris Mootee, Design Thinking for Strategic Innovation, 1/e, Adams Media, 2014.		
	Reference Books			
	1	David Lee, Design Thinking in the Classroom, Ulysses press, 2018.		
	2	Shrrutin N Shetty, Design the Future, 1/e, Norton Press, 2018.		
	3	William lidwell, Kritinaholden, &Jill butter, Universal principles of design, 2/e, Rockport Publishers, 2010.		
	4	Chesbrough.H, The era of open innovation, 2003.		

CO-PO/PSO Mapping Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
C218.1						2	3								
C218.2						2		2			2				
C218.3							3					2			
C218.4						2		2			2				
C218.5							3		2			2			
Avg.						**2**	**3**	**2**	**2**		**2**	**2**			

KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY (AUTONOMOUS)

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK Kakinada

Department of Electrical and Electronics Engineering

		L	T	P	Cr.
B.Tech. (V Sem.)	**POWER ELECTRONICS**				
	Course Code: R2331XXX	3	0	0	3

Pre-requisites: Electrical Circuit Analysis, Semiconductor Physics, Control Systems

Course Objectives:

- To know the characteristics of various power semiconductor devices.
- To learn the operation of single-phase controlled converters and perform harmonic analysis of input current.
- To learn the operation of three phase-controlled converters and AC/AC converters.
- To learn the operation of different types of DC-DC converters and control techniques.
- To learn the operation of PWM inverters for voltage control and harmonic mitigation.

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

C301.1	:	Illustrate the static and dynamic characteristics of SCR, Power- MOSFET and Power- IGBT.
C301.2	:	Analyze the operation of phase-controlled rectifiers.
C301.3	:	Analyze the operation of three-phase full–wave converters, AC Voltage Controllers and Cyclo converters.
C301.4	:	Examine the operation and design of different types of DC-DC converters.
C301.5	:	Analyze the operation of square wave inverters and PWM inverters for voltage control.

UNIT – I		10	hrs

Power Semi-Conductor Devices:

Silicon controlled rectifier (SCR) – Two transistor analogy - Static and Dynamic characteristics – Turn on and Turn off Methods - Triggering Methods (R, RC and UJT) – Snubber circuit design. Static and Dynamic Characteristics of Power MOSFET and Power IGBT-Numerical problems.

UNIT – II		10	hrs

Single-phase AC-DC Converters:

Single-phase half-wave controlled rectifiers - R and RL loads with and without freewheeling diode - Single-phase fully controlled mid-point and bridge converter with R load, RL load and RLE load - Continuous and Discontinuous conduction - Effect of source inductance in Single-phase fully

	controlled bridge rectifier – Expression for output voltages – Single-phase Semi-Converter with R load- RL load and RLE load – Continuous and Discontinuous conduction - Dual converter and its mode of operation - Numerical Problems.			
	UNIT – III		10	hrs
	Three-phase AC-DC Converters & AC – AC Converters: Three-phase half-wave Rectifier with R and RL load - Three-phase fully controlled rectifier with R and RL load - Three-phase semi converter with R and RL load - Expression for Output Voltage - Numerical Problems. Single-phase AC-AC power control by phase control with R and RL loads - Expression for RMS output voltage – Single-phase step down and step up Cycloconverter - Numerical Problems.			
	UNIT – IV		10	hrs
	DC–DC Converters: Operation of Basic Chopper – Analysis of Buck, Boost and Buck-Boost converters in Continuous Conduction Mode (CCM) and Discontinuous Conduction Modes (DCM) - Output voltage equations using volt-sec balance in CCM & DCM – Expressions for output voltage ripple and inductor current ripple – control techniques – Introduction to PWM control -Numerical Problems.			
	UNIT – V		10	hrs
	DC–AC Converters: Introduction - Single-phase half-bridge and full-bridge inverters with R and RL loads – Phase Displacement Control – PWM with bipolar voltage switching, PWM with unipolar voltage switching - Three-phase square wave inverters - 120^0 conduction and 180^0 conduction modes of operation - Sinusoidal Pulse Width Modulation - Current Source Inverter (CSI) - Numerical Problems.			
	Text Books			
	1	Power Electronics: Converters, Applications and Design by Ned Mohan, Tore M Undeland, William P Robbins, John Wiley & Sons, 2002.		
	2	Power Electronics: Circuits, Devices and Applications – by M. H. Rashid, Prentice Hall of India, 2nd edition, 2017.		
	Reference Books			
	1	Elements of Power Electronics–Philip T. Krein. Oxford University Press; Second edition, 2014.		
	2	Power Electronics – by P. S. Bhimbra, Khanna Publishers.		
	3	Thyristorised Power Controllers – by G. K. Dubey, S. R. Doradla, A. Joshi and R. M. K. Sinha, New Age International (P) Limited Publishers, 1996.		
	E-RESOURCES:			
	1	https://archive.nptel.ac.in/courses/108/101/108101126		

CO-PO/PSO Mapping Matrix																
	CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO2**	**PSO3**
	C301.1	2	3											3		
	C301.2	2	3											3		
	C301.3	2	3											3		
	C301.4	2	3											3		
	C301.5	2	3											3		
	Avg.	**2**	**3**											**3**		

KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY (AUTONOMOUS)

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK Kakinada

Department of Electrical and Electronics Engineering

		L	T	P	Cr
B.Tech. (V Sem.)	**DIGITAL CIRCUITS**				
	Course Code: R2331XXXX	3	0	0	3

Pre-requisites: Knowledge of electronic components and semiconductor devices, number systems, binary arithmetic, Boolean or switching algebra and logic gates.

Course Objectives:

- To know the simplification methods of Boolean functions
- To understand the realization of arithmetic, data routing and memory logic circuits.
- To know the operation and design of various counters and registers.
- To understand the analysis and design of synchronous sequential circuits.
- To understand the basic concepts of digital integrated circuits.

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

C302.1	:	Use the concepts of Boolean algebra, K-map, tabulation method in minimization of switching functions and able to design the arithmetic combinational circuits.
C302.2	:	Realize different types of data routing combinational circuits and PLDs.
C302.3	:	Apply knowledge of flip-flops in designing of registers and counters.
C302.4	:	Analyze synchronous sequential circuits and apply different methods for the design of synchronous sequential circuits.
C302.5	:	Understand the logic families in the form of digital integrated circuits.

UNIT – I 10 hrs

Combinational logic circuits – I:

Definition of combinational logic, canonical forms, Generation of switching equations from truth tables, simplification of logic functions using Boolean theorems, NAND and NOR implementations, Karnaugh maps – 3,4,5 variables, Incompletely specified functions (Don‘t care terms), Simplifying Max term equations, Quine-McCluskey minimization technique, General approach to combinational logic design, Look ahead carry adder, Cascading full adders, 4-bit adder-subtractor circuit, BCD adder circuit, Excess 3 adder, Binary comparators.

UNIT – II 10 hrs

Combinational logic circuits – II:

Decoders, BCD decoders, 7 segment decoder, higher order decoder, multiplexer, higher order multiplexing, de-multiplexers, higher order de-multiplexing, realization of Boolean functions using

	decoders, multiplexers, encoders, priority encoder, Read only and Read/Write Memories, Programmable ROM, PAL, PLA-Basics structures, programming tables of PROM, PAL, PLA, realization of Boolean functions.			
	UNIT – III		10	hrs
	Sequential logic circuits: Timing considerations of flip-flops, master-slave flip-flop, edge triggered flip-flops, characteristic equations, flip-flops with reset and clear terminals, excitation tables, conversion from one flip-flop to another flip-flop, design of asynchronous and synchronous counters, design of modulus-N counters, Johnson counter, ring counter, design of registers - buffer register, control buffer register, shift register, bi-directional shift register, universal shift register.			
	UNIT – IV		14	hrs
	Sequential Circuit Design: Mealy and Moore models, State machine notation, Synchronous Sequential circuit analysis, Construction of state diagrams, Analysis of clocked sequential circuits, realization of sequence detector circuit, state reduction and assignments, design procedure.			
	UNIT – V		10	hrs
	Digital integrated circuits: Logic levels, propagation delay time, power dissipation, fan-out and fan-in, noise margin, logic families – RTL and DTL Circuits, TTL, Emitter-Coupled Logic, Metal-Oxide Semiconductor, Complementary MOS, CMOS Transmission Gate Circuits.			
	Text Books			
	1	Switching and finite automata theory Zvi. Kohavi, 3rd edition, Cambridge University Press, 2010.		
	2	M. Morris Mano and M. D. Ciletti, "Digital Design", 4th Edition, Pearson Education,2006.		
	Reference Books			
	1	Fundamentals of Logic Design by Charles H. Roth Jr, Jaico Publishers, 5th Edition, 1992.		
	2	Switching Theory and Logic Design by A. Anand Kumar, Prentice Hall India Pvt., Limited, Third Edition, 2016.		
	E-RESOURCES:			
	1	https://nptel.ac.in/courses/117106086.		
	2	https://nptel.ac.in/courses/108105113		

CO-PO/PSO Mapping Matrix																
	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
	C302.1	3	2													
	C302.2	3	2													
	C302.3	3	2													
	C302.4	3	2													
	C302.5	3	2													
	Avg.	**3**	**2**													

KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY
(AUTONOMOUS)

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK Kakinada

Department of Electrical and Electronics Engineering

		L	T	P	Cr.
B.Tech. (V Sem.)	**POWER SYSTEMS-II**				
	Course Code: R2331XXXX	3	0	0	3

Pre-requisites: Power Systems-I, Electrical circuit Analysis.

Course Objectives:

- To understand the concepts of GMD & GMR to compute inductance & capacitance of transmission lines.
- To distinguish the models of short, medium and long length transmission lines and analyzes their performance.
- To learn the effect of travelling waves on transmission lines with different terminal conditions.
- To learn the concepts of corona, the factors effecting corona and effects of transmission lines.
- To design the sag and tension of transmission lines as well as to learn the performance of line insulators.

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

C303.1	:	Calculate parameters of transmission lines for different circuit configurations.
C303.2	:	Analyze the performance of short, medium and long transmission lines.
C303.3	:	Analyze the effect of travelling waves on transmission lines.
C303.4	:	Estimate the effects of corona in transmission lines.
C303.5	:	Calculate sag and tension of transmission lines and design the line insulators.

UNIT – I		10	hrs

Transmission Line Parameters Calculations:

Conductor materials – Types of conductors – Calculation of resistance for solid conductors – Calculation of inductance for Single-phase and Three-phase single and double circuit lines– Concept of GMR and GMD–Symmetrical and asymmetrical conductor configuration with and without transposition–Bundled conductors, Skin and Proximity effects.

Calculation of capacitance for 2 wire and 3 wire systems – Effect of ground on capacitance – Capacitance calculations for symmetrical and asymmetrical single and Three-phase single and double circuit lines without and with Bundled conductors.

UNIT – II		10	hrs

	Performance Analysis of Transmission Lines: Classification of Transmission Lines – Short, medium, long lines and their model representation – Nominal-T, Nominal-π and A, B, C, D Constants for symmetrical Networks. Rigorous Solution for long line equations –Representation of Long lines – Equivalent T and Equivalent π network models - Surge Impedance and Surge Impedance Loading of Long Lines - Regulation and efficiency for all types of lines – Ferranti effect.			
	UNIT – III		10	hrs
	Power System Transients: Types of System Transients – Propagation of Surges – Attenuation–Distortion– Reflection and Refraction Coefficients. Termination of lines with different types of conditions: Open Circuited Line–Short Circuited Line, Line terminated through a resistance and line connected to a cable. Reflection and Refraction at a T-Junction.			
	UNIT – IV		14	hrs
	Corona& Effects of transmission lines: Description of the phenomenon – Types of Corona - critical voltages and power loss – Advantages and Disadvantages of Corona - Factors affecting corona - Radio Interference.			
	UNIT – V		10	hrs
	Sag and Tension Calculations and Overhead Line Insulators: Sag and Tension calculations with equal and unequal heights of towers–Effect of Wind and Ice weight on conductor – Stringing chart and sag template and its applications. Types of Insulators – Voltage distribution in suspension insulators–Calculation of string efficiency and Methods for String efficiency improvement – Capacitance grading and Static Shielding.			
	Text Books			
	1	Electrical Power Systems – by C. L. Wadhwa, New Age International (P) Limited, 1998.		
	2	Power System Engineering by I. J. Nagarath and D. P. Kothari, Tata McGraw Hill, 3rd Edition, 2019.		
	Reference Books			
	1	Power system Analysis–by John J Grainger William D Stevenson, TMC Companies, 4th edition		
	2	Power System Analysis and Design by B. R. Gupta, Wheeler Publishing.		
	3	A Text Book on Power System Engineering by M. L. Soni, P. V. Gupta, U. S. Bhatnagar A. Chakrabarthy, Dhanpat Rai Co Pvt. Ltd.2016.		
	4	Electrical Power Systems by P.S.R. Murthy, B.S. Publications, 2017.		
	E-RESOURCES:			
	1	https://archive.nptel.ac.in/courses/108/105/108105104		
	2	https://archive.nptel.ac.in/courses/108/102/108102047		

CO-PO/PSO Mapping Matrix																
	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
	C303.1	2	3											3		
	C303.2	2	3											3		
	C303.3	2	3											3		
	C303.4	2	3											3		
	C303.5	2	3											3		
	Avg.	**2**	**3**											**3**		

KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY (AUTONOMOUS)

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK Kakinada

Department of Electrical and Electronics Engineering

		PROFESSIONAL ELECTIVE- I	**L**	**T**	**P**	**Cr.**
B.Tech. (V Sem.)		**RENEWABLE AND DISTRIBUTED ENERGY TECHNOLOGIES**				
		Course Code: R23PEXXXX	3	0	0	3

Pre-requisites: To impart knowledge on various renewable sources such as solar, wind and hydel perspectives. To know the requirements of various hybrid sources as distributed energy technologies.

Course Objectives:

- To understand the basic concepts on wind energy systems.
- To understand the various relations between speed, power and energy in the wind systems.
- To analyze the solar energy systems, various components of solar thermal systems, applications in the relevant fields and design of PV systems.
- To design the Hydel system components and to get an idea on different other sources like tidal, geothermal and gas-based units.
- To understand the concepts of hybrid renewable systems.

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

C304A.1	:	Illustrate basic concepts of renewable and distributed sources of wind energy.
C304A.2	:	Demonstrate the components of wind energy conversion systems.
C304A.3	:	Model PV systems and analyse MPPT Techniques.
C304A.4	:	Illustrate the concept of Energy Production from Hydro - Tidal and Geothermal.
C304A.5	:	Explain the aspects of hybrid renewable energy systems.

UNIT – I		10	hrs

Introduction and wind energy systems:

Brief idea on renewable and distributed sources - their usefulness and advantages; Wind Energy Systems: Estimates of wind energy potential - wind maps - Instrumentation for wind velocity measurements - Aerodynamic and mechanical aspects of wind machine design - Conversion to electrical energy - Aspects of location of wind farms.

UNIT – II		10	hrs

Wind power and energy:

Wind speed and energy - Speed and power relations - Power extraction from wind - Tip speed ratio (TSR) - Functional structure of wind energy conversion systems - Pitch and speed control - Power

	speed-TSR characteristics - Fixed speed and variable speed wind turbine control - Power optimization - Electrical generators - Self-Excited and Doubly-Fed Induction Generators operation and control.			
	UNIT – III		10	hrs
	Solar PV systems: Solar PV Systems: Present and new technological developments in photovoltaic - estimation of solar irradiance - components of solar energy systems - solar-thermal system applications to power generation - heating - Types of PV systems - Modelling of PV cell - current-voltage and power-voltage characteristics - Effects of temperature - Solar array simulator - Sun tracking - Peak power operations - PV system - MPPT techniques - Effects of partial shading on the characteristic curves and associated MPPT techniques - Solar park design outline.			
	UNIT – IV		14	hrs
	Small hydro and other sources: Hydel Power: Water power estimates - use of hydrographs - hydraulic turbine - characteristics and part load performance - design of wheels - draft tubes and penstocks - plant layouts; Brief idea of other sources viz. - tidal - geothermal - gas-based - etc.			
	UNIT – V		10	hrs
	Hybrid renewable systems: Requirements of hybrid/combined use of different renewable and distributed sources - Need of energy storage; Control of frequency and voltage of distributed generation in Stand-alone and Grid-connected mode - use of energy storage and power electronics interfaces for the connection to grid and loads - Design and optimization of size of renewable sources and storages.			
	Text Books			
	1	Math J. Bollen - Fainan Hassan ‘Integration of Distributed Generation in the Power System’ - IEEE Press - 2011.		
	Reference Books			
	1	Studies’ Craig Anderson and Rudolf I. Howard ‘Wind and Hydropower Integration: Concepts - Considerations and Case - Nova Publisher - 2012.		
	2	Amanda E. Niemi and Cory M. Fincher ‘Hydropower from Small and Low-Head Hydro Technologies’ - Nova Publisher - 2011.		
	3.	D. Yogi Goswami - Frank Kreith and Jan F. Kreider ‘Principles of Solar Engineering’ - Taylor & Francis 2000.		
	4.	Math J. Bollen - Fainan Hassan ‘Integration of Distributed Generation in the Power System’ - IEEE Press - 2011.		
	5.	S. Heier and R. Waddington ‘Grid Intergration of Wind Energy Conversion Systems’ – Wiley - 2006.		

CO-PO/PSO Mapping Matrix																
	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
	C304A.1	2	3											**3**		
	C304A.2	2	3											**3**		
	C304A.3	2	3											**3**		
	C304A.4	2	3											**3**		
	C304A.5	2	3											**3**		
	Avg.	**2**	**3**											**3**		

KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY
(AUTONOMOUS)

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK Kakinada

Department of Electrical and Electronics Engineering

		PROFESSIONAL ELECTIVE- I	**L**	**T**	**P**	**Cr.**
B.Tech. (V Sem.)		**COMPUTER ARCHITECTURE AND ORGANIZATION**				
		Course Code: R23PEXXXX	3	0	0	3

Pre-requisites: Basic knowledge in digital electronics, fundamentals of computers.

Course Objectives:

- To explain the basic working of a digital computer.
- To understand the register transfer language and micro-operators.
- To learn various addressing modes supported by the processors.
- To be familiar with peripheral interfacing with processors.
- To understand memory hierarchy in computers.

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

C304B.1	:	Demonstrate the instruction cycle of a computer.
C304B.2	:	Understand various micro-operations and register transfer language.
C304B.3	:	Describe parallel processing and pipe-lining.
C304B.4	:	Interface different peripherals with processors.
C304B.5	:	Know the advantages of cache and virtual memory.

UNIT – I		10	hrs

Basic Computer Organization and Design: Instruction Codes, Computer Registers, Computer Instructions, Timing and Control, Instruction Cycle, Memory-Reference Instructions, Input-Output and Interrupt, Complete Computer Description, Design of Basic Computer, Design of Accumulator Logic.

UNIT – II		10	hrs

Register Transfer and Micro operations: Register Transfer Language, Register Transfer, Bus and Memory Transfers, Arithmetic Micro operations, Logic Micro operations, Shift Micro operations, Arithmetic Logic Shift Unit. Micro programmed Control: Control Memory, Address Sequencing, Micro program Example, Design of Control Unit.

UNIT – III		10	hrs

Central Processing Unit: Introduction, General Register Organization, Stack Organization, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control, Reduced Instruction Set Computer (RISC) Pipeline and Vector Processing: Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISK Pipeline, Vector Processing, Array

	Processors.			
	UNIT – IV		14	hrs
	Input/output Organization: Peripheral Devices, I/O interface, Asynchronous data transfer, Modes of transfer, priority Interrupt, Direct memory access, Input-Output Processor (IOP), Serial Communication.			
	UNIT – V		10	hrs
	Memory Organization: Memory Hierarchy, Main memory, Auxiliary memory, Associate Memory, Cache Memory, and Virtual memory, Memory Management Hardware.			
	Text Books			
	1	Computer System Architecture, M. Morris Mano, Prentice Hall of India Pvt. Ltd., 3rd Edition, Sept. 2008.		
	Reference Books			
	1	Computer Architecture and Organization, William Stallings, PHI Pvt. Ltd., Eastern Economy Edition, Sixth Edition, 2003.		
	2	Computer Organization and Architecture, Linda Null, Julia Lobur, Narosa Publications ISBN 81- 7319-609-5		
	3	Computer System Organization by John. P. Hayes.		

CO-PO/PSO Mapping Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
C304B.1	2	3											**3**		
C304B.2	2	3											**3**		
C304B.3	2	3											**3**		
C304B.4	2	3											**3**		
C304B.5	2	3											**3**		
Avg.	**2**	**3**											**3**		

KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY
(AUTONOMOUS)

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK Kakinada

Department of Electrical and Electronics Engineering

		PROFESSIONAL ELECTIVE- I	**L**	**T**	**P**	**Cr.**
B.Tech. (V Sem.)		**COMMUNICATION SYSTEMS**				
		Course Code: R23PEXXXX	3	0	0	3

Pre-requisites: Basic knowledge in digital electronics.

Course Objectives:

Analyze the performance of analog modulation schemes in time and frequency domains.

- Analyze the performance of angle modulated signals.
- Characterize analog signals in time domain as random processes and noise
- Characterize the influence of channel on analog modulated signals
- Determine the performance of analog communication systems in terms of SNR
- Analyze pulse amplitude modulation, pulse position modulation, pulse code modulation and TDM systems.

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

C304C.1	:	Explain the fundamental concepts of analog and digital communication systems.
C304C.2	:	Analyze amplitude, frequency, and phase modulation techniques.
C304C.3	:	Apply sampling theorem and pulse modulation techniques in communication.
C304C.4	:	Evaluate the performance of communication systems under the influence of noise.
C304C.5	:	Design simple analog and digital communication systems for practical applications.

UNIT – I		10	hrs

Basic tools for communication, Fourier Series/Transform, Properties, Autocorrelation, Energy Spectral Density, Parsevals Relation, Amplitude Modulation (AM), Spectrum of AM, Envelope Detection, Power Efficiency, Modulation Index.

UNIT – II		10	hrs

Double Sideband Suppressed Carrier (DSB-SC) Modulation, Demodulation, Costas Receiver, Single Sideband Modulation (SSB), Hilbert Transform, Complex Pre-envelope/ Envelope, Demodulation of SSB, Vestigial Sideband Modulation (VSB)

UNIT – III		10	hrs

Angle Modulation, Frequency Modulation (FM), Phase Modulation (PM), Modulation Index, Instantaneous Frequency, Spectrum of FM Signals, Carsons Rule for FM Bandwidth, Narrowband FM Generation, Wideband FM Generation via Indirect Method, FM Demodulation

UNIT – IV		14	hrs

	Introduction to Sampling, Spectrum of Sampled Signal, Aliasing, Nyquist Criterion, Signal Reconstruction from Sampled Signal, Pulse Amplitude Modulation**,** Quantization, Uniform Quantizers – Midrise and Midtread, Quantization noise, Non uniform Quantizers, Delta Modulation, Differential Pulse Code Modulation (DPCM)		
	UNIT – V	10	hrs
	Basics of Probability, Conditional Probability, MAP Principle, Random Variables, Probability Density Functions, Applications in Wireless Channels, Basics of Random Processes, Gaussian Random Process, Noise.		
	Text Books		
	1 Simon Haykin, Communications Systems, 4th Edition. John Wiley and Sons, Inc		
	2 Fundamentals of Wireless Communication by David Tse		

CO-PO/PSO Mapping Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
C304C.1	2	3											3		
C304C.2	2	3											3		
C304C.3	2	3											3		
C304C.4	2	3											3		
C304C.5	2	3											3		
Avg.	**2**	**3**											**3**		

PROFESSIONAL ELECTIVE- I

12 Week MOOCS SWAYAM NPTEL Course recommended by BOS

KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY
(AUTONOMOUS)

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK Kakinada

Department of Electrical and Electronics Engineering

		OPEN ELECTIVE-I	**L**	**T**	**P**	**Cr.**
B.Tech. (V Sem.)		**RENEWABLE ENERGY SOURCES**				
		Course Code: R23OEXXXX	3	0	0	3

Pre-requisites: Basic Electrical Engineering

Course Objectives:

- To study the solar radiation data, equivalent circuit of PV cell and its I-V & P-V characteristics.
- To understand the concept of Wind Energy Conversion & its applications.
- To study the principles of biomass, hydel and geothermal energy.
- To understand the principles of ocean Thermal Energy Conversion, waves and power associated with it.
- To study the various chemical energy sources such as fuel cell and hydrogen energy along with their operation and equivalent circuit.

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

C305A.1	:	Analyze solar radiation data, extra-terrestrial radiation, radiation on earth's surface and solar Energy Storage.
C305A.2	:	Illustrate the components of wind energy systems.
C305A.3	:	Illustrate the working of biomass, hydel plants and Geothermal plants.
C305A.4	:	Demonstrate the principle of Energy production from OTEC, Tidal and Waves.
C305A.5	:	Evaluate the concept and working of Fuel cells & MHD power generation.

UNIT – I		10	hrs

Solar Energy:
Introduction - Renewable Sources - prospects, solar radiation at the Earth Surface - Equivalent circuit of a Photovoltaic (PV) Cell - I-V & P-V Characteristics - Solar Energy Collectors: Flat plate Collectors, concentrating collectors - Solar Energy storage systems and Applications: Solar Pond - Solar water heating - Solar Green house.

UNIT – II		10	hrs

Wind Energy:
Introduction - basic Principles of Wind Energy Conversion, the nature of Wind - the power in the wind - Wind Energy Conversion - Site selection considerations - basic components of Wind Energy Conversion Systems (WECS) - Classification - Applications.

UNIT – III		10	hrs

Biomass, Hydel and Geothermal Energy:

Biomass: Introduction - Biomass conversion technologies- Photosynthesis. Factors affecting Bio digestion.

Hydro plants: Basic working principle – Classification of hydro systems**:** Large, small, micro hydel plants.

Geothermal Energy: Introduction, Geothermal Sources – Applications - operational and Environmental problems.

UNIT – IV		14	hrs

Energy from oceans, Waves & Tides:

Oceans: Introduction - Ocean Thermal Electric Conversion (OTEC) – methods - prospects of OTEC in India.

Waves: Introduction - Energy and Power from the waves - Wave Energy conversion devices.

Tides: Basic principle of Tide Energy -Components of Tidal Energy.

UNIT – V		10	hrs

Chemical Energy Sources:

Fuel Cells: Introduction - Fuel Cell Equivalent Circuit - operation of Fuel cell - types of Fuel Cells - Applications.

Hydrogen Energy: Introduction - Methods of Hydrogen production - Storage and Applications

Magneto Hydro Dynamic (MHD) Power generation: Principle of Operation - Types.

Text Books

1	G. D. Rai, Non-Conventional Energy Sources, Khanna Publications, 2011.
2	John Twidell& Tony Weir, Renewable Energy Sources, Taylor & Francis, 2013.

Reference Books

1	S. P. Sukhatme & J. K. Nayak, Solar Energy-Principles of Thermal Collection and Storage, TMH, 2011.
2	John Andrews & Nick Jelly, Energy Science- principles, Technologies and Impacts, Oxford, 2nd edition, 2013.

E-RESOURCES:

1	https://archive.nptel.ac.in/courses/103/103/103103206
2	https://archive.nptel.ac.in/courses/103/107/103107157

CO-PO/PSO Mapping Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
C305A.1	2	3											3		
C305A.2	2	3											3		
C305A.3	2	3											3		
C305A.4	2	3											3		
C305A.5	2	3											3		
Avg.	**2**	**3**											**3**		

KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY (AUTONOMOUS)

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK Kakinada

Department of Electrical and Electronics Engineering

	OPEN ELECTIVE-I	**L**	**T**	**P**	**Cr.**
B.Tech. (V Sem.)	**CONCEPTS OF ENERGY AUDITING & MANAGEMENT**				
	Course Code: R23OEXXX	3	0	0	3

Pre-requisites: Basics of Conservation of Electrical Energy

Course Objectives:

- To understand basic concepts of Energy Audit & various Energy conservation schemes.
- To design energy an energy management program.
- To understand concept of Energy Efficient Motors and lighting control efficiencies.
- To estimate/calculate power factor of systems and propose suitable compensation techniques.
- To calculate life cycle costing analysis and return on investment on energy efficient technologies.

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

C305B.1	:	Understand the principles of energy audit along with various Energy related terminologies.
C305B.2	:	Asses the role of Energy Manager and Energy Management program.
C305B.3	:	Design an energy efficient motors and good lighting system.
C305B.4	:	Analyze the methods to improve the power factor and identify the energy instruments for various real time applications.
C305B.5	:	Evaluate the computational techniques with regard to economic aspects.6

UNIT – I 10 hrs

Basic Principles of Energy Audit:

Energy audit- definitions - concept - types of **Energy** audit - energy index - cost index - pie charts - Sankey diagrams and load profiles - Energy conservation schemes- Energy audit of industries- energy saving potential - energy audit of process industry, thermal power station - building energy audit - Conservation of Energy Building Codes (ECBC-2017)

UNIT – II 10 hrs

Energy Management:

Principles of energy management - organizing energy management program - initiating - planning - controlling - promoting - monitoring - reporting. Energy manager - qualities and functions -

	language - Questionnaire – check list for top management.			
	UNIT – III		10	hrs
	Energy Efficient Motors and Lighting: Energy efficient motors - factors affecting efficiency - loss distribution - constructional details - characteristics – variable speed - RMS - voltage variation-voltage unbalance-over motoring-motor energy audit. lighting system design and practice - lighting control - lighting energy audit.			
	UNIT – IV		14	hrs
	Power Factor Improvement and Energy Instruments: Power factor – methods of improvement - location of capacitors - Power factor with non-linear loads - effect of harmonics on power factor - power factor motor controllers – Energy Instruments-watt meter - data loggers - thermocouples - pyrometers - lux meters - tongue testers.			
	UNIT – V		10	hrs
	Economic Aspects and their Computation: Economics Analysis Depreciation Methods - time value of money - rate of return - present worth method - replacement analysis - lifecycle costing analysis – Energy efficient motors. Calculation of simple payback method - net present value method- Power factor correction - lighting – Applications of life cycle costing analysis - return on investment.			
	Text Books			
	1	Energy management by W. R. Murphy & G. Mckay Butter worth - Heinemann publications 1982.		
	2	Energy management hand book by W. C Turner – John wiley and sons - 1982.		
	Reference Books			
	1	Energy efficient electric motors by John. C. Andreas - Marcel Dekker Inc Ltd-2nd edition – 1995		
	2	Energy management by Paul o' Callaghan – Mc - graw Hill Book company-1st edition - 1998		
	3	Energy management and good lighting practice: fuel efficiency- booklet12-EEO		
	E-RESOURCES:			
	1	https://nptel.ac.in/courses/108106022		
	2	https://archive.nptel.ac.in/courses/108/106/108106022		

CO-PO/PSO Mapping Matrix																
	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
	C305B.1	2	3													1
	C305B.2	2	2	3												2
	C305B.3	2	3											2	2	
	C305B.4	2	3											2		1
	C305B.5	2	3											2		
	Avg.	**2**	**2.83**	**3**										**2**	**2**	**1.33**

KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY
(AUTONOMOUS)

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK Kakinada

Department of Electrical and Electronics Engineering

		OPEN ELECTIVE-I	**L**	**T**	**P**	**Cr.**
B.Tech. (V Sem.)		**CONCEPTS OF CONTROL SYSTEMS**				
		Course Code: R23OEXXX	3	0	0	3

Pre-requisites: Basics of Mathematics and Electrical Circuit Analysis

Course Objectives:

- To learn the mathematical modelling of physical systems and to use block diagram algebra and signal flow graph to determine overall transfer function
- To analyze the time response of first and second order systems and improvement of performance using PI, PD, PID controllers.
- To investigate the stability of closed loop systems using Routh's stability criterion and root locus method.
- To learn Frequency Response approaches for the analysis of LTI systems using Bode plots, polar plots and Nyquist stability criterion.
- To learn state space approach for analysis of LTI systems and understand the concepts of controllability and observability.

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

C305C.1	:	Derive the transfer function of physical systems and determination of overall transfer function using block diagram algebra and signal flow graphs.
C305C.2	:	Determine time response specifications of second order systems and to determine error constants.
C305C.3	:	Analyze absolute and relative stability of LTI systems using Routh's stability criterion and the root locus method.
C305C.4	:	Analyze the stability of LTI systems using frequency response methods.
C305C.5	:	Represent physical systems as state models and determine the response. Understanding the concepts of controllability and observability

UNIT – I		10	hrs

Mathematical Modelling of Control Systems:
Classification of control systems - open loop and closed loop control systems and their differences - transfer function of linear system - differential equations of electrical networks - translational and rotational mechanical systems – block diagram algebra – Feedback characteristics

UNIT – II		10	hrs

	Time Response Analysis: Standard test signals – time response of first and second order systems – time domain specifications - steady state errors and error constants - P - PI & PID Controllers			
	UNIT – III		10	hrs
	Stability and Root Locus Technique: The concept of stability – Routh-Hurwitz Criteria – limitations of Routh-Hurwitz criterion-.Root locus concept – construction of root loci (simple problems).			
	UNIT – IV		14	hrs
	Frequency Response: Analysis Introduction to frequency domain specifications – Bode diagrams – Transfer function from the Bode diagram – phase margin and gain margin.			
	UNIT – V		10	hrs
	State Space Analysis of Linear Time Invariant (LTI) Systems: Concepts of state - state variables and state model - state space representation of transfer function - State Transition Matrix and it's properties - concepts of controllability and observability.			

	Text Books	
	1	Modern Control Engineering by Kotsuhiko Ogata - Prentice Hall of India.
	2	Automatic control systems by Benjamin C. Kuo - Prentice Hall of India - 2 nd Edition.
	Reference Books	
	1	Control Systems principles and design by M. Gopal - Tata Mc Graw Hill education Pvt Ltd. - 4 th Edition.
	2	Control Systems by Manik Dhanesh N - Cengage publications.
	3	Control Systems Engineering by I. J. Nagarath and M. Gopal - Newage International Publications - 5 th Edition.
	4	Control Systems Engineering by S. Palani - Tata Mc Graw Hill Publications.

CO-PO/PSO Mapping Matrix

	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
	C305C.1	2	3											2		
	C305C.2	2	3											2		
	C305C.3		3											2		
	C305C.4		3											2		
	C305C.5		3											2		
	Avg.	**2**	**3**											**2**		

KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY (AUTONOMOUS)

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK Kakinada

Department of Electrical and Electronics Engineering

		L	T	P	Cr.
B.Tech. (V Sem.)	**POWER ELECTRONICS LAB**				
	Course Code: R2331XXXL	0	0	3	1.5

Pre-requisites: Basic knowledge on power electronics

Course Objectives:

- To learn the characteristics of various power electronic devices and analyze firing circuits and commutation circuits of SCR.
- To analyze the performance of single–phase and three–phase full–wave bridge converters with both resistive and inductive loads.
- To understand the operation of AC voltage regulator with resistive and inductive loads.
- To understand the working of Buck converter and Boost converter.
- To understand the working of single-phase & three-phase inverters.

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

C306.1	:	Compile the data, organize and analyze it for discussion and report the findings and observations from experimental learning activities in the laboratory.
C306.2	:	Build holistic development and pleasing disposition by reviewing and correcting the performance to become independent and autonomous thinker.
C306.3	:	Study the characteristics of power electronic devices, demonstrate the firing circuits of SCR, IGBT and Analyze the performance of converters.
C306.4	:	Explain the operation of single-phase AC voltage regulator, inverters, Buck and Boost converters.

Any 10 of the Following Experiments are to be conducted	
1	Characteristics of SCR - Power MOSFET & Power IGBT
2	R, RC & UJT firing circuits for SCR.
3	Single -Phase semi-converter with R & RL loads
4	Single -Phase full-converter with R & RL loads.
5	Three- Phase full-converter with R & RL loads.
6	Single-phase dual converter in circulating current & non circulating current mode of operation.
7	Single-Phase AC Voltage Regulator with R & RL Loads.
8	Single-phase step down Cyclo-converter with R & RL Loads

	9	Boost converter in Continuous Conduction Mode operation.
	10	Buck converter in Continuous Conduction Mode operation.
	11	Single -Phase square wave bridge inverter with R & RL Loads.
	12	Single - Phase PWM inverter.
	13	Three-phase bridge inverter with 120^0 and 180^0 conduction mode.
	14	SPWM control of Three-phase bridge inverter

CO-PO/PSO Mapping Matrix

	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
	C306.1									3	2					3
	C306.2								2	3	2					3
	C306.3	2			3					3						3
	C306.4	2			3					3						3
	Avg.	**2**			**3**				**2**	**3**	**2**					**3**

KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY (AUTONOMOUS)

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK Kakinada

Department of Electrical and Electronics Engineering

		L	T	P	Cr
B.Tech. (V Sem.)	**ANALOG AND DIGITAL CIRCUITS LAB**				
	Course Code: R2331XXXXL	0	0	3	1.5

Pre-requisites: Basic knowledge on analog circuits and digital circuits

Course Objectives:

- Analysis of transistor amplifiers
- Analysis of feedback amplifiers and oscillators
- Realization of digital circuits such data routing, registers and counters.

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

C307.1	:	Compile the data, organize and analyze it for discussion and report the findings and observations from experimental learning activities in the laboratory.
C307.2	:	Build holistic development and pleasing disposition by reviewing and correcting the performance to become independent and autonomous thinker.
C307.3	:	Analyze the applications of linear IC's
C307.4	:	Demonstrate the operation of digital circuits such as arithmetic, data routing, registers and counters.

Any 5 of the Following Experiments are to be conducted from each PART.

PART-A

1.	Analysis of clipper and clamper circuits.
2.	Analysis of self-bias to a transistor.
3.	Analysis of voltage series and current series feedback amplifiers.
4.	Analysis of Wien Bridge oscillator and RC-phase shift oscillator.
5.	Analysis of Integrator and Differentiator Circuits using IC 741.
6.	Analysis of Mono stable and A stable multivibrator operation using IC 555 Timer.
7.	Analysis of Schmitt Trigger Circuits using IC 741 and IC 555.
8.	Verify the PLL characteristics using IC 565.
9.	Analysis of 8 bit A to D and D to A circuits

PART-B

1.	Design of Full adder and Full Subtractor using logic gates.
2.	Realization of parallel adder/subtractor using IC 7483.
3.	Implementation of 3 to 8 line decoder using logic gates and IC 7445.

	4.	Implementation of 8 to 1 multiplexer using logic gates and IC 74151.
	5.	Verify the operation of master-slave JK flip-flop using IC7476.
	6.	Realization of the following shift registers using IC7495. a) SISO b) SIPO c) PISO d) PIPO
	7.	Implementation ofMod-10 ripples counter using flip-flops and IC 7490.
	8.	Implementation of Mod-8 synchronous up/down counters using flip-flops.
	9.	Implementation of 4-bit Ring Counter and Johnson Counter using D flip-flops/J-K flip-flops.

CO-PO/PSO Mapping Matrix

	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
	C307.1									3	2					
	C307.2								2	3	2					
	C307.3				3					3						
	C307.4				3					3						
	Avg.				**3**				**2**	**3**	**2**					

KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY (AUTONOMOUS)

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK Kakinada

Department of Electrical and Electronics Engineering

		L	T	P	Cr.
B.Tech. (V Sem.)	**SKILL ENHANCEMENT COURSE SOFT SKILLS**				
	Course Code: R2331XXXXL	0	1	2	2

Pre-requisites: Basic English Knowledge

Course Objectives:

- To prepare to face global competition for employment and excellence in profession.
- To help the students understand and build interpersonal and interpersonal skills that will enable them to lead meaningful professional life.

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

C308.1	:	Assimilate and understood the meaning and importance of soft skills and Learn how to develop them.
C308.2	:	Understand the significance of soft skills in the working environment for Professional excellence.
C308.3	:	Prepare to undergo the placement process with confidence and clarity.
C308.4	:	Ready to face any situation in life and equip themselves to handle them effectively.
C308.5	:	Understand and learn the importance of etiquette in both professional and personal life.

UNIT – I:

INTRODUCTION:

Introduction- Emergence of life skills, Definition & Meaning, Importance& need, reasons for skill gap, Analysis--Soft Skills vs Hard skills, Linkage between industry and soft skills, Challenges, Personality Developments. Soft Skills, Soft Skills vs English - Improving Techniques.

UNIT – II:

Intra-Personal:

Definition-Meaning – Importance-SWOT analysis, Johari windows - Goal Setting- quotient skills - Emotional Intelligence- Attitudinal skills - Right thinking- Problem Solving-Time management, stress management.

UNIT – III:

Inter-Personal:

Definition–Meaning–Importance-Communications skills - Team Work, managerial Skills-Negotiation Skills-Leadership skills, corporate etiquettes

UNIT – IV:

Verbal Skills:

Definition and Meaning-Listening skills, need- types, advantages, Importance-Improving Tips for Listening, Speaking, need- types, advantages, Importance- Improving Tips, Reading- Writing Skills, Report, Resume, statement of purpose, need- types, advantages, Importance-Improving Tips.

UNIT – V:

Non-Verbal Skills & Interview skills:

Definition and Meaning – Importance- Facial Expressions- Eye Contact – Proxemics - Haptics - Posture, cross cultural body language, body language in interview room, appearance and dress code –Kinetics-Para Language -tone, pitch, pause, neutralization of accent, use of appropriate language, Interview skills, interview methods and questions.

Text Books

1	Sher field, M. Robertatal, CornerstoneDevelopingSoftSkills,4/e, Pearson Publication, New Delhi, 2014.
2	AlkaWadkar Life Skills for Success,1/e, Sage Publications India Private Limited, 2016.

Reference Books

1	Sambaiah.M. Technical English,Wiley publishers India.NewDelhi.2014
2	Gangadhar Joshi, From Campus to Corporate, SAGETEXT.
3	Alex. K, Soft Skills, 3rded. S. Chand Publication, New Delhi, 2014.
4	Shalini Varma, Body Language for Your SuccessMantra,4/e, S. Chand Publication, New Delhi, 2014.

E-RESOURCES:

1	https://onlinecourses.nptel.ac.in/noc20_hs60/preview
2	https://www.youtube.com/@softskillsdevelopment6210
3	https://youtube.com/playlist?list=PLLy_2iUCG87CQhELCytvXh0E_ybOO1_q&si=Fs05Xh8ZrOPsR8F4

CO-PO/PSO Mapping Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
C308.1	3	3													
C308.2	3	2													
C308.3												3			
C308.4					3				3	3		2			
C308.5					3					2					
Avg.	**3**	**2.5**			**3**				**3**	**2.5**		**2.5**			

KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY
(AUTONOMOUS)

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK Kakinada

Department of Electrical and Electronics Engineering

		L	T	P	Cr.
B.Tech. (V Sem.)	**TINKERING LAB**				
	Course Code: R23XXXXX	0	0	2	1

Pre-requisites: The aim of tinkering lab for engineering students is to provide a hands-on learning environment where students can explore, experiment, and innovate by building and testing prototypes. These labs are designed to demonstrate practical skills that complement theoretical knowledge.

Course Objectives:

- Encourage Innovation and Creativity
- Provide Hands-on Learning
- Impart Skill Development
- Foster Collaboration and Teamwork
- Enable Interdisciplinary Learning
- Impart Problem-Solving mind-set
- Prepare for Industry and Entrepreneurship

Course Outcomes: The students will be able to experiment, innovate, and solve real-world challenges.

C309.1	:	Apply engineering fundamentals to design simple prototypes using available tools and materials
C309.2	:	Use modern tools, sensors, microcontrollers and software platforms for prototyping
C309.3	:	Collaborate effectively in teams to brainstorm, design, and implement solutions.
C309.4	:	Analyze real-world problems and propose feasible technical solutions using tinkering methodologies

List of experiments:

1.	Make your own parallel and series circuits using breadboard for any application of your choice.
2.	Demonstrate a traffic light circuit using breadboard.
3.	Build and demonstrate automatic Street Light using LDR.
4.	Simulate the Arduino LED blinking activity in Tinkercad.

	5.	Simulate the Arduino LED blinking activity in Tinkercad.
	6.	Build and demonstrate an Arduino LED blinking activity using Arduino IDE.
	7.	Interfacing IR Sensor and Servo Motor with Arduino.
	8.	Blink LED using ESP32.
	9.	LDR Interfacing with ESP32.
	10.	Control an LED using Mobile App.
	11.	Design and 3D print a Walking Robot
	12.	Design and 3D Print a Rocket.
	13.	Build a live soil moisture monitoring project, and monitor soil moisture levels of a remote plan in your computer dashboard
	14.	Demonstrate all the steps in design thinking to redesign a motor bike.

	E-RESOURCES:	
	1	https://aim.gov.in/pdf/Level-3.pdf
	2	https://aim.gov.in/pdf/equipment-manual-pdf.pdf
	3	https://atl.aim.gov.in/ATL-Equipment-Manual/
	4	https://aim.gov.in/pdf/Level-1.pdf
	5	https://aim.gov.in/pdf/Level-2.pdf

CO-PO/PSO Mapping Matrix

	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
	C309.1	2								3	2				3	
	C309.2	2							2	3	2				3	
	C309.3	2			3					3					3	
	C309.4	2			3					3					3	
	Avg.	**2**			**3**				**2**	**3**	**2**				**3**	

KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY
(AUTONOMOUS)

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK Kakinada

Department of Electrical and Electronics Engineering

		L	T	P	Cr.
B.Tech. (V Sem.)	**EVALUATION OF COMMUNITY SERVICE INTERNSHIP**				
	Course Code: 23PCXXXXX	0	0	0	2

Pre-requisites: Identifying a need, developing a plan, recruiting volunteers, and securing necessary resources.

Course Objectives:

- To demonstrate the capability to participate in community-engaged services/ activities for promoting the wellbeing of society
- To gain knowledge through field practice and experiential learning
- To gain first-hand understanding of the policies, regulations, organizational structures, processes, and programs that guide the socio-economic development process
- To know the ways of transforming the society through technology and systematic programme implementation
- To construct coherent written and present effective oral forms of communication.

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

C310.1	:	Demonstrate the capability to participate in community-engaged services/ activities for promoting the wellbeing of society
C310.2	:	Gain knowledge through field practice and experiential learning
C310.3	:	Gain first-hand understanding of the policies, regulations, organizational structures, processes, and programs that guide the socio-economic development process
C310.4	:	Know the ways of transforming the society through technology and systematic programme implementation
C310.5	:	Construct coherent written and present effective oral forms of communication.

e-resources

1	https://www.nitt.edu/home/students/facilitiesnservices/library/e-resources/#:~:text=National%20Digital%20Library%20(NDL)%20is%20an%20initiative,contents)%20for%20primary%20to%20PG%20level%20students.

CO-PO/PSO Mapping Matrix																
	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
	C310.1						3	3								3
	C310.2					3										3
	C310.3						3					2				3
	C310.4	3														3
	C310.5										3					3
	Avg.	**3**				**3**	**3**	**3**			**3**	**2**				**3**

KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY
(AUTONOMOUS)

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK Kakinada

Department of Electrical and Electronics Engineering

		L	T	P	Cr.
B.Tech. (VI _ Sem)	**ELECTRICAL MEASUREMENTS AND INSTRUMENTATION**				
	Course Code: 23PCXXXXX	3	0	0	3

Pre-requisites:
Basics of Electrical and Electronics Engineering.

Course Objectives:

- To understand and analyze the factors that affect the various measuring units.
- To choose the appropriate meters for measuring of voltage, current, power, power factor and energy qualities and understand the concept of standardization.
- Describe the operating principle of AC & DC bridges for measurement of resistance, inductance and capacitance.
- To understand the concept of the transducer and their effectiveness in converting from one form to the other form for the ease of calculating and measuring purposes.
- To understand the operating principles of basic building blocks of digital systems, record and display units.

Course Outcomes: After the completion of the course the student should be able to:

C311.1	:	Know the construction and working of various types of analog instruments.
C311.2	:	Describe the construction and working of wattmeter and power factor meters
C311.3	:	Know the construction and working various bridges for the measurement Resistance inductance and capacitance
C311.4	:	Know the operational concepts of various transducers
C311.5	:	Know the construction and operation digital meters

UNIT – I 10 hrs

Analog Ammeter and Voltmeters

Classification – deflecting, control and damping torques – PMMC, moving iron type and electrostatic instruments – Construction– Torque equation – Range extension – Errors and compensations – advantages and disadvantages. Instrument transformers: Current Transformer and Potential Transformer – theory –Ratio and phase angle errors–Numerical Problems.

UNIT – II 10 hrs

Analog Wattmeter's and Power Factor Meters

	Electrodynamometer type wattmeter (LPF and UPF) – Power factor meters: Dynamometer and M. I type (Single phase and three phase) – Construction – torque equation – advantages and dis advantages. Potentiometers: Principle and operation of D.C Crompton's potentiometer – Standardization –Applications –AC Potentiometer (Polar and coordinate types) – Standardization – Applications – Numerical Problems.			
	UNIT – III		10	hrs
	Measurements of Electrical parameters **DC Bridges:** Method of measuring low, medium and high resistance –Wheat stone's bridge or measuring medium resistance– Kelvin's double bridge for measuring low resistance – Loss of charge method for measurement of high resistance – Megger – measurement of earth resistance – Numerical Problems. **AC Bridges:** Measurement of inductance and quality factor – Maxwell's bridge – Hay's bridge – Anderson's bridge. Measurement of capacitance and loss angle – Desauty's bridge – Schering Bridge – Wien's bridge –Numerical Problems.			
	UNIT – IV		10	hrs
	Transducers Definition – Classification – Resistive, Inductive and Capacitive Transducer – LVDT – Strain Gauge – Thermistors – Thermocouples – Piezo electric and Photo Diode Transducers – Hall effect sensors – Numerical Problems.			
	UNIT – V		10	hrs
	Digital meters Digital Voltmeters – Successive approximation DVM – Ramp type DVM and Integrating type DVM – Digital frequency meter – Digital multimeter – Digital tachometer – Digital Energy Meter – Q meter. CRO – measurement of phase difference and Frequency using lissajious patterns – Numerical Problems.			
	Text Books			
	1	Electrical Measurements and measuring Instruments by E.W. Golding and F.C.Widdis - 5th Edition - Wheeler Publishing.		
	2	Modern Electronic Instrumentation and Measurement Techniques by A.D. Helfrick and W.D. Cooper - PHI - 5th Edition - 2002.		
	Reference Books			
	1	Electrical & Electronic Measurement & Instruments by A.K. Sawhney Dhanpat Rai & Co. Publications - 19th revised edition - 2011.		
	2	Electrical and Electronic Measurements and instrumentation by R.K. Rajput- S. Chand - 3rd edition		
	3	Electrical Measurements by Buckingham and Price - Prentice – Hall		
	4	Electrical Measurements by Forest K. Harris. John Wiley and Sons		
	E-RESOURCES:			
	1	https://archive.nptel.ac.in/courses/108/105/108105153		

CO-PO/PSO Mapping Matrix																
	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
	C311.1	2	3											3		
	C311.2	2	3											3		
	C311.3	2	3											3		
	C311.4	2	3											3		
	C311.5	2	3											3		
	Avg.	**2**	**3**											**3**		

KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY
(AUTONOMOUS)

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK Kakinada

Department of Electrical and Electronics Engineering

		L	T	P	Cr.
B.Tech. (VI Sem)	**MICROPROCESSORS AND MICROCONTROLLERS**				
	Course Code: 23PCXXXXX	3	0	0	3

Pre-requisites: Basic knowledge in digital electronics, fundamentals of computers.

Course Objectives:

- To understand the organization and architecture of Microprocessor
- To understand addressing modes to access memory
- To understand 8051 micro controller architecture
- To understand the programming principles for 8086 and 8051
- To understand the interfacing of Microprocessor with I/O as well as other devices
- To understand how to develop cyber physical systems

Course Outcomes: After the completion of the course the student should be able to:

C312.1	:	Know the concepts of the Microprocessor capability in general and explore the evaluation of microprocessors.
C312.2	:	Analyse the instruction sets - addressing modes - minimum and maximum modes operations of 8086 Microprocessors
C312.3	:	Analyse the Microcontroller and interfacing capability
C312.4	:	Describe the architecture and interfacing of 8051 controller
C312.5	:	Know the concepts of PIC micro controller and its programming.

UNIT – I 10 hrs

Introduction to Microprocessor Architecture

Introduction and evolution of Microprocessors – Architecture of 8086 – Memory Organization of 8086 – Register Organization of 8086– Introduction to 80286 - 80386- 80486 and Pentium (brief description about architectural advancements only).

UNIT – II 10 hrs

Minimum and Maximum Mode Operations

Instruction sets of 8086 - Addressing modes – Assembler directives –Simple Programs-General bus operation of 8086 – Minimum and Maximum mode operations of 8086 – 8086 Control signal interfacing – Read and write cycle timing diagrams.

UNIT – III 10 hr.

Microprocessors I/O interfacing

8255 PPI– Architecture of 8255–Modes of operation– Interfacing I/O devices to 8086 using 8255– Interfacing A to D converters– Interfacing D to A converters– Stepper motor interfacing– Static memory interfacing with 8086 – Architecture and interfacing of DMA controller (8257).

UNIT – IV 10 hrs

8051 Microcontroller

Overview of 8051 Microcontroller – Architecture– Memory Organization – Register set – Instruction set – Simple Programs - I/O ports and Interrupts – Timers and Counters – Serial Communication – Interfacing of peripherals.

UNIT – V 10 hrs

PIC Architecture

Block diagram of basic PIC 18 micro controller – registers I/O ports – Programming in C for PIC: Data types - I/O programming - logical operations - data conversion.

Text Books

1. Ray and Burchandi - "Advanced Microprocessors and Interfacing"- Tata McGraw–Hill - 3rd edition - 2006.
2. Kenneth J Ayala - "The 8051 Microcontroller Architecture- Programming and Applications" - Thomson Publishers - 2nd Edition.
3. PIC Microcontroller and Embedded Systems using Assembly and C for PIC 18 -Muhammad Ali Mazidi – Rolind D. Mckinay- Danny causey -Pearson Publisher 21st Impression.

Reference Books

1. Microprocessors and Interfacing - Douglas V Hall - Mc–Graw Hill - 2nd Edition.
2. R.S. Kaler- "A Text book of Microprocessors and Micro Controllers" - I.K. International Publishing House Pvt. Ltd.

E-RESOURCES:

1. https://archive.nptel.ac.in/courses/108/105/108105102
2. https://archive.nptel.ac.in/courses/108/103/108103157

CO-PO/PSO Mapping Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
C312.1	3	3													
C312.2	3	3	3												
C312.3	3	3													
C312.4	3	3	1												
C312.5	3	3													
Avg.	**3**	**3**	**2**												

KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY
(AUTONOMOUS)

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK Kakinada

Department of Electrical and Electronics Engineering

		L	T	P	Cr.
B.Tech. (VI Sem)	**POWER SYSTEM ANALYSIS**				
	Course Code: 23PCXXXXX	3	0	0	3

Pre-requisites: Concepts of electrical circuits and power systems-II.

Course Objectives:

- To develop the impedance diagram (p.u) and formation of Ybus
- To learn the different load flow methods.
- To learn the Zbus building algorithm.
- To learn short circuit calculation for symmetrical faults
- To learn the effect of unsymmetrical faults and their effects.
- To learn the stability of power systems and method to improve stability.

Course Outcomes: After the completion of the course the student should be able to:

C313.1	:	Draw impedance diagram for a power system network and calculate per unit quantities.
C313.2	:	Apply the load flow solution to a power system using different methods.
C313.3	:	Form Zbus for a power system network and analyse the effect of symmetrical faults.
C313.4	:	Find the sequence components for power system Components and analyse its effects of unsymmetrical faults.
C313.5	:	Analyse the stability concepts of a power system.

UNIT – I 10 hrs

Circuit Topology

Graph theory definitions – Formation of element node incidence and bus incidence matrices – Primitive network representation – Formation of Y_{bus} matrix by singular transformation and direct inspection methods.

Per Unit Representation

Per Unit Quantities–Single line diagram – Impedance diagram of a power system – Numerical Problems.

UNIT – II 10 hrs

Power Flow Studies

Necessity of power flow studies – Derivation of static power flow equations – Power flow solution

using Gauss-Seidel Method – Newton Raphson Method (Rectangular and polar coordinates form) – Decoupled and Fast Decoupled methods – Algorithmic approach – Numerical Problems on 3–bus system only.

UNIT – III		10	hr.

Z-Bus Algorithm

Formation of Z_{bus}**:** Algorithm for the Modification of Z_{bus} Matrix (without mutual impedance) – Numerical Problems.

Symmetrical Fault Analysis

Reactance's of Synchronous Machine – Three Phase Short Circuit Currents - Short circuit MVA calculations for Power Systems – Numerical Problems.

UNIT – IV		10	hrs

Symmetrical Components

Definition of symmetrical components – symmetrical components of unbalanced three phase systems – Power in symmetrical components – Sequence impedances and Sequence networks of Synchronous generator, Transformers and Transmission line - Numerical Problems.

UNIT – V		10	hrs

Power System Stability Analysis

Elementary concepts of Steady state – Dynamic and Transient Stabilities – Swing equation – Steady state stability – Equal area criterion of stability – Applications of Equal area criterion – Factors affecting transient stability – Methods to improve steady state and transient stability – Numerical problems.

Text Books

1	Power System Analysis by Grainger and Stevenson - Tata McGraw Hill.2003
2	Modern Power system Analysis – by I. J. Nagrath & D. P. Kothari: Tata McGraw–Hill Publishing Company - 3rd edition - 2007.

Reference Books

1	Power System Analysis – by A. R. Bergen- Prentice Hall - 2nd edition - 2009.
2	Power System Analysis by Hadi Saadat – Tata McGraw–Hill 3rd edition - 2010.
3	Power System Analysis by B. R. Gupta - A H Wheeler Publishing Company Limited - 1998.
4	Power System Analysis and Design by J. Duncan Glover - M. S. Sarma - T. J. Overbye – Cengage Learning publications - 5th edition - 2011.

E-RESOURCES:

1	https://archive.nptel.ac.in/courses/117/105/117105140

CO-PO/PSO Mapping Matrix																
	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
	C313.1	2	3											3		
	C313.2	2	3											3		
	C313.3	2	3											3		
	C313.4	2	3											3		
	C313.5	2	3											3		
	Avg.	**2**	**3**											**3**		

KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY
(AUTONOMOUS)

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK Kakinada

Department of Electrical and Electronics Engineering

		PROFESSIONAL ELECTIVE -II	**L**	**T**	**P**	**Cr.**
B.Tech. (VI Sem)		**SWITCHGEAR AND PROTECTION**				
		Course Code: 23PEXXXXX	3	0	0	3

Pre-requisites: Basic concepts of Electrical Machines and Power Systems.

Course Objectives:

- To explain the working principles and applications of circuit breakers in power systems, including MCBs, oil, SF6, and vacuum breakers.
- To provide an understanding of electromagnetic protection mechanisms, particularly relays used in fault detection and system protection (overcurrent, under-voltage, directional, differential).
- To analyze protection techniques for generators and transformers, including fault protection schemes like percentage differential protection and Buchholz relays.
- To explore feeder and busbar protection methods using advanced relay systems such as distance and static relays.
- To study over-voltage protection systems including lightning arresters and neutral grounding methods to safeguard the power system.

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

C314A.1	:	Understand and describe the operation of circuit breakers, including their ratings, principles of arc interruption, and types.
C314A.2	:	Analyze relay-based protection systems, identifying and explaining their roles in overcurrent, undervoltage, and fault detection.
C314A.3	:	Design protection schemes for generators and transformers, addressing faults like restricted earth faults and inter-turn faults.
C314A.4	:	Implement feeder and busbar protection using advanced relays such as distance, impedance, and static relays.
C314A.5	:	Evaluate over-voltage protection strategies, including the use of lightning arresters, and understand various neutral grounding techniques.

UNIT – I		10	hrs

Circuit Breakers

Miniature Circuit Breaker (MCB)– Elementary principles of arc interruption– Restriking Voltage and Recovery voltages– Restriking phenomenon - RRRV– Average and Max. RRRV– Current

	chopping and Resistance switching– Concept of oil circuit breakers– Description and operation of Air Blast– Vacuum and SF_6 circuit breakers– Circuit Breaker ratings and specifications– Concept of Auto reclosing.			
	UNIT – II		10	hrs
	Electromagnetic Protection Relay connection – Balanced beam type attracted armature relay - induction disc and induction cup relays–Torque equation - Relays classification–Instantaneous– DMT and IDMT types– Applications of relays: Over current and under voltage relays– Directional relays– Differential relays and percentage differential relays– Universal torque equation– Distance relays: Impedance– Reactance– Mho and offset mho relays– Characteristics of distance relays and comparison.			
	UNIT – III		10	hr.
	Generator Protection Protection of generators against stator faults– Rotor faults and abnormal conditions– restricted earth fault and inter turn fault protection– Numerical examples. **Transformer Protection** Percentage differential protection– Design of CT's ratio– Buchholz relay protection–Numerical examples.			
	UNIT – IV		10	hrs
	Feeder and Bus bar Protection & Static Relays: Over current Protection schemes – PSM – TMS – Numerical examples – Carrier current and three zone distance relay using impedance relays. Protection of bus bars by using Differential protection. Static relays: Introduction – Classification of Static Relays – Basic Components of Static Relays.			
	UNIT – V		10	hrs
	Protection against over voltage and grounding Generation of over voltages in power systems– Protection against lightning over voltages– Valve type and zinc oxide lighting arresters. Grounded and ungrounded neutral systems – Effects of ungrounded neutral on system performance – Methods of neutral grounding: Solid–resistance– Reactance–Arcing grounds and grounding Practices.			
	Text Books			
	1	Power System Protection and Switchgear by Badri Ram and D.N Viswakarma- Tata McGraw Hill Publications - 2nd edition - 2011.		
	2	Power system protection- Static Relays with microprocessor applications by T. S. Madhava Rao - Tata McGraw Hill - 2nd edition.		
	Reference Books			
	1	Fundamentals of Power System Protection by Paithankar and S. R. Bhide. - PHI - 2003.		
	2	Art & Science of Protective Relaying – by C R Mason - Wiley Eastern Ltd.		
	E-RESOURCES:			
	1	https://archive.nptel.ac.in/courses/108/107/108107167		
	2	https://archive.nptel.ac.in/courses/108/105/108105167		

CO-PO/PSO Mapping Matrix

	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
	C314A.1	2	3												3	
	C314A.2	2	3												3	
	C314A.3	2	3												3	
	C314A.4	2	3												3	
	C314A.5	2	3												3	
	Avg.	**2**	**3**												**3**	

KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY
(AUTONOMOUS)

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK Kakinada

Department of Electrical and Electronics Engineering

		PROFESSIONAL ELECTIVE - II	**L**	**T**	**P**	**Cr.**
B.Tech. (VI Sem)		**ADVANCED CONTROL SYSTEMS**				
		Course Code: 23PEXXXXX	3	0	0	3

Pre-requisites: Basic concepts of Control Systems.

Course Objectives:

- To understand the concept of controllability, observability, and their tests for continuous-time systems, as well as the principle of duality in state-space analysis.
- To understand the state-space methods to assess controllability, observability, and design state feedback controllers via pole placement.
- To know the stability of nonlinear systems using phase-plane analysis, describing functions, and Lyapunov's stability theorems.
- To Learn optimal control strategies using the calculus of variations, including constrained minimization and the minimum principle.
- To learn Optimal control and state regulator problems.

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

C314B.1	:	Explain controllability, observability, and the principle of duality in state-space systems.
C314B.2	:	Apply state-space methods to analyze controllability, observability, and design state feedback controllers.
C314B.3	:	Analyze the stability of nonlinear systems using phase-plane analysis and Lyapunov's stability theorems.
C314B.4	:	Examine the minimization of functional and control variable inequality constraints.
C314B.5	:	Formulate and solve the optimal regulator problems.

UNIT – I		10	hrs

Controllability - Observability and Design of Pole Placement

General concepts of controllability and observability -Tests for controllability and observability for continuous time systems - Principle of duality - Effect of state feedback on controllability and observability - Design of state feedback control through pole placement, full order and reduced order observers.

UNIT – II		10	hrs

Nonlinear Systems

Introduction to nonlinear systems - Types of nonlinearities. Introduction to phase plane analysis, construction of phase trajectories-Analytical and Isocline method, describing function - Describing functions of on-off nonlinearity, on-off nonlinearity with hysteresis, and relay with dead zone.

UNIT – III | 10 hrs

Stability analysis by Lyapunov Method

Stability in the sense of Lyapunov – Lyapunov's stability and Lyapunov's instability theorems – Direct method of Lyapunov for the linear and nonlinear continuous time autonomous systems.

UNIT – IV | 10 hrs

Calculus of Variations

Minimization of functionals - functionals of single function – Constrained minimization – Minimum principle – Control variable inequality constraints – Control and state variable inequality constraints.

UNIT – V | 10 hrs

Optimal Control

Necessary conditions for optimal control, Formulation of the optimal control problem, minimum time problem, minimum energy problem, minimum fuel problem, state regulator problem, output regulator problem.

Text Books

1	Modern Control Engineering – by K. Ogata - Prentice Hall of India - 3rd edition - 1998
2	Automatic Control Systems by B.C. Kuo - Prentice Hall Publication.

Reference Books

1	Modern Control System Theory – by M. Gopal - New Age International Publishers - 2nd edition – 1996.
2	Optimal control theory: an Introduction by Donald E. Kirk by Dover publications.
3	Control Systems Engineering by I.J. Nagarath and M. Gopal - New Age International (P) Ltd.

E-RESOURCES:

1	https://archive.nptel.ac.in/courses/108/103/108103007
2	https://archive.nptel.ac.in/courses/108/107/108107115

CO-PO/PSO Mapping Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
C314B.1	2	3												3	
C314B.2	2	3												3	
C314B.3	2	3												3	
C314B.4	2	3												3	
C314B.5	2	3												3	
Avg.	**2**	**3**												**3**	

KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY
(AUTONOMOUS)

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK Kakinada

Department of Electrical and Electronics Engineering

		PROFESSIONAL ELECTIVE – II	**L**	**T**	**P**	**Cr.**
B.Tech. (VI Sem)		**SIGNALS & SYSTEMS**				
		Course Code: 23PEXXXXX	3	0	0	3

Pre-requisites: A solid foundation in mathematics, particularly calculus (integration and differentiation), complex numbers, and linear algebra.

Course Objectives:

- To introduce the terminology of signals and systems.
- To introduce Fourier tools through the analogy between vectors and signals.
- To introduce the concept of sampling and reconstruction of signals.
- To analyze the linear systems in time and frequency domains.
- To study z-transform as mathematical tool to analyze discrete-time signals and systems.

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

C314C.1	:	Characterize the signals and systems and principles of vector spaces, Concept of orthogonality.
C314C.2	:	Analyze the continuous-time signals and continuous-time systems using Fourier series, Fourier transform and Laplace transform.
C314C.3	:	Apply sampling theorem to convert continuous-time signals to discrete-time signal and reconstruct back.
C314C.4	:	Understand the relationships among the various representations of LTI systems
C314C.5	:	Understand the Concepts of convolution, correlation, Energy and Power density spectrum and their relationships.

UNIT – I		10	hrs

Introduction:

Definition of Signals and Systems, Classification of Signals, Classification of Systems, Operations on signals: time-shifting, time-scaling, amplitude-shifting, amplitude-scaling. Problems on classification and characteristics of Signals and Systems. Complex exponential and sinusoidal signals, Singularity functions and related functions: impulse function, step function signum function and ramp function. Analogy between vectors and signals, orthogonal signal space, Signal approximation using orthogonal functions, Mean square error, closed or complete set of orthogonal functions, Orthogonality in complex functions.

UNIT – II		10	hrs

Fourier Series and Fourier Transform:

Fourier series representation of continuous time periodic signals, properties of Fourier series, Dirichlet's conditions, Trigonometric Fourier series and Exponential Fourier series, Complex Fourier spectrum. Deriving Fourier transform from Fourier series, Fourier transform of arbitrary signal, Fourier transform of standard signals, Fourier transform of periodic signals, properties of Fourier transforms, Fourier transforms involving impulse function and Signum function. Introduction to Hilbert Transform.

UNIT – III		10	hrs

Sampling Theorem

Graphical and analytical proof for Band Limited Signals, impulse sampling, Natural and Flat top Sampling, Reconstruction of signal from its samples, effect of under sampling – Aliasing, Introduction to Band Pass sampling.

UNIT – IV		10	hrs

Analysis of Linear Systems:

Linear system, impulse response, Response of a linear system, Linear time invariant (LTI) system, Linear time variant (LTV) system, Concept of convolution in time domain and frequency domain, Graphical representation of convolution, Transfer function of a LTI system. Filter characteristics of linear systems. Distortion less transmission through a system, Signal bandwidth, system bandwidth, Ideal LPF, HPF and BPF characteristics, Causality and Poly-Wiener criterion for physical realization, relationship between bandwidth and rise time.

Cross-correlation and auto-correlation of functions, properties of correlation function, Energy density spectrum, Parseval's theorem, Power density spectrum, Relation between auto correlation function and energy/power spectral density function. Relation between convolution and correlation, Detection of periodic signals in the presence of noise by correlation, Extraction of signal from noise by filtering.

UNIT – V		10	hrs

Laplace Transforms:

Review of Laplace transforms, Partial fraction expansion, Inverse Laplace transform, Concept of region of convergence (ROC) for Laplace transforms, constraints on ROC for various classes of signals, Properties of L.T's, Relation between L.T's, and F.T. of a signal. Laplace transform of certain signals using waveform synthesis.

UNIT – VI		10	hrs

Z–Transforms:

Fundamental difference between continuous-time and discrete-time signals, discrete time signal representation using complex exponential and sinusoidal components, Periodicity of discrete time using complex exponential signal, Concept of Z- Transform of a discrete sequence. Distinction between Laplace, Fourier and Z transforms. Region of convergence in Z-Transform, constraints on ROC for various classes of signals, Inverse Z-transform, properties of Z-transforms.

Text Books

1	Signals, Systems & Communications - B. P. Lathi, B S Publications,2003.
2	Signals and Systems - A.V. Oppenheim, A. S. Willsky and S. H. Nawab, PHI, 2nd Edn.

	Reference Books	
	1	Signals & Systems – Simon Haykin and VanVeen, Wiley, 2nd Edition.
	2	Principles of Linear Systems and Signals – B P Lathi, Oxford University Press, 2015
	3	Signals and Systems – K Raja Rajeswari, B Visweswara Rao, PHI, 2009
	4	Fundamentals of Signals and Systems- Michel J. Robert, MGH International Edition, 2008.

CO-PO/PSO Mapping Matrix

	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
	C314C.1	2	3												3	
	C314C.2	2	3												3	
	C314C.3	2	3												3	
	C314C.4	2	3												3	
	C314C.5	2	3												3	
	Avg.	**2**	**3**												**3**	

12 Week MOOCS SWAYAM NPTEL Course recommended by BOS

KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY
(AUTONOMOUS)

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK Kakinada

Department of Electrical and Electronics Engineering

		PROFESSIONAL ELECTIVE-III	**L**	**T**	**P**	**Cr.**
B.Tech. (VI Sem)		**ELECTRIC DRIVES**				
		Course Code: 23PEXXXXX	3	0	0	3

Pre-requisites:
Electrical Circuit Analysis, Power electronics, Electrical Machines and Control Systems.

Course Objectives:

- To learn the fundamentals of electric drive and different electric braking methods.
- To analyze the operation of three phase converter-controlled dc motors and four quadrants operation of dc motors using dual converters.
- To discuss the DC-DC converter control of dc motors.
- To understand the concept of speed control of induction motor by using AC voltage controllers, voltage source inverters and slip power recovery scheme.
- To learn the speed control mechanism of synchronous motors.

Course Outcomes: After the completion of the course the student should be able to:

C315A.1	:	Explain the fundamentals of electric drive and different electric braking methods.
C315A.2	:	Analyze the operation of three-phase converter fed dc motors and four quadrant operations of dc motors using dual converters.
C315A.3	:	Describe the DC-DC converter fed control of dc motors in various quadrants of operation
C315A.4	:	Know the concept of speed control of induction motor by using AC voltage controllers and voltage source inverters and differentiate the stator side control and rotor side control
C315A.5	:	Learn the concepts of speed control of synchronous motor with different methods.

UNIT – I		10	hrs

Fundamentals of Electric Drives
Electric drive and its components– Fundamental torque equation – Load torque components – Nature and classification of load torque – Steady state stability – Load equalization– Four quadrant operation of drive (hoist control) – Braking methods**:** Dynamic Braking, Plugging and Regenerative Braking –Numerical problems.

UNIT – II		10	hrs

Converter Fed DC Motor Drives

3-phase half and fully-controlled converter fed separately and self-excited DC motor drive – Output voltage and current waveforms – Speed-torque characteristics and expressions – 3-phase Dual converter fed DC motor drives – Numerical problems.

UNIT – III		10	hrs

DC–DC Converter Fed DC Motor Drives

Single quadrant, two quadrant and four quadrant DC-DC converter fed separately excited and self-excited DC motors – Continuous Current Mode of operation - Output voltage and current waveforms – Speed-torque characteristics and expressions – Closed loop operation (qualitative treatment only) – Numerical problems.

UNIT – IV		10	hrs

Control of 3-phase Induction motor Drives

Stator voltage control using 3-phase AC voltage regulators – Waveforms –Speed torque characteristics– Variable Voltage Variable Frequency control of induction motor by PWM voltage source inverter – Closed loop V/f control of induction motor drives (qualitative treatment only). Static rotor resistance control – Slip power recovery schemes – Static Scher Bius drive – Static Kramer drive – Performance and speed torque characteristics– Numerical problems.

UNIT – V		10	hrs

Control of Synchronous Motor Drives

Separate control of synchronous motor – self-control of synchronous motor employing load commutated thyristor inverter - closed loop control of synchronous motor drive (qualitative treatment only)– PMSM: Basic operation and advantages – Numerical problems.

Text Books

1	Fundamentals of Electric Drives – G K Dubey - Narosa Publications - 2nd edition – 2002.
2	Power Semiconductor Drives - S. B. Dewan - G. R. Slemon - A. Straughen -Wiley India - 1984

Reference Books

1	Electric Motors and Drives Fundamentals - Types and Applications - by Austin Hughes and Bill Drury - Newnes.4th edition - 2013.
2	Thyristor Control of Electric drives – Veda Subramanyam Tata McGraw Hill Publications - 1987.
3	Power Electronic Circuits - Devices and applications by M.H. Rashid - PHI - 3rd edition - 2009.

E-RESOURCES:

1	https://archive.nptel.ac.in/courses/108/104/108104140
2	https://nptel.ac.in/courses/108104011

CO-PO/PSO Mapping Matrix

	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
	C315A.1	2	3												3	
	C315A.2	2	3												3	
	C315A.3	2	3												3	
	C315A.4	2	3												3	
	C315A.5	2	3												3	
	Avg.	**2**	**3**												**3**	

KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY (AUTONOMOUS)

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK Kakinada

Department of Electrical and Electronics Engineering

		PROFESSIONAL ELECTIVE-III	**L**	**T**	**P**	**Cr.**
B.Tech. (VI Sem)		**DIGITAL SIGNAL PROCESSING**				
		Course Code: 23PEXXXXX	3	0	0	3

Pre-requisites: Laplace Transforms, Z- Transforms, Fourier series and transforms

Course Objectives:

- To explore the basic concepts of digital signal processing.
- To connect the time domain signal to frequency domain signals using Fourier transform.
- To understand the basic structures of IRR systems.
- To understand and design FIR Digital filters.
- To explore the concepts of multiple sampling rates for DSP

Course Outcomes: After the completion of the course the student should be able to:

C315B.1	:	Know the concepts of Digital signal processing - frequency domain representation &z- transform.
C315B.2	:	Compute discrete Fourier transform and fast Fourier transforms for different sequences.
C315B.3	:	Design IIR filters through analog filter approximation and basic structure of IIR filters.
C315B.4	:	Design FIR filters with window techniques and basic structure of FIR filters.
C315B.5	:	Learn the concepts of Multirate Signal Processing.

UNIT – I 10 hrs

Introduction to Digital Signal Processing

Discrete time signals & sequences - Classification of Discrete time systems - stability of LTI systems - Invertibility - Response of LTI systems to arbitrary inputs. Solution of Linear constant coefficient difference equations. Frequency domain representation of discrete time signals and systems. Review of Z-transforms - solution of difference equations using Z-transforms - System function.

UNIT – II 10 hrs

Discrete Fourier Transforms and FFT Algorithms

Discrete Fourier Series representation of periodic sequences -Properties of Discrete Fourier Series

- Discrete Fourier transforms: Properties of DFT - linear filtering methods based on DFT - Fast Fourier transforms (FFT) - Radix-2 decimation in time and decimation in frequency FFT Algorithms - Inverse FFT.

UNIT – III		10	hrs

Design and Realizations of IIR Digital Filters

Analog filter approximations – Butterworth and Chebyshev filters - Design of IIR Digital filters from analog filters with examples. Analog and Digital frequency transformations.

Basic structures of IIR systems – Direct-Form Structures - Transposed Structures - Cascade-Form Structures - Parallel-Form Structures Lattice and Lattice-Ladder Structures.

UNIT – IV		10	hrs

Design and Realizations of FIR Digital Filters

Characteristics of FIR Filters with Linear Phase - Frequency Response of Linear Phase FIR Filters - Design of FIR Digital Filters using Window Techniques and Frequency Sampling technique - Comparison of IIR & FIR filters.

Basic structures of FIR systems – Direct-Form Structure - Cascade-Form Structures Linear Phase Realizations - Lattice structures.

UNIT – V		10	hrs

Multirate Digital Signal Processing

Decimation –Interpolation-Sampling Rate Conversion by a Rational Factor–Implementation of sampling rate converters–Applications of Multirate Signal Processing-Digital Filter Banks.

Text Books

1	Digital Signal Processing – Principles Algorithms and Applications: John G. Proakis – Dimitris G. Manolakis - 4th Edition - Pearson Education / PHI - 2007.
2	Discrete Time Signal Processing – A.V.Oppenheim and R.W. Schaffer - PHI.
3	Digital Signal Processing: A Computer based approach. Sanjit K Mitra - 4th Edition - TMH-2014.

Reference Books

1	Digital Signal Processing: Andreas Antoniou - TATA McGraw Hill - 2006.
2	Digital Signal Processing: MH Hayes - Schaum's Outlines - TATA Mc-Graw Hill - 2007.
3	DSP Primer - C. Britton Rorabaugh - Tata McGraw Hill - 2005.
4	Fundamentals of Digital Signal Processing using Matlab – Robert J. Schilling - Sandra L. Harris - Thomson - 2007.
5	Digital Signal Processing – Alan V. Oppenheim - Ronald W. Schafer - PHI Ed. - 2006.
6	Digital Signal Processing – K Raja Rajeswari - 1st edition - I.K. International Publishing - House – 2014

CO-PO/PSO Mapping Matrix																
	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
	C315B.1	2	3												3	
	C315B.2	2	3												3	
	C315B.3	2	3												3	
	C315B.4	2	3												3	
	C315B.5	2	3												3	
	Avg.	**2**	**3**												**3**	

KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY (AUTONOMOUS)

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK Kakinada

Department of Electrical and Electronics Engineering

		PROFESSIONAL ELECTIVE-III	**L**	**T**	**P**	**Cr.**
B.Tech. (VI Sem)		**HIGH VOLTAGE ENGINEERING**				
		Course Code: 23PEXXXXX	3	0	0	3

Pre-requisites:
Material Science, Electromagnetic Fields and Basics of Transient Circuits.

Course Objectives:

- To understand HV breakdown phenomena in gases.
- To understand the breakdown phenomenon of liquids and solid dielectrics.
- To acquaint with the generating principle of operation and design of HVDC, AC voltages.
- To understand the generating principles of Impulse voltages & currents.
- To understand various techniques for AC, DC and Impulse measurements of high voltages and currents.

Course Outcomes: After the completion of the course the student should be able to:

C315C.1	:	Recognize the dielectric properties of gaseous materials used in HV equipment.
C315C.2	:	Differentiate the break down phenomenon in liquid and solid dielectric materials.
C315C.3	:	Acquaint with the techniques of generation of high AC and DC voltages
C315C.4	:	Acquaint with the techniques of generation of high Impulse voltages and currents.
C315C.5	:	Getting the knowledge of measurement of high AC - DC - Impulse voltages and currents.

UNIT – I		10	hrs

Break down phenomenon in Gaseous and Vacuum:
Insulating Materials: Types, properties and its applications. Gases as insulating media – Collision process – Ionization process – Townsend's criteria of breakdown in gases and its limitations – Streamers Theory of break down – time lag – Paschen's law- Paschen's curve, Penning Effect. Breakdown mechanisms in Vacuum.

UNIT – II		10	hrs

Break down phenomenon in Liquids:
Liquid as Insulator – Pure and commercial liquids – Breakdown in pure and commercial liquids- Mechanisms.

Break down phenomenon in Solids:

	Intrinsic breakdown – Electromechanical breakdown – Thermal breakdown –Breakdown of composite solid dielectrics.			
	UNIT – III		10	hrs
	Generation of High DC voltages: Voltage Doubler Circuit - Voltage Multiplier Circuit – Vande- Graaff Generator. **Generation of High AC voltages**: Cascaded Transformers – Resonant Transformers –Tesla Coil.			
	UNIT – IV		10	hrs
	Generation of Impulse voltages: Specifications of impulse wave – Analysis of RLC circuits - Marx Circuit. **Generation of Impulse currents:** Definitions – Circuits for producing Impulse current waves – Wave shape control - Tripping and control of impulse generators			
	UNIT – V		10	hrs
	Measurement of High DC & AC Voltages: Resistance potential divider - Generating Voltmeter - Capacitor Voltage Transformer (CVT) - Electrostatic Voltmeters – Sphere Gaps. **Measurement of Impulse Voltages & Currents:** Potential dividers with CRO - Hall Generator - Rogowski Coils.			
	Text Books			
	1	High Voltage Engineering: Fundamentals by E. Kuffel - W.S. Zaengl - J. Kuffel by Elsevier - 2nd Edition.		
	2	High Voltage Engineering by M. S. Naidu and V. Kamaraju – TMH Publications - 3rd Edition.		
	Reference Books			
	1	High Voltage Engineering and Technology by Ryan - IET Publishers - 2nd edition.		
	2	High Voltage Engineering by C. L. Wadhwa- New Age Internationals (P) Limited – 1997.		
	3	High Voltage Insulation Engineering by Ravindra Arora - Wolfgang Mosch - New Age International (P) Limited - 1995.		
	E-RESOURCES:			
	1	https://archive.nptel.ac.in/courses/108/104/108104048		
	2	https://bharatsrajpurohit.weebly.com/high-voltage-engineering-course.html		

CO-PO/PSO Mapping Matrix																
	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
	C315C.1	2	3												3	
	C315C.2	2	3												3	
	C315C.3	2	3												3	
	C315C.4	2	3												3	
	C315C.5	2	3												3	
	Avg.	**2**	**3**												**3**	

12 Week MOOCS SWAYAM NPTEL
Course recommended by BOS

KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY
(AUTONOMOUS)

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK Kakinada

Department of Electrical and Electronics Engineering

		OPEN ELECTIVE-II	**L**	**T**	**P**	**Cr.**
B.Tech. (VI Sem)		**FUNDAMENTALS OF ELECTRIC VEHICLES**				
		Course Code: 23OEXXXXX	3	0	0	3

Pre-requisites:
Basic knowledge in Physics, Chemistry and Basics of Electrical and Electronics.

Course Objectives:

- To familiarize the students with the need and advantages of electric and hybrid electric vehicles.
- To understand various power converters used in electric vehicles.
- To be familiar all the different types of motors suitable for electric vehicles.
- To know various architecture of hybrid electric vehicles.
- To have knowledge on latest developments in batteries and other storage systems.

Course Outcomes: After the completion of the course the student should be able to:

C316A.1	:	Illustrate the use and advantages of different types of electric vehicles.
C316A.2	:	Use suitable power converters for EV application.
C316A.3	:	Select suitable electric motor for EV power train.
C316A.4	:	Design HEV configuration for a specific application.
C316A.5	:	Analyse various storage systems and battery management system for EVs

UNIT – I		10	hrs

Introduction
Fundamentals of vehicles – Vehicle model –Calculation Road load and tractive force – Components of conventional vehicles – Ddrawbacks of conventional vehicles – Need for electric vehicles– Advantages and applications of Electric Vehicles – History of Electric Vehicles – EV Market in India and outside India –Types of Electric Vehicles.

UNIT – II		10	hrs

Components of Electric Vehicles
Main components of Electric Vehicles – Electric Traction Motor and Controller –Power Converters – Rectifiers used in EVs – Bidirectional DC–DC Converters – Voltage Source Inverters – PWM inverters used in EVs.

UNIT – III		10	hrs

Motors for Electric Vehicles
Characteristics of traction drive – requirements of electric machines for EVs – Comparison of

Different motors for Electric and Hybrid Vehicles – Induction Motors – Synchronous Motors – Permanent Magnetic Synchronous Motors – Brushless DC Motors – Switched Reluctance Motors (Construction details and working only).

UNIT – IV | 10 hrs

Hybrid Electric Vehicles

Evolution of Hybrid Electric Vehicles – Advantages and Applications of Hybrid Electric Vehicles – Architecture of HEVs – Series and Parallel HEVs – Complex HEVs – Range extended HEVs – Examples – Merits and Demerits.

UNIT – V | 10 hrs

Energy Sources for Electric Vehicles

Batteries– Types of Batteries – Lithium-ion – Nickel-metal hydride – Lead-acid – Comparison of Batteries – Battery Charging – Fast Charging –Battery Management System – Ultra capacitors – Flywheels – Compressed air energy storage (CAES)– Fuel Cell – it's working.

Text Books

1	Iqbal Hussein - Electric and Hybrid Vehicles: Design Fundamentals - CRC Press - 2021.
2	Tom Denton, Hayley Pells - Electric and hybrid vehicles, Third Edition, 2024

Reference Books

1	Kumar - L. Ashok - and S. Albert Alexander. Power Converters for Electric Vehicles. CRC Press - 2020.
2	Chau - Kwok Tong. Electric vehicle machines and drives: design - analysis and application. John Wiley & Sons - 2015.
3	Berg - Helena. Batteries for electric vehicles: materials and electrochemistry. Cambridge university press – 2015

E-RESOURCES:

1	MOOC at https://www.edx.org/learn/electric-cars
2	https://archive.nptel.ac.in/courses/108/106/108106170

CO-PO/PSO Mapping Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
C316A.1	2	3												3	
C316A.2	2	3												3	
C316A.3	2	3												3	
C316A.4	2	3												3	
C316A.5	2	3												3	
Avg.	**2**	**3**												**3**	

KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY
(AUTONOMOUS)

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK Kakinada

Department of Electrical and Electronics Engineering

		OPEN ELECTIVE-II	**L**	**T**	**P**	**Cr.**
B.Tech. (VI Sem)		**ELECTRICAL WIRING ESTIMATION AND COSTING**				
		Course Code: 23OEXXXXX	3	0	0	3

Pre-requisites:
Electrical Circuits, Basics of Power Systems and Electrical Machines.

Course Objectives:

- Introduce the electrical symbols and simple electrical circuits
- Able to learn the design of electrical installations.
- Able to learn the design of electrical installation for different types of buildings and small industries.
- Learn the basic components of electrical substations.
- Familiarize with the motor control circuits

Course Outcomes: After the completion of the course the student should be able to:

C316B.1	:	Demonstrate the various electrical apparatus and their interconnections.
C316B.2	:	Examine various components of electrical installations.
C316B.3	:	Estimate the cost for installation of wiring for different types of building and small industries.
C316B.4	:	Illustrate the components of electrical substations.
C316B.5	:	Design suitable control circuit for starting of three phase induction motor and synchronous motor.

UNIT – I		10	hrs

Electrical Symbols and Simple Electrical Circuits
Identification of electrical symbols - Electrical wiring Diagrams - Methods of representation of wiring diagrams - introduction to simple light and fan circuits - system of connection of appliances and accessories.

UNIT – II		10	hrs

Design Considerations of Electrical Installations
Electric supply system - Three-phase four wire distribution system - protection of electric installation against overload - short circuit and earth fault - earthing- neutral and earth wire - types of loads - systems of wiring - permissible of voltage drops and sizes of wires - estimating and costing of electrical installations.

	UNIT – III		10	hrs
	Electrical Installation for Different Types of Buildings and Small Industries Electrical installations for electrical buildings - estimating and costing of material - simple examples on electrical installation for residential buildings - electrical installations for commercial buildings - electrical installation for small industries-case study.			
	UNIT – IV		10	hrs
	Substations Introduction - types of substations - outdoor substations-pole mounted type – indoor substations-floor mounted type - simple examples on quantity estimation-case study.			
	UNIT – V		10	hrs
	Motor control circuits Introduction to AC motors - starting of three phase squirrel cage induction motors - starting of wound rotor motors - starting of synchronous motors - contractor control circuit components - basic control circuits - motor protection – Schematic and wiring diagrams for motor control circuits.			
	Text Books			
	1	Electrical Design and Estimation Costing - K. B. Raina and S. K. Bhattacharya – New Age International Publishers - 2007.		
	Reference Books			
	1	Electrical wiring estimating and costing – S. L. Uppal and G. C. Garg – Khanna publishers - 6th edition - 1987.		
	2	A course in electrical installation estimating and costing – J. B. Gupta –Kataria SK & Sons - 2013.		
	E-RESOURCES:			
	1	https://onlinecourses.swayam2.ac.in/nou25_ec07/preview		

CO-PO/PSO Mapping Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
C316B.1	2	3											3		
C316B.2	2	3											3		
C316B.3	2	3											3		
C316B.4	2	3											3		
C316B.5	2	3											3		
Avg.	**2**	**3**											**3**		

KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY
(AUTONOMOUS)

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK Kakinada

Department of Electrical and Electronics Engineering

		OPEN ELECTIVE – II	**L**	**T**	**P**	**Cr.**
B.Tech. (VI_ Sem.)		**SAFETY ENGINEERING**				
		Course Code: **23OEXXXXX**	3	0	0	3

Pre-requisites: Basic Electrical Engineering

Course Objectives:

- To understand the concepts of industrial safety and management.
- To demonstrate the accident preventions and protective equipment.
- To understand and apply the knowledge of safety acts
- To have the knowledge about fire prevention and protection systems
- To understand and apply fire safety principles in buildings

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

C316C.1	:	Learn the concepts of industrial safety and management.
C316C.2	:	Demonstrate the accident preventions and protective equipment
C316C.3	:	Apply the knowledge of safety acts.
C316C.4	:	Analyse about fire prevention and protection systems.
C316C.5	:	Apply the fire safety principles in buildings

UNIT – I		10	hrs

Introduction to The Development of Industrial Safety and Management: History and development of Industrial safety: Implementation of factories act, Safety and productivity, Safety organizations. Safety committees and structure, Role of management and role of Govt. in industrial safety.

UNIT – II		10	hrs

Accident Preventions and Protective Equipment: Personal protective equipment, Survey the plant for locations, Part of body to be protected, Education and training in safety, Prevention causes and cost of accident, Housekeeping, First aid, Accident reporting, Investigations. Industrial psychology in accident prevention, Safety trials, Safety related to operations.

UNIT – III		10	hrs

Safety Acts: Features of Factory Act, Introduction of Explosive Act, Boiler Act, ESI Act, Workman's compensation Act, Industrial hygiene, Occupational safety, Diseases prevention, Ergonomics, Occupational diseases, stress, fatigue, health, safety and the physical environment, Engineering methods of controlling chemical hazards, safety and the physical environment,

Control of industrial noise and protection against it, Code and regulations for worker safety and health, codes for safety of systems.

UNIT – IV 10 hrs

Fire Prevention and Protection: Sources of ignition – fire triangle – principles of fire extinguishing – active and passive fire protection systems – various classes of fires – A, B, C, D, E Fire extinguishing agents- Water, Foam, Dry chemical powder, Carbon-dioxide Halon alternatives Halocarbon compounds-Inert gases, dry powders – types of fire extinguishers – fire stoppers – hydrant pipes – hoses – monitors – fire watchers – layout of stand pipes – fire station- fire alarms and sirens – maintenance of fire trucks – foam generators – escape from fire rescue operations – fire drills – first aid for burns.

UNIT – V 10 hrs

Building Fire Safety: Objectives of fire safe building design, Fire load, fire resistant material and fire testing – structural fire protection – structural integrity – concept of egress design - exit – width calculations - fire certificates – fire safety requirements for high rise buildings.

Text Books

1. Purandare D. D & Abhay D. Purandare, "Hand book on Industrial Fire Safety" P & A publications, New Delhi, 2006.
2. McElroy, Frank E., "Accident Prevention Manual for Industrial Operations", NSC, Chicago, 1988.

Reference Books

1. Installation, Servicing and Maintenance Bhattacharya, S.N. - S. Chand and Co.
2. Jain V K "Fire Safety in Building" New Age International 1996.
3. Occupational Safety Management and Engineering Willie Hammer – Prentice Hall.

CO-PO/PSO Mapping Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
C316.1	2	3												3	
C316.2	2	3												3	
C316.3	2	3												3	
C316.4	2	3												3	
C316.5	2	3												3	
Avg.	**2**	**3**												**3**	

KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY
(AUTONOMOUS)

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK Kakinada

Department of Electrical and Electronics Engineering

			L	T	P	Cr.
B.Tech. (VI Sem)		**ELECTRICAL MEASUREMENTS AND INSTRUMENTATION LAB**				
		Course Code: 23PEXXXXX	0	0	3	1.5

Pre-requisites: Basic knowledge on measurements

Course Objectives:

- To understand students how different types of meters work and their construction.
- To make the students understand how to measure resistance, inductance and capacitance by AC & DC bridges.
- To understand the testing of CT and PT.
- To Understand and the characteristics of Thermo couples, LVDT, Capacitive transducer, piezoelectric transducer and measurement of strain and choke coil parameters.
- To study the procedure for standardization and calibration of various methods.

Course Outcomes: After the completion of the course the student should be able to:

C317.1	:	Know about the phantom loading and calibration process.
C317.2	:	Measure the electrical parameters voltage - current - power- energy and electrical characteristics of resistance - inductance and capacitance.
C317.3	:	Gain the skill knowledge of various brides and their applications
C317.4	:	Learn the usage of CT's - PT's for measurement purpose.
C317.5	:	Know the characteristics of transducers and measure the strains - frequency and phase difference.

List of Experiments
(Any ten experiments from the following list)

1	Calibration of dynamometer wattmeter using phantom loading
2	Measurement of resistance using Kelvin's double Bridge and Determination of its tolerance
3	Measurement of Capacitance using Schering Bridge.
4	Measurement of Inductance using Anderson Bridge.

	5	Calibration of LPF Wattmeter by direct loading.
	6	Measurements of 3 phase reactive power using single wattmeter method for a balanced load.
	7	Testing of C.T. using mutual inductor – Measurement of % ratio error and phase angle of given C.T. by Null deflection method.
	8	P.T. testing by comparison – V.G as Null detector – Measurement of % ratio error and phase angle of the given P.T.
	9	Determination of the characteristics of a Thermocouple.
	10	Determination of the characteristics of a LVDT.
	11	Determination of the characteristics for a capacitive transducer.
	12	Measurement of strain for a bridge strain gauge.
	13	Measurement of Choke coil parameters and single-phase power using three voltmeter and three ammeter methods.
	14	Calibration of single-phase Induction Type Energy Meter.
	15	Calibration of DC ammeter and voltmeter using Crompton DC Potentiometer
	16	AC Potentiometer: Polar Form / Cartesian Form - Calibration of AC voltmeter - Parameters of choke.

Reference Books

1. Electrical & Electronic Measurement & Instruments by A.K. Sawhney Dhanpat Rai & Co. Publications.
2. Electrical and Electronic Measurements and instrumentation by R.K.Rajput, S.Chand.

CO-PO/PSO Mapping Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
C317.1									3	2					3
C317.2								2	3	2					3
C317.3	2			3					3						3
C317.4	2			3					3						3
Avg.	**2**			**3**				**2**	**3**	**2**					**3**

KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY
(AUTONOMOUS)

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK Kakinada

Department of Electrical and Electronics Engineering

			L	T	P	Cr.
B.Tech. (VI Sem)		**MICROPROCESSORS AND MICROCONTROLLERS LAB**				
		Course Code: 23PEXXXXX	0	0	3	1.5

Pre-requisites:
Concepts of Microprocessors and Microcontrollers

Course Objectives:

- To study programming based on 8086 microprocessor and 8051 microcontrollers.
- To study 8086 microprocessor-based ALP using arithmetic, logical and shift operations.
- To study to interface 8086 with I/O and other devices.
- To study parallel and serial communication using 8051& PIC 18 micro controllers.

Course Outcomes: After the completion of the course the student should be able to:

C318.1	:	Write assembly language program using 8086 microprocessors based on arithmetic - logical number systems and shift operations.
C318.2	:	Write assembly language programs for numeric operations and array handling problems.
C318.3	:	Write an assembly program on string operations.
C318.4	:	Interface 8086 with I/O and other devices.
C318.5	:	Do parallel and serial communication using 8051 & PIC 18 micro controllers

List of Experiments
(Any ten experiments from the following list)

8086 Microprocessor Programs

1.	Arithmetic operations – Two 16-bit numbers and multibyte numbers: addition - subtraction - multiplication and division – Signed and unsigned arithmetic operations - ASCII – Arithmetic operations.
2.	Logic operations – Shift and rotate – Converting packed BCD to unpacked BCD - BCD to ASCII conversion – BCD numbers addition.
3.	Arrange the given array in ascending and descending order Determine the factorial of a given number By using string operation and Instruction prefix: Move block - Reverse string Sorting -

		Inserting- Deleting- Length of the string - String comparison.
	4.	Find the first and nth number of ‘n’ natural numbers of a Fibonacci series.
	5.	Find the number and sum of even and odd numbers of a given array
	6.	Find the sum of ‘n’ natural numbers and squares of ‘n’ natural numbers
	7.	Arithmetic operations on 8051
	8.	Conversion of decimal number to hexa equivalent and hexa equivalent to decimal number.
	Programs on Interfacing	
	9.	Interfacing 8255–PPI with 8086.
	10.	Stepper motor control using 8253/8255.
	11.	Reading and Writing on a parallel port using 8051
	12.	Timer in different modes using 8051
	13.	Serial communication implementation using 8051
	14.	Understanding three memory areas of 00 – FF Using 8051 external interrupts.
	15.	Traffic Light Controller using 8051.
	Reference Books	
	1	R.S. Kaler, “A Text book of Microprocessors and Micro Controllers”, I.K. International Publishing House Pvt. Ltd.
	2	Ajay V. Deshmukh, “Microcontrollers – Theory and Applications”, Tata McGraw– Hill Companies –2005.

CO-PO/PSO Mapping Matrix																
	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
	C318.1									3	2					
	C318.2								2	3	2					
	C318.3	2			3					3						
	C318.4	2			3					3						
	Avg.	**2**			**3**				**2**	**3**	**2**					

KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY
(AUTONOMOUS)

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK Kakinada

Department of Electrical and Electronics Engineering

		L	T	P	Cr.
B.Tech. (VI Sem)	**IOT APPLICATIONS OF ELECTRICAL ENGINEERING LAB**				
	Course Code: 23PEXXXXX	0	0	3	1.5

Pre-requisites:
Concepts of Computer Organization, Computer Networks.

Course Objectives:

- To understand the working of Arduino.
- To learn the programming of Raspberry PI.
- To know various sensors with Arduino/Raspberry Pi.
- To interface various displays with Arduino/Raspberry Pi.
- To connect with various wireless communication devices

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

C319.1	:	Operate the Arduino Integrated Development Environment with embedded c.
C319.2	:	Program the embedded Python in Raspberry Pi OS.
C319.3	:	Interface various sensors with Arduino /Raspberry Pi in the IoT environment.
C319.4	:	Connect different displays with Arduino/Raspberry Pi

List of Experiments
(Any ten experiments from the following list)

1.	Familiarization with Arduino/Raspberry Pi and perform necessary software installation.
2.	Interfacing of LED/Buzzer with Arduino/Raspberry Pi and write a program to turn ON LED for 1 sec after every 2 seconds.
3.	Interfacing of Push button/Digital sensor (IR/LDR) with Arduino/Raspberry Pi and write a program to turn ON LED when push button is pressed or at sensor detection.
4.	Interfacing of temperature sensor with Arduino/Raspberry Pi and write a program to print temperature and humidity readings
5.	Interfacing of Organic Light Emitting Diode (OLED) with Arduino/Raspberry Pi
6.	Interfacing of Bluetooth with Arduino/Raspberry Pi and write a program to send sensor data to smartphone using Bluetooth

	7.	Interfacing of Bluetooth with Arduino/Raspberry Pi and write a program to turn LED ON/OFF when '1'/'0' is received from smartphone using Bluetooth
	8.	Write a program on Arduino/Raspberry Pi to upload and retrieve temperature and humidity data to things peak cloud.
	9.	Interfacing of 7 Segment Display with Arduino/Raspberry Pi
	10.	Interfacing of Joystick with Arduino/Raspberry Pi
	11.	Interfacing of Analog Input & Digital Output with Arduino/Raspberry Pi
	12.	Night Light Controlled & Monitoring System
	13.	Interfacing of Fire Alarm Using Arduino/Raspberry Pi
	14.	IR Remote Control for Home Appliances
	15.	A Heart Rate Monitoring System
	16.	Alexa based Home Automation System

Reference Books

1. Designing the Internet of Things, Adrian McEwen and Hakim Cassimally, Wiley
2. Getting Started with the Internet of Things, CunoPfister , Oreilly.

CO-PO/PSO Mapping Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
C319.1									3	2				3	
C319.2								2	3	2				3	
C319.3			3	3					3					3	
C319.4			3	3					3					3	
Avg.			**3**	**3**				**2**	**3**	**2**				**3**	

KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY (AUTONOMOUS)

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK Kakinada

Department of Electrical and Electronics Engineering

		L	T	P	Cr.
B. Tech (VII Sem.)	**RESEARCH METHODOLOGY**				
	Course Code: R23XXXX	3	0	0	3

Pre-requisites:

Course Objectives:

- Familiarize students with the fundamentals of research process and methodologies.
- Enable students to identify, formulate, and define research problems systematically.
- Develop skills in literature review, data collection, analysis, and interpretation.
- Expose students to research ethics, plagiarism, and intellectual property rights
- Train students in technical writing, presentation, and documentation of research outcomes.

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

C320.1	:	Explain research concepts, types, and the overall research process.
C320.2	:	Identify and define research problems through systematic literature review and gap analysis.
C320.3	:	Apply appropriate research design, methodology, and tools for data collection and analysis.
C320.4	:	Interpret research results and draw valid conclusions in line with research objectives.
C320.5	:	Demonstrate awareness of research ethics, plagiarism, and intellectual property rights and Prepare technical reports, research papers, and effectively communicate research outcomes

UNIT – I		10	hrs

Foundations of Research: Meaning, Objectives, Motivation, Utility. Concept of theory, empiricism, deductive and inductive theory. Characteristics of scientific method – Understanding the language of research – Concept, Construct, Definition, Variable

Research Process: Problem Identification & Formulation – Research Question – Investigation Question – Measurement Issues – Hypothesis – Qualities of a good Hypothesis –Null Hypothesis & Alternative Hypothesis. Hypothesis Testing – Logic & Importance

UNIT – II		10	hrs

Research Design: Concept and Importance in Research – Features of a good research design – Exploratory Research Design – concept, types and uses, Descriptive Research Designs – concept, types and uses. Experimental Design: Concept of Independent & Dependent variables

Qualitative and Quantitative Research: Qualitative research – Quantitative research – Concept

	of measurement, causality, generalization, replication. Merging the two approaches			
	UNIT – III		10	hrs
	Measurement: Concept of measurement– what is measured? Problems in measurement in research – Validity and Reliability. Levels of measurement – Nominal, Ordinal, Interval, Ratio **Sampling:** Concepts of Statistical Population, Sample, Sampling Frame, Sampling Error, Sample Size, Non Response. Characteristics of a good sample. Probability Sample – Simple Random Sample, Systematic Sample, Stratified Random Sample & Multi-stage sampling. Determining size of the sample – Practical considerations in sampling and sample size.			
	UNIT – IV		10	hrs
	Data Analysis: Data Preparation – Univariate analysis (frequency tables, bar charts, pie charts, percentages), Bivariate analysis – Cross tabulations and Chi-square test including testing hypothesis of association **Interpretation of Data and Paper Writing** – Layout of a Research Paper, Journals in Computer Science, Impact factor of Journals, When and where to publish? Ethical issues related to publishing, Plagiarism and Self-Plagiarism			
	UNIT – V		10	hrs
	Use of Encyclopedias, Research Guides, Handbook etc., Academic Databases for Computer Science Discipline **Use of tools / techniques for Research**: methods to search required information effectively, Reference Management Software like Zotero/Mendeley, Software for paper formatting like LaTeX/MS Office, Software for detection of Plagiarism			
	Text Books			
	1	**C.R. Kothari & Gaurav Garg** – *Research Methodology: Methods and Techniques* – New Age International Publishers., 3rd Edition, 2007		
	2	**K.N. Krishnaswamy, Appa Iyer Sivakumar, M. Mathirajan** – *Management Research Methodology: Integration of Principles, Methods and Techniques* – Pearson Education., 2009.		
	Reference Books			
	1	**Donald R. Cooper & Pamela S. Schindler** – *Business Research Methods* – McGraw Hill.		

CO-PO/PSO Mapping Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
C320.1	3	2								3		2			
C320.2	3	2								3		2			
C320.3	3	2								3		2			
C320.4	3	2								3		2			
C320.5	3	2								3		2			
Avg.	**3**	**2**								**3**		**2**			

KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY (AUTONOMOUS)

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK Kakinada

Department of Electrical and Electronics Engineering

		L	T	P	Cr.
B. Tech (VII Sem.)	**POWER SYSTEM OPERATION AND CONTROL**				
	Course Code: R2341XXXX	3	0	0	3

Pre-requisites: A solid knowledge on power systems -I, II, system analysis.

Course Objectives:

- To understand optimal dispatch of generation with and without losses.
- To study the optimal scheduling of hydro thermal systems.
- To study the optimal unit commitment problem.
- To study the load frequency control for single area system with and without controllers
- To study the load frequency control for two area system with and without controllers
- To understand the reactive power control and compensation of transmission lines.

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

C401.1	:	Able to compute optimal scheduling of Generators.
C401.2	:	Able to understand hydrothermal scheduling.
C401.3	:	Understand the unit commitment problem.
C401.4	:	Able to understand importance of the frequency.
C401.5	:	Understand importance of PID controllers in single area and two area systems.

UNIT – I 10 hrs

Economic Operation of Power Systems

Optimal operation of Generators in Thermal power stations, – Heat rate curve – Cost Curve – Incremental fuel and Production costs – Input–output characteristics – Optimum generation allocation with line losses neglected – Optimum generation allocation including the effect of transmission line losses – Loss Coefficients – General transmission line loss formula.

UNIT – II 10 hrs

Hydrothermal Scheduling

Optimal scheduling of Hydrothermal System**:** Hydroelectric power plant models – Scheduling problems – Short term hydrothermal scheduling problem.

UNIT – III 10 hrs

Unit Commitment

Optimal unit commitment problem – Need for unit commitment – Constraints in unit commitment –

Cost function formulation – Solution methods – Priority ordering – Dynamic programming.

UNIT – IV | 10 hrs

Load Frequency Control-I

Modeling of steam turbine – Generator – Mathematical modeling of speed governing system – Transfer function – Modeling of Hydro turbine –Necessity of keeping frequency constant – Definitions of Control area – Single area control system – Block diagram representation of an isolated power system – Steady state analysis – Dynamic response – Uncontrolled case. Proportional plus Integral control of single area and its block diagram representation – Steady state response.

Load Frequency Control-II

Block diagram development of Load Frequency Control of two area system uncontrolled case and controlled case. Tie-line bias control. Load Frequency Control and Economic dispatch control.

UNIT – V | 10 hrs

Reactive Power Control

Overview of Reactive Power control – Reactive Power compensation in transmission systems – Advantages and disadvantages of different types of compensating equipment for transmission systems – Load compensation – Specifications of load compensator – Uncompensated and compensated transmission lines**:** Shunt and series compensation – Need for FACTS controllers.

Text Books

1. Electric Energy systems Theory – by O.I.Elgerd, Tata McGraw–hill Publishing Company Ltd., Second edition.
2. Modern Power System Analysis – by I.J.Nagrath&D.P.Kothari Tata McGraw Hill Publishing Company Ltd, 2nd edition.

Reference Books

1. Power System Analysis and Design by J.Duncan Glover and M.S.Sarma., Thompson, 3rd Edition.
2. Power System Analysis by Grainger and Stevenson, Tata McGraw Hill.

CO-PO/PSO Mapping Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
C401.1	2	3											1		3
C401.2	2	3											1		3
C401.3	2	3											1		3
C401.4	2	3											1		3
C401.5	2	3											1		3
Avg.	**2**	**3**											**1**		**3**

KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY
(AUTONOMOUS)

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK Kakinada

Department of Electrical and Electronics Engineering

		L	T	P	Cr.
B. Tech (VII Sem.)	**ENERGY MANAGEMENT & AUDITING**				
	Course Code: R2341XXXX	2	0	0	2

Pre-requisites: Basic knowledge on HVDC systems

Course Objectives:

- To understand energy efficiency, scope, conservation and technologies.
- To design energy efficient lighting systems.
- To estimate/calculate power factor of systems and propose suitable compensation techniques.
- To understand energy conservation in HVAC systems.
- To calculate life cycle costing analysis and return on investment on energy efficient technologies.

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

C402.1	:	Explain energy efficiency, conservation and various technologies.
C402.2	:	Design energy efficient lighting systems.
C402.3	:	Calculate power factor of systems and propose suitable compensation techniques.
C402.4	:	Understand of types of space heating and ventilation.
C402.5	:	Explain energy conservation in HVAC systems.

UNIT – I 10 hrs

Basic Principles of Energy Audit and management

Energy audit – Definitions – Concept – Types of audit – Energy index – Cost index – Pie charts – Sankey diagrams – Load profiles – Energy conservation schemes and energy saving potential – Numerical problems – Principles of energy management – Initiating, planning, controlling, promoting, monitoring, reporting – Energy manager – Qualities and functions – Language – Questionnaire – Check list for top management.

UNIT – II 10 hrs

Lighting

Modification of existing systems – Replacement of existing systems – Priorities**:** 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.

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		10	hrs

Space Heating and Ventilation

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.

UNIT – IV		10	Hrs

Economic Aspects and Financial Analysis

Understanding energy cost - Economics Analysis – Depreciation Methods – Time value of money – Rate of return – Present worth method – Replacement analysis – Life cycle costing analysis – Energy efficient motors (basic concepts) – Economics of energy efficient motors and systems.

UNIT – V		10	Hrs

Computation of Economic Aspects

Need of investment, appraisal and criteria - Calculation of simple payback period–Return on investment – Net present value – Internal rate of return – numerical examples – Power factor correction – Lighting – Applications of life cycle costing analysis – Return on investment – Numerical examples.

Text Books

1	Hand Book of Energy Audit by Sonal Desai- Tata McGraw hill
2	Energy efficient electric motors by John .C. Andreas, Marcel Dekker Inc Ltd–2nd edition, 1995

Reference Books

1	Energy management by W.R. Murphy & G. Mckay Butter worth, Elsevier publications. 2012
2	Electric Energy Utilization and Conservation by S C Tripathy, Tata McGraw hill publishing company Ltd. New Delhi.
3	Energy management by Paul o' Callaghan, Mc–Graw Hill Book company–1st edition, 1998.

CO-PO/PSO Mapping Matrix																
	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
	C402.1	2	3													
	C402.2	2	3	3												
	C402.3	2	3											2		
	C402.4	2	3											2		
	C402.5	2	3											2		
	Avg.	**2**	**3**	**3**										**2**		

KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY
(AUTONOMOUS)

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK Kakinada

Department of Electrical and Electronics Engineering

	PROFESSIONAL ELECTIVE –IV	L	T	P	Cr.
B. Tech (VII Sem)	**EHVAC & HVDC TRANSMISSION SYSTEMS**				
	Course Code: R2341XXX	3	0	0	3

Pre-requisites: Conversion of AC power to DC power at the sending end and then back to AC at the receiving end.

Course Objectives:

- To Understand basic concepts of HVDC Transmission.
- To analyze the converter configuration.
- To Know the control of converter and HVDC Transmission.
- To Understand the significance of reactive power control and AC/Dc load flow.
- To Know different converter faults, protection and effect of harmonics.
- To leave low pass and high pass filters.

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

C403A.1	:	Explain different types of HVDC levels and basic concepts
C403A.2	:	Explain the operation of converters.
C403A.3	:	Analyze the converter configuration.
C403A.4	:	Describe control concept of reactive power control and AC/DC load flow.
C403A.5	:	converter faults, protection and harmonic effects

UNIT – I		10	hrs

Basic Concepts

Economics & Terminal equipment of HVDC transmission systems: Types of HVDC Links – Apparatus required for HVDC Systems – Comparison of AC &DC Transmission, Application of DC Transmission System – Planning & Modern trends in D.C. Transmission.

UNIT – II		10	hrs

Analysis of HVDC Converters

Choice of converter configuration – analysis of Graetz – characteristics of 6 pulse & 12 pulse converters –Cases of two 3 phase converters in star –star mode – their performance.

UNIT – III		10	hrs

Converter & HVDC System Control

Principal of DC Link Control – Converters Control Characteristics – Firing angle control – Current

and extinction angle control – Effect of source inductance on the system - Starting and stopping of DC link - Power Control.

UNIT – IV | 10 hrs

Reactive Power Control in HVDC

Reactive Power Requirements in steady state-Conventional control strategies-Alternate control strategies sources of reactive power-AC Filters – shunt capacitors-synchronous condensers.

Power Flow Analysis In AC/DC Systems

Modelling of DC Links-DC Network-DC Converter-Controller Equations-Solution of DC load flow –solution of AC-DC Power flow-Simultaneous Method-Sequential method.

UNIT – V | 10 hrs

Converter Fault & Protection

Converter faults – protection against over current and over voltage in converter station – surge arresters –smoothing reactors – DC breakers –Audible noise-space charge field-corona effects on DC lines-Radio interference.

Harmonics

Generation of Harmonics –Characteristics harmonics, calculation of AC Harmonics, Non-Characteristics harmonics, adverse effects of harmonics – Calculation of voltage & Current harmonics – Effect of Pulse number on harmonics.

Text Books

1. HVDC Power Transmission Systems: Technology and system Interactions – by K. R. Padiyar, New Age International (P) Limited, and Publishers.
2. HVDC Transmission by S. Kamakshaiah and V. Kamaraju -Tata McGraw–Hill

Reference Books

1. HVDC Transmission – J. Arrillaga.
2. Direct Current Transmission – by E. W. Kimbark, John Wiley & Sons.
3. Power Transmision by Direct Current – by E. Uhlmann, B. S. Publications.

CO-PO/PSO Mapping Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
C403.1	2	3												3	
C403.2	2	3												3	
C403.3	2	3												3	
C403.4	2	3												3	
C403.5	2	3												3	
Avg.	**2**	**3**												**3**	

KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY
(AUTONOMOUS)

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK Kakinada

Department of Electrical and Electronics Engineering

		PROFESSIONAL ELECTIVE –IV	**L**	**T**	**P**	**Cr.**
B. Tech (VII Sem.)		**PROGAMMABLE LOGIC CONTROLLERS & APPLICATIONS**				
		Course Code: R2341XXX	3	0	0	3

Pre-requisites: A grasp of basic electrical and electronic principles, digital logic circuits, and computer programming concepts.

Course Objectives:

- To have knowledge on PLC.
- To acquire the knowledge on programming of PLC.
- To understand different PLC registers and their description.
- To have knowledge on data handling functions of PLC.
- To know how to handle analog signal and converting of A/D in PLC.

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

C403B.1	:	Understand the PLCs and their I/O modules.
C403B.2	:	Develop control algorithms to PLC using ladder logic.
C403B.3	:	Develop counters to PLC using ladder logic.
C403B.4	:	Develop control instruments to PLC using ladder logic.
C403B.5	:	Manage PLC registers for effective utilization in different applications.

UNIT – I		10	hrs

Introduction

PLC Basics: PLC system, I/O modules and interfacing, CPU processor, programming equipment, programming formats, construction of PLC ladder diagrams, devices connected to I/O modules.

UNIT – II		10	hrs

PLC Programming

PLC Programming: Input instructions, outputs, operational procedures, programming examples using contacts and coils. Digital logic gates, programming in the Boolean algebra system, conversion examples. Ladder diagrams and sequence listings, ladder diagram construction.

UNIT – III		10	hrs

Programmable Timers and Counters

Timer instructions – On delay time instruction – Off delay timer instruction – Retentive timer – Counter instructions – Up counter – Down counter - Cascading counters - Incremental encoder – Counter applications – Combining counter and timer functions.

	UNIT – IV		10	hrs
	Program Control Instructions Master control reset instruction – Jump instructions and sub routines – Immediate input and output instructions.			
	UNIT – V		10	hrs
	Other Instructions Data manipulation – Data transfer operation – Data compare instruction – Data manipulation programs – Numerical data I/O interfaces – Math instructions – Addition, subtraction, multiplication & division instruction – Sequential instructions – Sequence programs – Shift registers – Word shift registers. **Applications** Control of water level indicator – Alarm monitor - Conveyor motor control – Parking garage – Ladder diagram for process control – PID controller.			

Text Books

1	Programmable logic controllers by Frank D.Petruzella- McGraw Hill – 3rd Edition.
2	Programmable Logic Controllers – Principle and Applications by John W. Webb and Ronald A. Reiss, Fifth Edition, PHI

Reference Books

1	Programmable Logic Controllers – Programming Method and Applications by JR. Hackworth and F.D Hackworth Jr. – Pearson, 2004.
2	Introduction to Programmable Logic Controllers- Gary Dunning-Cengage Learning.
3	Programmable Logic Controllers –W.Bolton-Elsevier publisher

CO-PO/PSO Mapping Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
C403B.1	2	3													1
C403B.2	2	3													1
C403B.3	2	3													1
C403B.4	2	3											1		1
C403B.5	2	3													1
Avg.	**2**	**3**											**1**		**1**

KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY (AUTONOMOUS)

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK Kakinada

Department of Electrical and Electronics Engineering

	PROFESSIONAL ELECTIVE –IV	L	T	P	Cr.
B. Tech (VII Sem.)	**ELECTRICAL DISTRIBUTION SYSTEMS**				
	Course Code: R2341XXX	3	0	0	3

Pre-requisites: A solid understanding of basic electrical engineering principles and power system analysis.

Course Objectives:

- To study different factors of Distribution system.
- To study and design the substations and distribution systems.
- To study the concepts of voltage drop and power loss.
- To study the distribution system protection and its coordination.
- To study the effect of compensation for power factor improvement.
- To study the effect of voltage control on distribution system.

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

C403C.1	:	Discuss the various factors of distribution system.
C403C.2	:	Design the substation and feeders.
C403C.3	:	Determine the voltage drop and power loss.
C403C.4	:	Explain the protection and its coordination.
C403C.5	:	Illustrate the effect of compensation on power factor improvement.

UNIT – I		10	hrs

General Concepts

Introduction to distribution systems, Load modeling and characteristics – Coincidence factor – Contribution factor loss factor – Relationship between the load factor and loss factor – Classification of loads (Residential, commercial, Agricultural and Industrial).

UNIT – II		10	hrs

Substations

Location of substations**:** Rating of distribution substation – Service area with‘n’primary feeders – Benefits and methods of optimal location of substations.

Distribution Feeders

Design Considerations of distribution feeders**:** Radial and loop types of primary feeders – Voltage levels – Feeder loading – Basic design practice of the secondary distribution system.

	UNIT – III		10	hrs
	System Analysis Voltage drop and power–loss calculations**:** Derivation for voltage drop and power loss in lines – Uniformly distributed loads and non-uniformly distributed loads – Numerical problems - Three phase balanced primary lines.			
	UNIT – IV		10	hrs
	Protection Objectives of distribution system protection – Types of common faults and procedure for fault calculations for distribution system – Protective devices**:** Principle of operation of fuses – Circuit reclosures – Line sectionalizes and circuit breakers. **Coordination** Coordination of protective devices**:** General coordination procedure –Various types of co-ordinated operation of protective devices - Residual Current Circuit Breaker			
	UNIT – V		10	hrs
	Compensation for Power Factor Improvement Capacitive compensation for power factor control – Different types of power capacitors – shunt and series capacitors – Effect of shunt capacitors (Fixed and switched) – Power factor correction – Capacitor allocation – Economic justification – Procedure to determine the best capacitor location – Numerical problems. **Voltage Control** Voltage Control**:** Equipment for voltage control – Effect of series capacitors – Effect of AVB/AVR – Line drop compensation – Numerical problems.			

Text Books

1	"Electric Power Distribution system, Engineering" – by TuranGonen, McGraw–hill Book Company.

Reference Books

1	Electrical Distribution Systems by Dale R.Patrick and Stephen W.Fardo, CRC press
2	Electrical Power Distribution Systems by V.Kamaraju, Right Publishers.

CO-PO/PSO Mapping Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
C403C.1	2	3												3	
C403C.2	2	3												3	
C403C.3	2	3												3	
C403C.4	2	3												3	
C403C.5	2	3												3	
Avg.	**2**	**3**												**3**	

12 Week MOOCS SWAYAM NPTEL Course recommended by BOS

KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY
(AUTONOMOUS)

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK Kakinada

Department of Electrical and Electronics Engineering

	PROFESSIONAL ELECTIVE –V	L	T	P	Cr.
B. Tech (VII Sem.)	**ELECTRIC VEHICLES**				
	Course Code: R2341XXX	3	0	0	3

Pre-requisites: This course aims to study and understand merits of electric and hybrid electric vehicles. It also deals with different power electronic converters and battery storage systems for electric and hybrid electric vehicles.

Course Objectives:

- To familiarize the students with the need and advantages of electric and hybrid electric vehicles.
- To know various architectures of hybrid electric vehicles.
- To understand the power management of plug-in electric vehicles.
- To study and understand different power converters used in electrical vehicles.
- To familiarize with different batteries and other storage systems.

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

C404A.1	:	Know the concept of electric vehicles and hybrid electric vehicles.
C404A.2	:	Familiar with different configuration of hybrid electric vehicles.
C404A.3	:	Explain the power converters used in hybrid electric vehicles
C404A.4	:	Know different batteries and other energy storage systems.
C404.5	:	Represent physical systems as state models and determine the response. Understanding the concepts of controllability and observability

UNIT – I		10	hrs

Introduction

Fundamentals of vehicle, components of conventional vehicle and propulsion load; Drive cycles and drive terrain. Concept of electric vehicle and hybrid electric vehicle; History of hybrid vehicles, advantages and applications of Electric and Hybrid Electric Vehicles, different Motors suitable for of Electric and Hybrid Electric Vehicles.

UNIT – II		10	hrs

Hybridization of Automobile

Architectures of HEVs, series and parallel HEVs, complex HEVs. Plug-in hybrid vehicle, constituents of PHEV, comparison of HEV and PHEV; Fuel Cell vehicles and its constituents.

UNIT – III		10	hrs

Plug-in Hybrid Electric Vehicle

PHEVs and EREVs blended PHEVs, PHEV Architectures, equivalent electric range of blended PHEVs. Fuel economy of PHEVs, power management of PHEVs, end-of-life battery for electric power grid support, vehicle to grid technology, PHEV battery charging.

UNIT – IV 10 hrs

Power Electronics in HEVs

Rectifiers used in HEVs, voltage ripples; Buck converter used in HEVs, non-isolated bidirectional DC-DC converter, voltage source inverter, current source inverter, isolated bidirectional DC-DC converter, PWM rectifier in HEVs, EV and PHEV battery chargers.

UNIT – V 10 hrs

Battery and Storage Systems

Energy Storage Parameters; Lead–Acid Batteries; Ultra capacitors; Flywheels Superconducting Magnetic Storage System; Pumped Hydroelectric Energy Storage; Compressed Air Energy Storage - Storage Heat; Energy Storage as an Economic Resource.

Text Books

1. Ali Emadi, Advanced Electric Drive Vehicles, CRC Press, 2014.
2. Iqbal Hussein, Electric and Hybrid Vehicles: Design Fundamentals, CRC Press, 2003.

Reference Books

1. Mehrdad Ehsani, Yimi Gao, Sebastian E. Gay, Ali Emadi, Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design, CRC Press, 2004.
2. James Larminie, John Lowry, Electric Vehicle Technology Explained, Wiley, 2003.
3. Mi Chris, Masrur A., and Gao D.W., "Hybrid Electric Vehicle: Principles and Applications with Practical Perspectives" 1995.

CO-PO/PSO Mapping Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
C403A.1	2	3												3	
C403A.2	2	3												3	
C403A.3	2	3												3	
C403A.4	2	3												3	
C403A.5	2	3												3	
Avg.	**2**	**3**												**3**	

KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY (AUTONOMOUS)

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK Kakinada

Department of Electrical and Electronics Engineering

	PROFESSIONAL ELECTIVE-V	L	T	P	Cr.
B. Tech. (VII Sem.)	**SWITCHED MODE POWER CONVERSION**				
	Course code: 2341XXXX	3	0	0	3

Pre-requisites: Basic knowledge on power electronics.

Course Objectives:

- Understand the principles of high-efficiency power conversion.
- Analyze and design non-isolated DC-DC converters, including Buck, Boost, and Buck-Boost topologies.
- Learn and apply resonant converter principles, including Zero Voltage Switching (ZVS).
- Analyze and design closed-loop control systems for switched-mode power converters.
- Develop the ability to design and implement power converters for various applications.

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

C404B.1	:	Understand Switch Mode Power Conversion and classify the DC-to-DC Converters.
C404B.2	:	Differentiate the various Power semiconductor switches.
C404B.3	:	Illustrate Isolated Power Conversion
C404B.4	:	Analyze the performance of the Magnetic Components.
C404B.5	:	Analyze the switching regulator control, soft-switched dc-dc power converters

UNIT – I		10	hrs

Introduction To Switch Mode Power Converters About Switch Mode Power Conversion, SMPS requirements. Cuk converters - and their principles of operation; continuous and discontinuous modes of operation.

UNIT – II		10	hrs

Thyristor Commutation Techniques Review of Recent developments in power devices for switch mode power supplies. Selection of devices, Commutation: Load Commutation, Resonant Pulse Commutation, Complementary Commutation, Impulse Commutation, External Pulse Commutation.

UNIT – III		10	hrs

Transformer-Isolated Converters Single-switch and multi-switch transformer-isolated DC-DC converters. Flyback and forward converters; transformer isolated half-bridge, full bridge

	converters. Push-pull converters. Voltage fed and current-fed converters			
	UNIT – IV		10	hrs
	Magnetic Component Design Magnetic core materials and performance; basic inductor and transformer design; practical magnetic design; design aspects to be considered for designing transformers for specific applications – flyback, push-pull converters			
	UNIT – V		10	hrs
	Switching Regulator Control, Soft-Switched Dc-Dc Power Converters Small-signal models for switching regulators. Performance analysis and design of closed-loop system under different control methods, and operating modes. Measurement of small signal transfer functions. Soft Switched DC-DC Power Converters -Motivation. Hard-switching vs soft-switching.			
	Text Books			
	1	N Mohan, T M Undeland and W P Robbins, "Power Electronics: Converters, Applications and Design", Wiley, 3rd Edition, 2007		
	2	Abraham Pressman, Keith Billings, Taylor Morey, "Switching Power Supply Design", McGraw-Hill.3rd Edition, 2009		
	Reference Books			
	1	K. Kit Sum, Switch Mode Power Conversion: Basic Theory and Design 1st Edition, Kindle Edition,2017		

CO-PO/PSO Mapping Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
C404B.1	2	3												3	
C404B.2	2	3												3	
C404B.3	2	3												3	
C404B.4	2	3												3	
C404B.5	2	3												3	
Avg.	**2**	**3**												**3**	

KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY
(AUTONOMOUS)

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK Kakinada

Department of Electrical and Electronics Engineering

	PROFESSIONAL ELECTIVE-V	L	T	P	Cr.
B. Tech. (VII Sem.)	**DESIGN OF PV SYSTEMS**				
	Course code: 2341XXXX	3	0	0	3

Pre-requisites:

Course Objectives:

- Provide knowledge of solar photovoltaic (PV) energy conversion principles and characteristics of solar cells.
- Develop analytical skills to design and size standalone and grid-connected PV systems.
- Familiarize students with PV modules, arrays, balance of systems (BOS), and storage technologies.
- Expose students to design considerations, performance evaluation, and economic aspects of PV systems.
- Enable students to apply PV design standards, simulation tools, and practical engineering approaches for real-world applications

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

C404C.1	:	Explain the principles of solar radiation, PV effect, and electrical characteristics of solar cells.
C404C.2	:	Analyze and model PV modules, arrays, and their performance under different environmental conditions.
C404C.3	:	Design standalone PV systems with appropriate battery sizing, charge controllers, and inverters.
C404C.4	:	Design grid-connected PV systems considering inverter interfacing, MPPT, and safety standards.
C404C.5	:	Evaluate the performance, reliability, and economic feasibility of PV systems for various applications and Apply simulation tools and design standards to solve real-world PV system design problems.

UNIT – I 10 Hrs

Review of Energy Scenario and Semiconductor Physics:

Review of world energy scenario including contribution from photovoltaic - The solar resource - Availability of energy from the sun and geographic availability - Direct diffuse and global isolation - Concept of air mass - Definition of solar geometric terms - Solar altitude - Inclination of collector -

	Azimuth angle (solar & surface) - Declination - Incident angle - Hour angle - Solar constant - Zenith angle etc . Review of semiconductor physics: Semiconductors as solar cell material - Arrangement of atoms in space - Arrangement of electrons in atom - Formation of energy bands - Direct and indirect band gap - Charge carriers and their motion in semiconductors - Charge carriers -Carrier concentration and distribution - Carrier motion - Electric field and energy band bending (density of states, drift, and diffusion).			
	UNIT – II		10	Hrs
	Solar Cell Design: Upper limits of cell parameters - Short circuit current - Open circuit voltage - Fill factor - Efficiency - Losses in solar cells - Model of a solar cell (equivalent circuit-one diode and two diode models) - Effect of series and shunt resistances on efficiency - Effect of solar radiation on efficiency - Effect of temperature on efficiency - Solar Cell design - Design for high Isc - High Voc - High FF - Analytical techniques - Solar simulator - I-V measurement - Quantum efficiency (QE) measurement - Minority carrier lifetime and diffusion length measurements Standard test conditions (STC) - Normal operating cell temperature (NOC) - Standard operating conditions (SOC) - Series and parallel connection of PV modules - Mismatch in series and parallel connections - Need for bypass and blocking diodes.			
	UNIT – III		10	Hrs
	Balance of Systems: Batteries for PV Systems - Lead acid - Nickel Cadmium - Nickel metal hydride - Lithium ion - Factors impacting battery performance - DC to DC Converters -Charge controllers - Maximum Powerpoint Trackers(MPPT)-Inverters-Grid Tied-Off Grid-Hybrid Inverters-Variable Frequency Drive - Types - Set points - Algorithm (for MPPT) -Mounting structures-Single Axis-Dual Axis- Maximum Powerpoint Tracking - Junction boxes - Array combiner boxes - Cables - Protection devices -Earthing - Lightning arrestor and other safety issues.			
	UNIT – IV		10	Hrs
	PV System Design and Applications: Standalone PV systems - Lighting - Water pumping - Hybrid PV Systems - PV wind and PV diesel - Grid connected PV Systems - PV power plants - Roof top and ground mounted small & large power plants.			
	UNIT – V		10	Hrs
	Evaluations of PV Systems and PV Power Plants: Sensors and data acquisition system - Typical instruments and sensors used - Pyranometer - Anemometer/wind vane - Ambient temperature measuring device - Thermocouples to measure cell temperature - DC and AC energy meters - I-V curve tracers (or Array testers) - IR Thermal Imager - Inverters - Data logger - Server - Web-based software –Latest and Emerging trends in solar cell technologies (organic, dye sensitized, quantum dots, thermo-photovoltaic)-Laser Grooved Buried Contact(LGBC)-Passive Emitter Rear Locally diffused(PERL)-Passive Rear Contact Cells Selecting Emitter(PERC)-Peroskvite Cells-Graphene Based Solar Cells- Environmental impact of photovoltaic - Economic analysis (net present value -Simple payback - Capital recovery factor -Discounted cash flow analysis) - Life cycle costing (example: Solar PV pumping system).			
	Text Books			
	1	Solar Photo voltaics: Fundamentals, Technologies and Applications, Chetan Singh Solanki, PHI		

		Learning Private Limited 2011 (or later edition).
	2	Solar Cells: Operating Principles, Technology and System Applications, Martin A, Green, Prentice Hall Inc.
	Reference Books	
	1	A guide to the Photovoltaic Revolution, Pauk D. Maycock and Edward N. Stirewalt, Rodale Press, Emmaus, Pa.

CO-PO/PSO Mapping Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
C404.1	2	3												3	
C404.2	2	3												3	
C404.3	2	3												3	
C404.4	2	3												3	
C404.5	2	3												3	
Avg.	**2**	**3**												**3**	

12 Week MOOCS SWAYAM NPTEL Course recommended by BOS

KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY (AUTONOMOUS)

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK Kakinada

Department of Electrical and Electronics Engineering

	OPEN ELECTIVE - III	L	T	P	Cr.
B.Tech. (VII_ Sem.)	**BATTERY MANAGEMENT SYSTEMS AND CHARGING STATIONS**				
	Course Code: 2341XXXX	3	0	0	3

Pre-requisites: The objective of this course is to introduce learner to batteries, its parameters, charging requirements and modelling. The course will help learner to understand the types of batteries and their charging methods, develop battery management and modelling algorithms for batteries.

Course Objectives:

1. To Understand the working of different batteries for EV applications
2. To know the fundamentals of battery charging methods and their advantages
3. To know the different kinds of equipment in charging station
4. To know the requirements of battery management.

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

C405A.1	:	Describe the construction and operation of different batteries for EV applications
C405A.2	:	Describe charging algorithms of different batteries and balancing methods of battery packs
C405A.3	:	Describe the different kinds of infrastructure needed in the charging stations
C405A.4	:	Describe the requirements of battery management and their maintenance.
C405A.5	:	Obtain the modelling of batteries and develop their simulation models.

UNIT – I		10	hrs

EV Batteries

Cells & Batteries, Nominal voltage and capacity, C rate, Energy and power, Cells connected in series, Cells connected in parallel.

Lead Acid Batteries: Lead acid battery basics, special characteristics of lead acid batteries, battery life and maintenance, Li-ion batteries.

Nickel-based Batteries: Nickel cadmium, Nickel metal hydride batteries.

Sodium-Based Batteries: Introduction, sodium Sulphur batteries, sodium metal chloride (Zebra) batteries.

Lithium Batteries: Introduction, the lithium polymer battery, lithium-ion battery.

UNIT – II		10	hrs

Battery charging strategies

Charging algorithms for a single battery: Basic terms for charging performance evaluation and characterization, CC charging for NiCd/NiMH batteries, CV charging for lead acid batteries, CC/CV charging for lead acid and Li-ion batteries, MSCC charging for lead acid, NiMH and Li-ion batteries, TSCC/CV charging for Li-ion batteries, CVCC/CV charging for Li-ion batteries, Pulse charging for lead acid, NiCd/NiMH and Li-ion batteries, Charging termination techniques, Comparisons of charging algorithms and new development; Balancing methods for battery pack charging: Battery sorting Overcharge for balancing, Passive balancing, Active balancing.

UNIT – III		10	hrs

Charging Infrastructure

Domestic Charging Infrastructure, Public charging Infrastructure, Normal Charging Station, Occasional Charging Station, Fast Charging Station, Battery Swapping Station, Move-and-charge zone.

UNIT – IV		10	hrs

Battery-Management-System Requirements

Battery-pack topology, BMS design requirements, Voltage sense, Temperature sense, Current sense, Contactor control, Isolation sense, Thermal control, Protection, Charger control, Communication via CAN bus, Log book, SOC estimation, Energy estimation, Power estimation, Diagnostics.

UNIT – V		10	hrs

Battery Modelling

General approach to modelling batteries, simulation model of rechargeable Li-ion battery, simulation model of a rechargeable NiCd battery, Parameterization of NiCd battery model, Simulation examples.

Text Books

1	Electric Vehicles Technology Explained by James Larminie Oxford Brookes University, Oxford, UK John Lowry Acenti Designs Ltd., Uk. (Unit-1)
2	Energy Systems for Electric and Hybrid Vehicles by K.T. Chau, IET Publications, First edition, 2016. (Unit-2)

Reference Books

1	Modern Electric Vehicles Technology by C. C. Chan, K.T Chau, Oxford University Press Inc., New york 2001. (Unit-3)
2	Battery Management Systems Vol. – II Equivalent Circuits and Methods, by Gregory L. Plett, Artech House publisher, First edition 2016. (Unit-4)
3	Battery Management Systems: design by Modelling by Henk Jan Bergveld, Wanda S. Kruijt, Springer Science & Business Media, 2002. (Unit-5)

CO-PO/PSO Mapping Matrix																
	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
	C405A.1	2	3											3		
	C405A.2	2	3											3		
	C405A.3	2	3											3		
	C405A.4	2	3											3		
	C405A.5	2	3											3		
	Avg.	**2**	**3**											**3**		

KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY
(AUTONOMOUS)

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK Kakinada

Department of Electrical and Electronics Engineering

	OPEN ELECTIVE – III	**L**	**T**	**P**	**Cr.**
B.Tech. (VII_ Sem.)	**CONCEPTS OF SMART GRID TECHNOLOGIES**				
	Course Code: 2341XXXX	3	0	0	3

Pre-requisites: Basic Understanding of Power System and Power Electronics Engineering.

Course Objectives:

- To learn about recent trends in grids as smart grid
- To understand about smart grid architecture and technologies.
- To know about smart substations.
- To learn about smart transmission systems.
- To learn about smart distribution systems.

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

C405B.1	:	Explain the trends in Smart Grids.
C405B.2	:	Analyse the needs and roles of smart substation.
C405B.3	:	Analyse the needs and roles of smart transmission system
C405B.4	:	Compute the needs and roles of smart distribution system
C405B.5	:	Distinguish between SCADA and DSCADA systems in practical working environment

UNIT – I 10 Hrs

Introduction to Smart Grid

Working definitions of Smart GRID AND Associated concepts - -Smart Grid Functions – Traditional Power Grid and Smart Grid – New technologies for Smart Grid – Advantages – Indian Smart Grid – Key challenges for Smart Grid.

Smart Grid Architecture: Components and Architecture of Smart Grid design – Review of the proposed architectures for Smart Grid. The fundamental components of Smart Grid designs – Transmission Automation - Distribution Automation – Renewable Integration.

UNIT – II 10 Hrs

Smart Grid Technologies

Characteristics of Smart Grid, Micro grids, Definitions, Drives, benefits, types of Micro Grid building blocks, Renewable energy resources, needs in Smart Grid, Integration impact, Integration standards, Load frequency control, reactive power control, case studies and test beds.

	UNIT – III		10	Hrs
	Smart Substations Protection, Monitoring and control devices, sensors, SCADA, Master stations, Remote terminal unit, Interoperability and IEC 61850, Process level, Bay level, Station level, Benefits, role of substations and Smart Grid, Volt / VAR control equipment inside substation.			
	UNIT – IV		10	Hrs
	Smart Transmission Energy management systems, History, current technology, EMS for the smart grid, wide area monitoring systems (WAMS), protection & control (WAMPC), needs in smart grid, role of substations in smart grid drivers and benefits, Role of transmission system in smart grid, synchro phasor measurement units (PMUS)			
	UNIT – V		10	Hrs
	Smart Distribution Systems DMS, DSCADA, trends in DSCADA and control, current and advanced DMS's, voltage fluctuations, effect of voltage on customer load, Drivers, objectives and benefits, voltage-VAR control equipment on distribution feeders, implementation and optimization, FDIR-Fault Detection Isolation and Service restoration (FDIR), Faults, objectives and benefits, equipment, implementation.			
	Text Books			
	1	Stuart Borlase, smart Grids- Infrastructure, Technology and Solutions, CRC Press I.e, 2013		
	2	Gil Masters, Renewable and Efficient Electric Power Systems, Wiley-Press, 2e,2013.		
	Reference Books			
	1	A.G. Phadke sand J.S. Thorp, Synchromized Phasor Measurements and their Applications Springer Edition, 2e, 2017.		
	2	T. Ackermann, Wind Power in Power Syetems, Hoboken, NJ, USA, John Wiley, 2e, 2012.		
	3	Power System stability & control - Prabha Kundur - TMH - 1994.		

CO-PO/PSO Mapping Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
C405B.1	2	3											3		
C405B.2	2	3											3		
C405B.3	2	3											3		
C405B.4	2	3											3		
C405B.5	2	3											3		
Avg.	**2**	**3**											**3**		

KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY
(AUTONOMOUS)

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK Kakinada

Department of Electrical and Electronics Engineering

	OPEN ELECTIVE-III	L	T	P	Cr.
B. Tech (VII Sem)	**ADVANCED CONTROL SYSTEMS**				
	Course Code: R23XXXXXX	3	0	0	3

Pre-requisites: A solid foundation in core control systems concepts and strong mathematical skills.

Course Objectives:

- Review of the state space representation of a control system**:** Formulation of different models from the signal flow graph, diagonalization.
- To introduce the concept of controllability and observability. Design by pole placement technique.
- Analysis of a nonlinear system using Describing function approach and Phase plane analysis.
- The Lypanov's method of stability analysis of a system.
- Formulation of Euler Laugrange equation for the optimization of typical functionals and solutions.
- Formulation of linear quadratic optimal regulator (LQR) problem by parameter adjustment and solving riccatti equation.

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

C405C.1	:	State space representation of control system and formulation of different state models are reviewed.
C405C.2	:	Able to design of control system using the pole placement technique is given after introducing the concept of controllability and observability.
C405C.3	:	Able to analyse of nonlinear system using the describing function technique and phase plane analysis.
C405C.4	:	Able to analyse the stability analysis using lypnov method.
C405C.5	:	Minimization of functionals using calculus of variation studied.

UNIT – I		10	hrs

State space analysis

State Space Representation – Solution of state equation – State transition matrix, –Canonical forms – Controllable canonical form – Observable canonical form, Jordan Canonical Form.

UNIT – II		10	hrs

Controllability, observability and design of pole placement

Tests for controllability and observability for continuous time systems – Time varying case – Minimum energy control – Time invariant case – Principle of duality – Controllability and observability form Jordan canonical form and other canonical forms – Effect of state feedback on controllability and observability – Design of state feedback control through pole placement.

UNIT – III		10	hrs

Describing function analysis

Introduction to nonlinear systems, Types of nonlinearities, describing functions, Introduction to phase–plane analysis.

UNIT – IV		10	hrs

Stability analysis

Stability in the sense of Lyapunov – Lyapunov's stability and Lypanov's instability theorems – Direct method of Lyapunov for the linear and nonlinear continuous time autonomous systems.

Calculus of variations

Minimization of functional of single function – Constrained minimization – Minimum principle – Control variable inequality constraints – Control and state variable inequality constraints – Euler lagrangine equation

UNIT – V		10	hrs

Optimal control

Linear Quadratic Optimal Regulator (LQR) problem formulation – Optimal regulator design by parameter adjustment (Lyapunov method) – Optimal regulator design by Continuous Time Algebraic Riccatti equation (CARE) - Optimal controller design using LQG framework.

Text Books

1	Modern Control Engineering – by K. Ogata, Prentice Hall of India, 3rd edition, 1998
2	Automatic Control Systems by B.C. Kuo, Prentice Hall Publication

Reference Books

1	Modern Control System Theory – by M. Gopal, New Age International Publishers, 2nd edition,1996
2	Control Systems Engineering by I.J. Nagarath and M.Gopal, New Age International (P) Ltd.

CO-PO/PSO Mapping Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
C405C.1	2	3											3		
C405C.2	2	3											3		
C405C.3	2	3											3		
C405C.4	2	3											3		
C405C.5	2	3											3		
Avg.	**2**	**3**											**3**		

KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY
(AUTONOMOUS)

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK Kakinada

Department of Electrical and Electronics Engineering

	OPEN ELECTIVE-IV	**L**	**T**	**P**	**Cr.**
B. Tech (VII Sem).	**CONCEPTS OF POWER QUALITY**				
	Course Code: R23XXXXXX	3	0	0	3

Pre-requisites: Circuit and Networks, Basic Electrical Engineering, Power Electronics, Power System, and Linear Control System.

Course Objectives:

- To learn different types of power quality phenomena.
- To identify sources for voltage sag, voltage swell, interruptions, transients, long duration over voltages and harmonics in a power system.
- To describe power quality terms and study power quality standards.
- To learn the principle of voltage regulation and power factor improvement methods.
- To explain the relationship between distributed generation and power quality.
- To understand the power quality monitoring concepts and the usage of measuring instruments.

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

C406A.1	:	Differentiate between different types of power quality problems.
C406A.2	:	Explain the sources of voltage sag, voltage swell, interruptions, transients, long duration over voltages and harmonics in a power system.
C406A.3	:	Analyze power quality terms and power quality standards.
C406A.4	:	Explain the principle of voltage regulation and power factor improvement methods.
C406A.5	:	Demonstrate the relationship between distributed generation and power quality.

UNIT – I		10	hrs

Introduction

Overview of power quality – Concern about the power quality – General classes of power quality and voltage quality problems – Transients – Long–duration voltage variations – Short–duration voltage variations – Voltage unbalance – Waveform distortion – Voltage fluctuation – Power frequency variations.

UNIT – II		10	hrs

Voltage imperfections in power systems

Power quality terms – Voltage sags – Voltage swells and interruptions – Sources of voltage sag, swell and interruptions – Nonlinear loads – IEEE and IEC standards. Source of transient over

	voltages – Principles of over voltage protection – Devices for over voltage protection – Utility capacitor switching transients.			
	UNIT – III		10	hrs
	Voltage Regulation and power factor improvement: Principles of regulating the voltage – Device for voltage regulation – Utility voltage regulator application – Capacitor for voltage regulation – End–user capacitor application – Regulating utility voltage with distributed resources – Flicker – Power factor penalty – Static VAR compensations for power factor improvement.			
	UNIT – IV		10	hrs
	Harmonic distortion and solutions Voltage distortion vs. Current distortion – Harmonics vs. Transients – Harmonic indices – Sources of harmonics – Effect of harmonic distortion – Impact of capacitors, transformers, motors and meters – Point of common coupling – Passive and active filtering – Numerical problems.			
	UNIT – V		10	hrs
	Distributed Generation and Power Quality Resurgence of distributed generation – DG technologies – Interface to the utility system – Power quality issues and operating conflicts – DG on low voltage distribution networks. **Monitoring and Instrumentation** Power quality monitoring and considerations – Historical perspective of PQ measuring instruments – PQ measurement equipment – Assessment of PQ measuring data – Application of intelligent systems – PQ monitoring standards.			
	Text Books			
	1	Electrical Power Systems Quality, Dugan R C, McGranaghan M F, Santoso S, and Beaty H W, Second Edition, McGraw–Hill, 2012, 3rd edition.		
	2	Electric power quality problems –M. H. J. Bollen IEEE series-Wiley India publications,2011.		
	Reference Books			
	1	Power Quality Primer, Kennedy B W, First Edition, McGraw–Hill, 2000.		
	2	Understanding Power Quality Problems: Voltage Sags and Interruptions, Bollen M HJ, First Edition, IEEE Press; 2000.		
	3	Power System Harmonics, Arrillaga J and Watson N R, Second Edition, John Wiley & Sons 2003.		
	4	Electric Power Quality control Techniques, W. E. Kazibwe and M. H. Sendaula, Van Nostrad Reinhold, New York.		

CO-PO/PSO Mapping Matrix																
	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
	C406A.1	2	3											3		
	C406A.2	2	3											3		
	C406A.3	2	3											3		
	C406A.4	2	3											3		
	C406A.5	2	3											3		
	Avg.	**2**	**3**											**3**		

KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY
(AUTONOMOUS)

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK Kakinada

Department of Electrical and Electronics Engineering

	OPEN ELECTIVE-IV	L	T	P	Cr.
B. Tech. (VII Sem.)	**INTELLIGENT OF CONTROL SYSTEMS**				
	Course code: 23XXXXXX	3	0	0	3

Pre-requisites: This course covers mathematical modeling, time response, frequency response, stability analysis of Linear Time Invariant (LTI) control systems and their analysis. State space analysis of LTI systems and design of compensator using Bode diagrams is also discussed in this course.

Course Objectives:

- To learn the mathematical modelling of physical systems and to use block diagram algebra and signal flow graph to determine overall transfer function.
- To analyze the time response of first and second order systems and improvement of performance using PI, PD, PID controllers.
- To investigate the stability of closed loop systems using Routh's stability criterion and root locus method.
- To learn Frequency Response approaches for the analysis of LTI systems using Bode plots, polar plots and Nyquist stability criterion.
- To learn state space approach for analysis of LTI systems and understand the concepts of controllability and observability.

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

C406B.1	:	Derive the transfer function of physical systems and determination of overall transfer function using block diagram algebra and signal flow graphs.
C406B.2	:	Determine time response specifications of second order systems and to determine error constants.
C406B.3	:	Analyze absolute and relative stability of LTI systems using Routh's stability criterion and the root locus method.
C406B.4	:	Analyze the stability of LTI systems using frequency response methods.
C406B.5	:	Represent physical systems as state models and determine the response. Understanding the concepts of controllability and observability

UNIT – I		10	hrs

Mathematical Modelling of Control Systems

Classification of control systems - open loop and closed loop control systems and their differences -

transfer function of linear system - differential equations of electrical networks - translational and rotational mechanical systems – block diagram algebra – Feedback characteristics.

UNIT – II		10	hrs

Time Response Analysis

Standard test signals – time response of first and second order systems – time domain specifications - steady state errors and error constants - P - PI & PID Controllers.

UNIT – III		10	hrs

Stability and Root Locus Technique

The concept of stability – Routh-Hurwitz Criteria – limitations of Routh-Hurwitz criterion-.Root locus concept – construction of root loci (simple problems).

UNIT – IV		10	hrs

Frequency Response

Analysis Introduction to frequency domain specifications – Bode diagrams – Transfer function from the Bode diagram – phase margin and gain margin.

UNIT – V		10	hrs

State Space Analysis of Linear Time Invariant (LTI) Systems

Concepts of state - state variables and state model - state space representation of transfer function - State Transition Matrix and it's properties - concepts of controllability and observability.

Text Books

1	Modern Control Engineering by Kotsuhiko Ogata - Prentice Hall of India.
2	Automatic control systems by Benjamin C. Kuo - Prentice Hall of India - 2 nd Edition.

Reference Books

1	Control Systems principles and design by M. Gopal - Tata Mc Graw Hill education Pvt Ltd. - 4th Edition
2	Control Systems Engineering by I. J. Nagarath and M. Gopal - Newage International Publications - 5 th Edition.
3	Control Systems Engineering by S. Palani - Tata Mc Graw Hill Publications.

CO-PO/PSO Mapping Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
C406B.1	2	3											3		
C406B.2	2	3											3		
C406B.3	2	3											3		
C406B.4	2	3											3		
C406B.5	2	3											3		
Avg.	**2**	**3**											**3**		

KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY
(AUTONOMOUS)

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK Kakinada

Department of Electrical and Electronics Engineering

	OPEN ELECTIVE-IV	**L**	**T**	**P**	**Cr.**
B.Tech. (VII_ Sem.)	**INSTRUMENTATION**				
	Course Code:23XXXXXX	3	0	0	3

Pre-requisites: This course introduces the principle of operation of basic analog and digital measuring instruments for measurement of current, voltage, power, energy etc. Measurement of resistance, inductance and capacitance by using bridge circuits will be discussed in detail. It is expected that student will be thorough with various measuring techniques that are required for an electrical engineer.

Course Objectives:

- To study the principle of operation and working of different types of instruments for measurement of Electrical Quantities.
- To study the working principle of operation of different types of instruments for measurement of power and power factor.
- To understand the principle of operation and working of various types of bridges for measurement of parameters –resistance, inductance, capacitance and frequency.
- To understand the principle of operation and working of transducers.
- To study the principle of operation and working of DVMS, Power analyser and applications of CRO.

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

C406C.1	:	Select right type of instrument for measurement of AC and DC Electrical quantities.
C406C.2	:	Explain the construction and working of meters used for measurement of power and power factor.
C406C.3	:	Analyze suitable bridges for measurement of electrical parameters.
C406C.4	:	Illustrate the operation of different types of Transducers.
C406C.5	:	Summarize Digital meters and Compute frequency and phase difference between signals using CRO.

UNIT – I		10	hrs

Analog Ammeter and Voltmeters

Classification – deflecting, control and damping torques, – PMMC, moving iron type and electrostatic instruments, Construction, Torque equation, Range extension, Effect of temperature, Errors and compensations, advantages and disadvantages. Instrument transformers: Current

	Transformer and Potential Transformer-construction, theory, errors-Numerical Problems.			
	UNIT – II		10	hrs
	Analog Wattmeter's and Power Factor Meters Electrodynamometer type wattmeter (LPF and UPF), Power factor meters: Dynamometer and M.I type (Single phase and three phase), construction, theory, torque equation, advantages and disadvantages -Numerical Problems.			
	UNIT – III		10	hrs
	Measurements of Electrical parameters: **DC Bridges**: Method of measuring low, medium and high resistance – sensitivity of Wheat stone's bridge, Kelvin's double bridge for measuring low resistance, Loss of charge method for measurement of high resistance, Megger – measurement of earth resistance - Numerical Problems. **AC Bridges**: Measurement of inductance – quality factor, Maxwell's bridge, Hay's bridge, Anderson's bridge, measurement of capacitance and loss angle, Desauty's bridge, Schering Bridge, Wagner's earthing device, Wien's bridge- Numerical Problems.			
	UNIT – IV		10	hrs
	Transducers Definition, Classification, Resistive, Inductive and Capacitive Transducer, LVDT, Strain Gauge, Thermistors, Thermocouples, Piezo electric and Photo Diode Transducers, Digital shaft encoders, Hall effect sensors- Numerical Problems.			
	UNIT – V		10	hrs
	Digital meters Digital voltmeter – Successive approximation DVM, Ramp type DVM and Integrating type DVM – Digital frequency meter, Digital multimeter, Digital tachometer, Digital Energy Meter, LCR Q meter, Power Analyzer-Measurement of phase difference, Frequency, hysteresis loop using lissajious patterns in CRO- Numerical Problems.			
	Text Books			
	1	Electrical Measurements and measuring Instruments by E.W. Golding and F.C.Widdis, fifth Edition, Wheeler Publishing.		
	2	Modern Electronic Instrumentation and Measurement Techniques by A.D. Helfrick and W.D. Cooper, PHI, 5th Edition, 2002.		
	Reference Books			
	1	Electrical & Electronic Measurement & Instruments by A. K. Sawhney Dhanpat Rai & Co. Publications.		
	2	Electrical and Electronic Measurements and instrumentation by R. K. Rajput, S. Chand. Publications.		
	3	Electrical and Electronic Measurements by G. K. Banerjee PHI Learning Private Ltd, New Delhi–2012.		

CO-PO/PSO Mapping Matrix																
	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
	C406C.1	2	3											3		
	C406C.2	2	3											3		
	C406C.3	2	3											3		
	C406C.4	2	3											3		
	C406C.5	2	3											3		
	Avg.	**2**	**3**											**3**		

KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY
(AUTONOMOUS)

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK Kakinada

Department of Electrical and Electronics Engineering

		L	T	P	Cr.
B.Tech. (VI I Sem.)	**POWER SYSTEMS AND SIMULATION LABORATORY**				
	Course Code: 23XXXXXX	0	0	4	2

Pre-requisites:

Course Objectives:

To impart the practical knowledge of functioning of various power system components and determination of various parameters and simulation of load flows, transient stability, LFC and Economic dispatch.

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

C407.1	:	Compile the data, organize and analyze it for discussion and report the findings and observations from experimental learning activities in the laboratory.
C407.2	:	Build holistic development and pleasing disposition by reviewing and correcting the performance to become independent and autonomous thinker.
C407.3	:	**S**imulate and plot the Reponses of different power electronic converters and load frequency control of a power system With and Without Control and economic dispatch of a power system With and Without losses using MATLAB Software.
C407.4	:	Determine sequence impedances of three phase alternator and ABCD parameters of a transmission line.

List of Experiments

(Any of the 5 experiments are required to be conducted in each PART)

	PART-A: Power Systems
1	Estimation of sequence impedances of 3-phase Transformer.
2	Estimation of sequence impedances of 3-phase Alternator by Fault Analysis.
3	Estimation of sequence impedances of 3-phase Alternator by Direct method.
4	Estimation of ABCD parameters on transmission line model.
5	Performance of long transmission line without compensation.
6	Performance of long transmission line with shunt compensation.

	7	Analyze the Ferranti effect on long transmission line.
		PART-B: Simulation
	9	Determination of Y-bus using direct inspection method.
	10	Load flow solution of a power system network using Gauss-Seidel method
		.
	11	Load flow solution of a power system network using Newton Raphson method.
	12	Formation of Z_bus by building algorithm.
	13	Economic load dispatch with & without losses.
	14	Load frequency control of a two area Power System without & with PI controller.
	15	Transient Stability analysis of single machine connected to an infinite bus (SMIB) using equal area criterion.
	Reference Books:	
	1	Microprocessors and Microcontrollers-Architecture, Programming and System Design by Krishna Kant, PHI Learning Private Limited, Second Edition, 2014.
	2	Microprocessors and Microcontrollers by N. Senthil Kumar, M. Saravanan and S. Jeevananthan, Oxford University Press, Seventh Impression 2013

CO-PO/PSO Mapping Matrix

	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
	C407.1									2	3		2			
	C407.2								2	2	3		2			
	C407.3					3									2	
	C407.4					3							2		2	
	Avg.					**3**			**2**	**2**	**3**		**2**		**2**	

KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY
(AUTONOMOUS)

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK Kakinada

Department of Electrical and Electronics Engineering

			L	T	P	Cr.
B. Tech. (VII Sem)		**CONSTITUTION OF INDIA**				
		Course Code: 23XXXXXX (Common to EEE, CSE, IT, CSE(AI&ML))	2	0	0	0

Pre-requisites: Basic societal knowledge

Course Objectives:

- Enable the student to understand the importance of constitution.
- Understand the structure of executive, legislature and judiciary.
- Understand philosophy of fundamental rights and duties.
- Understand the autonomous nature of constitutional bodies like Supreme Court and high court controller and auditor general of India and election commission of India.
- Understand the central and state relation financial and administrative.

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

C408.1	:	Explain the importance and the features of Indian Constitution.
C408.2	:	Identify the structure and powers of Union Government and the administration of the Indian Union.
C408.3	:	Explain the structure and administration of State Government
C408.4	:	Distinguish three tier government system of Local Administration.
C408.5	:	Understand the purpose of Election Commission and Niti Aayog in national development and democracy.

UNIT – I		10	hrs

Introduction to Indian Constitution: Constitution meaning of the term, Indian Constitution - Sources and constitutional history, Features - Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy.

Learning outcomes: After completion of this unit student will understand the concept of Indian constitution

- Apply the knowledge on directive principle of state policy
- Analyze the History, features of Indian constitution
- Evaluate Preamble Fundamental Rights and Duties

UNIT – II		10	hrs

	Union Government and its Administration Structure of the Indian Union: Federalism, Centre State relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, Lok Sabha, Rajya Sabha, The Supreme Court and High Court: Powers and Functions; Learning outcomes: -After completion of this unit student will • Understand the structure of Indian government • Differentiate between the state and central government • Explain the role of President and Prime Minister • Know the Structure of supreme court			
	UNIT – III		10	hrs
	State Government and its Administration Governor - Role and Position - CM and Council of ministers, State Secretariat: Organization, Structure and Functions Learning outcomes: -After completion of this unit student will • Understand the structure of state government • Analyze the role Governor and Chief Minister • Explain the role of state Secretariat • Differentiate between structure and functions of state secretariat			
	UNIT – IV		10	hrs
	Local Administration - District's Administration Head - Role and Importance, Municipalities - Mayor and role of Elected Representative - CEO of Municipal Corporation Panchayati Raj: Functions PRI: ZilaPanchayat, Elected officials and their roles, CEO ZilaPanchayat: Block level Organizational Hierarchy - (Different departments), Village level - Role of Elected and Appointed officials - Importance of grass root democracy Learning outcomes: -After completion of this unit student will • Understand the local Administration • Compare and contrast district administration role and importance • Analyze the role of Mayer and elected representatives of Municipalities • Evaluate Zillapanchayat block level organization			
	UNIT – V		10	hrs
	Election Commission: Election Commission- Role of Chief Election Commissioner and Election Commissioner ate State Election Commission: Functions of Commissions for the welfare of SC/ST/OBC and women Learning outcomes: -After completion of this unit student will • Know the role of Election Commission apply knowledge • Contrast and compare the role of Chief Election commissioner and Commissionerate • Analyze role of state election commission • Evaluate the role of states in national development priorities, sectors and strategies.			
	Text Books			
	1	Durga Das Basu, Introduction to the Constitution of India, Prentice – Hall of India Pvt. Ltd., New Delhi		
	2	Subash Kashyap, Indian Constitution, National Book Trust		
	3	J.A. Siwach, Dynamics of Indian Government &Politics		

	4	D.C. Gupta, Indian Government and Politics
	5	H.M.Sreevai, Constitutional Law of India, 4th edition in 3 volumes (Universal Law Publication)

	e-resources	
	1	https://lecturenotes.in/video-tutorial/63226-constitution-of-india?reading=true
	2	https://lecturenotes.in/s/910-constitution-of-india-ci/videos

CO-PO/PSO Mapping Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
C408.1						2		2	1			1			
C408.2						2		2	1			1			
C408.3						2		2	1			1			
C408.4						2		2	1			1			
C408.5						2		2	1			1			
Avg.						**2**		**2**	**1**			**1**			

KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY
(AUTONOMOUS)

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK Kakinada

Department of Electrical and Electronics Engineering

		EVALUATIONOF INDUSTRY INTERNSHIP	**L**	**T**	**P**	**Cr.**
B.Tech. (VII Sem.)						
		Course Code: 23XXXXXX	0	0	0	2

Pre-requisites: Basic Electrical and Electronics

Course Objectives:

- Gain knowledge through field practice and experiential learning (PO5)
- To Apply knowledge of engineering techniques, tools and resources on the project appropriate to the internship program (PO1, PO2)
- To Understand the implication of solutions provided on society and environment (PO 6 and 7)
- Learning of professional ethics and develop ability to work effectively as a member and leader in teams. (PO 8 and 9)
- Communicate effectively (oral and written communication, report writing, presentation skills). (PO 10)

To identify and address their own educational needs in a changing world in ways sufficient to maintain their competence. (PO 12)

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

C409.1	:	Gain knowledge through field practice and experiential learning
C409.2	:	Apply knowledge in application of engineering techniques, tools and resources on the project appropriate to the internship program
C409.3	:	Apply appropriate knowledge and skills to identify, formulate, analyze, and solve complex engineering problems in order to reach substantiated conclusions
C409.4	:	Apply professional engineering knowledge to assess societal, health, safety, legal issues and Economical feasibility. Identify the importance and methods of environment protection & sustainability
C409.5	:	Learning of professional ethics and develop ability to work effectively as a member and leader in teams
C409.6		Communicate effectively (oral and written communication, report writing, presentation skills)
C409.7		Identify and to address their own educational needs in a changing world in ways sufficient to maintain their competence

	e-resources	
	1	https://powerintegrated.in/iit-eee-projects/

CO-PO/PSO Mapping Matrix

	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO1
	C409.1					3								3		
	C409.2	3	3											3		
	C409.3			3	3										3	
	C409.4						3	3				3				
	C409.5								3	3						3
	C409.6										3					3
	C409.7												3			3
	Avg.	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**