Annasaheb Dange College of Engineering and Technology

Ashta, Dist: Sangli-416301 (An Autonomous Institute Affiliated to Shivaji University, Kolhapur)

Department of Electrical Engineering

Vision & Mission of Institute

Vision: **To be a Leader in preparing professionally competent engineers**

Mission: **We, at Annasaheb Dange College of Engineering and Technology, Ashta, are committed to achieve our vision by**

Imparting effective outcome based education.

- **Preparing students through skill oriented courses to excel in their profession with ethical values.**
- **Promoting research to benefit the society.**
- **Strengthening relationship with all stakeholders.**

Vision & Mission of Department

Vision: **To be a leader in developing electrical engineering graduate with knowledge, skill & ethics.**

Mission: **We, at department of electrical Engineering, are committed to achieve our vision by,**

- **Facilitating learning through outcomes based education**
- **Cultivating Skills & attitude among graduates to excel in their career**
- **Motivating research approach of graduates to solve real-time problems for benefit of the society**
- **Strengthening relationship with all stakeholders for continues improvement**

Annasaheb Dange College of Engg. & Tech. ASHTA 416301

Head of Department

Head
Electrical Engineering Department
ADCET, Ashta

Annasaheb Dange College of Engineering and Technology

Ashta, Dist: Sangli-416301 (An Autonomous Institute Affiliated to Shivaji University, Kolhapur)

Department of Electrical Engineering

Program Educational Objectives (PEOs)

The graduates of the Department of Aeronautical Engineering at ADCET, Ashta will be able to,

PEO 1:	**Domain Knowledge:- Solve related problems using Electrical Engineering principles, tools and practices.**
PEO 2:	**Core Competency:- Become a practicing Engineer in diversified fields of Electrical Engineering.**
PEO 3:	**lifelong learning:-Engage in lifelong learning for effective adaptation to technological challenges.**
PEO 4:	**Professionalism :-Demonstrate leadership skills at workplace and function professionally in competitive environment.**

Head of Department

Head
Electrical Engineering Department
ADCET, Ashta

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Department of Electrical Engineering

Program Outcomes (POs)

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

Annasaheb Dange College of Engineering and Technology

Ashta, Dist: Sangli-416301 (An Autonomous Institute Affiliated to Shivaji University, Kolhapur)

Department of Electrical Engineering

Program Specific Outcomes (PSOs)

PSO 1	Ability to apply electrical engineering knowledge, skills for testing, control & maintenance of electrical systems such as Machines, Power Systems, Drives & Automation
PSO 2	Ability to identify problems in the diversified areas of Electrical Engineering and determine the hardware or software solutions to support the Societal, Environmental & Industrial needs.

Head of Department

Head
Electrical Engineering Department
ADCET, Ashta

Annasaheb Dange College of Engg. & Tech. ASHTA 416301

Annasaheb Dange College of Engineering & Technology, Ashta

An Autonomous Institute Affiliated to Shivaji University, Kolhapur.

Curriculum

S. Y. B. Tech.

DEPARTMENT OF ELECTRICAL ENGINEERING

SEM III & SEM IV

(Academic Year 2018-2019)

Sant Dnyaneshwar Shikshan Sanstha's
Annasaheb Dange College of Engineering and Technology, Ashta
An Autonomous Institute
Department of Electrical Engineering

B. Tech Electrical Engineering: III Semester

Course Code	Course	Teaching Scheme				Evaluation Scheme				
						Scheme	Theory (Marks)		Practical (Marks)	
		L	T	P	Credits		Max	Min. for Passing	Max	Min. for Passing
0EEBS201	Applied Mathematics – III	3	1	--	4	ISE - I	10	40	--	--
						MSE	30		--	--
						ISE - II	10		--	--
						ESE	50		--	--
0EEPC202	Electrical Circuits & Networks	4	--	--	4	ISE - I	10	40	--	--
						MSE	30		--	--
						ISE - II	10		--	--
						ESE	50		--	--
0EEPC203	Electrical Engineering Materials	4	--	--	4	ISE - I	10	40	--	--
						MSE	30		--	--
						ISE - II	10		--	--
						ESE	50		--	--
0EEPC204	Analog Electronics	4	--	--	4	ISE - I	10	40	--	--
						MSE	30		--	--
						ISE - II	10		--	--
						ESE	50		--	--
0EEPC205	Electrical Measurements	3	--	--	3	ISE - I	10	40	--	--
						MSE	30		--	--
						ISE - II	10		--	--
						ESE	50		--	--
0EEPC251	Electrical Circuits & Networks Laboratory	--	--	2	1	ISE	--	--	50	20
						ESE	POE		50	20
0EEPC252	Analog Electronics Laboratory	--	--	2	1	ISE	--	--	50	20
0EEPC253	Electrical Measurements Laboratory	--	--	2	1	ISE	--	--	50	20
						ESE	POE		50	20
0EEES254	Programming in C++	1	--	2	2	ISE	--	--	50	20
0EEMC206	Environmental Studies	2	--	--	--	ISE	Grade		--	--
	Total	**21**	**1**	**8**	**24**	--	**500**	--	**300**	--
	Total Contact Hours/Week: 30 hrs									

Course Category	HS	BS	ES	PC	PE	OE	MC	AC	PR
Credits	--	4	2	18	--	--	--	--	--
Cumulative Sum	3	20	31	18	--	--	--	--	--

HOD Electrical | Dean Academics | Director | Executive Director

Annasaheb Dange College Of Engg. & Tech. Ashta — An Autonomous Institute — Dean Acadamic Office

Sant Dnyaneshwar Shikshan Sanstha's
Annasaheb Dange College of Engineering and Technology, Ashta
An Autonomous Institute
Department of Electrical Engineering

B. Tech Electrical Engineering: IV Semester

Course Code	Course	Teaching Scheme				Evaluation Scheme				
						Scheme	Theory (Marks)		Practical (Marks)	
		L	T	P	Credits		Max	Min. for Passing	Max	Min. for Passing
0EEES207	Signals & Systems	4	--	--	4	ISE - I	10	40	--	--
						MSE	30		--	--
						ISE - II	10		--	--
						ESE	50		--	--
0EEPC208	Generation, Transmission & Distribution	4	--	--	4	ISE - I	10	40	--	--
						MSE	30		--	--
						ISE - II	10		--	--
						ESE	50		--	--
0EEPC209	DC Machines & Transformers	4	--	--	4	ISE - I	10	40	--	--
						MSE	30		--	--
						ISE - II	10		--	--
						ESE	50		--	--
0EEES210	Digital Electronics	4	--	--	4	ISE - I	10	40	--	--
						MSE	30		--	--
						ISE - II	10		--	--
						ESE	50		--	--
0EEPC211	Instrumentation & Communication	4	--	--	4	ISE - I	10	40	--	--
						MSE	30		--	--
						ISE - II	10		--	--
						ESE	50		--	--
0EEPC255	DC Machines & Transformers Laboratory	--	--	2	1	ISE	--	--	50	20
						ESE	POE		50	20
0EEES256	Digital Electronics Laboratory	--	--	2	1	ISE	--	--	50	20
						ESE	POE		50	20
0EEPC257	Instrumentation & Communication Laboratory	--	--	2	1	ISE	--	--	50	20
0EEPC258	Software Tools for Electrical Engineering	--	--	2	1	ISE	--	--	50	20
0EEAC212	Professional Skills-I	2	--	--	--	ISE	Grade		--	--
	Total	**22**	**--**	**8**	**24**	--	**500**	--	**300**	--
	Total Contact Hours/Week: 30 hrs									

Course Category	HS	BS	ES	PC	PE	OE	MC	AC	PR
Credits	--	--	9	15	--	--	--	--	--
Cumulative Sum	3	20	40	33		--	--	--	--

HOD Electrical 3/6/18 | Dean Academics 11/6/18 | Director | Executive Director

Annasaheb Dange College Of Engg. & Tech. Ashta — Dean Academic Office — An Autonomous Institute

Department of Electrical Engineering
S. Y. B. Tech. Curriculum

Class	S. Y. B. Tech. Semester-III
Course Code and Course Title	0EEBS201, **Applied Mathematics- III**
Prerequisite/s	0BSBS102,0BSBS113
Teaching Scheme: Lecture/Tutorial	03/01
Credits	04
Evaluation Scheme: ISE I / MSE / ISE II / ESE	10/30/10/50

Course Outcomes (COs): After successful completion of this course, the students will be able to:	
0EEBS201.1	**Demonstrate** basic knowledge of Laplace transform, Fourier series and Z transforms. **(K^2)**
0EEBS201.2	**Solve** the problems on Fourier Series, Laplace Transform and ZTransform.**(K^3)**
0EEBS201.3	**Make use of** Linear Differential Equation with constant coefficients to solve the Electrical Engineering problem. **(K^3)**
0EEBS201.4	**Solve** the problems of vector calculus. **(K^3)**
0EEBS201.5	**Demonstrate** numerical ability to solve the problem. **(S^2)**

Course Contents:		
Unit 1	**Vector Calculus** Introduction, Scalar and vector point functions - vector operator del, Del applied to scalar point functions - gradient, Directional derivative, Del applied to vector point functions - Divergence and curl, Line integral , Green's theorem in the plane.	**07 Hr**
Unit 2	**Linear Differential Equations and its Application** Linear Differential Equations, Definition, Complete solution, Operator D , Rules for finding the Complementary function, Inverse operator, Rules for finding the Particular integral, Working procedure to solve the equation, Applications of Linear Differential Equations to Oscillatory Electrical Circuit.	**07 Hr**
Unit 3	**Fourier series** Introduction, Euler's Formulae, Conditions for a Fourier expansion, Functions having points of discontinuity, Change of interval, Expansion of odd or even periodic functions, Half range series.	**07 Hr**
Unit 4	**Laplace Transform** Introduction, Definition; Conditions for existence, Transforms of elementary functions, Properties of Laplace Transform - Linearity property, shifting property, Change of scale property, Laplace Transforms of Periodic functions, Multiplication by t^n, Division by t , Laplace transform of derivatives , Laplace transform of integrals, Unit step function, Unit impulse function.	**07 Hr**
Unit 5	**Inverse Laplace Transform** Inverse Laplace transform - Definition, Standard forms, Methods of finding inverse transforms by Shifting property, Partial fraction, Convolution theorem, Inverse transforms of derivative and integral, Application of Laplace transform to solve Linear Differential Equations.	**07 Hr**
Unit 6	**Z-Transforms** Introduction, Definition, Properties, Z-transforms of basic sequences, Z transforms of some standard discrete functions , Evaluation of inverse Z transforms, Application to difference Equations.	**07 Hr**

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List of Tutorial:

Tutorial No.	Title of Tutorial	Contact Hrs
01	Vector Calculus	01
02	Linear Differential Equations (LDE)	02
03	Applications of Linear Differential Equations	01
04	Fourier Series- Change of interval	02
05	Fourier Series – Half range series	01
06	Laplace Transform	02
07	Inverse Laplace Transform	02
08	Z transform	01

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Higher Engineering Mathematics	Dr. B. S. Grewal	Khanna Publication, New Delhi	40	2007
02	Higher Engineering Mathematics.	H. K. Das	S. Chand and company ltd., New Delhi.	1	2011
03	Higher Engineering Mathematics.	B.V. Ramana	Tata McGraw Hill Education Private limited, Delhi	1	2007
04	A text book of Engineering Mathematics	N.P.Bali, Manish Goyal	Laxmi Publication, New Delhi	7	2007

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Advanced Engineering Mathematics	Erwin Kreyszig	John Wiley &Sons,Inc.	9	2007
02	Advanced Engineering Mathematics.	Potter Merle C.	Oxford University Press	3	2005
03	Engineering Mathematics Volume I and II	ITL Education	Cengage Learing India Pvt. Ltd., Delhi	1	2015
04	Advanced Engineering Mathematics.	ONeil Peter V	Cengage Learing India Pvt. Ltd., Delhi	1	2012
05	Engineering Mathematics Vol- I.	Kandasamy P., Thilagavathy K. and Gunavathy K.	S Chand & Company Ltd , New Delhi	3	2000
06	Engineering Mathematics Vol- II.	Kandasamy P., Thilagavathy K. and Gunavathy K.	S. Chand & Company Ltd, New Delhi	4	1999

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Class	S. Y. B. Tech. Semester-III
Course Code and Course Title	0EEPC202,**Electrical Circuits & Networks**
Prerequisite/s	0BSES103
Teaching Scheme: Lecture/Tutorial/Practical	04/00/00
Credits	04
Evaluation Scheme: ISE I/MSE/ ISE II / ESE	10/30/10/50

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
0EEPC202.1	**Use** network techniques, like node analysis and mesh analysis, to write equations for various linear circuits. **(K^3)**
0EEPC202.2	**Apply** network theorems to analyze various circuits and networks. **(K^3)**
0EEPC202.3	**Calculate** initial conditions for current and voltage in first order and second order circuits. **(K^3)**
0EEPC202.4	**Derive** resonance condition in ac circuits, and **solve** ac circuits in sinusoidal steady state conditions. **(K^3)**
0EEPC202.5	**Calculate** and correlate two port network parameters. **(K^3)**
0EEPC202.6	**Apply** the transform analysis to linear circuits and systems. **(K^3)**

Course Contents:		
Unit 1	**Analysis of D. C. Circuits:-** Basic laws, Types of Sources, Dependent and Independent sources, Ladder Network, Star-delta transformation, Source transformation, Nodal analysis, Nodal Analysis with voltage sources, Mesh analysis, Mesh analysis with current sources, Nodal and Mesh analysis by inspection.	**10 Hr**
Unit 2	**Circuit Theorems** (Applicable to D. C. Circuits):- Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum power transfer, Millman's theorem, Reciprocity theorem, Substitution theorem, Compensation theorem, Tellegen's theorem	**09 Hr**
Unit 3	**Analysis of First order circuits and Second order circuits:** **First order circuits:-** Energy stored in capacitor, inductor, Initial condition of switched circuits, Source free R-C Circuit with initial condition, Source free R-L Circuit with initial condition, Step Response of R-C Circuit, Step Response of R-L Circuit, Initial condition of switched circuits, Transient analysis of general first order circuits. **Second order circuits:-** Source free series RLC circuit, Source free parallel RLC circuit, Step response of series R-L-C Circuit, Step response of parallel R-L-C Circuit, Analysis of general second order circuits.	**10 Hr**
Unit 4	**Analysis of A. C. Circuits:-** Sinusoidal Steady State Analysis:- Properties of sinusoidal functions, Phasor, Impedance and admittance, Series and parallel resonance, Q factor, Selectivity and band width, A.C. network solution using Norton's theorem, Thevenin's theorem, Superposition theorem, Maximum average power transfer theorem Magnetically coupled circuits:-Self and Mutual Inductance, Dot convention, Energy in coupled circuits, Ideal Transformer	**10 Hr**

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Unit 5	**Analysis of Two port networks:-** Single port and two port networks, Driving point function, Transfer function of two port network. Impedance parameters, Admittance parameters, Hybrid parameters, Transmission parameters, Relationships between parameters, Interconnection of networks.	**08 Hr**
Unit 6	**Laplace Transform:**-Properties of Laplace transform, The inverse Laplace transform, Application to integrodifferential equations, Circuit element models, Circuit analysis, Transfer functions. **Fourier Series**:- Trigonometric Fourier series, Symmetry properties, Circuit applications. **Fourier Transform**:- Properties of the Fourier transform, Circuit applications	**09 Hr**

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Fundamentals of Electric Circuits	Charles K Alexander, Mathew N O Sadiku	Tata McGraw-Hill	Third	2008
02	Network Analysis and Synthesis	C.L Wadhwa	New Age International Publishers	Second	2006
03	Circuit Theory (Analysis and Synthesis)	A Chakrabarti	DhanpatRai& Co.	Second	2010
04	"Circuits & Network Analysis & Synthesis"	A.Sudhakaar&ShyanmugamS.Palli	McGraw-Hill Co.	Third	2007

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Network Analysis and Synthesis	Franklin F Kuo	Jhon Wiley and Sons	Second	2009
02	Network Analysis	M.E. Van Valkenburg	Prentice Hall of India	Third	1974
03	Networks and Systems	D.RoyChoudhary	New Age International Publishers	Reprint	2005
04	Basic Circuit Theory	L.P.Huelsman	Prentice-Hall	illustated	2006

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Class	S. Y. B. Tech. Semester-III
Course Code and Course Title	0EEPC203, **Electrical Engineering Materials**
Prerequisite/s	0BSBS101,0BSBS108
Teaching Scheme: Lecture/Tutorial/Practical	04/00/00
Credits	04
Evaluation Scheme: ISEI/MSE / ISE II /ESE	10/30/10/50

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
0EEPC203.1	**Understand** the different properties of Conducting, Insulating, Magnetic and Dielectric Materials in the Electrical Engineering. **(K^2)**
0EEPC203.2	**Understanding** the properties of solid, liquid and gaseous of the insulating materials **(K^2)**
0EEPC203.3	**Explain** the phenomenon of the polarization mechanism which use for the Dielectric in the Capacitor **(K^3)**
0EEPC203.4	**Evaluate** Conducting, Insulating and Magnetic Materials use in the Electrical Engineering **(K^3)**
0EEPC203.5	**Explain the** construction, working and application of the new methods of the renewable energy sources **(K^3)**
0EEPC203.6	**Select** the particular battery use for various applications. **(K^4)**

Course Contents		
Unit 1	**Conducting Materials:** Introduction of Classification of material into conducting, semi conducting and insulating materials -Resistance and factors affecting it such as alloying and temperature - Classification of conducting material as low resistivity and high resistivity materials, Low resistance materials Low resistivity copper alloys, their practical applications, High resistivity materials and their applications, conductors, cable, solder and sheathing materials, electrical properties of these materials, Superconductivity.	**12 Hr**
Unit 2	**Magnetic Materials:** Magnetization; Atomic Magnetic Moments; Classification of Magnetic Materials; Diamagnetic, Paramagnetic and Ferromagnetic Materials; Ferromagnetic Domains; Magnetization Curve; Soft and Hard Ferromagnetic Materials; Losses in Magnetic Materials; Factors Affecting Permeability and Hysteresis Loss; Anti-Ferromagnetism; Ferromagnetism, Magnetic Resonance, Magnetic materials for electrical devices.	**09 Hr**
Unit 3	**Insulating Materials:** Insulating Materials: Electrical, mechanical, chemical and Thermal Properties of the insulating materials, Liquid insulating materials, Solid insulating materials, Thermal classification of insulating material, insulating materials for electrical devices.	**08 Hr**
Unit 4	**Dielectric Materials:** Introduction, Classification of dielectric materials, polarization mechanism, dielectric losses, frequency and temperature effect, dielectric breakdown, Ferro electricity and Piezoelectricity	**06 Hr**
Unit 5	**Materials required for Renewable Sources** Solar cells (Different materials used for plastic, organic and thin-film solar	**09 Hr**

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	cells), MHD generations, Fuel cells, Thermo electric generator, Thermo ionic converters. **Application of Nano-Materials in Electrical Engineering** Introduction to Nano Materials, Applications of Nano Materials	
Unit 6	**Batteries:** Introduction to Batteries, Elements of Electro Chemical Cell, Battery classification, Battery Parameters, Factors affecting battery performance, Zero Emission Battery Research Activity (ZEBRA) Batteries, Batteries used in Electric Vehicle (EV) and Electric Hybrid Vehicle (EHV) .	**12 Hr**

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	A Course in Electrical Engineering Materials	S. P. Seth	DhanpatRai and Sons publication	3	2010
02	Electrical Engineering Materials	R.K.Shula, Archana Singh	Tata McGraw Hill publication	1	2012
03	Electrical Engineering Materials	K. B. Raina & S. K. Bhattacharya	S. K. Kataria& Sons.	3	2010
04	Understanding Batteries	Ronald M. Dell and David A.J. Rand	Royal Society of Chemistry	1	2001

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Electrical Engineering Materials	C. S. Indulkar& S. Thiruvengadam	S. Chand & Com. Ltd	4	2012
02	Non-Conventional Energy Sources	S.Hasan Saeed D.K.Sharma	S. K. Kataria& Sons.	3	2012
03	Handbook of Batteries	Linden and Reddy	New York McGraw Hill	1	2002
04	Essentials of Nanotechnology	Jeremy Ramsden	Jeremy Ramsden&Ventus Publishing ApS	1	2009

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Class	S. Y. B. Tech. Semester-III
Course Code and Course Title	0EEPC204, **Analog Electronics**
Prerequisite/s	0ESES109
Teaching Scheme: Lecture/Tutorial/Practical	04/00/00
Credits	04
Evaluation Scheme: ISE I / MSE / ISE II / ESE	10/30/10/50

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
0EEES204.1	**Classify** different characteristic of analog electronic components. **(K^2)**
0EEES204.2	**Compare** different signals using ICs.**(K^2)**
0EEES204.3	**Describe** Applications of OP-AMP**(K^2)**
0EEES204.4	**Explain** semiconductor devices and its applications.**(K^3)**
0EEES204.5	**Solve** numerical based on analog electronic circuits.**(K^3)**

Course Contents		
Unit 1	**Diode Applications** – Review of Diode, Half wave rectifier, full wave rectifier, Rectifier with filters, clipper, clamper, voltage doublers LED, Photo diode, Zenor Diode, Optocouplers. [Numerical on rectifiers]	**9 Hr**
Unit 2	**Transistorized Circuits –** Review of transistors, BJT biasing, bias stability, thermal runaway, heat sink, transistor as switch, Darlington connection, common emitter amplifier, RC phase shift, Wien bridge, Hartley, Colpitts and crystal oscillators, MOSFET.[Numerical on BJT].	**10 Hr**
Unit 3	**a. FET Circuits** – Introduction to FET, FET biasing circuits, FET amplifiers, **b. Voltage Regulators** – Introduction to voltage regulator, Block diagram of voltage regulator, 78XX and 79XX series fixed voltage regulator, LM317 adjustable voltage regulator, packages, regulated power supply design.	**8 Hr**
Unit 4	**Fundamentals of Operational Amplifier –** Ideal op-amp characteristics-Non ideal characteristics- DC characteristics – Input bias current-Input offset voltage- Input offset current- Thermal drift- AC characteristics- Frequency response- Frequency compensation- Slew rate. Op-amp pin diagram, Open loop & Feedback Modes- Inverting and Non Inverting amplifier.[Numerical]	**10 Hr**
Unit 5	**Op Amp Applications** – Comparator, zero crossing detector, Instrumentation amplifier, Summing amplifier, Difference amplifier, Voltage follower, Differentiator, Integrator, V to I converter, I to V converter, peak detector, precision rectifier, Schmitt Trigger	**09 Hr**
Unit 6	**Timer and Phase Locked Loops – Timer –** Introduction of Timer and its needs, IC 555 Timer: functional diagram, Monostable multi vibrator, Astable multi vibrator **Phase Locked Loops –** Introduction of PLL and its needs,IC 566 PLL: Functional block diagram, Voltage Controlled Oscillator, frequency detection and synthesis	**10 Hr**

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Text Book:					
Sr. No	**Title**	**Author**	**Publisher**	**Edition**	**Year of Edition**
01	Electronics Devices and Circuits	Anil Maini	Wiley	3rd	2012
02	Electronic Devices and Circuits	Millman, Halkias and SatyabrataJit,	McGraw Hill Education (India) Private Limited,	4th	2015
03	Operational amplifiers and linear IC's	David A Bell	Oxford University Press	4th	2014
04	Op-Amps and linear integrated Circuits	Ramakant A. Gayakwad	Pearson Education, 2015	4th	2015
05	Electronic devices and circuit theory	Robert L. Boylestad and Louis Nashelsky	Prentice Hall India Ltd, 2015	11th	2015

Reference Book:					
Sr. No	**Title**	**Author**	**Publisher**	**Edition**	**Year of Edition**
1.	Microelectronic Circuits	A. S. Sedra and K.C.Smith	Oxford Publication	6th	2013
2.	Electronic Devices	Thomas L. Floyed	an Imprint of MacMillan publishing company	9th	2009
3.	Op Amps and Linear Integrated Circuits-Concepts and Applications	James M. Fiore	Cengage Learning	2nd	2002
4.	Electronic Devices and Circuits	David A. Bell	Oxford University Press	5th	2008

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Department of Electrical Engineering
S. Y. B. Tech. Curriculum

Class	S. Y. B. Tech. Semester-III
Course Code and Course Title	0EEPC205, **Electrical Measurements**
Prerequisite/s	0BSES103
Teaching Scheme: Lecture/Tutorial/Practical	03/00/00
Credits	03
Evaluation Scheme: ISE I / MSE / ISE II / ESE	10/30/10/50

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
0EEPC205.1	**Explain** various concepts of measuring instruments (Analog/Digital), their classification, working principle and range extension technique. **(K^2)**
0EEPC205.2	**Explain** different methods for measurement of electrical parameter such as power, energy, resistance, inductance etc. **(K^2)**
0EEPC205.3	**Extend** range of measuring instruments by various methods & calculate its value. **(K^2)**
0EEPC205.4	**Determine** unknown electrical parameters by using various methods. **(K^3)**
0EEPC205.5	**Describe** various analyzers, its types & modern techniques in measurement. **(K^3)**

Course Contents:		
Unit 1	**Principles of Analog Measuring Instruments:** Errors in Measurement, Difference between Indicating and Integrating Instruments. Moving coil and Moving iron Ammeters & Voltmeters. Extension of ranges by using shunt, Multipliers, Instrument Transformers. Dynamometer type Wattmeter & Power Factor meters. Reed Moving Coil type Frequency Meters. Wheatstone type Synchro scope. DC Permanent magnet moving coil type Galvanometers. Ballistic Galvanometer. AC Vibration Galvanometer (only the basic working Principle and Application).	**08 Hr**
Unit 2	**Measurement of Resistance, Inductance& Capacitance** Measurement of low, medium and high resistance. Wheatstone bridge, Kelvin's double bridge, ammeter-voltmeter method, Megger, loss of charge method, Earth tester for earth resistance measurement. Maxwell's Inductance bridge, Maxwell's Inductance & Capacitance Bridge, Hay's bridge, Anderson's bridge, Owen's bridge, Campbell's Bridge, De sauty's Bridge, Schering Bridge, Q meter.	**10 Hr**
Unit 3	**Measurement of Power:** Construction, working principle, torque equation, errors and their compensation, advantages and disadvantages of dynamometer type wattmeter, low power factor wattmeter, poly-phase wattmeter. Active & reactive power measurement in three phase system for balanced and unbalanced load using three wattmeter method, two wattmeter method & one wattmeter method.	**07 Hr**
Unit 4	**Measurement of Energy:** Construction, working principle, torque equation, errors and adjustments of single phase conventional (induction type) energy meter. Calibration of energy meter. Block diagram and operation of electronic energy meter. Three phase energy meter, TOD meter.	**06 Hr**
Unit 5	**Digital Measuring Instruments** Advantages of digital meters over analogue meters. Resolution & sensitivity of digital meters. Working principles of digital Voltmeter, Ammeter, Energy Meter, Multimeter, Construction and working principle of CRO,	**07 Hr**

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	measurement of voltage, current, period and frequency by CRO. Phase angle & frequency by lissajous pattern & numerical. Construction and working principle of DSO, advantages and disadvantages of DSO over CRO.	
Unit 6	**Recent developments in Measurements** Wave Analyzers& Harmonic Distortion, Power Analyzer, Computer aided measurements, Micro sensors, Smart Sensors, Virtual Instrumentation.	**04 Hr**

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	A Course in Electrical and Electronic Measurements & Instrumentation	A. K. Sawhney	DhanpatRai& Co.	Nineteenth	2014
02	A Course in Electronics & Electrical Measurements & Instrumentation	J. B. Gupta,	S. K. Kataria& Sons.	Eighth	2012
03	Electronic Instrumentation	H.S.Kalsi	Tata McGraw Hill	Third	2012
04	Electrical Measurement & Instrumentation	U. A. Bakshi V. A. Bakshi	Technical Publication	Third	2015

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Electrical Measurements & Measuring Instruments	E. W. Golding F. C. Widdies	Reem Publications.	Third	2011
02	Introduction to Measureme-nts and Instrumentation	Arun K. Ghosh	PHI Publication	Fourth	2012
03	Electrical Measurement & Instrumentation	RS SirohiRadhakrisnan	New Age International	Third	2010
04	Instrumentation Measurement and Analysis	B. C. Nakra K. K. Chaudhari,	Tata McGraw Hill.	Second	2009

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Department of Electrical Engineering
S. Y. B. Tech. Curriculum

Class	S. Y. B. Tech. Semester-III
Course Code and Course Title	0EEPC251, **Electrical Circuits & Networks Laboratory**
Prerequisite/s	0BSES153
Teaching Scheme: Lecture/Tutorial/Practical	00/00/02
Credits	01
Evaluation Scheme: ISE / ESE	50/50

Course Outcomes (COs):
Upon successful completion of this course, the student will be able to:

0EEPC251.1	**Experiment** network theorems on linear circuits **(K^3)**
0EEPC251.2	**Demonstrate** series and parallel resonance, Calculate two port network parameters of T/Pi networks. **(K^3)**
0EEPC251.3	**Use** modern tools/software (like MATLAB/PSPICE) to model and solve power flow problems. **(S^2)**
0EEPC251.4	**Communicate** effectively about laboratory work both orally and in writing journals. **(S^2)**
0EEPC251.5	**Practice** professional and ethical behavior to carry forward in their life. **(A^2)**

List of Experiments:

Sr. No	Title of Experiments
1.	Generation of Various Waveforms using MATLAB
2.	Voltage & Current Response of RLC Circuit using MATLAB
3.	Verification of Node & Mesh analysis
4.	Verification of Superposition Theorem
5.	Verification Thevenin's Theorem
6.	Verification of Norton's Theorem
7.	Verification of Compensation Theorem
8.	Verification of Millman's Theorem
9.	Verification Maximum Power Transfer Theorem
10.	Locus Diagram of RL Series Circuits
11.	Locus Diagram of RC Series Circuits
12.	Determination of Self and Mutual Inductances and Co-Efficient of Coupling
13.	Verification of Star Delta Transformation
14.	Verification of Circuit Theorems with Simulation Software (MATLAB / Pspice)

Minimum Eight Experiments are to be conducted in semester.

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Department of Electrical Engineering
S. Y. B. Tech. Curriculum

Class	S. Y. B. Tech. Semester-III
Course Code and Course Title	0EEES252, **Analog Electronics Laboratory**
Prerequisite/s	0BSES157
Teaching Scheme Lecture/Tutorial/Practical	00/00/02
Credits	01
Evaluation Scheme: ISE /ESE	50/00

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
0EEES252.1	**Explain** electronic components their pin functions and packages(K^2)
0EEES252.2	**Design** and testing of analog electronic circuits.(S^3)
0EEES252.3	**Develop** and employ circuit using elementary electronic components, e.g., resistors, sources, inductors, capacitors, diodes and transistors(S^3)
0EEES252.4	**Perform testing** of circuits with the help of simulation software(S^3)
0EEES252.5	**Demonstrates** acceptable presentation skills through experiment report.(A2)
0EEES252.6	**Acquire** experience of working individually as well as a team in designing, building and troubleshooting simple analog electronic circuits(A^2)

List of Experiments

Expt. No.	Title of Experiment
1.	Characteristics of diode and Design and analysis of half wave, full wave bridge and full wave centre tap rectifiers
2.	Design & testing of clipper and clamper circuit
3.	Characteristics of transistor, FET, MOSFET.
4.	Frequency response and square wave testing of common emitter amplifier
5.	Use of transistor & MOSFET as a switch for interfacing low power and high power circuits using relays
6.	Design& testing of inverting, non-inverting amplifier
7.	Design & testing of adder and difference amplifier
8.	Design & testing of comparator, zero crossing detector and peak detector
9.	Design & testing of integrator and differentiator
10.	Design & testing of V to I and I to V converter
11.	Design Astable multi vibrator operation of timer using IC 555
12.	Design Monostable multi vibrator operation of timer using IC 555
13.	Introduction to software useful for Analog Electronic Circuits.
Mini-projects (Elective)	
1.	Mini project – using special purpose Diodes.
2.	Mini project – using transistors.
3.	Mini project – using FET or voltage regulator.
4.	Mini project – using OP-AMP IC 741.
5.	Mini project – using Timer IC-555 and PLL IC 566.

Minimum eight experiments and one mini project should be performed in laboratory, Experiment number 13 is compulsory.

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Department of Electrical Engineering
S. Y. B. Tech. Curriculum

Class	S. Y. B. Tech. Semester-III
Course Code and Course Title	0EEPC253, **Electrical Measurements Laboratory**
Prerequisite/s	0BSES153
Teaching Scheme: Lecture/Tutorial/Practical	00/00/02
Credits	01
Evaluation Scheme: ISE / ESE	50/50

Course Outcomes (COs) Upon completion of this course, students will be able to	
0EEPC253.1	**Demonstrate** mechanism of various measuring instruments. (K^3)
0EEPC253.2	**Demonstrate** different methods to measure power, energy & appropriate bridge for the measurements of various electrical parameters using appropriate bridge (K^3)
0EEPC253.3	**Select** proper instrument for measurement of electrical parameter. (S^2)
0EEPC253.4	**Respond** Effectively in the form of oral and writing journal.(S^2)
0EEPC253.5	**Examine** the observations and determine the result of experiment. (A^2)

Sr. No.	Title of Experiment
1	Demonstration of various analog measuring instruments
2	Measurement of active power in three phase circuit by using two wattmeter method
3	Measurement of reactive power in three phase circuit by using one wattmeter method
4	Calibration of single phase induction type energy meter.
5	Measurement of resistance using Wheatstone's/Kelvin's bridge.
6	Measurement of inductance using Maxwell's/Hay's/Anderson's bridge.
7	Measurement of capacitance using Schering's bridge
8	Measurement of voltage, current, time period and frequency using CRO & frequency measurement by lissajous pattern.
9	Measurement of resistance by ammeter voltmeter method.
10	Measurement of earth resistance using earth tester.
11	Measurement of insulation using meggar.
12	Measurement of Power by using Power Analyzer.
13	Use of CT,PT for range extension.

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Class	S. Y. B. Tech. Semester-III
Course Code & Course Title	0EEES254, **Programming in C++**
Prerequisites	0BSES112
Teaching Scheme(Lecture/Practical/Tutorial)	01/02/00/00
Credits	02
Evaluation Scheme(ISE/ESE)	50/00

Course Outcomes (COs):

Upon successful completion of this course, students will be able to

0EEES254.1	**Design** an algorithm solution by applying logical ability to solve the problems. **(K^3, A^3)**
0EEES254.2	**Use** C++ programming development environment, compiling, debugging, linking for executing a program **(S^3)**
0EEES254.3	**Use** features, in-built functions and customized functions in C++ programming for solving the problems **(K^3, S^3)**
0EEES254.4	**Design** programs involving decision making, loops and structures **(K^3)**
0EEES254.5	**Use** computer programming to solve engineering problems **(S^3, A^2)**
0EEES254.6	**Interface** hardware with computer **(S^3)**

Course Contents		
Unit 1	**Introduction to Object Oriented Programming:** Characteristics of Object oriented programming, structure of C++, Functions in C++, inline function, Memory Allocation functions	**3 Hr**
Unit 2	**Functions** Returning values from functions. Reference arguments. Overloaded function. Inline function. Default arguments. Returning by reference.	**2 Hr**
Unit 3	**Pointers** Addresses and pointers. The address of operator and pointer and arrays. Pointer and Faction pointer and C-types string. Memory management: New and Delete, pointers to objects, debugging pointers.	**2 Hr**
Unit 4	**Array and string** Arrays (Initialization, Declaration, One dimensional and Two dimensional arrays), String (String operations, String Arrays), Simple programs, sorting, searching, matrix operations	**2 Hr**
Unit 5	**Classes & Objects** Introduction, declaration of class, defining member function, making an outside function inline, Nesting member function, private member function, creating the objects, Arrays within a class, memory allocation for objects, Array of objects, pointer to members. Pointers to objects this Pointer.	**2 Hr**
Unit 6	**Overloading and Templates** Overloading unary operations. Overloading binary operators, data conversion, pitfalls of operators overloading and conversion keywords. Function templates.	**3 Hr**

Text Books

Sr. No.	Title of Book	Author	Edition	Publisher	Year of Edition
1	The C Programming language	Kernighan B.W and Ritchie D.M.	Second	Pearson Education	2006
2	The C Programming Language	Brian W. Kernighan Dennis M.	Second	PRENTICE HALL, Englewood	2006

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		Ritchie		Cliffs, New Jersey	
3	'C++: How to Program', 5 th edition	H. M. Deitel and P. J. Deitel	Fifth	Prentice Hall,	2012
4	Data Abstraction and Problem Solving with C++	Carrano& Prichard,	Fourth	Addison Wesley,	2016

Reference Books

Sr. No.	Title of Book	Author	Publisher
1	Programming with C++	Byron S Gottfried	TMH
2	How to Solve it by Computer	R.G. Dromey	Pearson Education
3	C++ programming Laboratory	Nadini S. Sidnal	Wiley

List of Experiments

Sr. No.	Laboratory Sessions on Programming
1	Introduction to software engineering and the software life cycle; top-down vs. bottom-up design; basic data types, operations and expressions
2	C++ program structure, include files; simple I/O; basic control statements (conditional statements, loops and loop statements)
3	Program using StreamI/O; arrays, pointers and pointer arithmetic, pointer-controlled loops, relation between arrays and pointers; strings and string processing.
4	Program using Functions, value/reference/address parameters, simple parameters vs. array parameters; scope; activation stack.
5	Program on **struct** and **class** , data hiding via **private** , member functions and public interface, introduction to initializing constructors.
6	Program using constructors, dynamic allocation of data members, deep vs. shallow construction, destructors and deep vs. shallow destruction; **new** and **delete.**
7	Program on Overloading and Template.
8	Program using Virtual functions, pure virtual functions, container classes
9	Introduction to simple data structures - linked lists and trees and the importance of pointers.
10	Program related to Recursion; introduction to testing.

Any eight laboratory sessions to be conducted.

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Department of Electrical Engineering
S. Y. B. Tech. Curriculum

Class	S. Y. B. Tech. Semester-III
Course Code and Course Title	0EEMC206, **Environmental Studies**
Prerequisite/s	--
Teaching Scheme: Lecture	02
Credits	--
Evaluation Scheme: ISE	50 (Grade)

Course Outcomes (COs)	
Upon successful completion of the course students will be able to:	
0EEMC206.1	Explain importance of environmental studies with necessary of acts.(K^2)
0EEMC206.2	Explain importance of public awareness on environmental problems (K^2)
0EEMC206.3	Write a technical report in team regarding course and impacts of environment related issues.(S^2)
0EEMC206.4	Discuss current concern of environment issues.(A^2)
0EEMC206.5	Describe the need of environment protection and ethics.(A^2)

Course Contents:

Unit 1: Nature of Environmental Studies

Definition, scope and importance. Multidisciplinary nature of environmental studies, Need for public awareness.

(02Hrs)

Unit 2: Natural Resources and Associated Problems

a) Forest resources: Use and over-exploitation, deforestation, dams and their effects on forests and tribal people; b) Water resources: Use and over-utilization of surface and groundwater, floods, drought, conflicts over water, dams-benefits and problems. c) Mineral resources: Usage and exploitation. Environmental effects of extracting and using mineral resources. d) Food resources: World food problem, changes caused by agriculture effect of modern agriculture, fertilizer-pesticide problems. e) Energy resources: Growing energy needs, renewable and non renewable energy resources, use of alternate energy sources. Solar energy, Biomass energy, Nuclear energy, f) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources.

(04Hrs)

Unit 3: 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, characteristics features, structure and function of the following ecosystem :- a) Forest ecosystem, b) Grassland ecosystem, c) Desert ecosystem d)Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

(04Hrs)

Unit 4: Biodiversity and its conservation

Introduction- Definition: genetic, species and ecosystem diversity. Bio-geographical classification of India. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. India as a mega- diversity nation. Western Ghat as a biodiversity region. Hot-spots of biodiversity. Threats to biodiversity habitat loss, poaching of wildlife, man-wild life conflicts. Endangered and endemic species of India. Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

(05Hrs)

Unit 5: Environmental Pollution

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Definition: Causes, effects and control measures of: Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards. Solid waste Management: Causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution.
(04Hrs)
Unit 6: Social Issues and the Environment
Disaster management: floods, earthquake, cyclone, tsunami and landslides Urban problems related to energy. Water conservation, rain water harvesting, watershed management. Resettlement and rehabilitation of people; its problems and concerns. Environmental ethics: Issue and possible solutions. Global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Wasteland reclamation. Consumerism and waste products.
(03Hrs)
Unit 7: Environmental Protection
From Unsustainable to Sustainable development Environmental Protection Act. Air (Prevention and Control of Pollution) Act. Water (Prevention and control of Pollution) Act. Wildlife Protection Act. Forest Conservation Act. Population Growth and Human Health, Human Rights
(06Hrs)

Mini Project	**Mini project based on :** Environmental assets River/Forest/Grassland/Hill/Mountain. OR A local polluted site Urban/Rural/Industrial/Agricultural. OR Study of common plants, insects, and birds. OR Study of simple ecosystems - ponds, river, hill slopes, etc. **(Mini Project report is Mandatory.)**

Assessment Method:

1. Mini Project report – 10 marks
2. ISE question paper format will be Multiple Choice Questions- 40 Marks

Unit No.	Topic Name	Weightage
1	Nature of Environmental Studies.	4 Marks
2	Natural Resources.	7 Marks
3	Ecosystems	7 Marks
4	Biodiversity and its conservation	7 Marks
5	Environmental Pollution	7 Marks
6	Social Issues and the Environment	8 Marks

IMPORTANT NOTES:

1. **ISE will be conducted in 14th week of semester.**
2. **Mini Project report will be submitted to course coordinator in 10th week of semester.**
3. **Students should get minimum 40% marks to get PP (PASS) grade.**
4. **Students getting less than 40% marks will be offered NP (NOT PASS) grade.**
5. **To get B. Tech. Degree PP grade in Environmental Studies is mandatory.**

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Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
1	Environmental Studies	Dr. B. S. Chauhan	University Science Press, New Delhi	1st	2008
2	Environmental Studies	Dr. P. D. Raut	S. U. Kolhapur	3rd	2011

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Principals of Environmental Science and Engineering	Raman Sivakumar	Cengage learning Singapore	2	2005
02	Elements of Environmental Science and Engineering	P. Meenakshi	Prentice Hall of India Private Limited, New Delhi	-	2006
03	Environmental Science – working with the Earth	G.Tyler Miller Jr	Thomson Brooks /Cole	11	2006

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Class	S. Y. B. Tech. Semester- IV
Course Code and Course Title	0EEES207, **Signals and Systems**
Prerequisite/s	0EEBS201
Teaching Scheme: Lecture/Tutorial	04/00
Credits	04
Evaluation Scheme: ISE I / MSE/ ISE II/ ESE	10/30/10/50

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
0EEES207.1	**Recall** and **identify** different types of Signals and Systems.(K^1)
0EEES207.2	**Explain** the conceptof linear algebra topics like vector space, basis, dimension, inner product, norm and orthogonal basis to signals, process of sampling, properties of CTFT , DTFT, ZT and LT, FIR and IIR response.(K^2)
0EEES207.3	**Classify** signals and systems based on their properties (K^2)
0EEES207.4	**Evaluate** the response of LTI system using convolution, and **determine** the fourier series coefficient of continuous time and discrete time periodic signals, Stability and ROC System by Laplace transform and Z-transform.(K^5)
0EEES207.5	**Construct** the signals using basic operations of signal(K^6)

Course Contents:		
Unit 1	**Introduction to signals & systems :** Classification of signals, standard test signals, basic operation on signals, classification of systems,models of Electrical systems Sampling methods, representing CT signals by samples, sampling DT signals, correlation , energy and power spectral density of signals.	**10 Hr**
Unit 2	**Time domain analysis of discrete and continuous time signals:** zero state response, zero input response, impulse response, step response, convolution sum and convolution integral, graphical representation of convolution, direct form I & direct form II, FIR and IIR systems	**08 Hr**
Unit 3	**System Analysis using Laplace transform** Introduction , ROC, S-plane,properties of Laplace and inverse Laplace transform, transfer function analysis, solution of LTI differential equation, analysis of electrical networks , relation between L.T and F.T, Block diagram representation, SFG, system realization, state space analysis	**08 Hr**
Unit 4	**System analysis using Z-transform :** A brief introduction to Z–transform, its properties & inverse – Z transform, ROC, connection between Laplace transform and Z–transform, transfer function analysis, solution of LTI difference equation, and stability in Z-domain.	**10 Hr**
Unit 5	**Fourier analysis of continuous signals:** Periodic representation by trigonometric Fourier series, Fourier spectrum, Dirichlet's condition, exponential Fourier series, exponential Fourier spectra, Parseval's theorem, Fourier transform and its properties, Relation between Fourier and Laplace Transform, Fourier spectrum	**10 Hr**

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Unit 6	**Fourier analysis of discrete signal** Introduction , properties of D.T. F. T., relation between DTFT & Z-transform,frequency response of first and second order system,T.F , DFT,zero padding, FFT , IDFT using FFT algorithm.	**10 Hr**

Text Books

Sr. No	Title	Author	Publisher	Edition	Year of Edition
1	Linear systems and signals,	B. P. Lathi	Oxford University Press	Second	2005
2	Signals and systems,	Simon Haykin,	Wiley Publications	Second	2007
3	Signals and systems	M. J. Roberts,	Tata McGraw Hill publications	Second	2012
4	Signals and systems	Allan V Oppenheim	PHI Learning pvt. ltd-New Delhi	Second	1997

Reference Books

Sr. No	Title	Author	Publisher	Edition	Year of Edition
1	Signals and systems	C. T. Chen	Oxford Publications,	Third	2004
2	Analog Signal Processing: Analysis & Synthesis	AlokBarua,	Wiley Publications	First	2014
3	Signals & Linear Systems,	Gabel	Wiley Publications	Third	1986
4	Signals and Systems	Krishnaveni	Wiley Publications	First	2012

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Department of Electrical Engineering
S. Y. B. Tech. Curriculum

Class	S. Y. B. Tech. Semester- IV
Course Code and Course Title	0EEPC208,**Generation, Transmission & Distribution**
Prerequisite/s	0BSES103, 0EEPC202
Teaching Scheme: Lecture/Tutorial	04/00
Credits	04
Evaluation Scheme: ISE I / MSE / ISE II / ESE	10/30/10/50

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
0EEPC208.1	**Describe** the electrical energy production methods & major power system components. **(K^2)**
0EEPC208.2	**Explain** the terms involved in generation cost& classify different tariff systems. **(K^2)**
0EEPC208.3	**Describe** about various types of distribution systems.& calculate the voltage drop of distributor for given parameters **(K^2)**
0EEPC208.4	**Discuss** the power factor & voltage improvement methods in electrical power systems.**(K^2)**
0EEPC208.5	**Apply** knowledge of overhead & underground transmission system elements to calculate the parameters in mechanical construction of lines. **(K^3)**
0EEPC208.6	**Derive** the electrical parameter values of overhead transmission lines. **(K^3)**

Course Contents:		
Unit 1	**Generation of Electrical Power:** AC power system Single line diagram, India's electricity scenario, Thermal power plant, hydro power plant, Nuclear power plant, Diesel power plant, Wind power plant, solar power plant, Tidal power plant schematic diagram, selection of site, advantages & Disadvantages, Substation, Indoor & Outdoor substation, Substation layout, Introduction to Gas Insulated substation (GIS), Brief Description of Power system elements such as Synchronous Machine, Transformer, Bus bar, Circuit Breaker, isolator, CT, PT	**10 Hr**
Unit 2	**Economics of Generation:** Load curve, Load duration curve, Maximum demand, Average Load, load factor, Demand factor, diversity factor, Plant capacity factor, plant use factor (Numerical) Economics of generation, Cost of the generation, fixed cost, semi fixed cost and running cost, methods of determining depreciation. Tariff, desirable characteristics of tariff, Tariff methods – two part tariff, three part tariff & Power factor tariff methods.	**08 Hr**
Unit 3	**Distribution system** Distribution system introduction, feeder & distributor, classification of distribution systems, connection schemes of distribution schemes, Voltage drop calculation (Derivation & Numerical) to AC distribution systems of radial and ring system	**08 Hr**

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Unit 4	**Mechanical Design of Transmission system** Main elements of transmission lines, Conductors, Hard drawn copper, hard drawn aluminum, ACSR, Expanded ACSR, ACAR, Bundle conductor, Line supports, types of line supports, Insulators, types of insulators, potential distribution over suspension insulators, string efficiency, methods to improve string efficiency, Sag, Calculation of sag (Numerical), Corona, important terms, factors affecting the corona, advantages and disadvantages of corona, methods to reduce the corona. Underground cable, Construction & Classification of single – phase and three – phase cables, method of laying underground cables, Grading of underground cables	**12 Hr**
Unit 5	**Electrical Design of transmission system:** Resistances, calculation of resistance, inductance, flux linkage of the single conductor, inductance of single phase two – wire line, three phase line and double circuit line, skin effect, Proximity effect, capacitance, capacitance of two – wire line, three phase line with equilateral space, capacitance of line with unequal spacing, Numerical	**09 Hr**
Unit 6	**Power factor improvement & Voltage control Methods:** Power factor, disadvantages of low power factor, causes of low power factor, methods of improving power factor – static capacitor, synchronous condensers, calculations of power factor, Most economical power factor for KW and KVAR loads, Numerical problemsNeed of voltage control, voltage control methods – voltage regulators, tap changing and booster transformers	**09 Hr**

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Principles of Power system	V K Mehta &Rohit Mehta	S. Chand company PVT LTD	Fourth	2007
02	Electrical power systems	AshfaqHussain	CBS publications	Fifth	2007
03	Electrical Power Generation, Transmission & Distribution	S N Singh	PHI learning PVT LTD	Second	2003
04	Modern Power system Analysis	D P Kothari & I J Nagrath	Tata McGraw – Hill	Third	2009
05	Generation of Electrical Energy	B. R. Gupta	S. Chand Publication	Fifth	2007

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Electrical Power System	Weedy B M, Cory B J	John Wiley Publication	Fifth	2013
02	Electrical Power Generation, Transmission & Distribution	Leonard L. Grigsby	CRC Press	Third	2012
03	Electrical Power systems	C L Wadhwa	New age International Limited	Sixth	1997
04	Transmission &Distribution	Dr. C R Bayliss Hardy	Newnes	Third	2007

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Dean Academic Office

Department of Electrical Engineering
S. Y. B. Tech. Curriculum

Class	S. Y. B. Tech. Semester- IV
Course Code and Course Title	0EEPC209, **DC Machines and Transformers**
Prerequisite/s	0BSE103
Teaching Scheme: Lecture/Tutorial	04/00
Credits	04
Evaluation Scheme: ISE I / MSE / ISE II/ ESE	10/30/10/50

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
0EEPC209.1	**Relate** Principle of electromechanical energy conversion and concept of torque production in electrical machine. **(K^2)**
0EEPC209.2	**Explain** Construction details of DC machine & transformer. **(K^2)**
0EEPC209.3	**Solve** the numerical on EMF Equation, speed control & testing of dc machine.**(K^3)**
0EEPC209.4	**Solve** the numerical on testing of transformer. **(K^3)**
0EEPC209.5	**Analyze** performance of particular machine by performing suitable test. **(K^4)**
0EEPC209.6	**Categories** machines for various applications. **(K^4)**

Course Contents:		
Unit 1	DC Generator a. DC generators, construction details, Armature Winding, coil pitch, back pitch, front pitch, Resultant pitch, commutator pitch, Pitch factor, Distribution factor lap & wave winding Electrical & Mechanical degree. b. EMF equation, Generated EMF in full& short pitched coil, methods of excitation Power Stages in DC Generator. c. Types and Characteristics of generators, armature reaction, effects of armature reaction compensating windings d. commutation ,methods to improve commutation e. Applications of DC generator	**09 Hr**
Unit 2	**D.C. Motors** a. Working principle of DC motor &significance of back e.m.f. Physical concept of torque production b. Power stages in DC motor, Speed Equation, Torque Equation, Losses & efficiency of DC motors. c. Types and characteristics of dc Motor d. Need& types of starter and reversing direction of rotation e. Speed control and Braking Methods. f. Applications of DC Motors g. Special Purpose motors: PMDC, BLDC, Stepper Motors, Servo Motors	**10 Hr**
Unit 3	**Testing of DC Motors.** a. Testing of D.C. Machines: Type of tests like routine, type test and supplementary test. b. Brake test. c. Swinburne's test. d. Regenerative or Hopkinson's test. e. Field's test for series motor.	**09Hr**

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Unit 4	**Single phase Transformer** a. Construction, types, Concept of ideal transformer, EMF equation. b. Exact and approximate equivalent circuit referred to either side. c. General Phasor diagrams on no load and load. Voltage Regulation d. Losses, Efficiency, maximum efficiency, all day efficiency transformer rating, e. Parallel operation of single phase transformers, conditions to be satisfied, load sharing under various conditions f. Testing of Transformer: Polarity Test, Load Test, Review of OC and SC test, Sumpner's Test, Impulse test. g. Special Purpose Transformers: Welding Transformer, Traction Transformer, Isolation Transformer, Grounding transformer, Autotransformers and its applications.	**12 Hr**
Unit 5	**Three – Phase Transformers** a. Poly-phase Transformers-connecting a bank of three identical single phase transformer for three phase transformation b. Standard connections for three phase transformers, their voltage Phasor diagrams, Phasor groups, suitability of particular connection for supplying unbalanced loads. c. Factor affecting the choice of connection. d. Open delta or V-V connection, application and vector diagram. e. Scott connection for three phases to two phase transformation and vice-versa, applications.	**10Hr**
Unit 6	**Testing of Transformer** a. Polarity Test, b. Load Test, c. OC and SC test, d. Sumpner's Test, e. Impulse test. f. Heat Run Test, g. Equivalent Delta test, h. Separation of Eddy current & hysteresis losses.	**06Hr**

Text Books

Sr. No	Title	Author	Publisher	Edition	Year of Edition
1	Electric Machinery	BimbhraP.S	Khanna Publisher	Seventh	2011
2	Generalized Machine Theory,	Bimbhra P.S	Khanna Publisher	Fourth	1987
3	Electric Machines	Kothari D.P Nagrath I.J	THM Publications	Fourth	2010
4	Electric Machinery	A.E Fitzgerald Stephen Kingsly	Tata Mcgraw Hill	Fourth	1983

Reference Books

Sr. No	Title	Author	Publisher	Edition	Year of Edition
1	Principles of Electric Machine	V. K. Mehta	Tata Mcgraw Hill	First	2006
2	Electric Machines	AshfaqHusain	Dhanpatrai	Third	2016
3	Electric Machines	M.V.Deshpande	Phi	First	2011
4	Electric Machines	Samarjit Ghosh	Pearson	Second	2012
5	Electric Machines	P.K. Mukherjee And S. hakrabarty	Dhanpatrai And Co.Publication	Third	2013

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Department of Electrical Engineering
S. Y. B. Tech. Curriculum

Class	S. Y. B. Tech. Semester- IV
Course Code and Course Title	0EEES210, **Digital Electronics**
Prerequisite/s	0BSES109
Teaching Scheme: Lecture/Tutorial	04/00
Credits	04
Evaluation Scheme: ISE I / MSE / ISE II / ESE	10/30/10/50

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
0EEES210.1	**Attempt** conversions among various number systems (K^2)
0EEES210.2	**Transform** given Boolean equation for minimum number of logic gates (K^2)
0EEES210.3	**Formulate** combinational logic circuits (K^2)
0EEES210.4	**Explain** architecture and working of 8085 microprocessor and peripherals (K^2)
0EEES210.5	**Interface** 8085 microprocessor with various peripheral devices (K^3)
0EEES210.6	**Develop** skill in program writing for 8085 microprocessor and applications (K^3)

Course Contents		
Unit 1	**Number Systems** – decimal, binary, octal, hexadecimal, conversions, BCD code, gray code, weighted codes, signed magnitude representation Logic gates, universal gates, logic families, performance parameters, Boolean theorem, Boolean algebra	**12 Hr**
Unit 2	**Combinational logic Circuit Design –** K-map, SOP and POS form, Half adder, full adder, subtractor, magnitude comparator, code converter, Multiplexer, de multiplexer, encoder, decoder	**10 Hr**
Unit 3	**Sequential Logic Circuit Design –** Latches, Flip flops, counters, shift registers	**06 Hr**
Unit 4	**Analog to Digital Conversion & Digital to Analog Conversion –** Working principle and operation of different types of ADC & DAC, Detailed study of ADC and DAC 0808, 0809	**08 Hr**
Unit 5	**Microprocessor 8085 –** Architecture, instruction set, addressing modes, memory, assembly language programming, interrupt, interrupt service routine	**12 Hr**
Unit 6	**Hardware Interfacing –** Address decoding, Memory interfacing, IO mapped IO, memory mapped IO, 8255 PPI interfacing, ADC 0808 and DAC 0809 interfacing	**08 Hr**

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	A Textbook of digital electronics	R.S. Sedha	S. Chand	Second	2005
02	8 bit Microprocessor	V.J. Vibhute& P.B. Borole	Tech-Max	Fifth	2007
03	Microprocessor 8085 Architecture, Programming Interfacing	Anil Sawarnkar	Genius	Second	2009
04	Microprocessor and its Applications	B.RAM	Tata Mc-Graw Hill	Sixth	2008

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Reference Books:					
Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Digital Electronics Principles & Applications	Anil Maini	Wiley	Second	2007
02	Modern Digital Electronics	R.P. Jain	Mcgraw Higher Ed	Fourth	2009
03	Fundamentals of Digital Electronics	A. Anand Kumar	PHI	Fourth	2016
04	Digital Design	Morris Mano	Pearson	Fifth	2012
05	Microprocessor Architecture, Programming & Application with 8085	Ramesh Gaonkar	Penram International	Third	1997

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Dean Acadamic Office
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Class	S. Y. B. Tech. Semester- IV
Course Code and Course Title	0EEPC211,**Instrumentation & Communication**
Prerequisite/s	0EEES204, 0EEPC205
Teaching Scheme: Lecture/Tutorial	04/00
Credits	04
Evaluation Scheme: ISE I/ MSE / ISE II/ ESE	10/30/10/50

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
0EEPC211.1	**Explain** instrumentation system design with block diagram approach. **(K^2)**
0EEPC211.2	**Explain** practical implementation issues, such as non-ideal filters, non-ideal sampling pulses, aliasing, and inter symbol interference. **(K^2)**
0EEPC211.3	**Develop** understanding about performance of analog communication systems. **(K^3)**
0EEPC211.4	**Convert** analog signals to digital while satisfying certain specifications. **(K^3)**
0EEPC211.5	**Convert** analog physical into electrical signal with the help of transducer. **(K^3)**
0EEPC211.6	**Evaluate** fundamental communication system parameters, such as bandwidth, power, signal to quantization noise ratio, and data rate. **(K^5)**

Course Contents:		
Unit 1	**Transducers, Classification of transducers** Transducers for measurement of displacement, strain, pressure, speed, temperature, acceleration, torque and vibration, Piezoelectric transducers, hall effect transducers, thermocouples	**10 Hr**
Unit 2	**Display and Recording Devices –** Analog Display devices, 7 segment display, LCD, graphic LCD, X-Y Recorder, digital data recorder, digital data acquisition system	**10 Hr**
Unit 3	**Introduction to Process Instrumentation-** Instrumentation set up for measurement of temperature using thermocouple, displacement measurement using LVDT, measurement of current and voltage using CT & PT, hall effect transducer for current measurement	**08 Hr**
Unit 4	**Amplitude Modulation and Demodulation –** Baseband and carrier communication, Generation of Amplitude modulation wave, SSB AM, DSB AM, VSB, carrier acquisition, AM receivers, Television communication system	**10 Hr**
Unit 5	**Frequency Modulation and Demodulation –** Concept of instantaneous frequency, band-width of angle modulated waves, generation of FM waves, demodulation of FM, Interference in FM modulation systems, FM receiver	**08 Hr**
Unit 6	**Sampling and Pulse Code Modulation –** Sampling theorem, quantization, quantization error, pulse code modulation and demodulation, differential PCM, delta modulation and demodulation Digital communication system – Block diagram, line coding, scrambler, regenerative repeater, digital carrier system, digital multiplexing	**10 Hr**

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Text Books:					
Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Modern Digital and Analog Communication systems	B.P. Lathi,	Oxford University Press	Third	2010
02	Principle of Communication System	Dr. Sanjay Sharma	Kataria& Sons	Eleventh	2015
03	Electronic Instrumentation	H. S. Kalsi	Tata McGraw Hill	Third	2010
04	Transducers and Instrumentations	D.V.S. Murty	PHI, 2nd Edition May 2016	Second	2016

Reference Books:					
Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Communication Electronics System	Kennedy	Tata McGraw Hill	Fourth	1999
02	Principle of Communication Electronics System	L.E. Frenzel Jr.	Tata McGraw Hill	Fourth	2010
03	A course in Electrical, Electronics measurement and Instrumentation	A.K. Sawhney	DhanpatRai	Nineteenth	2016
04	Instrumentation Devices and Systems	Rangan, Mani, Sharma	Tata Mc-Graw Hill	Twenty First	2010

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Department of Electrical Engineering
S. Y. B. Tech. Curriculum

Class	S. Y. B. Tech. Semester- IV
Lab Code and Lab Title	0EEPC255,**DC Machines and Transformers Laboratory**
Prerequisite/s	0BSE153
Teaching Scheme: Lecture/Tutorial/Practical	00/00/02
Credits	01
Evaluation Scheme: ISE / ESE	50/50

Course Outcomes (COs)	
Upon successful completion of this Lab, the student will be able to:	
0EEPC255.1	**Relate** the principle of DC machines and transformer in practical manner. **(K^2)**
0EEPC255.2	**Perform** different tests on DC machines. **(S^2)**
0EEPC255.3	**Perform** different tests on Transformer. **(S^2)**
0EEPC255.4	**Respond** Effectively in the form of oral and writing journal.**(S^2)**
0EEPC255.5	**Examine** the observations and determine the result of experiment. **(A^2)**

List of Experiments:

Expt. No.	Title of Experiment
1	Determination of OCC characteristics of d.c generator.
2	Speed control of D.C shunt motor by armature and field control.
3	Reversal of motor rotation of D. C. motor
4	Study of 3 and 4 point starters.
5	Load test on DC Motor.
6	Swinburne's test on DC shunts Motor: Determination of losses & efficiency.
7	Hopkinson's Test on DC motor.
8	Polarity and Ratio test on single phase transformer/three phase transformer.
9	Open circuit and short circuit test on single phase & three phase transformer
10	Load test on single phase & three phase transformer
11	Parallel operation of two single phase transformer.
12	Scott connection of two single phase transformer on no load and at balanced load.
13	To perform Sumpner's Test on 1Φ Transformer.
14	Separation of iron loss into hysteresis and eddy current loss components in a1Φ Transformer.
15	Mini Project: Working Model of DC machine, Working Model of Transformer

Note: Lab should consist of minimum eight experiments& one mini project.

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Department of Electrical Engineering
S. Y. B. Tech. Curriculum

Class	S. Y. B. Tech. Semester- IV
Lab Code and Lab Title	0EEES256, **Digital Electronics Laboratory**
Prerequisite/s	0BSES157
Teaching Scheme: Lecture/Tutorial/Practical	00/00/02
Credits	01
Evaluation Scheme: ISE / ESE	50/50

Course Outcomes (COs):
Upon successful completion of this course, the student will be able to:

0EEPC256.1	**Identify** electronic components their pin functions and packages (K^1)
0EEPC256.2	**Operate** digital electronics circuit on experimental set ups(K^2)
0EEPC256.3	**Tabulate** observations and communicate conclusion and results in oral as well as written form (S^2)
0EEPC256.4	**Perform** on destructive testing of circuits with the help of simulation software (S^3)
0EEPC256.5	**Acquire** experience of working individually as well as a team in designing, building and troubleshooting simple analog electronic circuits (A^2)
0EEPC256.6	**Follow** safety measures with ethics (A^3)

List of Experiments

Expt. No.	Title of Experiment
1	Study of digital electronics logic families – 74XX series and 40XX series logic gate ICs
2	Design of Half adder and full adder
3	Design of combinational logic circuit from SOP or POS equation
4	Design of combinational logic circuit using Multiplexer, de multiplexer, encoder and decoder
5	Study of 74XX series sequential logic ICs – flip flop, counters
6	Design of mod n asynchronous counter
7	Design of water level controller using logic gates
8	Design of industrial product counter
9	Assembly language programming of 8085 microprocessor for arithmetic, logical instructions
10	Assembly language programming of 8085 microprocessor for logical instructions
11	Assembly language programming of 8085 microprocessor for looping instructions
12	8255 interfacing with 8085 microprocessor
13	Input analog data from ADC to 8085 microprocessor and display on 8255 port
14	Waveform generation by interfacing DAC with 8085 microprocessor
15	Temperature measurement with microprocessor using LM35 temperature sensor and ADC

Note: Lab should consist of minimum eight experiments.

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Class	S. Y. B. Tech. Semester- IV
Course Code and Course Title	0EEPC257, **Instrumentation & Communication Laboratory**
Prerequisite/s	0EEES253, 0EEPC258
Teaching Scheme: Lecture/Tutorial/Practical	00/00/02
Credits	01
Evaluation Scheme: ISE/ESE	50/00

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
0EEPC257.1	**Explain** the industrial and laboratory applications of instruments **(K^2)**
0EEPC257.2	**Identify** electronics/ electrical instruments, their use, peculiar errors associated with the instruments and how to minimize such errors **(K^3)**
0EEPC257.3	**Select** and use a transducer for measurement of physical quantity **(S^2)**
0EEPC257.4	**Demonstrate** modulation and demodulation of message signal in communication system **(S^2)**
0EEPC257.5	**Acquire** experience of working individually as well as a team in designing, building and troubleshooting simple instrumentation system **(A^2)**
0EEPC257.6	**Examine** the observations and determine the result of experiment. **(A^2)**

List of Experiments

Expt. No.	Title of Experiment
1	Displacement measurement using LVDT
2	Temperature measurement using RTD / thermocouple
3	Vibration measurement using piezoelectric crystal
4	Study of cathode ray oscilloscope
5	Weight measurement using strain gauge / load cell
6	Speed measurement using optical pickup
7	Speed measurement using proximity pickup
8	Measurement of voltage, current, power and power factor measurement system using CT and PT
9	Demonstration of Amplitude Modulation and demodulation using AM transmitter and receiver
10	Demonstration of Frequency Modulation and demodulation using FM transmitter and receiver
11	Super heterodyne receiver
12	Sampling and aliasing (simulation)
13	Demonstration of quantization error in PCM system
14	Mini projects based on sensors and transducers.

Note: Lab should consist of minimum eight experiments& one mini project.

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Class	S. Y. B. Tech. Semester- IV
Course Code and Course Title	0EEPC258, **Software Tools for Electrical Engineering**
Prerequisite/s	0BSES112, 0BSES161, 0EEES254
Teaching Scheme: Lecture/Tutorial/Practical	00/00/02
Credits	01
Evaluation Scheme: ISE I /ESE	50/00

Course Outcomes (COs):
Upon successful completion of this course, the student will be able to:

0EEPC258.1	**List** and explain various features and tools available in software packages: MATLAB for Electrical Engineering. **(K^2)**
0EEPC258.2	**Apply** the Knowledge to solve various electrical engineering problems using software tools by programming or simulation. **(K^3)**
0EEPC258.3	**Use** the basic LABVIEW functions, useful for measurements of parameters. **(S^2)**
0EEPC258.4	**Develop** the electrical engineering machine designs using AutoCAD and power systems using ETAP **(S^2)**
0EEPC258.5	**Describe** the significance of Software Packages in Electrical Engineering. **(A^2)**

List of Experiments

Expt. No.	Title of the Experiments
1	Matrix Manipulation , Signal Manipulation & Plotting of Continuous and Discrete signals in MATLAB
2	Programming of Newton Raphson method to solve nonlinear equations using MATLAB Programming
3	Simulation of Single Phase Transformer and evaluation of system performance using MATLAB
4	Simulation and Analysis of AC-DC Converter (Rectifier) Using MATLAB
5	Study of Logic Gates using LABVIEW
6	Design of single line diagram using AutoCAD.
7	Design of distribution transformer core using AutoCAD.
8	Design of DC Motor armature using AutoCAD.
9	Design of control panel using AutoCAD.
10	Short circuit analysis of transformer by using ETAP
11	Design of Single Line Diagram Using ETAP

Any Eight Experiments should be performed from above listed table.

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	MATLAB: An Introduction with Applications	Rao V. Dukkipati	New Age International Publishers	1st	2010
02	MATLAB & Simulink For Engineers	Agam Kumar Tyagi	Oxford	1st	2012

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Department of Electrical Engineering
S. Y. B. Tech. Curriculum

Class	S. Y. B. Tech. Semester- IV
Course Code and Course Title	0EEAC212, **Professional Skills-I**
Prerequisite/s	0BSBS 102, 0BSBS 113
Teaching Scheme: Lecture/Tutorial/Practical	02/00/00
Credits	00
Evaluation Scheme: ISE	50 (Grade)

Course Outcomes (COs):
After successful completion of this course, the student will be able to:

0EEAC212.1	**Formulate** the problem quantitatively and use appropriate arithmetical, and/or statistical methods to solve the problem.(K^3)
0EEAC212.2	**Recall** Formulae.(K^3)
0EEAC212.3	**Demonstrate** various principles involved in solving mathematical problems and thereby reducing the time taken for performing job functions.(K^3)
0EEAC212.4	**Interpret** quantitative information (i.e., formulas, graphs, tables, models, and schematics) and draw implications from them.(K^3)
0EEAC212.5	**Critically** evaluate various real life situations by resorting to analysis of key issues and factors.(K^3)
0EEAC212.6	**Solve** problems related to Logical reasoning & data interpretation. (K^3)

Course Contents:

Unit 1	Number Systems & Simplifications : Types of Numbers, LCM/HCF ,averages,ratio	**05 Hr**
Unit 2	Problems on Percentages,Profit& Loss, SI & CI	**05 Hr**
Unit 3	Problems on Work,wages& Time, Pipes &Cisterns,Partnerships	**05Hr**
Unit 4	Problem on Trains, Boats & Streams, Speed	**05 Hr**
Unit 5	Examples on Probability,Permutation& Combinations	**04 Hr**
Unit 6	Logical Reasoning basics & Data Interpretation Basics	**04 Hr**

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Quantitative Aptitude	Dr. R.S. Aggarwal	S.Chand	5	2014
02	Quantitative Aptitude for Competitive Examinations	Abhijit Gupta	MC Graw Hill	6	2016
03	A Modern Approach to Verbal & Non-Verbal Reasoning	Dr. R. S Agarwal	S.Chand	Revised	2016
04	How to Prepare for Logical Reasoning for the CAT	Arun Sharma	MC Graw Hill	1	2012

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Department of Electrical Engineering

Curriculum

T. Y. B. Tech Semester- V

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Department of Electrical Engineering

B. Tech. Semester –V

Course Code	Course	Teaching Scheme				Evaluation Scheme				
						Scheme	Theory (Marks)		Practical (Marks)	
		L	T	P	Credits		Max	Min. for Passing	Max	Min. for Passing
0EEPC301	Feedback Control Systems	4	--	--	4	ISE – I	10	40	--	--
						MSE	30		--	--
						ISE – II	10		--	--
						ESE	50		--	--
0EEPC302	Power System Analysis	4	--	--	4	ISE – I	10	40	--	--
						MSE	30		--	--
						ISE – II	10		--	--
						ESE	50		--	--
0EEPC303	AC Machines	4	--	--	4	ISE – I	10	40	--	--
						MSE	30		--	--
						ISE – II	10		--	--
						ESE	50		--	--
0EEPC304	Power Electronics	4	--	--	4	ISE – I	10	40	--	--
						MSE	30		--	--
						ISE – II	10		--	--
						ESE	50		--	--
0EEPC305	Electromagnetic Engineering	4	--	--	4	ISE – I	10	40	--	--
						MSE	30		--	--
						ISE – II	10		--	--
						ESE	50		--	--
0EEPC351	AC Machines Laboratory	--	--	2	1	ISE	--	--	50	20
						ESE	POE		50	20
0EEPC352	Power Electronics Laboratory	--	--	2	1	ISE	--	--	50	20
						ESE	POE		50	20
0EEPC353	Power System Analysis Laboratory	--	--	2	1	ISE	--	--	50	20
0EEPC354	Feedback Control Systems Laboratory	--	--	2	1	ISE	--	--	50	20
0EEAC306	Professional Skills-II	2	--	--	--	--	--	Grade	--	--
	Total	**22**	--	**8**	**24**	--	**500**	--	**300**	--
Total Contact Hours/Week: 30 hrs										

Course Category	HS	BS	ES	PC	PE	OE	MC	AC	PR
Credits	--	--	--	24	--	--	--	--	--
Cumulative Sum	3	20	40	57	--	--	--	--	--

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Annasaheb Dange College of Engineering and Technology, Ashta
Department of Electrical Engineering

Class	B. Tech. Sem. –V
Course Code and Course Title	**0EEPC301, Feedback Control Systems**
Prerequisite/s	0EEES207
Teaching Scheme: Lecture/Tutorial/Practical	04/00/00
Credits	04
Evaluation Scheme: ISE I / MSE / ISE II / ESE	10/30/10/50

Course Objectives: The course aims to:	
1	**Understand** basic concepts in control system and determine its transfer function.
2	**Introduce** block diagram reduction of multiple subsystems to a single block representing its transfer function.
3	**Study** the stability of the system & evaluate system performance in time and frequency domain
4	**Determine** the range of preamplifier gain & time response parameters for given system.
5	**Understand** the concept of state space and its representation for a control system

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
0EEPC301_1	**Model** physical system to obtain its transfer function(K^3)
0EEPC301_2	**Use** the state space for representation of a physical system (K^3)
0EEPC301_3	**Determine** the transfer function using block diagram reduction and signal flow graph. (K^3)
0EEPC301_4	**Compute** the performance parameters for given physical system (K^3)
0EEPC301_5	**Analyze** the stability of the given system in time &frequency domain. (K^4)

Course Contents:		
Unit 1	**Introduction to Control System and mathematical modeling** Introduction, types of systems, feedback control system, modeling of electrical, mechanical, thermal, hydraulic systems, determination of the transfer function using block diagram reduction and signal flow graph.	**10 Hrs.**
Unit 2	**Components of Control Systems** Error detectors, potentiometer, synchros, optical rotary encoders, DC and AC servomotors, stepper motor, gear trains, AC and DC tacho-generators, transfer function of components of control system and its applications.	**08 Hrs.**
Unit 3	**Time Domain Analysis of Control system** Response of first and second order system, generalized second order system, steady state error, static error constants and type of system, steady state error specifications, Routh-Hurwitz criteria for stability.	**12 Hrs.**
Unit 4	**Root Locus** Definition of root locus, rules for plotting root loci, root contour, stability analysis using root locus, effect of addition of pole and zero on root locus.	**08 Hrs.**
Unit 5	**Frequency Response Analysis of Control system** Introduction to frequency response, frequency domain performance specifications, stability analysis of system using Bode plot and Nyquist plot, co-relation between time domain and frequency domain.	**08 Hrs.**

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Unit 6	**State Space Representation** Introduction to State space, phase variable form, controllable canonical form, jordan canonical form, conversion of transfer function to state space and vice versa, state transition matrix and its significance, eigen values, eigen vectors, solution of state equations, concept of state feedback control, controllability and observability.	**10 Hrs.**

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Control System Engineering	I.J. Nagrath M. Gopal	New Age International Publication	Fifth	2009
02	Control System Engineering	Norman Nise	Wiley Publication	Sixth	2013
03	Modern Control Engineering	Ogata	Prentice Hall	Fifth	2010
04	Feedback Control Systems	U. A. Bakshi & S. C. Goyal	Technical Publications	Second	2008

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Automatic Control System	Kuo & Golnaraghi	Wiley	Ninth	2013
02	Control Systems: Theory and Applications	Smarajit Ghosh	Pearson Education	Second	2012
03	Control Systems	N. C. Jagan	B. S. Publications	Second	2008
04	Feedback Control Systems	C.L. Phillips, R.D. Harbor,	Prentice Hall	Fourth	1999

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Annasaheb Dange College of Engg. & Tech. ASHTA 416 301

Annasaheb Dange College of Engineering and Technology, Ashta
Department of Electrical Engineering

Class	B. Tech. Sem. -V
Course Code and Course Title	**0EEPC302, Power System Analysis**
Prerequisite/s	0EEPC202, 0EEPC208
Teaching Scheme: Lecture/Tutorial/Practical	04/00/00
Credits	04
Evaluation Scheme: ISE I / MSE / ISE II / ESE	10/30/10/50

Course Objectives:
The course aims to:

1	**Introduce** the single line diagram, reactance diagram, impedance diagram and per unit system concepts.
2	**Study** the load flow in power system networks by various methods and its importance.
3	**Learn** the computation of line parameters.
4	**Study** Symmetrical and unsymmetrical systems and fault analysis
5	**Understand** the sequence impedances and sequence components of different equipment.

Course Outcomes (COs):
Upon successful completion of this course, the student will be able to:

0EEPC302_1	**Describe** the concepts of power system under steady state and fault conditions. (K^2)
0EEPC302_2	**Illustrate** the model of power system and its elements. (K^3)
0EEPC302_3	**Derive** the mathematical equations to study power system analysis. (K^3)
0EEPC302_4	**Compute** the sequence network components of the power system. (K^3)
0EEPC302_5	**Determine** the power system steady state parameters and its performance. (K^4)
0EEPC302_6	**Analyze** the fault conditions for the protection of power system. (K^4)

Course Contents:

Unit 1	**Performance of Transmission Lines** Introduction and classification of transmission lines, short, medium, long transmission lines, generalized constants of transmission lines, Ferranti effect, surge impedance loading, tuned power lines, complex power flow through a transmission line, receiving end power circle diagram for transmission line (assuming ABCD constants are already given).	**10 Hrs.**
Unit 2	**Per unit Representation of Power system & its Components** Introduction, single phase representation of balanced 3 phase networks, single line diagram, impedance & reactance diagram, introduction of per unit system, P.U. representation of transformer, representation of generator, P.U. impedance diagram of power system, representation of loads.	**06 Hrs.**
Unit 3	**Load flow analysis** Load flow analysis introduction and its importance, bus classifications, nodal admittance matrix (Y_{BUS}) formation, development of load flow equations, load flow solution using iterative techniques like Gauss Seidel, Newton Raphson method, Decoupled and Fast Decoupled methods. Comparison of Load Flow methods, Algorithms & flow charts.	**11 Hrs.**
Unit 4	**Symmetrical Fault Analysis** Introduction to fault, types of faults, transient on transmission line, short circuit current and reactance's of synchronous machine on no load and loaded condition,	**10 Hrs.**

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Annasaheb Dange College of Engg. & Tech. ASHTA 416 301

	short circuit MVA, algorithm for short circuit studies, Z- bus formulation (step by step method without mutual coupling), selection of circuit breakers and current limiting reactors and their location in power system.	
Unit 5	**Symmetrical Components** Introduction to symmetrical components, symmetrical component transformation, phase shift in star-delta transformers, sequence impedances and sequence network of transmission line, synchronous machine and transformer, power invariance, construction of sequence network of a power system.	**10 Hrs.**
Unit 6	**Asymmetrical Fault Analysis** Introduction to asymmetrical fault analysis, symmetrical component analysis of asymmetrical faults, single Line to Ground (L-G) fault, Line to Line (L-L) fault, Double Line to Ground (L-L-G) fault, open conductor faults, bus impedance matrix for analysis of asymmetrical shunt faults.	**09 Hrs.**

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
1	Modern Power System Analysis	D.P. Kothari, I. J. Nagrath	Mc-Graw Hill Publications	Fourth	2011
2	Electrical Power Systems	Ashfaq Hussain	CBS publishers, New Delhi	Third	2007
3	Power System Analysis	Hadi Saadat	Tata Mc-Graw Hill	First	2002
4	Power System Analysis	Grainger John J and W D Stevenson	McGraw Hill	First	1994

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
1	Power System Analysis	A.R. Bergen and Vijay Vittal	Pearson Education	Second	2009
2	Power System Analysis	P S R Murhty	BS Publication	First	2007
3	Electrical Power Systems	D. Das	New Age international	First	2010
4	Electric Power Systems: A first course	Ned Mohan	Wiley Publication	First	2012
5	Power System Analysis & Design	J. Duncun Glover Mulukutla S Sharma Thomas J Overbye	Prentice Hall	Third	2002

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Annasaheb Dange College of Engg. & Tech. ASHTA 416 301

Annasaheb Dange College of Engineering and Technology, Ashta
Department of Electrical Engineering

Class	B. Tech. Sem. -V
Course Code and Course Title	**0EEPC303, AC Machines**
Prerequisite/s	0BSES103, 0EEPC209
Teaching Scheme: Lecture/Tutorial/Practical	04/00/00
Credits	04
Evaluation Scheme: ISE I / MSE / ISE II / ESE	10/30/10/50

Course Objectives: The course aims to:	
1	**Learn** the different parts of AC machines and its principle of operation.
2	**Understand** the circuit parameters and its effect on the performance characteristics of AC machines.
3	**Study** the different types of starters and speed control methods employed in AC machines
4	**Find the** numerical solution for the performance of the AC machines based on its parameters.
5	**Understand the** different type of test conducted on AC machines

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
0EEPC303_1	**Explain** the constructional details and working principle of AC machines (K^2)
0EEPC303_2	**Describe** the effects of system parameters on performance of AC Machines. (K^2)
0EEPC303_3	**Solve** numerical to determine the performance parameters of AC machines.(K^3)
0EEPC303_4	**Select** the suitable starter & speed control method for specific application.(K^3)
0EEPC303_5	**Analyze** the performance of a AC machine by using appropriate testing methods.(K^4)

Course Contents:		
Unit 1	**Three Phase Induction Motor** Construction details, production of rotating magnetic field and principle of operation, types of rotors, rotor quantities (emf, current, frequency, pf),torque equation, torque-slip characteristics, necessity of starters for 3 ph. induction motors, types of starters (DOL, autotransformer, star-delta, rotor resistance starter), speed control methods from stator side (stator voltage control, stator frequency control, pole changing) & rotor side (rotor resistance control, cascade control, EMF injection control), braking methods, applications of 3 ph. induction motors.	**10 Hrs.**
Unit 2	**Performance of Induction Motor** Losses and efficiency, direct load test, no load & blocked rotor test, equivalent circuit of 3 phase induction motor, power flow diagram, phasor diagram of 3 phase induction motor, performance of 3 phase induction motor using circle diagram, crawling & cogging, induction motor as induction generator, double cage induction motor and its characteristics	**12 Hrs.**
Unit 3	**Three Phase Alternator** Construction details, principle of operation, emf equation, parameters of armature winding (resistance & leakage reactance), armature reaction (at unity, lagging zero and leading zero power factor), concept of synchronous reactance and synchronous impedance. equivalent circuit of 3 phase alternator, alternator on load (resistive, inductive & capacitive)	**08 Hrs.**

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Annasaheb Dange College of Engg. & Tech. ASHTA 416 301

Unit 4	**Performance of Alternator** Direct load test ,OC test & SC test on 3 phase alternator, voltage regulation methods (EMF, MMF, ZPF and direct loading method), losses and efficiency, necessity for parallel operation of alternators, conditions for parallel operation, synchronizing procedures, hunting and oscillation in alternators	**10 Hrs.**
Unit 5	**Synchronous Motor** Construction and principle of operation, necessity of starters, starting methods of synchronous motors, phasor diagrams of three phase synchronous motor at unity, lagging and leading power factor, effect of varying field current and load, V & inverted V curves, operation of synchronous motor as synchronous condenser, hunting, applications	**08 Hrs**
Unit 6	**Single Phase Induction Motors and Special Purpose Motors** Single phase induction motor- double field revolving theory, equivalent circuit, split phase induction motor, capacitor start inductor motor, capacitor start capacitor run induction motor (two value capacitor method), shaded pole induction motor, universal motor, linear induction motor, switched reluctance motor, AC servo motor, permanent magnet synchronous motor	**08 Hrs.**

Text Books

Sr. No	Title	Author	Publisher	Edition	Year of Edition
1	Electric Machinery	Bimbhra P.S	Khanna Publisher	Seventh	2011
2	Principles of Electric Machine	V. K. Mehta	Tata Mcgraw Hill	First	2006
3	Electric machines	Ashfaq Husain	Dhanpatrai And Co.Publication	Third	2016
4	Electric Machinery	A.E Fitzgerald Stephen Kingsly	Tata Mcgraw Hill	Fourth	1983

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
1	Generalized Machine Theory,	Bhimra P.S	Khanna Publisher	Fourth	1987
2	Electric Machines	Kothari D.P Nagrath I.J	THM Publications	Fourth	2010
3	Electric machines	M.V.Deshpande	PHI Publication	First	2011
4	Electric machines	Samarjit Ghosh	Pearson	Second	2012

Other Books/E-material

Sr. No	Title	Author	Publisher	Edition	Year of Edition
1	Electrical Machines	Prof. Debaprasad Kastha, IITKH	NPTEL Videos	--	--

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Annasaheb Dange College of Engg. & Tech. ASHTA 416 301

Annasaheb Dange College of Engineering and Technology, Ashta
Department of Electrical Engineering

Class	B. Tech. Sem. -V
Course Code and Course Title	**0EEPC304, Power Electronics**
Prerequisite/s	0EEPC204, 0BSES109
Teaching Scheme: Lecture/Tutorial/Practical	04/00/00
Credits	04
Evaluation Scheme: ISE I / MSE / ISE II / ESE	10/30/10/50

Course Objectives: The course aims to:	
1	**Study** the fundamentals of power electronic devices and characteristics.
2	**Learn** the concepts and operating principles of power electronics.
3	**Develop** the suitable power converter for drive applications.
4	**Analyze** the characteristics and performance parameters of various power converters.
5	**Familiarize** with recent applications of power electronics.

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
0EEPC304_1	**Describe** construction, working and operation of power semiconductor devices. **(K^2)**
0EEPC304_2	**Explain** working of power electronic converters.**(K^2)**
0EEPC304_3	**Draw** switching characteristics of power electronic devices.**(K^2)**
0EEPC304_4	**Solve** numerical to find performance parameters of power electronic converters.**(K^3)**
0EEPC304_5	**Analyze** the performance of power electronic converters for different types of load.**(K^4)**

Course Contents:		
Unit 1	**Power Semi-Conductor Devices and Commutation Circuits** Configuration, principle of operation, characteristics of power semiconductor devices (Power Diodes, SCR, TRIAC, Power MOSFET, IGBT, GTO), triggering methods and commutation techniques.	**11 Hrs.**
Unit 2	**Uncontrolled Converters** Construction, working, performance analysis of single phase half wave rectifiers with R, RL load with and without freewheeling diodes, single phase full wave rectifier with R, RL load with and without freewheeling diodes, three phase half wave rectifiers with R load, three phase bridge rectifiers with R load.	**09 Hrs.**
Unit 3	**Single Phase Controlled Converters** Construction, working, performance analysis of single phase half and full wave controlled converter (Centre Tapped)with R, RL load, single phase half bridge controlled converter with R, RL load, single phase full bridge controlled converter with R load, R-L load and R-L-E load with and without freewheeling diodes, effects of source inductance.	**09 Hrs.**
Unit 4	**Three Phase Controlled Converters** Construction, working, performance analysis of three phase half bridge controlled converter with R, RL load, Three phase full bridge controlled converter with R, RL load. **Dual Converters** Construction, working, performance analysis of single phase and three phase dual	**10 Hrs.**

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Annasaheb Dange College of Engg. & Tech. ASHTA 416 301

	converter with R, RL load.	
Unit 5	**Chopper & Cycloconverters** Introduction to Chopper, types of Chopper, Principle, working and performance analysis of step-up and step-down chopper, Current Limit Control and Time Ratio Control Techniques, Concept of multiphase choppers. **Cycloconverters:** Principle, working and performance analysis of single phase and three phase cycloconverters.	**08 Hrs.**
Unit 6	**Inverters** Introduction to inverters, working principle and operation of Single Phase half and full Bridge inverter, Voltage Source Inverter (VSI), three-phase- six step (120/180 degree mode of operation), principle of operation for Current Source Inverter (CSI), PWM techniques-Single, Multiple and Sinusoidal PWM. **Resonant Converters:** Introduction to resonant converters, principle of operation, types of resonant converters, applications.	**09 Hrs.**

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Power Electronics: Devices, Circuits and applications	Muhammad H. Rashid	Prentice Hall of India	Fifth	2013
02	Power Electronics	P.S. Bimbhra	Khanna Publishers, New Delhi	Third	2012
03	Electrical Machines & Drives, A First course	Ned Mohan	Wiley Publications	First	2012
04	Power Electronics	M. D. Singh & K. B. Kanchandhani	Tata McGraw - Hill Publishing	First	1998

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Power Electronics: Principles and Applications	Joseph Vithayathil	McGraw Hill Publication	first	2010
02	Power Electronics	B.W.Williams	John Willey	Second	2009
03	Power Electronics, Converter Applications and Design	Mohan, Undel and and Robins	John Wiley and sons (Asia) Pvt. Ltd.	Third	2001
04	Thyristorised Power Controllers	G.K. Dubey, S. R. Doradla, A. Joshi and R. M., K. Sinha	New Age International (P) Limited Publishers	First	1999

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Annasaheb Dange College of Engg. & Tech. ASHTA 416 301

Annasaheb Dange College of Engineering and Technology, Ashta
Department of Electrical Engineering

Class	B. Tech. Sem.- V
Course Code and Course Title	**0EEPC305, Electromagnetic Engineering**
Prerequisite/s	0BSES103, 0EEPC202
Teaching Scheme: Lecture/Tutorial/Practical	04/00/00
Credits	04
Evaluation Scheme: ISE I / MSE / ISE II / ESE	10/30/10/50

Course Objectives: The course aims to:	
1	**Introduce** the concept of vector analysis and different coordinate systems in the context of electromagnetic fields.
2	**Impart** knowledge on electrostatic field, electrical potential, energy density and their applications.
3	**Familiar** with concepts of magnetostatic field, magnetic potential and its energy density.
4	**Expose** the numerical solution for vector quantities associated with electrostatic, magnetostatic and time varying fields
5	**Understand** the existence of Maxwell's Equations and propagation of electromagnetic waves

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
0EEPC305_1	**Apply** different technique of vector analysis and appropriate coordinate systems for physical quantities dealt in electromagnetic fields. **(K^3)**
0EEPC305_2	**Derive** the physical quantities of electromagnetic fields in different engineering problems.**(K^3)**
0EEPC305_3	**Determine** the energy, potential, capacitance, inductance and its energy densities. **(K^3)**
0EEPC305_4	**Illustrate** the boundary conditions in different media and interfaces **(K^3)**
0EEPC305_5	**Apply** the Maxwell's equations in different forms and its diverse applications **(K^3)**
0EEPC305_6	**Examine** the electromagnetic wave propagation in different media and its means for transporting energy or information **(K^4)**

Course Contents:		
Unit 1	**Vector Analysis and Coordinate Systems:** Scalars and vectors, need for 3D coordinate systems, rectangular, cylindrical and spherical coordinate systems, transformation between coordinate systems, vector calculus, gradient, divergence and curl line, surface and volume integrals, divergence theorem, stoke's theorem.	**10 Hrs.**
Unit 2	**Electrostatic Fields** Coulomb's law, electric field intensity, field due to point and continuous charges, electric field due to finite line charge, circular disc and infinite sheet of charge, electric flux density, gauss's law and its applications, energy and potential, potential gradient, potential field of a point charge and system of charges, electric dipole, equi-potential surfaces, energy density in the electrostatic field.	**12 Hrs.**
Unit 3	**Electric Fields in Material Space** Current density, continuity of current, properties of conductors and dielectric materials-boundary conditions between two dielectric media, capacitance and	**08 Hrs.**

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Annasaheb Dange College of Engg. & Tech. ASHTA 416 301

	capacitors: parallel plate capacitor with single and two dielectric, cylindrical cable, two wire transmission line, Poisson's and Laplace's equations.	
Unit 4	**Magnetostatic Fields** Lorentz force, Biot-savart's law, Ampere's circuital law, modified Ampere's law, magnetic field intensity due to infinite long straight conductor and infinite sheet of current, magnetic flux density, boundary conditions, force and torque on a closed circuit, inductance, energy density.	**12 Hrs.**
Unit 5	**Time-Varying Fields and Maxwell's Equations:** Faraday's laws, transformer and motional emf, conduction and displacement current, Maxwell's equations in differential and integral forms, applications	**06 Hrs.**
Unit 6	**Electromagnetic Wave Propagation:** Electromagnetic wave equations, uniform plane wave, wave parameters, wave propagation in free space, lossy and lossless dielectrics, wave propagation in conductors, skin effect and skin depth, poynting vector and poynting theorem.	**08 Hrs.**

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
1.	Engineering Electromagnetics	William H Hayt And John A Buck	Tata McGraw-Hill Publication	Eighth	2014
2.	Electromagnetic with applications	J.D.Krauss and Daniel Fleisch	Tata McGraw-Hill Publication	Fifth	2011
3.	Foundation of Electromagnetic Theory	John. R. reitz Frederic J. Milford	Pearson Educatio	Forth	2010
4.	Principle of Electromagnetic	R. G. Kaduskar	Wiley India	First	2010

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
1.	Electromagnetic	Edministar Joseph	Tata McGraw-Hill Publication	Second	2010
2.	Electromagnetic Theory & Application	Pramanaik Ashutosh	PHI Learning Private Limited	Fifth	2009
3	Principle of Electromagnetic	Matthew N.O. Sadiku S. V. Kulkarni	Oxford University Press, YMCA	Sixth	2015
4	Fundamentals of Electromagnetic	A.V. Mahatme	Laxmi Publication	First	2014

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Annasaheb Dange College of Engg. & Tech. ASHTA 416 301

Annasaheb Dange College of Engineering and Technology, Ashta
Department of Electrical Engineering

Class	B. Tech. Sem. –V
Course Code and Course Title	**0EEAC306, Professional Skills - II**
Prerequisite/s	0BSHS156
Teaching Scheme: Lecture/Tutorial /Practical	02/00/00
Credits	-
Evaluation Scheme: ISE	(Grade)

Course Objectives : The course aims to:	
1	**Equip** students with effective speaking and listening skills in English.
2	**Evaluate** one self and develop professionals with practical and moral values.
3	**Develop** inter personal skills and be an effective goal oriented team player.
4	**Develop** leadership qualities.

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
0EEAC306_1	**Communicate** with gestures and nonverbal manners with others.(S^2)
0EEAC306_2	**Practice** writing skills effectively through writing reports, e-mails and letters. (S^2)
0EEAC306_3	**Present** inter personal skills of leadership. (S^2)
0EEAC306_4	**Act** as an effective goal oriented team player.(S^2)
0EEAC306_5	**Develop** time management skills.(S^3)
0EEAC306_6	**Follow** professionals skills with moral values.(A^2)

Course Contents:		
Unit 1	**Introduction to Professional Communication** Importance of communication, non verbal communication-personal appearance, gesture, posture, facial expression, eye contact, space distancing, personality development.	**03 Hrs.**
Unit 2	**Self-Analysis.** SWOC (Strength, Weakness, Opportunities, Challenges) analysis, who am I, attributes, importance of self confidence, self esteem, decision making, career planning, stress management, motivation.	**04 Hrs.**
Unit 3	**Goal Setting** Bucket list, blue print for success, immediate, short term, long term, smart goals, strategies to achieve goals.	**02 Hrs.**
Unit 4	**Time Management** Value of time, diagnosing time management, weekly planner, to do list, identifying timewasters, time management skills, prioritizing work.	**03Hrs.**
Unit 5	**Leadership and Team Management** Qualities of a good leader, leadership styles, decision making, problem solving, negotiation skills.	**02Hrs.**
Unit 6	**Written Communication** Writing reports, email writing, essay writing, formal letter writing, writing business letter.	**04 Hrs.**
Unit 7	**Oral Communication** Making effective presentation, planning and preparing speech, speeches for various	**06 Hrs.**

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Annasaheb Dange College of Engg. & Tech. ASHTA 416 301

	occasions, debates, group discussion, extempore, meeting management, adaptability & work ethics, group communication skills, organizational communications.	
Unit 8	**Job Interviews** Identifying job openings, drafting effective Resume and Curriculum Vitiate, covering letter, facing job interviews, emotional intelligence & critical thinking.	**04 Hrs.**

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Business Communication	Urmila Rai and S.M.Rai	Himalaya Publishing House	Third	2012
02	Communication Skills	Meena kashi Raman and Sangeeta Sharma	Oxford University Press	Third	2015
03	Effective Technical Communication	Ashraf Rizvi	Tata McGraw-Hill	Fifth	2014
04	Business Correspondence and Report writing	R.C.Sharma & Krishna Mohan	Tata McGraw-Hill	Second	2010

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Technical writing & professional communication for non- native speakers of English	Thomas N.Huckin & Leslie A.Olsen	Tata McGraw-Hill	First	2004
02	Better English Pronunciation	J.D.Oconnor	Universal Book Stall	First	1997
03	High School English grammar and composition	Wren & Martin	S.chand and Co. New delhi	First	2011
04	The ACE of Soft Skills	Gopal Swami Ramesh Mahadevan	Pearson Publication,Delhi	Second	2011

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Annasaheb Dange College of Engg. & Tech. ASHTA #16 301

Annasaheb Dange College of Engineering and Technology, Ashta
Department of Electrical Engineering

Class	B. Tech. Sem. -V
Lab Code and Lab Title	**0EEPC351, AC Machines Laboratory**
Prerequisite/s	0BSES153, 0EEPC255
Teaching Scheme: Lecture/Tutorial/Practical	00/00/02
Credits	01
Evaluation Scheme: ISE / ESE	50/50

Course Objectives: The course aims to:	
1	**Understand** electro mechanical energy conversion process in practical.
2	**Learn** different types of starters used to start AC machines.
3	**Find** suitable testing method to determine performance of particular machine.
4	**Outline** test setup for different AC machines
5	**Determine** performance of particular machine from experiment results.

Course Outcomes (COs) Upon successful completion of this course, the student will be able to:	
0EEPC351_1	**Determine** performance parameters of AC machines by using appropriate testing methods. (K^3)
0EEPC351_2	**Demonstrate** different tests and speed control methods of Induction machines. (S^2)
0EEPC351_3	**Perform** different tests on Synchronous Machines to find performance parameters. (S^2)
0EEPC351_4	**Communicate** effectively in the form of oral and writing journal.(S^2)
0EEPC351_5	**Practice** safety precautions and ethics while performing practical in AC machines.(A^2)

List of Experiments:

Sr. No.	Title of Experiment
1	Speed control methods of three phase squirrel cage induction motor.
2	Speed control methods of three phase slip ring induction motor.
3	Efficiency & speed regulation of three phase squirrel cage induction motor by direct loading method
4	Efficiency & speed regulation of three phase squirrel cage induction motor by indirect loading method
5	Efficiency & speed regulation of single phase induction motor.
6	Efficiency of Alternator by direct loading method
7	Voltage regulation of Alternator by direct loading method
8	Voltage regulation of an alternator by EMF, MMF, ZPF method
9	Determination of load sharing by parallel operation
10	Determination of efficiency of synchronous motor by direct loading
11	Determination of V curves of a synchronous motor

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Annasaheb Dange College of Engg. & Tech. ASHTA 416 301

Annasaheb Dange College of Engineering and Technology, Ashta
Department of Electrical Engineering

Class	B. Tech. Sem. –V
Course Code and Course Title	**0EEPC352, Power Electronics Laboratory**
Prerequisite/s	0BSES157, 0EEPC252
Teaching Scheme: Lecture/Tutorial/Practical	00/00/02
Credits	01
Evaluation Scheme: ISE / ESE	50/50

Course Objectives The course aims to:	
1	**Understand** the fundamental principles and applications of power electronics circuits.
2	**Identify** various power devices and understand their coding, characteristics, useful for various industrial applications.
3	**Analyze** Power Electronics based circuits applying fundamentals of mathematics, Basic Electrical knowledge and Network theory.
4	**Develop** the skills of simulation, analysis and design of power electronic converters.
5	**Communicate** effectively, think critically and creatively.

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
0EEPC352_1	**Choose** suitable power semiconductor device for a converter. (K^3)
0EEPC352_2	**Plot** V-I characteristic and switching characteristic of power semiconductor devices.(K^3)
0EEPC352_3	**Simulate** various power electronic converters using MATLAB.(S^2)
0EEPC352_4	**Demonstrate** operation of power electronic converters. (S^2)
0EEPC352_5	**Work** in groups for performing practices in power electronics laboratory. (S^2)

List of Experiments

Sr. No.	Title of the Experiment
1	V-I characteristics of various power semiconductor devices.
2	Gate Firing circuits for SCR's (R, RC, UJT, ramp and pedestal.).
3	Single Phase Half-Wave Controlled Rectifier with R and RL load.
4	Single Phase fully controlled bridge converter with R and RL load.
5	Three Phase Half -Wave Converter with R Load.
6	Three Phase Full-Wave Bridge Converters with R Load.
7	Dual Converter.
8	D.C. Chopper. (Step up and Step Down).
9	Single phase Inverter.
10	Resonant Converters.
11	MATLAB Simulation of Three Phase PWM Inverter.
12	MATLAB Simulation of Switched Mode AC Power Supplies and Bidirectional AC Power Supplies.
Mini Project on Converter Design	
Design any one Converter in a group of maximum 5 students in each batch.	

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Annasaheb Dange College of Engg. & Tech. ASHTA 416 301

Annasaheb Dange College of Engineering and Technology, Ashta
Department of Electrical Engineering

Class	B. Tech, Sem.- V
Lab Code and Lab Title	**0EEPC353, Power System Analysis Laboratory**
Prerequisite/s	0EEPC258
Teaching Scheme: Lecture/Tutorial/Practical	00/00/02
Credits	01
Evaluation Scheme: ISE / ESE	50/00

Course Objectives: The Course aims to	
1	**Allow** students to practically verify several concepts and procedures learned in power system analysis.
2	**Develop** hands-on experience of how certain procedures of power system operation are carried out.
3	**Promote** effective communication skills.
4	**Carry out** system studies using power systems analysis software to assess system operation in steady state and under faulted conditions.
5	**Learn** effect of line parameters on transmission line performance.

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
0EEPC353_1	**Develop** the MATLAB program to determine the power system parameters.(K^3)
0EEPC353_2	**Demonstrate** the performance of transmission line using transmission line trainer kit. (S^2)
0EEPC353_3	**Use** the modern software like ETAP/ Power World Simulator/ MATPOWER to understand the concepts of the power system under steady state and fault conditions (S^3)
0EEPC353_4	**Present** the technical report effectively. (S^3)
0EEPC353_5	**Practice** the safety rules in the laboratory and behave ethically in time standards (A^3)

List of Experiments:

Sr. No.	Title of Experiment
01	Measurement of ABCD parameters of a medium & long transmission line.
02	Efficiency and voltage regulation of Short, medium and long transmission line.
03	Ferranti Effect on transmission line.(Using transmission line trainer kit)
04	Y- Bus matrix of a power system using MATLAB.
05	Power flow analysis using Gauss-Seidal method in MATLAB.
06	Power flow analysis using Newton-Raphson method in MATLAB.
07	Transients in series R-L circuit &synchronous generator behavior under symmetrical fault
08	Symmetrical fault analysis of a 3-bus system using MATLAB.
09	Conversion of phasors to symmetrical components and vice versa using MATLAB
10	positive, negative and zero sequence impedances of transformer (hardware)
11	Power flow analysis using ETAP.
12	Asymmetrical fault analysis for LL, LG, LLG Faults using MATLAB.

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Annasaheb Dange College of Engg. & Tech. ASHTA 416 301

Annasaheb Dange College of Engineering and Technology, Ashta
Department of Electrical Engineering

Class	B. Tech. Sem. –V
Course Code and Course Title	**0EEPC354, Feedback Control System Laboratory**
Prerequisite/s	0EEPC207
Teaching Scheme: Lecture/Tutorial/Practical	00/00/02
Credits	01
Evaluation Scheme: ISE / ESE	50/00

Course Objectives: The course aims to:	
1	**Learn** the basics of a control system to obtain its transfer function.
2	**Perform** block diagram reduction of multiple subsystems to a single block for given system.
3	**Study** the generation of standard test signals to check their effect on the performance of system.
4	**Evaluate** the stability of a control system in time and frequency domain.
5	**Illustrate** relationship between state space and transfer function.

Course Outcomes (COs) Upon successful completion of this course, the student will be able to:	
0EEPC354_1	**Sketch** the response of system for a given transfer function. **(K^3)**
0EEPC354_2	**Analyze** the performance of system in time and frequency domain. **(K^3)**
0EEPC354_3	**Demonstrate** relationship between transfer function and state space using MATLAB. **(S^2)**
0EEPC354_4	**Communicate** effectively about laboratory work orally and through writing journals. **(S^2)**
0EEPC354_5	**Practice** professional and ethical behavior to carry forward in their life. **(A^2)**

List of Experiments

Expt. No	Title of Experiment
1	Generation & plotting of standard test signals
2	Block diagram reduction using MATLAB
3	Time domain specifications of a system.
4	Time Domain Analysis of 2nd order system
5	Stability of control system using Root locus
6	Effect of addition of poles and zeros on the performance of system.
7	Stability of control system using Bode plot
8	Stability of control system using Nyquist plot
9	Conversion of Transfer Function to State space and vice- versa.
10	Controllability and Observability of given system
11	Calculation of State Transition Matrix, State and Eigen Values
12	DC Position Control System

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Annasaheb Dange College of Engineering and Technology, Ashta
Department of Electrical Engineering

Curriculum

T. Y. B. Tech Semester- VI

Sant Dnyaneshwar Shikshan Sanstha's
Annasaheb Dange College of Engineering and Technology, Ashta
An Autonomous Institute
Department of Electrical Engineering

B. Tech. Semester –VI

Course Code	Course	Teaching Scheme				Evaluation Scheme				
						Scheme	Theory (Marks)		Practical (Marks)	
		L	T	P	Credits		Max	Min. for Passing	Max	Min. for Passing
0EEPC307	Control System Design	3	--	--	3	ISE – I	10	40	--	--
						MSE	30		--	--
						ISE – II	10		--	--
						ESE	50		--	--
0EEPC308	Power System Operations & Control	3	--	--	3	ISE – I	10	40	--	--
						MSE	30		--	--
						ISE – II	10		--	--
						ESE	50		--	--
0EEPC309	Electrical Drives and Control	3	--	--	3	ISE – I	10	40	--	--
						MSE	30		--	--
						ISE – II	10		--	--
						ESE	50		--	--
0EEES310	Microcontroller & It's Applications	3	--	--	3	ISE – I	10	40	--	--
						MSE	30		--	--
						ISE – II	10		--	--
						ESE	50		--	--
0EEOE311 To 0EEOE313	Open Elective	3	--	--	3	ISE – I	10	40	--	--
						MSE	30		--	--
						ISE – II	10		--	--
						ESE	50		--	--
0EEPC355	Electrical Machine Design Laboratory	1	--	2	2	ISE	--	--	50	20
						ESE	POE		50	20
0EEPC356	Electrical Drives and Control Laboratory	--	--	2	1	ISE	--	--	50	20
						ESE	POE		50	20
0EEES357	Microcontroller & It's Applications Laboratory	--	--	2	1	ISE	--	--	25	10
0EEPC358	Power System Operations & Control Laboratory	--	--	2	1	ISE	--	--	25	10
0EEPR359	Mini Project	--	--	2	2	ISE	--	--	50	20
0EEPR360	Seminar	--	--	2	2	ISE	--	--	50	20
	Total	**15**	**--**	**14**	**24**	--	**500**	--	**300**	--
	Total Contact Hours/Week: 29 hrs									

Course Category	HS	BS	ES	PC	PE	OE	MC	AC	PR
Credits	--	--	4	13	--	3	--	--	4
Cumulative Sum	3	20	44	70	--	3	--	--	4

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An Autonomous Institute
Department of Electrical Engineering

List of the Open Electives

Course Code	Name of Course
0EEOE311	Electric and Hybrid Vehicles
0EEOE312	Digital Signal Processing
0EEOE313	Industrial Automation

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Annasaheb Dange College of Engineering and Technology, Ashta
Department of Electrical Engineering

Class	B. Tech. Sem. –VI
Course Code and Course Title	**0EEPC307, Control System Design**
Prerequisite/s	0EEPC301, 0EEES207
Teaching Scheme: Lecture/Tutorial /Practical	03/00/00
Credits	03
Evaluation Scheme: ISE I / MSE / ISE II / ESE	10/30/10/50

Course Objectives: The course aims to:	
1	**Learn** different types of controllers and its tuning method
2	**Obtain** the response of a control system with different types of compensators in time domain
3	**Obtain** the response of a control system with different types of compensators in frequency domain
4	**Formation** of state feedback gain matrix using different techniques
5	**Understand** the concept of digital and non-linear control system

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
0EEPC307_1	**Describe** the type of controllers and their effects on system performance .(K^3)
0EEPC307_2	**Apply** the different approaches for analyzing non-linear control systems. (K^3)
0EEPC307_3	**Derive** z- transform and the relation between z-domain & s-domain for a digital control system. (K^3)
0EEPC307_4	**Design** the compensators in time and frequency domain (K^4)
0EEPC307_5	**Develop a** controller in state space using various techniques (K^4)

Course Contents:		
Unit 1	**Introduction to Controllers** Different types of controllers, P, I, D, PI, PD and PID controllers, effects of these controllers on system performance, tuning of PID controller using Ziegler-Nichols method, modifications of PID control scheme.	**06 Hr**
Unit 2	**Design of Compensator in Time Domain** Review of Root Locus, concept of Lead, Lag, Lag- Lead Compensator, design of Lead compensator, Lag compensator, and Lag- Lead compensator based on Root Locus approach.	**08 Hr**
Unit 3	**Design of Compensator in Frequency Domain** Review of Bode Plot, Design of Lead compensator , Lag compensator, Lag- Lead compensator based on frequency domain approach	**08 Hr**
Unit 4	**Design of Control Systems in State Space** **Pole placement technique:** Introduction, Controller design, State Feedback Law, Pole placement technique by Transformation Method, Direct Substitution Method and Ackermann's formula. **State Observers:** Introduction, Full Order State Observer, Transformation Approach, Direct Substitution Approach and Ackermann's formula to obtain observer gain matrix.	**08 Hr**
Unit 5	**Digital Control Systems** Introduction, Block diagram of digital control systems, Difference equation, Review of Z-transform, Z-transform Analysis of Sampled Data Control System, Relation	**06 Hr**

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	between Z domain and S domain.	
Unit 6	**Nonlinear Systems** Introduction, difference between linear and nonlinear systems, common physical nonlinearities, Approaches for analysis of non-linear systems: Linearization, Describing Function Analysis and phase plane analysis.	**06 Hr**

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Modern Control Engineering	K. Ogata	Prentice Hall India	5th	2010
02	Control System Engineering	Norman Nise	Wiley Publication	6th	2013
03	Feedback Control Systems	C.L. Phillips, R.D. Harbor,	Prentice Hall India	4th	1999
04	Introduction to Control Engineering: Model, Analysis & Design	A. K. Mandal	New Age International Pulishers	1st	2006

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Automatic Control System	Kuo & Golnaraghi	Wiley-India	9th	2013
02	Control System Engineering	I.J. Nagrath M. Gopal	New Age International Publication	5th	2009
03	Control Systems	N. C. Jagan	B. S. Publications	2nd	2008
04	Discrete Time Control Systems	K. Ogata	Prentice Hall International Inc.	2nd	1995

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Annasaheb Dange College of Engineering and Technology, Ashta
Department of Electrical Engineering

Class	B. Tech. Sem. –VI
Course Code and Course Title	**0EEPC308, Power System Operation and Control**
Prerequisite/s	0EEPC202, 0EEPC208, 0EEPC302
Teaching Scheme: Lecture/Tutorial /Practical	03/00/00
Credits	03
Evaluation Scheme: ISE I / MSE / ISE II / ESE	10/30/10/50

Course Objectives: The course aims to	
01	**Provide** basic knowledge about the dynamic mechanisms behind angle and voltage stability problem in electric
02	**Explain** methods of power system stability analysis and improving power system stability.
04	**Introduce** the concept of power system operation and control.
05	**Understand** the economics of power system operation with thermal and hydro units.
06	**Familiar** with the power system security issues and contingency studies.

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
0EEPC308_1	**Describe** fundamental concepts in power system stability and control. (K^2)
0EEPC308_2	**Explain** appropriate method to improve power system stability. (K^2)
0EEPC308_3	**Model** power system components to study the system performance. (K^3)
0EEPC308_4	**Solve** numerical on dynamics of synchronous machine, power system control and economical load dispatch. (K^3)
0EEPC308_5	**Derive** the equations for optimal operation of generation dispatching schemes for thermal and hydro units. (K^3).
0EEPC308_6	**Examine** stability of power system by numerical and graphical solution technique under different contingencies. (K^4)

Course Contents:		
Unit 1	**Introduction to Power System Stability & Control** Introduction to power system stability, classification power system stability, relationship between reliability, security, and stability, dynamics of synchronous machine (swing equation), power angle equation, node elimination technique.	**05 Hrs.**
Unit 2	**Power System Stability** Simple systems- machine connected to infinite bus, two machine systems, steady state stability, transient stability, factors affecting transient stability, equal area criteria- sudden change in mechanical input, effect of clearing time on stability, sudden loss of one of parallel lines, sudden short circuit on one of parallel lines, numerical solution of swing equation by point by point method.	**08 Hrs.**
Unit 3	**Methods of Improving Stability** Introduction, transient stability enhancements:- high speed fault clearing, reduction of transmission system reactance, regulated shunt compensation, dynamic braking , reactor switching, controlled system separation & load shedding, high speed excitation & control, discontinuous excitation control, small signal stability enhancement-power system stabilizers, supplementary control of SVC, methods of	**07 Hrs.**

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	improving voltage stability.	
Unit 4	**Power System Control** Introduction, load frequency control (LFC) (single area case), models of turbine, generator and load, load frequency control and economic dispatch control, automatic voltage control, LFC with generation rate constraints, speed governor dead band and its effect on Automatic Generation Control (AGC).	**08 Hrs.**
Unit 5	**Economic Operation of Power Systems** Introduction, generator operating cost, performance curves, load forecasting, optimal unit commitment- dynamic programming method, economic load dispatch neglecting losses, economic load dispatch including generator limits, economic load dispatch including losses.	**08 Hrs.**
Unit 6	**Power System Security** Introduction- Challenges to secure operation of today's power systems, comprehensive approach to system security, system state classification, security analysis, contingency analysis, sensitivity factors, and voltage collapse.	**06 Hrs.**

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Modern Power System Analysis	D. P .Kothari, I.J. Nagrath	Mc-Graw Hill Publications	Fourth	2011
02	Power System Stability and Control	Prabha Kundur	TMH Publications.	Second	1994
03	Power System Dynamics	KR Padiyar	BS Publications	Second	2008
04	Power System Analysis	Hadi Saadat	Tata Mc-Graw Hill	First	2002
05	Power System Operation and Control	Dr. K Uma Rao	Wiley India Publication	First	2012

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Power System Analysis	Grainger John J and W D Stevenson	McGraw Hill	First	1994
02	Power System Analysis and Design	J. Duncan Glover and Mulukuta S. Sarma	Prentice Hall	Third	2002
03	Power Generation, Operation And Control	Allen J Wood, Wollenberg	Wiley India	Second	1996
04	Power System Analysis	A.R. Bergen and Vijay Vittal	Pearson Education	Second	2009

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Class	B. Tech. Sem. –VI
Course Code and Course Title	**0EEPC309, Electrical Drives and Control**
Prerequisite/s	0EEPC202, 0EEPC209,0EEPC302, 0EEPC301
Teaching Scheme: Lecture/Tutorial /Practical	03/00/00
Credits	03
Evaluation Scheme: ISE I / MSE / ISE II / ESE	10/30/10/50

Course Objectives: The course aims to:	
01	**Discuss** the concepts in Electrical Machines, Power Electronics and Control Systems as prerequisites of electrical drives.
02	**Introduce** concept of stability of electrical drives & applied dynamics
03	**Understand** the characteristic of electric drive system employing DC machines.
04	**Apply** the knowledge of power electronics and control systems to use induction motors in AC drives.
05	**State** industrial applications of electrical drives.

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
0EEPC309_1	**Discuss** the parts of electrical drives, advantages and factors affecting the choice of electrical drive. (K^2)
0EEPC309_2	**Determine** the equivalent parameters, stability and components of load torque for a given motor-load system. (K^3)
0EEPC309_3	**Apply** the concepts of electrical machines, power electronics and control systems to study electrical drives. (K^3)
0EEPC309_4	**Solve** numerical to find speed, torque, mode and quadrant of operation of electrical drives. (K^3)
0EEPC309_5	**Plot** the performance characteristics of electrical drives. (K^3)
0EEPC309_6	**Design** electrical drives for a given industrial application. (K^4)

Course Contents		
Unit 1	**Electrical Drives: Fundamentals and Dynamics** Introduction to drives, concept of electrical drive, classification of electrical drives, block diagram of electrical drive, parts of electrical drive, nature of loads and their characteristics, motor load systems, dynamic conditions in electrical drives, stability of electrical drives	**06 Hrs.**
Unit 2	**DC Drives: Rectifier Fed DC Drives** Introduction, review of dc motors with respect to classification, speed control and electric braking, single phase half and full controlled converter fed dc motor drives, dc series motor drives, introduction to four quadrant operation and single phase dual converter fed dc motor drive, three phase half and full converter fed dc motor drive, four quadrant operation and three phase dual converter fed dc motor drive, closed loop control of converter fed dc drives.	**08 Hrs.**
Unit 3	**DC Drives: Chopper Fed DC Drives** Introduction, review of chopper operation with respect to its principle, configuration	**07 Hrs.**

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	and classification, one, two and four quadrant chopper fed separately excited dc motors drive, chopper fed series dc motors drive, closed loop control of chopper fed dc drives.	
Unit 4	**AC Drives: Stator Side Control of Induction Motor Drives** Introduction, review of types of three phase induction motors with respect to methods of speed control and torque-speed characteristic, three phase ac voltage controller fed induction motor drive, variable frequency characteristics, block diagram of variable frequency speed control, V/f control, voltage source inverter (VSI) fed induction motor drive, closed loop control of VSI fed induction motor drive, current source inverter (CSI) fed induction motor drive, closed loop control of CSI fed induction motor drive, comparison of VSI and CSI drives.	**08 Hrs.**
Unit 5	**AC Drives: Rotor Side Control of Induction Motor Drives** Introduction, conventional rotor resistance control, rotor resistance control using power converters, concept of slip power recovery, slip power recovery schemes, static kramer drive, static scherbius drive.	**06 Hrs.**
Unit 6	**Solar-Battery Powered Drives & Electric Vehicles** Solar powered pump drives, battery powered drives for vehicles, configurations of EV, performance of EV, traction motor characteristics, concept of hybrid electric drive trains, architecture of HEV drive trains.	**07 Hrs.**

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Fundamentals of Electrical Drives	G. K. Dubey	CRC Press	Second	2002
02	Electric Drives	N. K. De, P. K. Sen	PHI, Delhi	Third	2007
03	Electric Drives: Concepts & Applications	Vedam Subrahmanyam	Tata Mc-Graw Hill	Second	2011
04	Power Semiconductor Drives	S. Sivanagaraju, M. B. Reddy, A. M. Prasad	PHI, Delhi	Second	2009

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Power Electronics: Converters, Applications & Design	Ned Mohan	Wiley Publications	Third	2003
02	Power Electronics & Variable frequency drives: Technology & applications	Dr. B. K. Bose	Wiley Publications	First	1996
03	Principles of Electric Machines & Power Electronics	P. C. Sen	Wiley Publications	Second	2013
04	Electric and Hybrid Vehicles	Iqbal Husain	CRC Press	Second	2010
05	Power Electronics: Circuits, Devices, and Applications	M. H. Rashid	Prentice Hall	Third	2003

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Annasaheb Dange College of Engg. & Tech. ASHTA 416 301

Class	B. Tech. Sem. –VI
Course Code and Course Title	**0EEES310, Microcontroller & It's Applications**
Prerequisite/s	0EEPC213
Teaching Scheme: Lecture/Tutorial/Practical	03/00/00
Credits	03
Evaluation Scheme: ISE I / MSE / ISE II / ESE	10/30/10/50

Course Objectives: The course aims to:	
01	**Introduce** the features of 8051 microcontroller
02	**Explain** architecture and instruction set of 8051 microcontroller
03	**Describe** hardware interfacing with 8051 microcontroller
04	**Control** input output devices through 8051 microcontroller programming
05	**Impart** design steps for microcontroller based system.

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
0EEES310_1	**Outline** architecture and basic concepts in microcontroller. (K^2)
0EEES310_2	**Interface** external peripherals with 8051 microcontroller to run various applications (K^3)
0EEES310_3	**Develop** assembly language program for given application. (K^3)
0EEES310_4	**Choose** an advanced and efficient microcontroller for a given application. (K^3)
0EEES310_5	**Design** circuit and program for a microcontroller based application. (K^4)

Course Contents		
Unit 1	**Microcontroller Architecture** Introduction to microcontroller, comparison of microprocessor and microcontroller, features of microcontroller, block diagram, architecture of 8051, pin configuration, 40 pin dip of 8051, I/O ports, serial port, timer / counter, interrupt structure, Special Function Registers (SFRs), code memory and data memory, stack and stack pointer.	**08 Hrs.**
Unit 2	**Assembly language programming- I** **Addressing modes and instruction set** – assembler directives, data transfer, logical, arithmetic, jump and call, stack and machine cycle control instructions, **Simple assembly language programming examples-** delay generation, square wave, shift block, numbers sorting, and fibonacci series.	**08 Hrs.**
Unit 3	**Assembly language programming- II** I/O port programming, serial communication programming, timer/counter programming, interrupts and ISRs programming	**06 Hrs.**
Unit 4	**Basic Applications of Microcontroller** Switch, push button, Relay, ADC 0808, DAC 0809, LCD, 7-Segment LED display, Serial communication with computer through RS232 interface, I^2C communication protocol	**08 Hrs.**
Unit 5	**Advanced Applications of Microcontroller** Automatic power factor controller, DC Motor Interfacing, Stepper Motor Interfacing, Weighing Balance, Temperature Controller.	**06 Hrs.**

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Annasaheb Dange College of Engg. & Tech. ASHTA 416 301

Unit 6	**Advanced Microcontrollers** Introduction to AVR, ARM and PIC Microcontrollers, Arduino, 16-bit Microcontrollers.	**06 Hrs.**

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Microcontroller: Theory and Applications	Ajay Deshmukh	Tata McGraw-Hill	Fifth	2006
02	8051 Microcontroller: Hardware, Software and Applications	V Udayshankara, M S Mallikarjuna Swamy	McGraw-Hill Education India	Eighth	2014
03	8051 Microcontroller- Internals, Instructions, Programming & Interfacing	Subrata Ghoshal	Pearson Publication	First	2014
04	8051 Microcontroller and Embedded Systems	Sampath K Vyankatesh	SK Kataria & Sons	First	2013

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	8051 Microcontroller and Embedded Systems: Using Assembly and C	M. A. Mazidi	Pearson Publication	Second	2008
02	Microcontrollers: Principles & Applications	Ajit Pal	PHI Publications	Second	2008
03	The 8051 Microcontroller	Kenneth Ayala	Cengage Learning	Third	2007
04	C And The 8051	Thomas W Schultz	Wood Island Prints	Fourth	2008

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Annasaheb Dange College of Engg. & Tech. ASHTA 416 301

Class	B. Tech. Sem. –VI
Course Code and Course Title	**0EEOE311, Electric and Hybrid Vehicles**
Prerequisite/s	0EEPC209, 0EEPC303, 0EEPC309, 0BSES111
Teaching Scheme: Lecture/Tutorial/Practical	03/00/00
Credits	03
Evaluation Scheme: ISE I / MSE / ISE II / ESE	10/30/10/50

Course Objectives: The course aims to:	
1	**Understand** environmental impact due to electric and fuel powered vehicles
2	**Study** different propulsion systems in electric and hybrid vehicles.
3	**Introduce** various energy storage devices and regeneration of energy.
4	**Learn** the architecture of electric and hybrid vehicles.
5	**Draw** and explain different hybrid train designs.

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
0EEOE311_1	**Explain** vehicle mechanics & impact on environment of traditional transportation system. (K^2)
0EEOE311_2	**Describe** suitable energy storage & regeneration system for Electric and Hybrid Electric Vehicles (K^2)
0EEOE311_3	**Classify** different configuration of Electric and Hybrid Electric Vehicles (K^2)
0EEOE311_4	**Choose** appropriate propulsion technique for Electric and Hybrid Electric Vehicles (K^3)
0EEOE311_5	**Select** suitable drive train and control mechanism for Electric and Hybrid Electric Vehicles (K^3)

Course Contents:		
Unit 1	**Environmental Impact and Vehicle Fundamentals** Petroleum resources, induced cost, air pollution, global warming, , importance of different transportation development, history of electric and hybrid electric vehicles, general description of vehicle movement vehicle resistance, power train tractive effort and vehicle speed, vehicle performance, operating fuel economy, braking performance	**06Hrs.**
Unit 2	**Propulsion Systems** **IC Engine:** Spark ignited IC engines- Operating principle, operating parameters, Compression ignition IC engines **Electrical Drives:** DC Motor Drives- Principle of operation and performance, combined armature and voltage control, chopper control of DC motor drives, Induction motor drive- Basic operating principle, Volt/hertz control, power electronic control, field oriented control, BLDC motor drive- Basic principle, Control of BLDC drive, SRM drive- SRM drive controller, Modes of operation	**07 Hrs.**
Unit 3	**Energy Storage and Regeneration** Electrochemical batteries- Electrochemical reaction, thermodynamic voltage, specific energy, power , efficiency, applications of different battery technologies in	**07 Hrs.**

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Annasaheb Dange College of Engg. & Tech. ASHTA 416 301

	EV and HEV **Ultra capacitors**- Features, Basic operating principle, Performance, applications of different ultra capacitor technologies in EV and HEV **Ultra high speed flywheels**- operating principle, power capacity, applications of different flywheel technologies in EV and HEV Fundamentals of regenerative braking- Energy consumption in braking, braking power and energy on front and rear wheels, brake system for EV and HEV	
Unit 4	**Electric Vehicles (EV)** Configurations of EV, Performance of EV, Traction motor characteristics, tractive effort and transmission requirement, vehicle performance, tractive effort in normal driving, energy consumption	**07 Hrs.**
Unit 5	**Hybrid Electric Vehicles (HEV)** Concept of hybrid electric drive trains, architecture of HEV drive trains, series hybrid, parallel hybrid- Torque coupling drive trains, speed coupling drive trains, speed and torque coupling drive trains.	**07 Hrs.**
Unit 6	**Hybrid Drive Train Designs** Series Hybrid Electric Drive Train Design- Operation patters, control strategies, PPS control, Thermostat control, Sizing of major components, power rating design of traction motor and engine, Design of Peaking Power Source (PPS) Parallel Hybrid Drive train design –Control strategies, State of charge (SOC) control, engine on-off control, Design of drive train parameters	**08 Hrs**

Text Books

Sr. No	Title	Author	Publisher	Edition	Year of Edition
1	Modern Electric, Hybrid Electric and fuel cell vehicles	Mehrdad Ehsani, Yimin Gao	CRC Press	First	2005
2	Electric and Hybrid Vehicles	Iqbal Husain	CRC Press	Second	2010
3	Electric Vehicle Technology Explained	James Larminie, John Lowry	Wiley	First	2003

Reference Books

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Hybrid and Alternative Fuel Vehicles	James D. Halderman and Tony Martin	Professional Technician	Second	2010
2	How Your Car Works: Your Guide to the Components & Systems of Modern Cars, Including Hybrid & Electric Vehicles	Arvid Linde	Rac Handbook	Second	2011
3	Hybrid Electric Vehicles: Principles and Applications with Practical Perspectives	Chris Mi, M. Abul Masrur and David Wenzhong Gao	Willey Publications	Second	2011

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Annasaheb Dange College of Engg. & Tech. ASHTA 416 301

Class	B. Tech, Sem.-VI
Course Code and Course Title	**0EEOE312, Digital Signal Processing**
Prerequisite/s	0EEBS201, 0EEPC207
Teaching Scheme: Lecture/Tutorial/ Practical	03/00/00
Credits	03
Evaluation Scheme: ISE I / MSE / ISE II / ESE	10/30/10/50

Course Objectives	
1	**Impart** knowledge to analyze digital signal processing systems in time domain
2	**Implicit** the knowledge of discrete time signal analysis using DFT and FFT techniques
3	**Familiarize** the concept of analog and digital filter designs.
4	**Acquire** knowledge about the architectural features of DSP and modern Signal Processing concepts

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
0EEOE312_1	**Compute** the response of DFT and IDFT of signals using various methods. (K^3)
0EEOE312_2	**Apply** the knowledge of DFT to find the computational complexity and convolution for long duration sequence. (K^3)
0EEOE312_3	**Design** IIR filters using analog and digital filter design techniques. (K^4)
0EEOE312_4	**Examine** the FIR filters using windowing functions. (K^4)
0EEOE312_5	**Select** among the modern digital signal processing tools for given applications. (K^4)

Course Contents:		
Unit 1	**Introduction of Digital Signal Processing (DSP)** DSP system concept. Properties of DSP system, types of system, Some elementary signals and their responses Interconnection of DSP systems. Digital transfer function and response to different inputs. Advantages and limitations of DSP, Application of DSP	**06 Hrs.**
Unit 2	**The Discrete Fourier Transform (DFT)** Introduction, DFT, Relationship of the DFT to other transforms Linear convolution, Circular convolution, Methods to evaluate circular convolution, Comparison between Circular and Linear convolution algorithm, Filtering long duration sequence- overlap-save and overlap add-method	**08 Hrs.**
Unit 3	**The Fast Fourier Transform (FFT)** Introduction, FFT, Decimation in Time Algorithm (Radix-2 DIT- FFT Algorithm), Decimation in Frequency Algorithm (Radix-2 DIT- FFT Algorithm),	**06 Hrs.**
Unit 4	**Infinite Impulse Response Filters** Structure for IIR Systems: Direct form, Cascade form, Parallel form structures. IIR filter design: Characteristics of commonly used analog filter – Butterworth and Chebyshev filters, Frequency transformations. Design of Butterworth IIR Filters using Impulse invariance & Bilinear transformation.	**08 Hrs.**
Unit 5	**Finite Impulse Response Filters** Characteristics of FIR filter, Properties of FIR filter, Fourier , digital N/W for FIR filter, frequency sampling, Fourier series method, Windowing method, Filter design using window, Filter design using Kaiser window, Hanning, Hamming, Blackman window.	**08 Hrs.**

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Annasaheb Dange College of Engg. & Tech. ASHTA #16301

Unit 6	**Modern Digital Signal Processing** Digital Signal Processors- Introduction, Architecture, important blocks, Programming aspects, Multirate Signal Processing and Wavelet Transform and its applications.	06 Hrs.

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
1	Digital Signal Processing - Principles, Algorithms and Applications	John G, Proakis	Pearson Education	Second	2008
2	Digital Signal Processing	Sanjeet Mitra	TMH Pub.	First	2006
3	Digital Signal Processing	Dr P Ramesh Babu	Scitech Publications	Third	2011
4	Understanding Digital Signal Processing	Richard G. Lyons.	Prentice-Hall	Third	2010

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
1	Discrete Time Signal Processing	Oppenheim and R. W. Schafer	PHI Pub.	First	2005
2	Digital Signal Processors	Venkatramani, Bhaskar	TMH Pub.	First	2006
3	Wavelet Transform	Raghuveer Rao, Bopardikar,	Pearson Education	First	2000
4	Digital Signal Processing	Alan V. Oppenheim, Ronald W. Schafer	Prentice-Hall	second	2011

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Annasaheb Dange College of Engg. & Tech. ASHTA 416 301

Annasaheb Dange College of Engineering and Technology, Ashta
Department of Electrical Engineering

Class	B. Tech, Sem.-VI
Course Code and Course Title	**0EEOE313, Industrial Automation**
Prerequisite/s	0EEES210
Teaching Scheme: Lecture/Tutorial/ Practical	03/00/00
Credits	03
Evaluation Scheme: ISE I / MSE / ISE II / ESE	10/30/10/50

Course Objectives: The course aims to:	
1	**Introduce** PLC's main parts and their functions and basic sequence of operations.
2	**Learn** the PLC Hardware Components and its functions
3	**Impart** knowledge on conversion of relay schematics into PLC ladder logic programs and writing PLC programs from narrative descriptions.
4	**Learn** the PLC Functions- Timers, Counters and respective applications
5	**Familiarize** the role of SCADA system and its architecture.
6	**Discuss** possible design solutions for PLC and SCADA systems

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
0EEOE313_1	**Illustrate** the concept of Automation and Programmable Logic Controllers. (K^2)
0EEOE313_2	**Describe** the hardware units of architecture of Programmable Logic Controllers. (K^2)
0EEOE313_3	**Draw** the detail architecture of SCADA (K^2)
0EEOE313_4	**Develop** ladder diagram program for various application using advanced functions (K^3)
0EEOE313_5	**Analyze** the performance of PLC and SCADA based practical applications (K^4)

Course Contents:		
Unit 1	**Industrial Automation and Programmable Logic Controllers (An overview)** Fundamentals of industrial automation, need and role of automation, evolution of automation, History and evolution of PLC, Definition, types, selection criterion, Overall PLC system, PLC Input and output modules Types of processes, comparisons, advantages and disadvantages	**06 Hrs.**
Unit 2	**PLC Hardware Component** Architecture, DI-DO-AI-AO examples and ratings, I/O module, working of PLC, scan time, Installation of PLC, Rack installation, Grounding and shielding, physical, electrical, maintenance requirements, planning, verifying. Troubleshooting, Fault diagnosis techniques. Choosing PLC for Applications, Sensors, Contactors, Motor Starters, Output control Devices	**07 Hrs.**
Unit 3	**Fundamentals of Logic** Number systems and codes: Decimal system, Binary system, Octal system, Hexadecimal system, BCD system Negative Numbers, Gray code, ASCII code, Parity Bit, Binary Arithmetic. The Binary Concept, Boolean Algebra, Hardwired Logic versus Programmed Logic	**07 Hrs.**
Unit 4	**Basic of PLC Programming** Development of Relay Logic Ladder Diagram, Ladder diagram fundamentals, Boolean logic and relay logic, Introduction to PLC Programming, Programming	**07 Hrs.**

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Annasaheb Dange College of Engg. & Tech. ASHTA 416 301

	devices and languages as per IEC 61131-3 like LD, IL, FBD, PLC Timers and Counters, Set - Reset and PLC instructions. Sequence function, latch instruction, Arithmetic and logical instruction with various examples. Interfacing PLC with Programming Device / Process Loops and various devices	
Unit 5	**SCADA System** Introduction, definitions and history of Supervisory Control and Data Acquisition, typical SCADA system Architecture, Communication requirements, Desirable Properties of SCADA system, features, advantages, disadvantages and applications of SCADA. SCADA Architectures (First generation - Monolithic, Second generation - Distributed, Third generation – Networked Architecture)	**07 Hrs.**
Unit 6	**SCADA Protocols and SCADA Applications** Open systems interconnection (OSI) Model, TCP/IP protocol, Implementation of SCADA Systems, Petroleum Refining, Nuclear Power Generation, Conventional Electric Power Generation, Petroleum Wellhead Pump Control, Water Purification System, Crane Control, SCADA systems in chemical plants, Interfacing of SCADA with PLC.	**06 Hrs.**

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Programmable Logic Controllers: Principles and Application	John Webb, Resis Ronald,	Prentice hall of india	Fifth	2007
02	Programmable Logic Controllers: Programming Methods and Applications	Hackworth	Pearson india	First	2008
03	Programmable Logic Controllers	Frank Fetruzella	Elsevier India	Third	2007
04	Concept of SCADA System and its Evolution	Mini S. Thomas, John Douglas, McDonald	CRC Press	First	2015
05	Handbook of SCADA Control-System Security	Robert Radvonovsky, Jacob Brodsky	CRC Press	First	2013

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Programmable Controllers	Batten G. L	McGraw Hill Inc	Second	
02	Real Time Computer Control	Bennett Stuart	Prentice Hall	First	1988
03	Measurement Systems	Doebelin E. O.	McGraw-Hill International Editions	Fourth	1990
04	Practical Modern SCADA Protocols	Gordan Clark, Deem Reynders	ELSEVIER	First	2004
05	Programmable Logic Controllers with Applications	P. K. Srivstava	BPB Publications	First	2004

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Annasaheb Dange College of Engg. & Tech. ASHTA 416 301

Annasaheb Dange College of Engineering and Technology, Ashta
Department of Electrical Engineering

Class	B. Tech. Sem. –VI
Course Code and Course Title	**0EEPC355, Electrical Machine Design Laboratory**
Prerequisite/s	0EEPC209, 0EEPC303
Teaching Scheme: Lecture/Tutorial/Lab.	01/00/02
Credits	02
Evaluation Scheme: ISE/ ESE	50/50

Course Objectives: The course aims to:	
01	Familiar with the various materials use for the Electrical Machines
02	Develop the different parts of the Electrical Machines by using AutoCAD and MATLAB.
03	Explain the various types of cooling methods for the Electrical Machines

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
0EEPC355_1	**Identify** the materials to be used for the various parts of Electrical Machines(K^3)
0EEPC355_2	**Design** the various cooling methods for Electrical Machines(S^2)
0EEPC355_3	**Design** the DC and AC windings using AutoCAD(S^2)
0EEPC355_4	**Model** the parts of the DC Machines and Induction Motor using MATLAB(S^2)
0EEPC355_5	**Draw** different parts of Transformer using AutoCAD(S^2)

Course Contents:		
Unit 1	**General Design Aspects:** Introduction, Specification, Output Coefficient ,Importance of Specific Loadings, Electrical Materials - Conducting Materials Insulating Materials, Magnetic Materials, General Design Procedure, Steps to Get Optimal Design.	**02 Hrs.**
Unit 2	**Cooling of Electrical Machines:** Ventilation Schemes-Static Machines (Transformers), Rotating Machines, Types of Coolants, Types of Enclosures.	**01 Hrs.**
Unit 3	**Design of Windings:** Introduction ,Important Terms Related to Armature Windings, Classification of Armature Windings Winding Pitches ,Armature Windings for DC Machines ,Winding for AC Machines, Sequential Steps for Drawing a 3-ph Single Layer Winding, Sequential Steps for Draw a 3-ph Double Layer Winding	**02 Hrs.**
Unit 4	**DC Machines:** Introduction , Calculation of Armature main Dimensions and flux for pole, Design of Armature Winding & Core, Design of Poles & Calculation of AT.	**03 Hrs.**
Unit 5	**Transformers:** Introduction, Core Type Power Transformer Sequential Steps for Designing of Magnetic Frame, Windings, Tank.	**03 Hrs.**
Unit 6	**Three-Phase Induction Motor:** Introduction , Calculation of Stator Main Dimensions, Design of Squirrel Cage Rotor	**03 Hrs.**

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Annasaheb Dange College of Engg. & Tech. ASHTA 416301

Text Books:					
Sr. No	Title	Author	Publisher	Edition	Year of Edition
1	A Course in Electrical Machine Design	A. K. Sawhney,	Dhanpat Rai & sons New Delhi	Third	1988
2	Computer Aided Design for Electrical Machines	Vishnu Murthy	B.S. Publications.	First	2008
3	Computer Aided Electrical Drawing	M. Yogesh, B. S. Nagaraja	PHI	First	2009
4	Electrical Engineering Drawing	S.K. Bhattacharya	New Age International	First	1998

Reference Books:					
Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Theory and Performance and Design of A.C. Machines	M.G. Say,	ELBS London	Third	1988
02	Electrical Machine Design Data	A Shanmugasundaram, G. Gangadharan, R. Palani	Wiley Eastern Ltd., New Delhi	First	2005
03	Principles of Electrical Machine Design,	R. K. Agarwal	S. K. Katariya and sons.	Second	2009
04	Design of Electrical Machines	V N Mittle	Standard Publisher	second	2009

List of Experiments:

Sr. No.	Title of Experiment
1	Identify the Various Parts of Electrical Machines
2	Sketch the various cooling Methods for Electrical Machines
3	Details and layout of DC winding with design report using AutoCAD
4	Details and layout of AC winding with design report using AutoCAD
5	Calculation of Armature main Dimensions and flux for pole in MATLAB for
6	Design of Poles & Calculation of AT in MATLAB
7	Draw the various core of Transformer by using AutoCAD
8	Design of HV and LV Windings of Transformer using AutoCAD
9	Sketch the various types of Windings for Transformer
10	Details and Complete layout of core type Three Phase Transformer with design report
11	Calculation of Stator Main Dimensions in MATLAB
12	Industrial Visit Report on (Transformer or Motor) unit

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Annasaheb Dange College of Engg. & Tech. ASHTA 416 301

Annasaheb Dange College of Engineering and Technology, Ashta
Department of Electrical Engineering

Class	B. Tech. Sem. –VI
Laboratory Course Code and Course Title	**0EEPC356, Electrical Drives and Control Laboratory**
Prerequisite/s	0EEPC256, 0EEPC351, 0EEPC352
Teaching Scheme: Lecture/Tutorial/Practical	00/00/02
Credits	01
Evaluation Scheme: ISE/ESE	50/50

Course Objectives: The course aims to:	
01	**Familiarize** the students with latest converters based on power semiconductor devices.
02	**Conduct** the basic laboratory practical in the application of power electronics and electrical machine in electrical drives like thyristorized speed control of DC and AC motors.
03	**Introduce** the students with modern applications of drives.

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
0EEPC356_1	**Apply** the knowledge of electrical machines, power electronics and control system converter to control speed and torque of electrical drives. (K^3)
0EEPC356_2	**Implement** Adjustable Speed Drives (ASD) and Variable Frequency Drives (VFD) techniques to control speed and torque of electrical drives. (S^3)
0EEPC356_3	**Simulate** the simple models of electrical drive using MATLAB. (S^3)
0EEPC356_4	**Perform** individually and in a team to learn the practices in Electrical Drives & Control Laboratory. (A^2)
0EEPC356_5	**Follow** professional ethics and responsibilities during conduct of laboratory practice. (A^2)

List of Experiment:

Sr. No.	Title of Experiment
1	Four Quadrant operation of Electrical Drives
2	DC Drive Trainer to observe modes of operation and dynamic braking of DC Machine.
3	Single Phase Half Controlled Converter fed DC Drives
4	Single Phase Full Controlled Converter fed DC Drives
5	Three Phase Full Controlled Converter fed DC Drives
6	Chopper fed DC Series Motor Drives
7	Chopper Controller using MOSFET/IGBT for DC Motor Drives
8	Three Phase Induction Motor Controller using V/f scheme.
9	Three Phase Induction Motor Speed Control by Slip-Power-Recovery (SPR) scheme
10	Simulation of One Quadrant Chopper fed DC Drive in MATLAB
11	Simulation of Two Quadrant Rectifier fed DC Drive in MATLAB
12	Simulation of Six step VSI Induction Motor Drive in MATLAB

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Annasaheb Dange College of Engg. & Tech. ASHTA 416 301

Annasaheb Dange College of Engineering and Technology, Ashta
Department of Electrical Engineering

Class	B. Tech. Sem. –VI
Course Code and Course Title	**0EEPC357, Microcontroller & It's Applications Laboratory**
Prerequisite/s	0EEES253, 0EEPC258
Teaching Scheme: Lecture/Tutorial/Practical	00/00/02
Credits	01
Evaluation Scheme: ISE /ESE	25/00

Course Objectives: The course aims to:	
01	**Perform** practices of 8051 microcontroller based systems.
02	**Familiarize** with instruction writing sequence for programming
03	**Use** simulation software 8051 Microcontroller programming
04	**Demonstrate** hardware interfacing with 8051 microcontroller
05	**Design** of 8051 microcontroller based system design

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
0EEPC357_1	**Develop** programming logic by writing instructions sequentially (K^3)
0EEPC357_2	**Execute** a given program in Keil software environment. (S^3)
0EEPC357_3	**Demonstrate** peripheral interfacing applications with microcontroller (S^3)
0EEPC357_4	**Simulate** a microcontroller based system in Proteus software. (S^3)
0EEPC357_5	**Follow** professional ethics and responsibilities during conduction of lab sessions(A^3)

List of Experiments

Sr. No.	Title of Experiment
1	Data transfer between IO ports
2	Assembly language programming of arithmetic and logic operations
3	Push button / key interfacing for LED f lashing / running LED
4	7 segment display interfacing with microcontroller
5	LCD interfacing to microcontroller
6	ADC interfacing to microcontroller
7	DAC interfacing to microcontroller
8	RTC interfacing to microcontroller
9	ON – OFF temperature controller
10	Design of automatic power factor controller
11	DC Motor interfacing to microcontroller
12	Stepper Motor interfacing to microcontroller

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Annasaheb Dange College of Engg. & Tech. ASHTA 416 301

Annasaheb Dange College of Engineering and Technology, Ashta
Department of Electrical Engineering

Class	B. Tech. Sem. -VI
Course Code and Course Title	**0EEPC358, Power System Operations & Control Laboratory**
Prerequisite/s	0EEPC258, 0EEPC301,0EEPC353
Teaching Scheme: Lecture/Tutorial /Practical	00/00/02
Credits	01
Evaluation Scheme: ISE/ESE	25/00

Course Objectives: The course aims to:	
01	**Understand** the response of synchronous machine under disturbances.
02	**Study** step response of automatic load frequency control (ALFC) and automatic voltage control (AVC)
03	**Understand** optimal power flow dispatch in power system.

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
0EEPC358_1	**Evaluate** the parameters for dynamic operation and optimal power flow operation in power system (K^3)
0EEPC358_2	**Sketch** the response of synchronous machine, ALFC and AVR under disturbances. (K^4)
0EEPC358_3	**Use** modern tools/software (like MATLAB/POWER WORLD SIMULATOR/ ETAP) to find response of synchronous machine, ALFC and AVR under disturbances. (S^2)
0EEPC358_4	**Communicate** effectively about laboratory work both orally and in writing journals. (S^2)
0EEPC358_5	**Practice** professional and ethical behavior to carry forward in their life. (A^2)

List of Experiment

Sr. No.	**Name of the Experiment** Following Experiments are performed on MATLAB/Simulink/ETAP
1	Dynamics of synchronous machine.
2	Swing Equation in Simulink
3	Dynamic s of synchronous machine using Point-by-Point Method.
4	The power angle curve of SMIB system under transient instabilities.
5	The natural response of the rotor angle and frequency of SMIB system under small disturbance.
6	Equal area criteria to sudden change in power.
7	Step response of automatic load frequency control (ALFC) system of single area case.
8	The step response of the automatic voltage regulator (AVR) of a generator.
9	The optimal dispatch and the total cost in Rs/h of three thermal plants by neglecting line losses and generator limits.
10	Step response of automatic load frequency control (ALFC) system of two area case
11	Design of compensator using Root Locus/Bode Plot Method.
12	Design working prototype model of any one of method of improving stability in a group.

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Annasaheb Dange College of Engg. & Tech. ASHTA 416 301

Annasaheb Dange College of Engineering and Technology, Ashta
Department of Electrical Engineering

Class	B. Tech. Sem. -VI
Course Code and Course Title	**0EEPR359, Mini Project**
Prerequisite/s	0EEPC252, 0EEPC253, 0EEPC256, 0EEPC257, 0EEPC352, 0EEPC357
Teaching Scheme: Lecture/Tutorial/Practical	00/00/02
Credits	02
Evaluation Scheme: ISE/ESE	50/00

Course Objectives The course aims to:	
1	**Identify** the problem statement.
2	**Understand** the methodology to troubleshoot the small circuit .
3	**Convert** idea in to product.
4	**Work** in a group to implement the idea.
5	**Communicate** effectively to present theme of mini-project.

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
0EEPC359_1	**Apply** the knowledge of electric and electronic fundamental for problem definition. (K^3).
0EEPC359_2	**Develop** methodology to troubleshoot circuit (K^3, S^2).
0EEPC359_3	**Test** the outcomes for desired results(S^2).
0EEPC359_4	**Work** in groups to assemble Mini Project circuits (A^2).
0EEPC359_5	**Demonstrate** presentation skills through Mini Project report.(A^2).

Course Contents:

- Students should form groups of maximum four in respective practical batch.
- Mini project should be a working model based upon their knowledge, understanding and practices.
- Evaluation of mini project will be through presentation, demonstration and report writing
- Assessment of Mini project will be done by a panel of three examiners appointed by DAC.

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Annasaheb Dange College of Engg. & Tech. ASHTA 416 301

Annasaheb Dange College of Engineering and Technology, Ashta.
Department of Electrical Engineering

Class	B. Tech. Sem. -VI
Course Code and Course Title	**0EEPR360, Seminar**
Prerequisite/s	0BSHS106, 0BSH156, 0EEAC306
Teaching Scheme: Lecture/Tutorial/Practical	00/00/02
Credits	02
Evaluation Scheme: ISE/ESE	50/00

Course Objectives	
The course aims to:	
1	**Encourage** the students to study advanced engineering technology and its developments.
2	**Promote** and **develop** presentation skills and import a knowledgeable society.
3	**Expose** to prepare and present technical reports.
4	**Encourage** the students to use various teaching aids.
5	**Set** the stage for future recruitment by potential employers.

Course Outcomes (COs):	
Upon successful completion of this course, the student will be able to:	
0EEPR360_1	**Choose** the technical, contemporary and social issues related topic for seminar. **(K^3)**
0EEPR360_2	**Examine** real-world issues, explore creative avenues of expression, and make consequential decisions. **(K^3)**
0EEPR360_3	**Develop** the oral presentation and communication skills. **(S^2)**
0EEPR360_4	**Write** the seminar report related to the presentation. **(A^2)**
0EEPR360_5	**Apply** principles of ethics and respect in interaction with others. **(A^2)**

Course Contents:

Seminar will be conducted as per the instructions given below-

- Students should give minimum two seminars, in which one should be an advanced technical topic and other may be related to social issues.
- Student should give the seminar individually.
- Students are encouraged to use various teaching aids like overhead projectors, power point presentation and demonstrative models.
- A viva voce / discussion form which includes comprehensive questions based on the topic of presentation is expected.
- At the end of the seminar, student should submit a report on the topic of presentation.
- Evaluation of seminar will be assessed by a panel of examiner(s) appointed by DAC.

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Annasaheb Dange College of Engg. & Tech. ASHTA 416 301

Curriculum

B. Tech. Semester -VII

HOD Electrical | Dean Academics | Director | Executive Director

Curriculum

B. Tech. Semester -VIII

HOD Electrical | Dean Academics | Director | Executive Director

Sant Dnyaneshwar Shikshan Sanstha's

Annasaheb Dange College of Engineering and Technology, Ashta

An Autonomous Institute

Department of Electrical Engineering

B. Tech. Semester -VII

Course code	Course	Teaching Scheme				Evaluation Scheme				
						Scheme	Theory (Marks)		Practical (Marks)	
		L	T	P	Credits		Max	Min. for Passing	Max	Min. for Passing
0EEPC401	Electrical Installation, Testing and Maintenance	3	--	--	3	ISE I	10	-- 40	--	--
						MSE	30			
						ISE II	10		--	--
						ESE	50	20	--	--
0EEPC402	Switchgear & Protection	4	--	--	4	ISE I	10	-- 40	--	--
						MSE	30		--	--
						ISE II	10		--	--
						ESE	50	20	--	--
0EEHS403	Economics for Engineers	3	--	--	3	ISE I	10	-- 40	--	--
						MSE	30		--	--
						ISE II	10		--	--
						ESE	50	20	--	--
0EEPC404	FACTS and HVDC Systems	4	--	--	4	ISE I	10	-- 40	--	--
						MSE	30		--	--
						ISE II	10		--	--
						ESE	50	20	--	--
0EEOE4**	Open Elective	3	--	--	3	ISE I	10	-- 40	--	--
						MSE	30		--	--
						ISE II	10		--	--
						ESE	50	20	--	--
0EEMC409	Industrial Training	--	1	--	--	--	--	Grade	--	--
0EEAC410	Professional Skills- III	2	--	--	--	--	--	Grade	--	--
0EEPR451	Project Phase - I	--	--	4	4	ISE	---	POE	50	20
						ESE	---		100	40
0EEPC452	Switchgear & Protection Laboratory	--	--	2	1	ISE	---	POE	25	10
						ESE	---		25	10
0EEPC453	FACTS and HVDC Systems Laboratory	--	--	2	1	ISE	---	----	50	20
0EEPC454	Electrical Installation, Testing and Maintenance Laboratory	--	--	2	1	ISE	---	---	50	20
Total		**19**	**1**	**12**	**24**		**500**		**300**	
Total Contact Hours/Week:30 hrs										

Course Category	HS	BS	ES	PC	PE	OE	MC	AC	PR
Credits	3	--	--	14	--	3	--	--	4
Cumulative Sum	6	20	44	84	3	3	--	--	8

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Sant Dnyaneshwar Shikshan Sanstha's

Annasaheb Dange College of Engineering and Technology, Ashta

An Autonomous Institute

Department of Electrical Engineering

B. Tech. Semester -VIII

Course code	Course	Teaching Scheme				Evaluation Scheme				
						Scheme	Theory (Marks)		Practical (Marks)	
		L	T	P	Credits		Max	Min. for Passing	Max	Min. for Passing
0EEPC411	Electrical Utilization and Traction	4	--	--	4	ISE I	10	-- 40	--	--
						MSE	30			
						ISE II	10		--	--
						ESE	50	20	--	--
0EEPC412	High Voltage Engineering	3	--	--	3	ISE I	10	-- 40	--	--
						MSE	30		--	--
						ISE II	10		--	--
						ESE	50	20	--	--
0EEPE413 To 0EEPE415	Program Elective II	3	--	--	3	ISE I	10	-- 40	--	--
						MSE	30		--	--
						ISE II	10		--	--
						ESE	50	20	--	--
0EEPE416 To 0EEPE418	Program Elective III	3	--	--	3	ISE I	10	-- 40	--	--
						MSE	30		--	--
						ISE II	10		--	--
						ESE	50	20	--	--
0EEAC419	Professional Skills- IV	2	--	--	--	--	--	Grade	--	--
0EEPR455	Project Phase - II	--	--	8	8	ISE	--	POE	100	40
						ESE	--		100	40
0EEES456	Software Packages	--	--	2	1	ISE	--	POE	50	20
						ESE	--		50	20
0EEPC457	Design and Estimation Laboratory	--	--	2	1	ISE	--	--	50	20
0EEPC458	High Voltage Engineering Laboratory	--	--	2	1	ISE	--	--	50	20
Total		**19**	**1**	**12**	**24**		**400**		**400**	
Total Contact Hours/Week:30 hrs										

Course Category	HS	BS	ES	PC	PE	OE	MC	AC	PR	Total
Credits	--	--	1	9	6	--	--	--	8	192
Cumulative Sum	6	20	45	93	9	3	--	--	16	

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Annasaheb Dange College of Engineering and Technology, Ashta
An Autonomous Institute
Department of Electrical Engineering

- **List of Open Electives (OE)**

Open Electives (0EEOE4**)	
Course Code	**Name of Course**
0EEOE405	Renewable Energy Sources
0EEOE406	Industrial Automation, PLC and SCADA
0EEOE407	Electric and Hybrid Vehicles
0EEOE408	Nanotechnology

- **List of the Program Electives (PE)**

Elective - II		Elective - III	
Course Code	**Name of Course**	**Course Code**	**Name of Course**
0EEPE413	Advanced Relaying	0EEPE416	Smart Grid
0EEPE414	Computer Methods in Power System	0EEPE417	Real Time Control of Power System
0EEPE415	Power Quality and Harmonics	0EEPE418	Energy Audit and Management

Sr. No.	Name of Expert	Designation	Signature with Date
1.	Dr. G. R. Kulkarni	Chairman (HoD)	
2.	Dr. D. S. More	VC-Nominee	
3.	Mr. V. B. Patil	Secretary	

HOD Electrical **Dean Academics** **Director** **Executive Director**

B.Tech-ST-03/03

Department of Electrical Engineering
B. Tech. Curriculum

Class	B. Tech. Semester-VII
Course Code and Course Title	0EEPC401, **Electrical Installation Testing & Maintenance**
Prerequisite/s	0EEPC203, 0EEPC205, 0EEPC208,0EEPC209
Teaching Scheme: Lecture/Tutorial/Practical	03/00/00
Credits	03
Evaluation Scheme: ISE I / MSE / ISE II / ESE	10/30/10/50

Course Objectives: The course aims to:	
01	Understand safety measures & safety precautions.
02	Describe Installation of Transmission, Distribution lines, Transformers, Underground Cables and Domestic Installation.
03	Elaborate various methods of testing of Transformers, Maintenance of distribution Transformers &electrical Motors.
04	Discuss various types Maintenances.
05	Write Maintenance report at different period of interval.

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
0EEPC401_1	**Identify** tools and accessories use for Electrical Installation Testing & Maintenance and safety measures. (K2)
0EEPC401_2	**Describe** various testing on Transformers, Motors & various Electrical Equipment. (K2)
0EEPC401_3	**Explain** Laying of Underground Cables and tools used for installation. (K3)
0EEPC401_4	**Discus** various methods of Electrical Installation Testing & Maintenance for electrical equipments. (K3)
0EEPC401_5	**Develop** a maintenance plan & report on maintenance of Motors, Transmission and Distribution System, Transformers &Grid Substations. (K3)

Course Contents:		
Unit 1	**Tools and Accessories**: Tools, accessories and instruments required for installation, maintenance and repair work, India Electricity rules, safely codes, causes and prevention of accidents, artificial respiration, workmen's safety devices.	**05 Hrs**
Unit 2	**Installation of Transmission and Distribution Lines:** Ejection of steel structures, connecting of jumpers, tee-off points, joints and dead ends: crossing of roads, streets, power/telecommunication lines and railway crossings clearances: earthing of transmission lines and guarding, spacing and configuration of conductors, Arrangement for suspension and strain insulators, bird guards anti-climbing devices and danger plates. Sizes of conductor earth wire and guy wires. Testing and Commissioning Laying of service lines and earthing, provision of service fuses	**10 Hrs**
Unit 3	**Underground Cables:** Inspection on Arrival of underground cable, cable handling equipments, methods of laying underground cable, causes of cable fault, cable joints and terminations, testing and commission,	**06 Hrs**
Unit 4	**Testing of Various Electrical Equipment:** Electrical motor, transformers cables and generator and motor control centers, medium voltage distribution panels power control centers motor control, lighting arrestor. **Domestic Installation**: Testing of electrical installation of a building, testing of insulation resistance to earth testing of insulation and resistance between conductors continuity or open circuit test, short circuit test testing of earthing continuity location of faults IE rules for domestic installation	**06 Hrs**

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B-Tech - Ele - 01/45

Unit 5	**Maintenance:** Types of maintenance, maintenance schedules, procedures, Maintenance of Transmission and Distribution System, danger notice, caution notice permit to work, arranging of shutdowns personally and temporary earths cancellation of permit and restoration of supply, Patrolling and visual inspection of lines – points to be noted during patrolling from ground: special inspections and night inspections, Location of faults using Meggar, effect of open or loose neutral connections provision of proper fuses on service lines and their effect on system, causes and dim and flickering lights	**07 Hrs**
Unit 6	**Maintenance of Distribution Transformers:** Transformer maintenance Checking of insulation resistance transformer oil level and BDV test of oil, measurement of earth resistance. **Maintenance of Substations:** Checking and maintenance of bus bars, isolating switches, HT/LT circuit breakers, LT switches. **Maintenance of Motors:** Over hauling of motors, preventive maintenance, trouble shopping of electric motors	**08 Hrs**

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
1.	Installation commissioning & maintenance.	Tarloksingh	Katariya& sons.	Second	2002.
2.	Preventive Maintenance of Electrical Apparatus	SK Sharotri, Katson	Publishing House Ludhiana	Sixth	2013
3.	Testing, Commissioning Operation and Maintenance of Electrical Equipment	S Rao, Khanna	Technical Publication , New Delhi.	Third	2006
4.	Electrical Workshop	R. P. Singh	I K International Publishing House	Third	2012

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
1.	Testing, commissioning, operation &maintenance of electrical equipment.	S.Rao.	Khanna publishers, New Delhi	Third	2006
2.	Electrical Power Equipment Maintenance and Testing.	Paul Gill	CRC press	Second	2011
3.	Testing & Maintenance Of Electrical Machines	B P Patil	Technical Publication	Second	2011
4.	Electrical Systems Design	M.K. Giridharan	I K International Publishing House Pvt. Ltd	First	2010

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B. Tech - Elc - 07145

Department of Electrical Engineering
B. Tech. Curriculum

Class	B. Tech. Semester-VII
Course Code and Course Title	**0EEPC402, Switchgear & Protection**
Prerequisite/s	0EEPC353, 0EEPC308
Teaching Scheme: Lecture/Tutorial/Practical	04/00/00
Credits	04
Evaluation Scheme: ISE I / MSE / ISE II / ESE	10/30/10/50

Course Objectives
This course aims to:

1	Introduce Necessity for Power System Protection
2	Understand Arc generation and interruption process in Circuit Breakers
3	Classify various circuit breakers according to application
4	Clarify operating principle of Relay
5	Understand different protection scheme for Generators, Transmission line, Transformer and Busbar

Course Outcomes (COs):
Upon successful completion of this course, the student will be able to:

0EEPC402_1	**Explain** various types of CB and Arc Interruption Process **(K2)**
0EEPC402_2	**Describe** modern protection schemes like microprocessor based relays for the protection of the power system equipments**(K2)**
0EEPC402_3	**Distinguish** between various types of relays according to their characteristics and its use.**(K2)**
0EEPC402_4	**Determine** setting parameter for Relay.**(K3)**
0EEPC402_5	**Analyze** performance of Protection Scheme of Transformer, Generator, Busbar, Transmission line and Transformation Technique **(K4)**

Course Contents:

Unit 1	**Arc Interruption Process** Voltage - current characteristics of arc, Principles of DC and AC arc interruption, high resistance and current zero interruption, arc voltage, Transient Restriking Voltage (TRV), Recovery voltage, RRRV, current chopping, resistance switching, capacitive current interruption.	**8 Hrs**
Unit 2	**Circuit Breakers & Fuses** Classification of circuit breakers, brief study of construction and working of Air break and Air Blast CB, SF6 and Vacuum CB,HVDC Circuit breakers, MCB, ratings of CB and testing of CB, **Fuse –** Rewritable and HRC fuse, fuse characteristics, application and selection of fuse.	**9Hrs**
Unit 3	**Over Current Relays** Plug Setting, TSM, Brief theory and construction of electromagnetic relays. Different time current characteristics of over current relay, Directional relay, Microprocessor based over current relay, Directional over current relay, drawbacks of over current schemes.	**9 Hrs**
Unit 4	**Protection of Transformer, Generator and Bus Bar** Circulating current and opposed voltage principles, percentage differential relay, line protection, carrier aided protection scheme, Problems associated with percentage differential protection, Harmonic Restraint and Harmonic blocking schemes, Restricted Earth fault protection, Buchholz relay for incipient faults, Differential protection of generator, stator and rotor protection schemes of Generator, Loss of Excitation, Prime Mover Failure protection, Bus Bar protection.	**12 Hrs**
Unit 5	**Protection of Transmission Line** Impedance, reactance and admittance characteristics, relay settings for 3 zone protection, out of step blocking scheme, blinder relay, numerical relays for transmission line protection, microprocessor based impedance, Reactance and Mho relays	**9Hrs**
Unit 6	**Recent Developments in Protection** Introduction to numerical/digital relay techniques. New numerical /digital relaying algorithms, Data Acquisition System (DAS), Introduction of various transform techniques - Discrete Fourier Transform, Haar Transform	**9 Hrs**

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R-Tech -Cle- 03/05

Text Books					
Sr. No	Title	Author	Publisher	Edition	Year of Edition
1	Power System Protection and Switchgear	Badri Ram, Vishwakarma,	Tata McGraw Hill	Fifteenth	2001
2	A Tex book of Power System Engineering.	R.K. Rajput	Laxmi Publications,	First	2007
3	Principles of Power system	V.K. Mehta	S Chand	Third	2005
4	Switchgear and Protection	Sunil S. Rao,	Khanna publishers, New Delhi	Second	1986

Reference Books					
Sr. No	Title	Author	Publisher	Edition	Year of Edition
1	Switchgear and Protection	J.B.Gupta	S.K.Kataria& Sons	Second	2004
2	Fundamentals of Power System Protection	Y. G. Paithankar, S. R. Bhide	PHI	Second	2013
3	Power System Protection & Switchgear	Oza, Nair, Mehta and Makwana	MGH pub	Second	2011
4	Protective Relaying	J. Lewis Blackburn, Thomas J. Domin	CRC Press	Third	2006

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Department of Electrical Engineering
B. Tech. Curriculum

Class	B. Tech. Semester- VII
Course Code and Course Title	**0EEHS403, Economics for Engineers**
Prerequisite/s	-
Teaching Scheme (Lecture/Practical/Tutorial)	03/00/00
Credits	03
Evaluation Scheme: ISE I/MSE/ISE II/ESE	10/30/10/50

Course Objectives	
This Course aims to:	
1	Understand different financial terms used in economics.
2	Explain different terms in economics
3	Compare and Select Application of different Investment analysis methods
4	Explain financial system in India.
5	Design personal investment portfolio.

Course Outcomes (COs):	
Upon successful completion of this course, the student will be able to:	
0EEHS403_1	**Explain** concept of microeconomics and macroeconomics with parameters. (K^2)
0EEHS403_2	**Describe** forecasting tools of demand and supply management. (K^2)
0EEHS403_3	**Elaborate** different monetary policy tools.(K^2)
0EEHS403_4	**Compare** different direct and indirect taxes in Indian economy .(K^3)
0EEHS403_5	**Illustrate** basic concept budget and its analysis. (K^3).
0EEHS403_6	**Select** application of different Investment analysis methods. (K^4).

Course Contents:		
Unit 1	**Introduction to economics** Introduction to economics -Flow in an economy, Law of supply and demand, Concept of Engineering Economics – Engineering efficiency, Economic efficiency, Scope of engineering economics – Element of costs, Marginal cost, Marginal Revenue, Sunk cost, Opportunity cost, Break-even analysis, Elementary economic Analysis – Material selection for product Design selection for a product, Process planning, Meaning of Market, Types of Market – Perfect Competition, Monopoly, Oligopoly, Monopolistic Competition	**10 Hrs**
Unit 2	**Financial system** –Components of Monetary and Financial System, Central Bank –Commercial Banks & their functions; Monetary and Fiscal Policy Tools (CRR, SLR ,Repo rate, Reverse repo rate, Bank rate) & their impact on the economy – Inflation.	**6 Hrs**
Unit 3	**Taxation system** Direct tax (Income tax-basic concepts, salary income) and indirect taxes (basic concept GST, Excise, Custom, VAT), Import export management.	**5 Hrs**
Unit 4	**Financial techniques for Business Management** Cost & Cost Control (basic concept and elements of cost-material, labor and overheads), Types of Costs(Classification of cost), Budgets(basic concept), Capital Budgeting.	**5 Hrs**
Unit 5	**Investment Analysis Methods** – NPV, ROI, IRR, Payback Period, Time value of money (Case study). Financial Statement analysis –Cash flow, Balance sheet.	**6 Hrs**
Unit 6	**Personal Finance** Introduction of personal finance, goal setting, Planning, Different investment options – Fixed deposit, Recurring deposit, Shares, Non convertible Debentures(NCD), National Pension Schemes(NPS), Public provident fund(PPF), Employee Provident Fund(EPF), Mutual Fund(MF) etc. Insurance –types of insurance, term insurance, life insurance, health insurance. Portfolio Management. Case Study.	**10 Hrs**

HOD Electrical **Dean Academics** **Director** **Executive Director**

e Tech Ele - 05/195

Reference Books					
Sr. No	Title	Author	Publisher	Edition	Year of Edition
1	Fundamentals of Engineering Economics	Pravin Kumar	Wiley Precise Text book Series	First	2015
2	Principles of Economics	Mankiw Gregory	Thompson Asia	First	2002
3	Managerial Economics	V. Mote, S. Paul, G. Gupta	Tata McGraw Hill	Third	2004
4	Textbook of Business Economics	Pareek Saroj	Sunrise Publishers	Second	2003

HOD Electrical Dean Academics Director Executive Director

Class	B. Tech. Semester- VII
Course Code and Course Title	**0EEPC404, FACTS and HVDC Systems**
Prerequisite/s	0EEPC302, 0EEPC304
Teaching Scheme: Lecture/Tutorial/Practical	04/00/00
Credits	04
Evaluation Scheme: ISE I / MSE / ISE II / ESE	10/30/10/50

Course Objectives: The course aims to:	
01	Understand the concepts of High Voltage Direct Current Systems
02	Introduce what is reactive power and what are the FACTS devices.
03	Emphasizing on the working principles and constructions of HVDC Converters, Filters, Protection etc.
04	Evaluate the performance of various control schemes of combined shunt and series compensators.
05	choose the Grid Control operation and their Characteristics
06	Analyze voltage & current characteristics for different converters and correlate with actual HVDC systems.

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
0EEPC404_1	**Describe** the concepts of High Voltage Direct Current Systems (K^2)
0EEPC404_2	**Describe** FACTS systems and its various types (K^2)
0EEPC404_3	**Demonstrate** the working principles and constructions of HVDC Converters, Filters, Protection etc. (K^3)
0EEPC404_4	**Apply** the control schemes for series and shunt compensating devices (K^3)
0EEPC404_5	**Analyze** the performance of various control schemes of combined shunt and series compensators (K^4)
0EEPC404_6	**Analyze** voltage & current characteristics for different converters and correlate with actual HVDC systems. (K^4)

Course Contents:		
Unit 1	**FACTS Concept and General:** Transmission Interconnections, What Limits the Loading Capability, Power flow in AC Systems, Basic Types of FACTS Controllers, Power Flow and Dynamic Stability Considerations of a Transmission Interconnection, Benefits from FACTS Technology, Compare HVDC and FACTS.	**10 Hrs.**
Unit 2	**Static Shunt Compensators and STATCOM:** Objectives of Shunt Compensation, Operation & Control Scheme of TSC, TSR & TCR, FC-TCR, TSC-TCR, STATCOM, Hybrid Var Generators, Comparison Between STATCOM and SVC	**09 Hrs.**
Unit 3	**Static Series Compensators:** Objectives of Series Compensation, Variable Impedance Type Series Compensators, Operation & Control Scheme of GCSC, TSSC, TCSC, Static Synchronous Series Compensator (SSSC)	**09 Hrs.**
Unit 4	**General Background of HVDC systems:** Trends in transmission Voltages, Hierarchical Levels in transmission and distribution, Constitution of EHVAC and DC links, Types of HVDC System, HVDC projects in India and abroad, limitations and advantages of HVDC transmission over EHVAC, Layout of HVDC station, MTDC system, Types of MTDC Systems, Comparison between MTDC and AC, Reversal of Power in MTDC System.	**10 Hrs.**
Unit 5	**Control of HVDC Converters and Systems:** Individual phase control and equidistant firing control, comparison of analog and digital	**08 Hrs.**

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	controls, characteristics of D.C. power flow and telecommunication requirements.	
Unit 6	**Protection, Filters and Reactive Power in HVDC systems:** Disoperation of converters, d.c. rectors, damper circuits, Over current protection and over-voltage protection, fault clearing and reenergizing the line, Harmonic filters Types and Location, Reactive Power Requirement of HVDC Converter, Effect of angle of advance and extinction angle on reactive power requirement of converters.	**10 Hrs.**

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
1	Concept and Technology of Flexible AC Transmission Systems	Narain G. Hingorani and LaszolGyugyi	IEEE Press, A John Wiley & Sons	Second	2010
2	Thyristor-Based Facts Controllers For Electrical Transmission Systems	R. Mohan Mathur Rajiv K. Varma	IEEE Press, A John Wiley & Sons	First	2002
3	Facts Controller In Power Transmission And Distribution	K.R.Padiyar	New Age International	First	2012
4	HVDC power transmission systems	K R Padiyar	New Age International (p)Ltd	Second	2014
5	Direct Current Transmission	Edward Wilson Kimbark	Wiley publication Inter science	First	1971

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
1	Power System Stability and Control	P. Kundur	McGraw Hill, Inc.	Second	2008
2	EHVAC and HVDC Transmission Engineering and Practice	S. Rao	Khanna publication	Second	2008
3	HVDC Transmission	J.Arrillaga	Wiley publication Inter science	First	2007
4	Power Quality Enhancement Using Custom Power Devices	A. Ghosh and G. Ledwich	Kluwer Academic Publishers,	First	2002

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Department of Electrical Engineering
B. Tech. Curriculum

Class	B. Tech. Semester - VII
Course Code and Course Title	**0EEOE405, Renewable Energy Sources**
Prerequisite/s	0EEPC304, 0EEPC208
Teaching Scheme: Lecture/Tutorial/Practical	03/00/00
Credits	03
Evaluation Scheme: ISE I / MSE / ISE II / ESE	10/30/10/50

Course Objectives (COs): The course aims to:	
1	Explain various Renewable Energy Sources
2	Describe Energy Generation from Wind Turbine
3	Study Different topologies of wind energy generation
4	Explain energy generation from photovoltaic cell
5	Elaborate various Energy Storage Technologies

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
0EEOE405_1	**Explain** overview of different Renewable Energy Resources**(K2)**
0EEOE405_2	**Describe** various Energy Storage Technologies **(K2)**
0EEOE405_3	**Interpret** the concepts of solar, and wind energy generation. **(K3)**
0EEOE405_4	**Identify** different topologies of the wind energy generation **(K4)**
0EEOE405_5	**Analyze** various characteristics of Wind Energy System.**(K4)**

Course Contents:		
Unit 1	**Solar Energy:** Various Renewable Energy Sources, Sun as Source of Energy, Availability of Solar Energy, Nature of Solar Energy, Solar Energy & Environment. Various Methods of using solar energy –Photo thermal, Photovoltaic, Photosynthesis, Present & Future Scope of Solar energy. Payranometer, Solar site selection	**7 Hrs**
Unit 2	**Solar Cell:** PV cell technologies, Module and array, Equivalent electrical circuit, Open circuit voltage and short circuit current, i-v and p-v curves. Maximum Power Point Tracking (MPPT), PV Standalone System, **Case Study**(Find Position of Solar Pad, Open Circuit and Short Circuit test of Solar Pad, Series and Parallel operation of solar array, On grid test and analysis of solar array, off grid test and analysis of solar array, Testing and analysis of battery charger controller, Testing and analysis of solar grid tie inverter, Smart control system of solar)	**7 Hrs**
Unit 3	**Fundamental of Wind Turbines and its Characteristics:** Introduction, Wind energy production, System components, System design features, number of blades, vertical and horizontal axis rotors, tower spacing, airfoils and general concepts of aerodynamics, aerodynamics of wind turbines, drag and lift, aerodynamic power controls, pitch, stall, active stall, rotor power characteristics CP-λ Power curves. Wind speed characteristics and variations, Wind speedand power relation, available power and power extracted from the wind, Wind speed distribution and statistics, Weibull wind speed probability distribution function, Mean, mode, root mean cube,	**7 Hrs**
Unit 4	**Electrical aspects of Wind Turbines:** Induction and synchronous generators, Constant speed wind turbines, Fixed-speed direct connect generator systems, Direct-connect synchronous generator, Direct-connect induction generation, Multi-speed generator systems.	**7 Hrs**

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Unit 5	**Grid Connected System:** Interface Requirements, Synchronizing with Grid, Inrush Current, Synchronous Operation, Load Transient, Safety, Operating Limit, Voltage Regulation, Stability Limit, Energy Storage and Load Scheduling, Utility Resource Planning Tool	**7 Hrs**
Unit 6	**Energy Storage Technology:** Flywheels, Superconducting Magnetic Energy Storage (SMES, Batteries: Lead-Acid Batteries Lithium-Ion Batteries, Other Batteries in Development, Pumped Storage Hydroelectricity (PHS), Compressed Air Energy Storage (CAES), Electrolysis of water and Methanation Thermal Storage, Hydraulic Hydro Energy Storage (HHS)	**7 Hrs**

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
1	Solar Photo Voltaic	Chetan Singh Solanki	PHI Learning Pvt Ltd	Third	2009
2	Modeling and control of fuel cells	Hashem Nehrir and Caisheng Wang	IEEE Press	First	2009
3	Wind Energy Explained, theory design and applications	J.F. Manwell and J.G. McGowan	Wiley publication	Second	2010
4	Power Electronics for Renewable and Distributed Energy System	S.Chakraborty, M. G. Simões and W. E. Kramer	Springer	First	2013

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
1	Renewable Energy Resources	John Twidell , Tony Weir	Routledge	Third	2015
2	Wind Energy Systems	Gary-L. Johnson	Tata Mc-Graw-Hill Book Company	First	2006
3	Wind Power, Renewable Energy for Home, Farm, and Business	Paul Gipe	Chelsea Green Publishing	Second	2004
4	Sustainable Energy	Richard A. Dunlap,	Cengage Learning India	Second	2015.

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Class	B. Tech. Semester-VII
Course Code and Course Title	**0EEOE406, Industrial Automation, PLC and SCADA**
Prerequisite/s	0EEES210
Teaching Scheme: Lecture/Tutorial/ Practical	03/00/00
Credits	03
Evaluation Scheme: ISE I / MSE / ISE II / ESE	10/30/10/50

Course Objectives The course aims to	
1	**Study** the fundamentals of industrial automation, itsneed and Selection Criteria.
2	**Learn** the basic fundamentals of logic
3	**Develop** ladder diagram for various control tasks
4	**Analyze** the ladder diagram from process control descriptions
5	**Familiarize** with architecture and recent applications of SCADA

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
0EEOE406_1	**Describe** fundaments of industrial automation ($\mathbf{K^2}$)
0EEOE406_2	**Explain** working and operation of PLC($\mathbf{K^2}$)
0EEOE406_3	**Draw** ladder diagram for various control tasks($\mathbf{K^2}$)
0EEOE406_4	**Select** suitable advanced functions to creating ladder diagrams from various process control descriptions ($\mathbf{K^3}$)
0EEOE406_5	**Analyze** the industrial automation solution by suitable PLC –SCADA. ($\mathbf{K^3}$)

Course Contents:		
Unit 1	**Introduction to Automation:** Fundamentals of industrial automation, Definition of Automation, Goals of Automation, need and role of automation, evolution of automation. Types of processes, comparison, evolution of PLC, Low cost Automation, Types of Automation, Current scenario of automation in Industries, Issues of automation in Factory operations.	**04Hr**
Unit 2	**Fundamentals of Logic:** Number systems and codes, Boolean Algebra, Logic Gates, Karnaugh map, Combinational Logic circuits-code conversion, Mux, Demux, ,Encoders, Decoders, Combinational logic optimization and design-SOP and POS form, reduction techniques	**08 Hr**
Unit 3	**Programmable logic Controller:** PLC-an overview, Hardware Components, Basic PLC structure, Types of PLC, Inputs and Outputs, Selecting PLC, Factors to consider in selecting PLC, Remote I/O, Sourcing and Sinking, Basic Ladder Programming rules, General PLC Programming Procedure, Basic PLC Programming, Creating ladder diagram for operation task, Mnemonic Programming Code	**10 Hr**
Unit 4	**PLC Functions:** Programming Timers, Programming Counters, Program control instructions, Data Manipulation Instructions, Math Instructions, Sequence rand Shift Register Instructions, Creating ladder diagram from process control descriptions	**10 Hr**
Unit 5	**Introduction to SCADA systems:** Evolution of SCADA system, SCADA definition, System architecture of SCADA and its Selection Criteria, Overview of SCADA System Security Issues, SCADA and IT Convergence, Conventional IT Security and Relevant SCADA Issues, Desirable properties of SCADA system	**05 Hr**

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B. Tech - Elec - 11/45

Unit 6	**SCADA systems in industries:** Implementation of SCADA Systems, Petroleum Refining, Nuclear Power Generation, Conventional Electric Power Generation, Petroleum Wellhead Pump Control, Water Purification System, Crane Control, SCADA systems in chemical plants.	**05 Hr**

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Programmable Logic Controllers: Principles and Application	John Webb, Resis Ronald,	Prentice hall of india	Fifth	2007
02	Programmable Logic Controllers: Programming Methods and Applications	Hackworth	Pearson india	First	2008
03	Programmable Logic Controllers	Frank Fetruzella	Elsevier India	Third	2007
04	Concept of SCADA System and its Evolution	Mini S. Thomas, John Douglas, McDonald	CRC Press	First	2015
05	Handbook of SCADA Control-System Security	Robert Radvonovsky, Jacob Brodsky	CRC Press	First	2013

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Programmable Controllers	Batten G. L	McGraw Hill Inc	Second	-
02	Real Time Computer Control	Bennett Stuart	Prentice Hall	First	1988
03	Measurement Systems	Doebelin E. O.	McGraw-Hill International Editions	Fourth	1990
04	Practical Modern SCADA Protocols	Gordan Clark, Deem Reynders	ELSEVIER	First	2004
05	Programmable Logic Controllers with Applications	P. K. Srivstava	BPB Publications	First	2004

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B. Tech - EE 2015

Department of Electrical Engineering
B. Tech. Curriculum

Class	B. Tech. Semester-VII
Course Code and Course Title	**0EEOE407, Electric and Hybrid Vehicles**
Prerequisite/s	-
Teaching Scheme: Lecture/Tutorial/Practical	03/00/00
Credits	03
Evaluation Scheme: ISE I / MSE / ISE II / ESE	10/30/10/50

Course Objectives: The course aims to:	
1	**Understand** environmental impact due to electric and fuel powered vehicles
2	**Study** different propulsion systems in electric and hybrid vehicles.
3	**Introduce** various energy storage devices and regeneration of energy.
4	**Learn** the architecture of electric and hybrid vehicles.
5	**Draw** and explain different hybrid train designs.

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
0EEOE407_1	**Explain** vehicle mechanics & impact on environment of traditional transportation system. (K^2)
0EEOE407_2	**Describe** suitable energy storage & regeneration system for Electric and Hybrid Electric Vehicles (K^2)
0EEOE407_3	**Classify** different configuration of Electric and Hybrid Electric Vehicles (K^2)
0EEOE407_4	**Choose** appropriate propulsion technique for Electric and Hybrid Electric Vehicles (K^3)
0EEOE407_5	**Select** suitable drive train and control mechanism for Electric and Hybrid Electric Vehicles (K^3)

Course Contents:		
Unit 1	**Environmental Impact and Vehicle Fundamentals** Petroleum resources, induced cost, air pollution, global warming, , importance of different transportation development, history of electric and hybrid electric vehicles, general description of vehicle movement vehicle resistance, power train tractive effort and vehicle speed, vehicle performance, operating fuel economy, braking performance	**06Hrs.**
Unit 2	**Propulsion Systems** **IC Engine:** Spark ignited IC engines- Operating principle, operating parameters, Compression ignition IC engines **Electrical Drives:** DC Motor Drives- Principle of operation and performance, combined armature and voltage control, chopper control of DC motor drives, Induction motor drive- Basic operating principle, Volt/hertz control, power electronic control, field oriented control, BLDC motor drive- Basic principle, Control of BLDC drive, SRM drive- SRM drive controller, Modes of operation	**07 Hrs.**
Unit 3	**Energy Storage and Regeneration** Electrochemical batteries and its types- Electrochemical reaction, thermodynamic voltage, specific energy, power , efficiency, applications of different battery technologies in EV and HEV, Battery Management System **Ultra capacitors-** Features, Basic operating principle, Performance, applications of different ultra capacitor technologies in EV and HEV **Ultra high speed flywheels-** operating principle, power capacity, applications of different flywheel technologies in EV and HEV Fundamentals of regenerative braking- Energy consumption in braking, braking power and energy on front and rear wheels, brake system for EV and HEV	**07 Hrs.**

HOD Electrical **Dean Academics** **Director** **Executive Director**

B. Tech - Elec - 13145

Unit 4	**Electric Vehicles (EV)** Configurations of EV, Performance of EV, Traction motor characteristics, tractive effort and transmission requirement, vehicle performance, tractive effort in normal driving, energy consumption	**07 Hrs.**
Unit 5	**Hybrid Electric Vehicles (HEV)** Concept of hybrid electric drive trains, architecture of HEV drive trains, series hybrid, parallel hybrid- Torque coupling drive trains, speed coupling drive trains, speed and torque coupling drive trains.	**07 Hrs.**
Unit 6	**Hybrid Drive Train Designs** Series Hybrid Electric Drive Train Design- Operation patters, control strategies, PPS control, Thermostat control, Sizing of major components, power rating design of traction motor and engine, Design of Peaking Power Source (PPS) Parallel Hybrid Drive train design –Control strategies, State of charge (SOC) control, engine on-off control, Design of drive train parameters	**08 Hrs**

Text Books

Sr. No	Title	Author	Publisher	Edition	Year of Edition
1	Modern Electric, Hybrid Electric and fuel cell vehicles	MehrdadEhsani, YiminGao	CRC Press	First	2005
2	Electric and Hybrid Vehicles	Iqbal Husain	CRC Press	Second	2010
3	Electric Vehicle Technology Explained	James Larminie, John Lowry	Wiley	First	2003
4	Hybrid and Alternative Fuel Vehicles	James D. Halderman and Tony Martin	Professional Technician	Second	2010

Reference Books

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Fundamentals of Electrical Drives	G. K. Dubey	CRC Press	First	2002
2	How Your Car Works: Your Guide to the Components & Systems of Modern Cars, Including Hybrid & Electric Vehicles	ArvidLinde	Rac Handbook	Second	2011
3	Hybrid Electric Vehicles: Principles and Applications with Practical Perspectives	Chris Mi, M. AbulMasrur and David WenzhongGao	Willey Publications	Second	2011

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1445

Department of Electrical Engineering
B. Tech. Curriculum

Class	B. Tech. Semester-VII
Course Code and Course Title	0EEOE408, **Nanotechnology**
Prerequisite/s	0EEPC203
Teaching Scheme: Lecture/Tutorial/Practical	03/00/00
Credits	03
Evaluation Scheme: ISE I / MSE / ISE II / ESE	10/30/10/50

Course Objectives: This course aims to	
01	**Expand** the educational opportunities in Nanotechnology
02	**Knowledge** of Novel Properties of Nano-materials
03	**Encourage** the development of engineered nanomaterials that are safer and more sustainable alternatives to materials—nanoscale
04	**Promote** the design and development of safe and environmentally nanotechnology-enabled products.
05	**Enhance** nanotechnology-related employment opportunities

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
0EEOE408_1	**Familiar** with Background of Nanotechnology(K^2)
0EEOE408_2	**Understand** future perspectives of nanotechnology(K^2)
0EEOE408_3	**Determine** the Various Nanomaterials and their Benefits(K^2)
0EEOE408_4	**Evaluate** the different Properties of Nanomaterials(K^3)
0EEOE408_5	**Explain** the Manufacturing Processes of Nanomaterials(K^3)
0EEOE408_6	**Application** of Nanotechnology for Various Fields(K^5)

Course Contents:		
Unit 1	Historical perspective: An overview of natural and classical nanosystem	**02 Hrs.**
Unit 2	Classification and nomenclature of nanomaterials: Nanosized metals and alloys, semiconductors, ceramics - a comparison with respective bulk materials; organic semiconductors, carbon nanotubes, nanorods, nanocomposites consisting of organic, inorganic and biomaterials; zero-, one-, two-, and three dimensional nanostructures – quantum dots, quantum wells, quantum rods, quantum wires, quantum rings.	**05Hrs.**
Unit 3	Novel properties of nanomaterials: Size and shape dependent optical, emission, electronic, transport, photonic, refractive index, dielectric, mechanical, magnetic, non-linear optical properties; catalytic and photocatalytic properties	**09 Hrs.**
Unit 4	Synthesis of nanoparticulates: Nucleation and growth of nanosystems; Physical methods: mechanical milling, laser ablation, sputtering, microwave plasma etc.; Metallo organic chemical vapor deposition; designing of advanced integrated nanocomposites, functional nanomaterials and nanostructured thin films.	**08 Hrs.**
Unit 5	Theories of nanosized materials: Transition metal sols, origin of plasmon band, Mie theory, influence of various factors on the plasmon absorption, quantum confinement in semiconductors – particle in a box like model for quantum dots, origin of charge on colloidal sols and its implications in making building blocks.	**09Hrs.**
Unit 6	Applications and perspectives of nano-materials: Development of nano-scale catalysts, photo-catalysts, sensitizers, sensors, composites, polymers, ceramics, biomaterials, pharmaceuticals, optical, fluorescent, electronic, magnetic and photonic devices, future perspectives of nanotechnology in miniaturization of devices and fabrication of value added products	**09 Hrs.**

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R-Tech - 6/8-15/15

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Introduction to Nanosciecnce and Nanotechnology	Chattopadhyay K.K.	PHI Learning Private Ltd	First	2009
02	Springer Handbook of Nano-Technology	Bhushan Bharat	Springer	Third Revised	2010
03	Nanotechnology	Timp.G	Springer (India) Pvt.Ltd.	Third Reprint	2012
04	Nanotechnology : Technology Revolution of 21st Century	Rathi,R.	S.Chand & Company,Pvt. Ltd	First Reprint	2009

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Introduction to Nanoscience and Nanotechnology	Binns Chris	John Wiley and Sons	First	2010
02	Nano Materials	Viswanathan B	Narosa Publishing House	First	2013
03	Introduction to Nanotechnology	Poole Charles P	Wiley India	First	2013
04	Nanotechnology Applications	Minoli Daniel	Wiley India	First	2013

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Department of Electrical Engineering
B. Tech. Curriculum

Class	B. Tech. Semester-VII
Course Code and Course Title	**0EEMC409, Industrial Training**
Prerequisite/s	--
Teaching Scheme: Lecture/Tutorial/Practical	00/01/00
Credit	--
Evaluation Scheme: ISE	Grade

Course Objectives This Course aims to:	
1	Understand and realize an industrial environment.
2	Observe the various industrial processes.
3	Enhance the knowledge and skills for planning of human resources, material resources, production and maintenance.
4	Inculcate the creative thinking to solve industrial problem.

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
0EEMC409_1	**Explain** the knowledge acquired during industrial training (K^2)
0EEMC409_2	**Demonstrate** competency in relevant engineering fields through problem identification and formulation (K^2)
0EEMC409_3	**Apply** appropriate techniques, resources, and modern engineering tools to solve industrial problems.(K^3S^2)
0EEMC409_4	**Work & communicate** individually or in team in actual industrial environment, showing engineering & management principles. (S^2)
0EEMC409_5	**Present** an ability to write technical documents and give oral related to the work completed (A^2)
0EEMC409_6	**Demonstrate** the knowledge of professional and ethical responsibilities. (A^2)

Course Contents:

Industrial Training

The students have to undergo a training of minimum period of two weeks in an industry preferably dealing with Electrical engineering during the semester break after sixth semester and complete before the start of seventh semester. The students have to submit a report of the training undergone and present the contents of the report before the evaluation committee constituted by the department. An internal evaluation will be conducted for examining the quality and authenticity of contents of the report and award the marks at the end of the semester. It is expected that students should undertake small assignment or work related to any of the course related aspect. Report is based on compilation of work carried out related to facility and layout planning, Industrial engineering- time study and motion study, Line efficiency evaluation and improvement, process capability evaluation, Industrial automation, process or machinery modification as identified.

NOTE: Industrial training of minimum two weeks in an industry during the semester break after sixth semester and before the start of seventh semester. All students have to present their reports individually in seventh semester.

HOD Electrical **Dean Academics** **Director** **Executive Director**

B.Tech - Elx - 17/95

Department of Electrical Engineering
B. Tech. Curriculum

Class	B. Tech. Semester-VII
Course Code and Course Title	**0EEAC410, Professional Skill -III**
Prerequisite/s	0EEAC212
Teaching Scheme: (Lecture/Practical/Tutorial/Drawing)	02/00/00/00
Credit	--
Evaluation Scheme: ISE	Grade

Course Objectives This Course aims to:	
1	Introduce problems on advanced number system.
2	Solve problems related to Logical reasoning.
3	Develop Data Interpretation skill in students.
4	Improve the skills of student to solve aptitude problem in less time.

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
0EEAC410_1	**Recall** Formulae .(K^1)
0EEAC410_2	**Formulate** the problem quantitatively and use appropriate arithmetical, and/or statistical methods to solve the problem.(K^3)
0EEAC410_3	**Apply** various principles involved in solving mathematical problems and thereby reducing the time taken for performing job functions.(S^2)
0EEAC410_4	**Choose** methods to solve problems related to Logical reasoning & data interpretation. (S^2)
0EEAC410_5	**Use** quantitative information (i.e., formulas, graphs, tables, models, and schematics) and draw implications from them.(S^4)

Course Contents:		
Unit 1	**Advanced Number System and Simplification** Ratio, Proportion, Percentage & Averages, Profit & Loss, Simple Interest, Compound Interest, Surds, Indices.	**7 Hrs**
Unit 2	Mixtures and Alligations, Stocks and shares, Bankers Discount, Problems on Numbers	**7 Hrs**
Unit 3	Data Interpretation -Problems on table chart, Bar chart, Pie Chart, Line Chart. Seating Arrangement	**7 Hrs**
Unit 4	Syllogism, Blood Relations, Coding Decoding ,Statement and Argument, Number Systems, Sequence and Series	**7 Hrs**

Reference Books

Sr. No	Title	Author	Publisher	Edition	Year of Edition
1	Quantitative Aptitude	Dr. R.S. Aggarwal	S.Chand	Fifth	2014
2	Quantitative Aptitude for Competitive Examinations	Abhijit Gupta	MC Graw Hill	Sixth	2016
3	A Modern Approach to Verbal & Non-Verbal Reasoning	Dr. R. S Agarwal	S.Chand	Revised	2016
4	How to Prepare for Logical Reasoning for the CAT	Arun Sharma	MC Graw Hill	Eighth	2012

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B-Tech-Ele-18145

Department of Electrical Engineering
B. Tech. Curriculum

Class	B. Tech. Semester-VII
Course Code and Course Title	**0EEPR451, Project Phase I**
Prerequisite/s	All relevant subjects
Teaching Scheme: Lecture/Tutorial/Practical	00/00/04
Credits	04
Evaluation Scheme: ISE / ESE	50/100

Course Objectives: This Course aims to:	
01	Understand the real life institutional, social, local industrial problems.
02	Solve engineering problems and give optimal solution.
03	Analyze problem and Design system components.
04	Apply engineering and management principles to manage projects.
05	Communicate effectively and Engage in independent and life-long learning.

Course Outcomes (COs):- After successful completion of this course, the student will be able to,	
0EEPR451_1	Identify& Choose the real life institutional, social, local industrial problems relevant to the societal and environmental issues for sustainable development using survey and literature review. **(K^3 A^3)**
0EEPR451_2	Formulate, analyze complex engineering problems and give cost-effective, optimal solution considering societal, health, legal, safety and cultural issues. **(K^4 A^3)**
0EEPR451_3	Design/Development of system components or processes that meet the specified needs by using advance tools/ techniques/ resources **(K^5 S^3)**
0EEPR451_4	Function effectively as an individual and as a team for understanding of the engineering and management principles and apply these to manage projects maintaining professional and ethical principles. **(S^3 A^2)**
0EEPR451_5	Communicate effectively on complex engineering activities, write effective reports, design documentation and make effective presentations, **(S^3)**
0EEPR451_6	Recognize & Engage in independent and life-long learning in the broadest context of technological change**(A^3)**

Course Contents:

The project work should be based on hardware assembly. In Project Phase-I the batch of maximum 4 students should finalize. Identification of Problem for the project should finalize with consultation of guide.

Literature review: Literature survey, quality of literature and Interlink of literature survey with problem.

Synopsis: must contain identification of problem, literature review, proposed work, method and methodology, budget and work plan for whole year.

Demo – I: At list software design or simulation of project must be there with result. Also hardware design along with Components selection for layout of hardware.

Project Phase-I Report: The circuit should be finalized and the results of simulation shall be presented in the report of project phase I. Project Phase-I report should contain Introduction, Literature review, Proposed work, simulation model and results.

HOD Electrical **Dean Academics** **Director** **Executive Director**

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Class	B. Tech. Semester-VII
Course Code and Course Title	**0EEPC452, Switchgear & Protection Laboratory**
Prerequisite/s	0EEPC402
Teaching Scheme: Lecture/Tutorial/Practical	00/00/02
Credits	01
Evaluation Scheme: ISE / ESE	50/50

Course Objectives	
This Course aims to:	
01	Classify various types of Circuit Breakers
02	Explain working of Induction type Relays
03	Plot different characteristics of protective relays
04	Demonstrate Microprocessor based Relays according to functions
05	Analyze different Relay setting using Power World Simulator

Course Outcomes (COs):	
Upon successful completion of this course, the student will be able to:	
0EEPC452_1	**Relate** different power system protection components and schemes.(K2)
0EEPC452_2	**Examine** performance of different types of relays.(K3)
0EEPC452_3	**Make** use of Power World Simulator for relay setting and MATLAB for designing of relay.(S3)
0EEPC452_4	**Communicate** effectively about laboratory work both orally and writing.(S3)
0EEPC452_5	**Practice** professional and ethical behavior to carry forward in their life.(A2)

List of Experiments

Sr. No	Title of Experiment
1	Drawing sheet showing construction of Circuit Breakers.
2	Drawing sheet showing construction of Generator and Transformer protection schemes.
3	Study of construction and working of Induction Disc type relay
4	To plot time/current characteristic and study of electro-mechanical over current relay.
5	To plot time/current characteristic and study of electro-mechanical over voltage relay.
6	To plot different characteristic and study of Microprocessor over current relay.
7	Experimental study of Microprocessor Based Over voltage relay
8	Experimental study of Microprocessor Based Under voltage Relay.
9	Experimental study of microprocessor Based Impedance Relay
10	Introduction to Power World Simulator for Different Relay Setting

HOD Electrical **Dean Academics** **Director** **Executive Director**

Department of Electrical Engineering
B. Tech. Curriculum

Class	B. Tech. Semester-VII
Course Code and Course Title	**0EEPC453, FACTS and HVDC Systems Laboratory**
Prerequisite/s	---
Teaching Scheme: Lecture/Tutorial/Practical	00/00/02
Credits	01
Evaluation Scheme: ISE / ESE	50/00

Course Educational Objectives(CEOs): The course aims to:	
01	Demonstrate and design modeling of converters
02	Study and analyze HVDC converter Characteristic
03	Analyze the Modeling & Simulation of Three Phase Harmonic Filters
04	Design simulation models for circuit breakers, surge arrestors, Filter

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
0EEPC453_1	Analyze the transient performance of TSC & TSR(S^2, K^4)
0EEPC453_2	Design & Simulate the various Models of single and three phase rectifier and inverters using MATLAB SIMULINK environment(S^3, K6)
0EEPC453_3	Design Simulation Model of converter using MATLAB (S^3, K^6)
0EEPC453_4	Design simulation model of HVDC system using MATLAB (S^3, K^6)
0EEPC453_5	Communicate effectively about the laboratory work in oral and written manner (S^3)
0EEPC453_6	Practice professional and ethical behavior to carry forward in their life. (A^2)

List of Experiments:

Sr. No	Title of Experiments
1.	To analyze ideal switch of inductor current chopping
2.	Design transient free switching of capacitor
3.	Design transient free switching of inductor
4.	Design and Analyze Current Generation of TSC & TSR
5.	Modeling & Simulation of Two Identical Single-Phase Rectifiers.
6.	Modeling & Simulation of Three-phase diode rectifier.
7.	Design Simulation model of 3 phase SPWM and ISPWM Inverter.
8.	Design Simulation of 6 and 12 pulse 3 phase HVDC system.
9.	Steady-state and transient performance of a 12-pulse, 1000 MW (500 kV-2kA) 50/60 Hz HVDC transmission system.
10.	Study and Simulation of Circuit Breaker and surge arresters.
11.	Analyze VSC-Based HVDC Transmission Link.
12.	Modeling & Simulation of Three-Phase Harmonic Filters used on a 12-pulse AC/DC Converter.
13.	Harmonic analysis on sinusoidal waveform and working of sinusoidal PWM inverter.
14.	Study and simulation of 6 pulse HVDC system & observe Vd-Id characteristics.
15.	Hardware Design using Ardiuno

HOD Electrical **Dean Academics** **Director** **Executive Director**

P.Tech.-EE-21/45

Department of Electrical Engineering
B. Tech. Curriculum

Class	B. Tech. Semester-VII
Course Code and Course Title	**0EEPC454, Electrical Installation Testing & Maintenance Laboratory**
Prerequisite/s	0EEPC251, 0EEPC255
Teaching Scheme: Lecture/Tutorial/Practical	00/00/02
Credits	01
Evaluation Scheme: ISE / ESE	50/00

Course Education Objectives(CEOs)	
01	Learn different types of tools, instruments.
02	learn about application of safety code, I E Rules
03	Understand Earthing, Installation concepts.
04	Understand Substation Working.
05	Understand Motor Maintenance

Course Outcomes (COs)	
0EEPC454_1	**Select** codes and practices pertaining to safety in installation and maintenance of electrical equipment.(K3)
0EEPC454_2	**Categorize** the maintenance work done on electrical equipment(K4)
0EEPC454_3	**Determine** tools and equipment used for installation and maintenance of Electrical Equipments. (S3)
0EEPC454_4	**Develop** report on maintenance of different electrical equipments (S5)
0EEPC454_5	**Function** effectively as an individual and as team member (A3)

List of Experiments:

Expt. No.	Title of Experiment
1	Identification of Tools and Equipment.
2	Identification of IE rules
3	To Study Artificial Respiration
4	To measure Earthing Value of Earth pits
5	To measure Insulating value of Cable Insulation by Megger
6	A field visit to Substation for study of Maintenance work.
7	Study of Various Electrical Equipment by visiting a Substation
8	Study of Transformer and repair by Visiting a Manufacturing Plant
9	Study of short circuit test on Power Transformer
10	To study transformer Oil test
11	To study vibration tests for various electrical machines
12	A field visit to study how installation works in an industry
13	Insulation testing of a cable in HVE lab
14	Study of open circuit test on power transformer
15	To study insulation strength of a electrical machine

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Department of Electrical Engineering
B. Tech. Curriculum

Class	B. Tech. Semester-VIII
Course Code and Course Title	**0EEPC411, Electrical Utilization and Traction**
Prerequisite/s	0BSE103, 0EEPC209,0EEPC303, 0EEPC309
Teaching Scheme: Lecture/Tutorial/Practical	04/00/00
Credits	04
Evaluation Scheme: ISE I / MSE / ISE II / ESE	10/30/10/50

Course Objectives: The course aims to:	
1	**Learn** various concepts, laws and types of lamps of illumination system
2	**Understand** lightning system for indoor and outdoor application.
3	**Study** the different types heating and welding methods
4	**Find the** numerical solution for the performance of illumination and traction systems
5	**Understand the** different type traction system and their control

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
0EEPC411_1	**Explain** various concepts, laws and types of lamps of illumination system **(K^2)**
0EEPC411_2	**Choose** appropriate lightning system for indoor and outdoor application. **(K^3)**
0EEPC411_3	**Select** appropriate heating and welding method based on working principle and application**(K^3)**
0EEPC411_4	**Solve** numerical on illumination and traction systems.**(K^3)**
0EEPC411_5	**Draw** and explain various traction systems.**(K^3)**
0EEPC411_6	**Use** appropriate motor and control for traction system.**(K^3)**

Course Contents:		
Unit 1	**Illumination** Nature of light, visibility spectrum curve of relative sensitivity of human eye and wave length of light. Definition: Luminous flux, solid angle, luminous intensity, illumination, luminous efficiency, depreciation factor, coefficient of utilization, space to height ratio, reflection factor, glare, shadow, lux, Laws of illumination – simple numerical. Different types of lamps, construction and working of incandescent and discharge lamps – their characteristics, fittings required for filament lamp, mercury vapour lamp, fluorescent lamp, metal halide lamp, neon lamp, LED lamp	**10 Hrs.**
Unit 2	**Design of Lighting** Design of interior lighting, Illumination schemes; indoor and outdoor. Illumination levels Main requirements of proper lighting; absence of glare, contrast and shadow - General ideas about street lighting, flood lighting, monument lighting and decorative lighting, light characteristics- Numerical.	**06Hrs.**
Unit 3	**Electric Heating** Advantages of electrical heating, Heating methods: Resistance heating – direct and indirect resistance heating, electric ovens, their temperature range, properties of resistance heating elements, domestic water heaters and other heating appliances and thermostat control circuit. Induction heating; principle of core type and coreless induction furnace Electric arc heating; direct and indirect arc heating, construction, working and applications of arc furnace Dielectric heating, applications in various industrial fields -Simple design problems of resistance heating element.	**12 Hrs.**

HOD Electrical **Dean Academics** **Director** **Executive Director**

Unit 4	**Electric Welding** Advantages of electric welding and welding methods. Principles of resistance welding, types – spot, projection seam and butt welding and welding equipment used. Principle of arc production, electric arc welding, characteristics of arc; carbon arc, metal arc, hydrogen arc welding method of and their applications. Power supply required. Advantages of using coated electrodes, comparison between AC and DC arc welding, welding control circuits, welding of aluminium and copper. Introduction to TIG, MIG Welding	**10 Hrs.**
Unit 5	**Electric Traction** Advantages of electric traction, different systems of electric traction, DC and AC systems, diesel electric system, types of services – urban, sub-urban, and main lines and their speed-time curves. Factors affecting scheduled speed Different accessories for track electrification; such as overhead capacitor wire, conductor rail system, current collector-pantograph.	**08 Hrs.**
Unit 6	**Electric traction motor & their control:** Electrical block diagram of an electric locomotive with description of various equipment and accessories, Types of motors used for electric traction. Starting and braking of traction motors, Introduction to Electric Multiple Unit and metro railways	**08 Hrs.**

Text Books

Sr. No	Title	Author	Publisher	Edition	Year of Edition
1	Utilization of Electric Power and Electric Traction	J.B. Gupta,	Kataria Publications	Second	2009
2	Art and science of Utilization of Electric Energy	H. Partab	DhanpatRai& Sons.	Second	2015
3	A course in Electrical Power	Soni, Gupta and Bhatnagar	DhanpatRai	Ninth	1987
4	.Utilization of Electric Energy	Openshaw Taylor	Orient Blackswan	First	2006

Reference Books

Sr. No	Title	Author	Publisher	Edition	Year of Edition
1	Generation, Distribution and Utilization of Electrical Energy	C.L. Wadhwa	New AgeInternational Publications.	First	2005
2	Modern Electric Traction"	H. Partab	DhanpatRai& Sons.	First	2013
3	AText Book of Electrical Power	Dr. S. L. Uppal	Khanna Publications	Eighth	2017
4	Generation and Utilization of Electrical Energy	S. Sivanagaruju	Pearson	First	2010

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Department of Electrical Engineering
B. Tech. Curriculum

Class	B. Tech. Semester-VIII
Course Code and Course Title	**0EEPC412,High Voltage Engineering**
Prerequisite/s	0EEPC302, 0EEPC308
Teaching Scheme: Lecture/Tutorial/Practical	03/00/00
Credits	03
Evaluation Scheme: ISE I / MSE / ISE II / ESE	10/30/10/50

Course Objectives: The course aims to:	
01	Explain the concept related to ionization process and its theories
02	Explain process of breakdown in gaseous, liquid and solids
03	Develop the ability to design and test high voltage power apparatus
04	Develop the ability to estimate and analyze overvoltage in power system
05	Explain high voltage testing of electrical equipment

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
0EEPC412_1	**Explain** the generation of high DC, AC, impulse voltages and generation of high DC, AC, and impulse currents. .(K^2)
0EEPC412_2	**Illustrate** the various techniques used in the measurement of high DC, AC, impulse voltages and currents. .(K^3)
0EEPC412_3	**Interpret** the various causes of over voltages in electrical power systems (K^3)
0EEPC412_4	**Illustrate** the basic concepts of various breakdown processes occurring in gases, vacuum, liquid & solid insulating materials. (K^3)
0EEPC412_5	**Solve** the numerical on impulse generator, electrostatic voltmeter, rogowski coil & breakdown voltages (K^3)
0EEPC412_6	**Analyze** testing methods of high voltage electrical power apparatus.(K^4)

Course Contents:		
Unit 1	**Generation of High Voltages and High Currents** Generation of High DC Voltages: Voltage Doublers Circuit, Cockcroft Walton Voltage Multiplier Circuit, Van de Graff Generator. Generation of High Alternating Voltages: Cascade Transformers, Resonant Transformers, Generation of High Frequency AC High Voltages: Tesla Coils, Generation of Impulse Voltages: Standard Lightning& Switching Impulse Wave shape,Single Stage and Multistage Impulse Voltage Generation, Switching Impulse Voltage Generation Circuits, Generation of Impulse Current	**11 Hrs.**
Unit 2	**Measurement of High Voltages and High Currents** Resistance Potential Dividers, Electrostatic Voltmeters,Chubb Fortescue Method, Surge Recorder, Sphere Gaps for Measurement of High DC, AC and Impulse Voltage Measurements, Hall Generator, Rogowski Coils.	**07Hrs.**
Unit 3	**Over-voltages in Electrical Power Systems** Causes of over voltages and its effect on power system, lightning phenomena, charge formation in clouds, mechanism of lightning strokes, mathematical model for lightning, switching surges, origin of switching surges and characteristics of switching surges, power frequency over voltages and control techniques, temporary over voltages, protection of transmission line against over voltages.	**07 Hrs.**
Unit 4	**Electric Breakdown in Gases and Vacuum** Ionization and Decay Processes: Ionization by Collision, Photo-ionization and Secondary Ionization Processes. **Electric Breakdown in Gases:** Townsends Breakdown Mechanism, Breakdown in Electronegative Gases, Time Lags for Breakdown, Streamer Mechanism of Spark, Paschen"s Law, Gaseous Breakdown in Non-uniform Fields, Corona Discharges, Practical Considerations using Gases for Insulation Purposes, Mechanisms for Breakdown in Vacuum Insulation.	**06 Hrs.**

HOD Electrical **Dean Academics** **Director** **Executive Director**

Unit 5	**Electric Breakdown in Liquids and Solids** **Electric Breakdown in Liquids:** Properties of Liquid Dielectrics, Conduction and Breakdown in Pure Liquids, Conduction and Breakdown in Commercial Liquids: Suspended Particle Mechanism, Cavitation and Bubble Mechanism, Stressed Oil Volume Mechanism. **Breakdown in Solids**: Electromechanical Breakdown, Thermal Breakdown, Electrochemical Breakdown, Breakdown due to Treeing and Tracking, Breakdown due to Internal Discharges, Breakdown in Composite Insulation.	**06 Hrs.**
Unit 6	**High Voltage Testing and Insulation Co-Ordination** Testing of Insulators, Testing of Bushings, Testing of Isolators and Circuit Breakers, Testing of Cables, Testing of Transformers, Testing of Surge Arresters, Insulation Coordination, Equipment's used in Extra HVE Laboratories, Classification of HVE Laboratories, Recent trends in High Voltage Engineering.	**05 Hrs.**

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
1.	High Voltage Engineering	M.S.Naidu and V.Kamaraju	Tata McGraw Hill Education (India) Pvt. Ltd.	Fifth	2013
2.	High Voltage Engineering	C.L.Wadhwa	New Age International Pvt. Ltd.	Third	2012
3.	High Voltage Engineering Fundamentals	E. Kuffel, W. S. Zaengl, J. Kuffel	Elsevier	Second	2012
4.	Fundamentals of High-Voltage Engineering	Ravindra Arora and Bharat Singh Rajpurohit	Wiley	First	2019

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
1.	An Introduction To High Voltage Engineering	Subir Ray	Prentice Hall India Learning Private Limited	Second	2013
2.	High Voltage Technology	L.L. Alston	Oxford University Press,	First	2011
3.	High Voltage Engineering	E.Kuffel and M. Abdullah,	Pergamon Press	First	2013
4.	High-Voltage Engineering: Theory and Practice	Mazen Abdel-Salam, Hussein Anis, Ahdab El-Morshedy, RoshdyRadwan	Marcel Dekeer, New York	Second	2000

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R-Tech - Elc - 26/145

Department of Electrical Engineering
B. Tech. Curriculum

Class	B. Tech. Semester-VIII
Course Code and Course Title	**Advanced Relaying, 0EEPE413**
Prerequisite/s	0EEPC402
Teaching Scheme: Lecture/Tutorial/Practical	03/00/00
Credits	03
Evaluation Scheme: ISE-I / MSE /ISE-II / ESE	10/30/10/50

Course Objectives: The course aims to:	
01	Introduce Necessity for Digital Protection
02	Understand the knowledge of different elements of digital power system protection.
03	Familiarize the knowledge of modern day's protection like microprocessor based relays and protective schemes for transmission lines and power apparatus.
04	Develop the hardware required for digital relaying and developments being done in this field.
05	Classify different algorithms required for digital protection

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
0EEPE413_1	**Explain** the various fundamental aspects of the digital computer relaying system (K^2)
0EEPE413_2	**Describe** the realization of the algorithms of microprocessor based overcurrent relay, distance relay. (K^2)
0EEPE413_3	**Identify** the computation techniques and algorithm for a transmission relaying and applications(K^2)
0EEPE413_4	**Apply** the various dynamic characteristics of digital relays for protection of transmission lines. (K^3)
0EEPE413_5	**Analyze** the various dynamic characteristics of digital relays for protection of Power transformer. (K^4)
0EEPE413_6	**Summarize** different advanced algorithm for digital relaying (K^4)

Course Contents:		
Unit 1	**Introduction of Digital Protection and Introduction to Computer Relaying:** Development and historical background, expected relay architecture, A-D converters, phase & amplitude, Comparator, substation computer hierarchy. Review of relaying practices: Review of mathematical basis for protective relaying algorithms: Fourier series, orthogonal expansions, Fourier transforms, Discrete Fourier transforms.	**06Hrs**
Unit 2	**Microprocessor Based Protective Relays**: Overcurrent, directional, impedance, reactance relays. Generalized mathematical expressions for distance relays, mho and offset mho relays, quadrilateral relay, microprocessor implementation of digital distance relaying algorithms	**08Hrs**
Unit 3	**Digital Protection of Apparatus, Transmission Line Relaying Algorithms**: Introduction, sources of error, relaying as parameter estimation, Symmetrical component distance relay, Protection of series compensated lines, current based differential schemes, composite voltage and current based schemes	**06Hrs**
Unit 4	**Protection of Transformers**: Fourier based algorithms, finite duration impulse response filter based algorithms, least square curve fitting based algorithms, flux restrained current differential relay.	**08Hrs**
Unit 5	**Hardware Organization Computers for Relaying**: substation environment, Industry environmental standards, counter measures against EMI, Redundancy and Backup System relaying and control: Measurement of frequency and phase, sampling clock synchronization, Application of phase measurements to static and dynamic state estimation, system monitoring.	**06Hrs**

HOD Electrical **Dean Academics** **Director** **Executive Director**

A. Tech E/e - 27/4/5

Unit 6	**Recent trends in Digital Relaying:** Development in new relaying principles-Travelling waves in single phase and three phase lines travelling waves due to faults, directional wave relay, Travelling wave distance relay, Differential Relaying with phasors, travelling wave differential relays, adaptive relaying fault location algorithms	**08Hrs**

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Power System Protection and Switchgear	Badri Ram and D.N. Vishwakarma	Tata McGraw-Hill Publishing Company	Third	2009
02	Fundamentals of Power System Protection	Y.G. Paithankar and S.R Bhide	Prentice-Hall of India	Fourth	2003
03	Digital protection, Protective Relaying from Electromechanical to Microprocessor	L. P. Singh	John Wiley & Sons	Second	1995

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Power System Protection Static Relays With Microprocessor Applications	T. S.MadhavRao	Tata McGraw Hill	First	1994
02	Digital Protection for Power Systems	A. T.Johns and S.K.Salman	Peter Peregrinos	First	1995
03	Computer Relaying for power Systems	A.G.Phake, JamesS.Thorp	John–Wiley and sons	First	2014
04	Protective relaying principles and applications	J .Lewis Blackburn, Marcel & Dekker	Dekker Incorporated, Marcel	Second	1987

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B.Tech - Ele - 28/45

Department of Electrical Engineering
B. Tech. Curriculum

Class	B. Tech. Semester-VIII
Course Code and Course Title	**0EEPE414, Computer Methods in Power Systems**
Prerequisite/s	0EEPC202, 0EEPC302
Teaching Scheme: Lecture/Tutorial/Practical	03/00/00
Credits	03
Evaluation Scheme: ISE I / MSE / ISE II/ ESE	10/30/10/50

Course Objectives: The course aims to:	
01	**Understand** the concept of network topology.
02	**Explain** methods for formation of impedance and admittance matrices.
03	**Study** numerical methods for power flow analysis.
04	**Introduce** simultaneous faults in power networks.
05	**Understand** two component method to analyze faults on the power networks.

Course Outcomes (COs): (Theory) Upon successful completion of this course, the student will be able to:	
0EEPE414_1	**Illustrate** rules of writing incidence matrices and methods of obtaining network matrices of an electrical network. (K^3)
0EEPE414_2	**Construct** incidence matrices of an electrical network. (K^3)
0EEPE414_3	**Compute** admittance and impedance matrices of an electrical network by applying appropriate method. (K^3)
0EEPE414_4	**Discuss** the data required and procedure of formulating load flow problem using computer technology and also calculate unknown parameters at buses of a power network by applying numerical methods. (K^3)
0EEPE414_5	**Derive** simultaneous faults on the power system by two-port network theory and determine parameters of power network under kinds of simultaneous faults. (K^4)
0EEPE414_6	**Analyze** faults occurs on the power system by two-component method and sketch sequence network diagram. (K^4)

Course Contents:		
Unit 1	**Network Topology** Introduction, Basic Principles in Power System Analysis, Elementary Graph Theory, Incidence Matrices, Connectivity, Primitive Network, Numerical Treatment Expected	**06 Hrs.**
Unit 2	**Computer Solution Methods Using the Admittance Matrix** Introduction, Formation of Y_{BUS} by Singular Transformation, Non-singular Transformation, inspection- Modeling of transmission lines, Modeling of transformer, Modeling of shunt elements, Modeling of loads, Modeling of generator internal impedance, Step by Step Algorithm for Formation of Y_{BUS}, Numerical treatment expected	**09 Hrs.**
Unit 3	**Computer Solution Methods Using the Impedance Matrix** Impedance matrix in shunt fault computations, impedance matrix algorithm, adding a radial impedance to the reference node, adding a radial branch to a new node, closing a loop to the reference, closing a loop not involving the reference, Numerical treatment expected	**07 Hrs.**
Unit 4	**Computer techniques for Load flow analysis** Introduction, Impact of computers, orientation of engineering problems to computers, Power Flow equation, Classification of buses, Operating constraints, Data for load flow, Modelling for Load Flow Studies, Numerical methods for load flow analysis.	**06 Hrs.**
Unit 5	**Simultaneous Faults** Simultaneous Faults by Two-Port Network Theory- Two port networks, interconnection of two port networks, simultaneous fault connection of sequence networks, series-series connection (Z-type faults), Parallel -parallel connection (Y-type faults), series-parallel connection (H-type faults), Simultaneous faults by matrix transformations- constraint matrix for Z-type faults, constraint matrix for Y-type and H-type faults	**07 Hrs.**

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B.Tech-Ee-29/45

Unit 6	**Analytical Simplifications** **Two Component Method** Shunt Faults- SLG Fault, LL Fault, DLG Fault, Three phase fault, Series Faults- 2LO Fault, 1LO Fault, Change in symmetry with two component calculations- phase shifting transformer relations, SLG faults with arbitrary symmetry, DLG faults with arbitrary symmetry, and series faults with arbitrary symmetry.	07 Hrs.

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Circuit Theory (Analysis and Synthesis)	A. Chakrabarti	Dhanpat Rai & Co.	First	2010
02	Advanced Power System Analysis & Dynamics	L.P. Singh	New Age International Publishers	Fifth	2008
03	Power System Analysis	Grainger, J.J. and Stevenson, W. D.	Tata McGraw-Hill Edition	First	1994
04	Computer Techniques and Models in Power Systems	K. Uma Rao	I.K. International Publishing House Pvt Ltd	Second	2014

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Analysis of Faulted Power Systems	Paul.M. Anderson	IEEE Press Power Systems Engineering Series	First	1973
02	Circuits Analysis of A,C. power system VOL-II	Edith Clarke	J. Wiley & sons, Incorporated, 1950	First	2006
03	Introduction to Matrices & Power System	R.Bruce Shipley	Wiley Eastern Ltd	First	2007
04	Computer methods in Power System Analysis	Stagg G.W. & E.L. Abiad	McGraw-Hill	Ninth	1983
05	Operation and Control in Power Systems	Prof. P. S. R. Murty	B.S. Publications	First	2008

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B. Tech. - 10 - 2015

Class	B. Tech. Semester-VIII
Course Code and Course Title	**0EEPE415, Power Quality and Harmonics**
Prerequisite/s	0EEPC302, 0EEPC304
Teaching Scheme: Lecture/Tutorial	03/00
Credits	03
Evaluation Scheme: ISE I / MSE / ISE II / ESE	10/30/10/50

Course Objectives: The course aims to:	
01	Get familiar with power quality issues.
02	Gain knowledge of harmonics and their sources
03	Suppress harmonics through active and passive filters.
04	Mitigate voltage sags and interruptions.
05	Learn harmonic measurement and power quality monitoring techniques.

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
0EEPE415_1	**Describe** different power quality related issues, causes and their effects on power system equipment. (K^2)
0EEPE415_2	**Classify** the harmonic in three phase and single phase circuit. (K^3)
0EEPE415_3	**Distinguish** the different methods for mitigation of voltage sags and interruptions. (K^4)
0EEPE415_4	**Evaluate** the different power quality monitoring techniques. (K^5)
0EEPE415_5	**Design** the filter for suppression of current harmonics. (K^6)

Course Contents:		
Unit 1	**Introduction to power quality:** What is power quality, power quality related issues in distribution system, loads and their characteristics, electromagnetic phenomena, power quality evaluation procedure,	**06 Hrs.**
Unit 2	**Voltage sag, interruptions and mitigation:** End user issues, ups system, Ferro-resonant transformers, super conducting storage devices, dynamic voltage restorer and application of DSTATCOM.	**08 Hrs.**
Unit 3	**Wiring and grounding:** Reasons for grounding, typical wiring and grounding problem, solution to wiring and grounding problem.	**07 Hrs.**
Unit 4	**Power quality monitoring:** Monitoring considerations, power quality measurement equipment, and assessment of power quality, power quality monitoring and standard.	**07 Hrs.**
Unit 5	**Fundamentals of harmonics:** Sources of harmonics, effect of harmonics, types and characterization, THDs, influence on power factor, interference with communication network, harmonic indices, and synthesis of harmonic waveform originating from non-linear loads with the help of Fourier analysis. Power definitions and components-single phase circuits and three phase circuits.	**06 Hrs.**
Unit 6	**Harmonic suppression filters:** Shunt passive filters, design considerations case studies, voltage/ current source active filters-types: shunt, series and hybrid types, comparison.	**08 Hrs.**

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B. Tech. Ele - 31 Jan

Text Books:					
Sr. No	Title	Author	Publisher	Edition	Year of Edition
1	Electrical Power System Quality	Roger C. Dugan, Mark F. McGranaghan, Surya Snatoso, H. Wayne Beaty	Tata McGraw -Hill	First	2012
2	Electrical Power System Quality	J. Arnillaga , D A Bradey& P S Bodger	John Wiley Sons	First	2000
3	Power System Harmonics	George J. Wakileh	Springer	First	2007
4	Power Quality Primer	Barry W. Kennedy	Mc Graw Hill	First	2000

Reference Books:					
Sr. No	Title	Author	Publisher	Edition	Year of Edition
1	Uninterrupted Power Supplies and Active filters	Ali Emadi, AbdolhorienNasiri&Stoy on B Bekiarov	CRC Press	Second	2010
2	Handbook of Power Quality	Angelo Baggini	John Wiley Sons	First	2008
3	Power Quality in Electrical Systems	Alexander Kusko & Marc T.Thompson	Mc Graw Hill	First	2017
4	Power Electronic Converter Harmonics	Derek A. Paice	IEEE Press	First	1997

HOD Electrical Dean Academics Director Executive Director

Department of Electrical Engineering
B. Tech. Curriculum

Class	B. Tech. Semester-VIII
Course Code and Course Title	**0EEPE416, Smart Grid**
Prerequisite/s	0EEPC208, 0EEPC303, 0EEPC308
Teaching Scheme: Lecture/Tutorial/Practical	03/00/00
Credits	03
Evaluation Scheme: ISE-I / MSE / ISE-II / ESE	10/30/10/50

Course Objectives: The course aims to:	
01	Introduce various aspects of the smart grid, including technologies, components, architectures and applications
02	Understand the power electronics devises in smart grid
03	Discuss issues and challenges involved in smart grid
04	Discuss Energy Storage devices
05	Understand Electric and Hybrid Electric Vehicles
06	Explain concepts of Micro-grid

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
0EEPE416_1	**Describe** the various aspects of the smart grid, including technologies, components, architectures and applications. (K^2)
0EEPE416_2	**Apply** Power Electronics circuits in Smart Grid. (K^3)
0EEPE416_3	**Illustrate** the issues and challenges involved in smart grid. (K^3)
0EEPE416_4	**Explain** smart distribution systems & various energy storage devices. (K^3)
0EEPE416_5	**Explain** Electric and Hybrid Electric Vehicles (K^3)
0EEPE416_6	**Analyze** issues of interconnection, protection & control of micro-grid. (K^4)

Course Contents:		
Unit 1	**Introduction to Smart Grid:** Concept, definitions, difference between conventional and smart grid, issues & challenges in smart grid implementation, overview of the technologies required for the Smart Grid.	**05 Hrs.**
Unit 2	**Power Electronics in Smart Grid:** Introduction, Multilevel Inverter (MLI) concept, types of multilevel inverters, diode-clamped multilevel inverter, flying-capacitor multilevel inverter, cascade multilevel inverter, applications, switching device current, DC-link capacitor voltage balancing, applications of MLI, and comparisons of multilevel inverters.	**08 Hrs.**
Unit 3	**Renewable energy integration:** Carbon footprint & its effects, renewable resources: wind and solar, micro-grid architecture, modeling PV and wind systems, tackling intermittency, issues of interconnection of RES with smart grid, protection & control of micro-grid, islanding	**07 Hrs.**
Unit 4	**Smart Distribution Systems and Energy Storage:** smart meters & its functions, real time pricing, smart appliances, automatic meter reading (AMR), demand response issues, energy storage technologies: batteries, fuel cell and hydrogen electrolyser, flywheels, superconducting magnetic energy storage systems, super / ultra-capacitors, plug in hybrid electric vehicles (PHEV), compressed air, pumped hydro. etc	**08 Hrs.**
Unit 5	**Introduction of Electric and Hybrid Electric Vehicles (EVs & HEVs):** A brief history of EV & PHV (Plug-in Hybrid Vehicle), basics of EV & HEV, PHEV (Plug-in Hybrid Electric Vehicles), Architectures of EV & HEV, HEV fundamentals, vehicle-to-grid technology, EV charging stations	**06 Hrs.**
Unit 6	**Micro-grids:** Concept of micro-grid, need and applications of micro-grid, formation of micro-grid, issues of interconnection of micro-grid, protection and control of micro-grid,	**08 Hrs.**

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	organic and plastic solar cells, thin film solar cells, variable speed wind generators, fuel cells & its applications, micro turbines, captive power plants, integration of renewable energy sources, Recent trends in Smart Grid.	

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Smart Grid: Technology and Applications	Janaka Ekanayake, Kithsiri Liyanage, et.al.	Wiley	First	2012
02	Power Electronics Circuits, Devices, and Applications	Muhammad H. Rashid	Pearson Publication	Sixth	2009
03	The Advanced Smart Grid: Edge Power Driving Sustainability	Andres Carvallo, John Cooper	Artech House	Second	2015
04	Grid-connected Solar Electric Systems: The Earthscan Expert Handbook for Planning, Design and Installation	Geoff Stapleton, Susan Neill	Earthscan Publication, London, New York	First	2012
05	Smart Grids	Jean Claude Sabonnadière, Nouredine Hadjsaïd	Wiley Blackwell	First	2012

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Smart Grid: Fundamentals of Design and Analysis	James Momoh	A John Wiley & Sons, Inc. Publication	First	2012
02	Integration of Green and Renewable Energy in Electric Power Systems	Ali Keyhani, Mohammad N. Marwali, Min Dai	Wiley	First	2010
03	Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals, Theory & Design	Mehrdad Ehsani, Yimin Gao, Sebastien E. Gay, Ali Emadi	CRC Press	First	2005
04	Electric Vehicle Technology: Explained	James Larminie, John Lowry	Wiley	Second	2015
05	Microgrids and other Local Area Power and Energy Systems	Alexis Kwasinski, Wayne Weaver, Robert S. Balog	Cambridge University Press	First	2016
06	Battery Systems Engineering	Christopher D. Rahn, Chao-Yang Wang	Wiley	First	2013
07	Recent literature on Smart Grid				

HOD Electrical Dean Academics Director Executive Director

R.Tech. - Elec - 34145

Class	B. Tech. Semester-VIII
Course Code and Course Title	**0EEPE417, Real time control of Power Systems**
Prerequisite/s	0EEPC208, 0EEPC301, 0EEPC308
Teaching Scheme: Lecture/Tutorial/Practical	03/00/00
Credits	03
Evaluation Scheme: ISE I / MSE / ISE II / ESE	10/30/10/50

Course Objectives:	
01	To propose state estimation application to power system.
02	To propose generation control to maintain frequency.
03	To introduce SCADA for power system grid operation and control.
04	To apply reactive control methods to maintain voltage.
05	To introduce real time systems to monitor power system operation.

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
0EEPE417_1	**Discuss** the terms and State estimation models of power system. (K^2)
0EEPE417_2	**Describe** SCADA for power system application.(K^2)
0EEPE417_3	**Apply** state estimation techniques to power system.(K^3)
0EEPE417_4	**Use** analytical methods to process data and monitor system. (K^3)
0EEPE417_5	**Analyze** the security and contingency conditions of power system. (K^4).
0EEPE417_6	**Estimate** the various operational issues in real time control of power system. (K^4)

Course Contents:		
Unit 1	**An Introduction to State Estimation in Power Systems:** Introduction, Power System State Estimation, Weighted Least Square Estimation (WLS-SE). SE of AC networks Types of measurements – Linear WLS–SE theory – DC Load flow based WLS–SE – Linearized model of WLS–SE of Non–linear AC power systems – typical results of SE on an AC network.	**08 Hrs.**
Unit 2	**State Estimation in Power Systems:** Types of SE. Detection and Identification of bad measurements – Network Observability and Pseudo–measurements – observability by Graphical technique and triangularization approach – Optimal meter placement – Application of Power System SE The Use of Phasor Measurement Units (PMUS).Application of Power Systems State Estimation Importance of Data Verification and Validation. Power System Control Centres	**08 Hrs.**
Unit 3	**Security Analysis of Power System:** Concept of security – Security analysis and monitoring – factors affecting Power System Security – Contingency Analysis for Generator and Line Outages by Fast Decoupled Inverse Lemma–based approach – Network Sensitivity factors. Contingency selection	**07 Hrs.**
Unit 4	**SCADA Functions:** Introduction to SCADA: Grid Operation & Control, Difficulties in operating the large power systems manually, need for going to SCADA operation, advantages of SCADA operation. Lay out of substation / Generating Station, Main Equipment in Sub Station/ Generating Station, Instrument Transformers and their importance in measurements and protection, important parameters necessary for Grid operation: Analog Points (MW, MVar, Tap Position, Voltage, Frequency), Status Points (CB Status, Isolator Status, SOE Points), Alarms. Hardware required to get these parameters to RTU: Transducers & their connectivity.	**08 Hrs.**

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Unit 5	**Analytical Methods:** Modeling and identification of power system components, real time data processing, real time monitoring using phasor measurement	**06 Hrs.**
Unit 6	**Recent Trends in Real time control:** State Load Dispatch Center (SLDC): Inter Connectivity Of Sub-LDCs & SLDCs, Hierarchy of Data Transfer, Functions & Responsibilities of SLDC, Real Time Operation carried at SLDC.	**05 Hrs.**

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
1.	Power operation and control	P.S.R.Murthy	BS Publication	Second	2012
2.	Power generation operation and control	Wood, Wollenberg	Wiley India	Second	2010
3.	Power System Generation, Operation and Control	A.J Wood and B.F Wollenberg.	John Wiley and Sons.	First	1996
4.	Computer aided system analysis and control	A.K. Mahalanabis, D.P. Kothari, S.I. Ahson.	Tata McGraw-Hill	First	1988

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
1.	Power system operation & control	K. Uma rao	Wiley India	First	2013
2.	Power System Operation and Control	S. Sivanagaraju	Pearson Kindle Edition	First	2009
3.	Electric power distribution	A.S.Pabla	Tata McGraw-Hill Education,	First	2004
4.	Reactive power control of electric power system	J.E.Miller	Wiley	First	1982

HOD Electrical Dean Academics Director Executive Director

ATU - Ele - 36145

Class	B. Tech. Semester-VIII
Course Code and Course Title	**0EEPE418, Energy Audit and Management**
Prerequisite/s	0EEPC205
Teaching Scheme: Lecture/Tutorial/Practical	03/00/00
Credits	03
Evaluation Scheme: ISE I / MSE / ISE II / ESE	10/30/10/50

Course Objectives The course aims to:	
01	Understand importance of energy and energy security.
02	Understand impact of use energy resources on environment and emission standards, different operating frame work.
03	Follow format of energy management, energy policy.
04	Learn various tools of Demand Control.
05	Calculate economic viability of energy saving option

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
0EEPE418_1	**Identify** various forms of Energy. (K2)
0EEPE418_2	**Describe** concept of demand side management. (K2)
0EEPE418_3	**Explain** overall Energy Scenario in electrical system. (K3)
0EEPE418_4	**Explain** Energy Auditing and various instruments for energy audit. (K3)
0EEPE418_5	**Analyze** various parameter of energy audit for different systems.(K4)

Course Contents		
Unit 1	**Energy Scenario** Commercial and Non-Commercial Energy, Primary Energy Resources, Commercial Energy Production, Final Energy Consumption, Energy Needs of Growing Economy, Long Term Energy Scenario, Energy Pricing, Energy Sector Reforms, Energy and Environment, Air Pollution, Climate Change, Energy Security, Energy Conservation and its Importance, Energy Strategy for the Future, Energy Conservation Act-2001 and its Features.	**6Hrs.**
Unit 2	**Basic of Energy and its various forms** Electricity basics - DC & AC currents, Electricity tariff, Load management and Maximum demand control, Power factor. Thermal basics -Fuels, Thermal energy contents of fuel, Temperature & Pressure, Heat capacity, Sensible and Latent heat, Evaporation, Condensation, Steam, Moist air and Humidity & Heat transfer, Units and conversion.	**6Hrs.**
Unit 3	**Energy Management & Audit** Definition, Energy audit- need, Types of energy audit, Energy management (audit) approach-understanding energy costs, Bench marking, Energy performance, Matching energy use to requirement, Maximizing system efficiencies, Optimizing the input energy requirements, Fuel and energy substitution, Energy audit instruments	**6 Hrs.**
Unit 4	**Energy Conservation in Applications** Motive power (motor and drive system). b) Illumination c) Heating systems (boiler and steam systems) c) Ventilation(Fan, Blower, Compressors) and Air Conditioning systems d) Pumping System e) Cogeneration and waste heat recovery systems f) Utility industries (T and D Sector)g) Diesel generators	**8Hrs.**
Unit 5	**Demand Management** Supply side management (SSM), various measures involved such as use of FACTS, VAR Compensation, Generation system up gradation, constraints on SSM. Demand side	**10Hrs.**

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B Tech-Ele - 27/45

	management (DSM), advantages and Barriers, implementation of DSM, areas of development of demand side management in agricultural, domestic and commercial consumers. Demand management through tariffs (TOD). Power factor penalties and incentives in tariff for demand control. Apparent energy tariffs. Role of renewable energy sources in energy management, direct use (solar thermal, solar air conditioning, biomass) and indirect use (solar, wind etc.)	
Unit 6	**Financial Management and Case Studies** Investment-need, Appraisal and criteria, Financial analysis techniques-Simple payback period, Return on investment, Net present value, Internal rate of return, Cash flows, Risk and sensitivity analysis; Financing options, Energy performance contracts and role of ESCOs. Energy audit case studies such as IT sector, Textile, Municipal corporations, Educational Institutes, T and D Sector and Thermal Power stations.	**6 Hrs.**

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Energy Management, Audit and Conservation	Barun Kumar de	Vriand Publication	Second	2007
2	Generation and utilization of Electrical Energy	B.R. Gupta	S. Chand Publication	First	1983
3	Energy Auditing made simple	Balasubramanian	Bala Consultancy Services	Second	2013

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
1	Success stories of Energy Conservation	Bureau of Energy Efficiency	Bureau of Energy Efficiency	-	-
2	Energy Management	W.R. Murphy and Mackay	Reed Elsevier India Private Limited	Second	2009
3	Utilization of electrical energy	S.C. Tripathi	Tata McGraw Hill	First	1991

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Department of Electrical Engineering
B. Tech. Curriculum

Class	B. Tech. Semester-VIII
Course Code and Course Title	**0EEAC419, Professional Skill -IV**
Prerequisite/s	-
Teaching Scheme: Lecture/Tutorial/Practical	02/00/00
Credit	--
Evaluation Scheme: ISE	Grade

Course Objectives The course aims to:	
1	Introduce Business aspects to the students.
2	Develop and strengthen the entrepreneurship skills.
3	Formulate the proposal for the product.
4	Know the sources of help and support available for stating a small scale industry.
5	Develop a broad vision about the business.

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
0EEAC419_1	**Explain** the nature and function of entrepreneurship (K^2)
0EEAC419_2	**Describe** Concept and Characteristics of Small Scale Industry (K^2)
0EEAC419_3	**Choose** institutional support scheme according to business plan (S^2).
0EEAC419_4	**Select** Finance and marketing solutions for Business (S^2)
0EEAC419_5	**Identify** business opportunities and common pitfalls during the entrepreneurial process (S^3)
0EEAC419_6	**Construct** Business plan (S^4)

Course Contents		
Unit 1	**Introduction to economics** Concept, knowledge and skills requirement; characteristic of successful entrepreneurs; role of entrepreneurship in economic development; entrepreneurship process; factors impacting emergence of entrepreneurship; managerial vs. entrepreneurial approach and emergence of entrepreneurship	**7 Hrs**
Unit 2	**Starting the venture** Generating business idea – sources of new ideas, methods of generating ideas, creative problem solving, opportunity recognition; environmental scanning, competitor and industry analysis; feasibility study: market feasibility, technical/operational feasibility, financial feasibility; drawing business plan; preparing project report; presenting business plan to investors.	**10 Hrs**
Unit 3	**Functional Plans** -Functional plans: marketing plan – marketing research for the new venture, steps in preparing marketing plan, contingency planning; organizational plan: form of ownership, designing organization structure, job design, manpower planning; Financial plan: cash budget, working capital, Performa income statement Performa cash flow, perform balance sheet, break even analysis.	**9 Hrs**
Unit 4	**Institutional support to Entrepreneurship** Role of Directorate of Industries, District Industries, Centers (DICs), Industrial Development Corporation (IDC), State Financial corporation (SFCs), Commercial banks Small Scale Industries Development Corporations (SSIDCs), Khadi and village Industries Commission (KVIC), National Small Industries Corporation (NSIC), Small Industries Development Bank of India (SIDBI)	**2 Hrs**

HOD Electrical **Dean Academics** **Director** **Executive Director**

B.Tech-Ele-39145

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
1	The Dynamics of Entrepreneurial Development and Management	Vasant Desai	Himalaya Publishing House	Sixth	2018
2	Small-Scale Industries and Entrepreneurship – In the twenty-first century	Vasant Desai	Himalaya Publishing House	Ninth	2011

Reference Books:-

Sr. No	Title	Author	Publisher	Edition	Year of Edition
1	1 Entrepreneurship	Dean Shepherd, Michael Peters	Tata McGraw Hill Edition Pvt Ltd	Sixth	2008
2	Entrepreneurship : Successfully Launching New Ventures	Barringer and Ireland	Pearson	Ninth	2006
3	All In Startup : Launching a new Idea when Everything Is on the Line	Diana Kander	Wiley	Third	2014
4	Disciplined Entrepreneurship : 24 Steps to a Successful Startup	Bill Aulet	Wily	Third	2013

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Class	B. Tech. Semester-VIII
Course Code and Course Title	**0EEPR455, Project Phase II**
Prerequisite/s	All relevant subjects
Teaching Scheme: Lecture/Practical/Tutorial	00/08/00
Credits	08
Evaluation Scheme: ISE / ESE	100/100

Course Objectives: The course aims to:	
01	Apply the knowledge of engineering and science to project.
02	Determine & Develop the project hardware.
03	Apply the knowledge and skills to do experimentations and testing of project.
04	Apply engineering and management principles to project.
05	Communicate effectively Engage in life-long learning.

Course Outcomes (COs):- After successful completion of this course, the student will be able to,	
0EEPR455_1	Evaluate the output by experimentation with systems/components by applying the knowledge of engineering and science and demonstrate the understanding the responsibilities relevant to the professional engineering practices with the previous work(K^4,S^3)
0EEPR455_2	Evaluate, compare and summarize the results by applying the knowledge and skills with interpretation of data for the testing, control of designed electrical system using modern engineering and IT tools. (K^5, S^3)
0EEPR455_3	Design, Develop the hardware/software solution to the problem determined with concerns of societal, environmental and Industrial needs with validation and justification of designed solution. (K^6, A^3)
0EEPR455_4	Function effectively as an individual or as a team for understanding of the engineering and management principles and apply these to manage projects maintaining professional and ethical principles. (S^3 A^2)
0EEPR455_5	Communicate effectively on complex engineering activities, write effective reports, design documentation and make effective presentations, (S^3)
0EEPR455_6	Engage in independent and life-long learning in the broadest context of technological change(A^3)

Course Contents:

The assembly of components shall be done in project phase II. The testing shall be completed and necessary changes, if required shall be made.

Demo-II:

The project should be presented before the external examiner in working condition along with documents.

Participation in state/ National level project competition. A journal/conference paper published/ presented on project work is expected. The project batch shall be eligible to get more than 80% of marks in term work/ external examination, if above conditions are satisfied.

HOD Electrical **Dean Academics** **Director** **Executive Director**

Department of Electrical Engineering
B. Tech. Curriculum

Class	B. Tech. Semester-VIII
Course Code and Course Title	**0EEES456, Software Packages**
Prerequisite/s	0BSES112, 0BSES161, 0EEES254, 0EEPC258
Teaching Scheme: Lecture/Tutorial/Practical	00/00/02
Credits	01
Evaluation Scheme: ISE / ESE	50/50

Course Objectives:
The course aims to:

01	Introduce various software packages useful for industrial applications.
02	Identify the significance of software packages in Electrical Engineering.
03	Design electric circuits and systems using various software tools.
04	Study simulated system output on the basis of conceptual understanding.
05	Motivate the students to apply the knowledge of software packages to solve the Electrical Engineering problems.

Course Outcomes (COs):
Upon successful completion of this course, the student will be able to:

0EEES456_1	**Introduce** various software packages applicable for Electrical Engineering industrial applications.(K^2)
0EEES456_2	**Apply** the conceptual understanding to analyze the power system issues using software packages. (K^3)
0EEES456_3	**Develop** the power system models or circuits using different software tools. (K^4)
0EEES456_4	**Execute** system performance using advanced software packages. (S^2)
0EEES456_5	**Design** Electrical Engineering systems with advanced open source software packages effectively. (S^2)
0EEES456_6	**Perform** individually or in a team to solve open ended problems in Electrical Engineering and communicate effectively to represent. (A^2)

LIST OF EXPERIMENTS

*Students are expected to solve following Electrical Engineering problems using any industrial useful software and open source software tools such as MATLAB/Simulink, ETAP, Power World Simulator, SCILAB, SCICOS, KiCAD, E-3 Series, Part Sim, Power e-Sim, X- Circuit etc.

Expt. No.	Title of the Experiments
1	Active- Reactive power flow study for π network
2	Three phase transmission line Fault analysis(MATLAB)
3	Implementation of Renewable Energy System. (Wind/ Solar)
4	Analysis of three phase AC motor.(N-T Characteristics)
5	Load flow analysis
6	Short circuit analysis
7	Three phase transmission line Fault analysis (ETAP)
8	Simulation of Buck-Boost converters
9	Three phase diode bridge rectifier
10	Three phase PWM Inverter
11	Power Factor Correction (PFC) Circuit

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B.Tech-Ele 42/45

Text Books:					
Sr. No	Title	Authors	Publisher	Edition	Year of Edition
1.	MATLAB: An Introduction with Applications	Rao V. Dukkipati	New Age International Publishers	First	2010
2.	Essential MATLAB for Engineers and Scientists	Brian Hahn, Valentine, Daniel T.	Academic Press	Fifth	2013
3.	MATLAB & Simulink For Engineers	Agam Kumar Tyagi	Oxford	First	2012
4.	Introduction to PSpice Using OrCAD for Circuits and Electronics	Muhammad Rashid	Pearson	Third	2003

Reference Books:					
Sr. No	Title	Authors	Publisher	Edition	Year of Edition
1.	MATLAB: A Practical Approch	Stormy Attaway	Elsevier	Second	2009
2.	SPICE for Circuits and Electronics Using PSPICE	Muhammad Rashid	Prentice Hall	Second	1995
3.	Getting Started with ETAP ETAP® 14.0.0 (Demo)	--	Operation Technology, Inc. (https://www.udemy.com)	-	2015
4.	ETAP Resource Center/ Tutorials	--	https://etap.com	--	--

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Class	B. Tech. Semester-VIII
Lab Code and Lab Title	**0EEPC457, Design and Estimation Laboratory**
Prerequisite/s	0EEPC205, 0EEPC401, 0EEPC451
Teaching Scheme: Lecture/Tutorial/Practical	00/00/02
Credits	01
Evaluation Scheme: ISE / ESE	50/00

Course Outcomes: Upon successful completion of this Lab, the student will be able to:	
0EEPC457_1	**Choose** appropriate steps in Electrical Design Process and determine scope of Electrical Design. (K3)
0EEPC457_2	**Interpret** the various components of an Electrical plan, including general and specialize loads, lighting systems and distribution systems.(K4)
0EEPC457_3	**Estimate** residential and Industrial wiring plan.(K4)
0EEPC457_4	**Use** software tools for Electrical Planning.(S3)
0EEPC457_5	**Develop** report on case study.(S3)
0EEPC457_6	**Function** effectively as an individual and as team member.(A3)

List of Experiment:

Expt. No.	Title of Experiment
1.	Introduction to Electrical Planning software.
2.	Case Study on Electrical Domestic Wiring
3.	A. Site Visit
4.	B. Parameter calculation C. Layout drawing
5.	Case Study on Industrial Earthing
6.	A. Site Visit
7.	B. Parameter calculation C. Layout drawing
8.	Case Study on Street Light
9.	A. Site Visit
10.	B. Parameter calculation C. Layout drawing

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
1	Electrical Design, estimating & Costing	Raina, K. B. and Bhattacharya,S.K	New Age International (p) Limited, New Delhi	Fourth	2014
2	A Course in Electrical Installation, Estimating and Costing	J.B Gupta, S.K Kataria and Sons,	S. Chand	Second	2013.
3	Electrical Estimating & costing	Uppal, S L	New Age International (p) Limited, New Delhi	Second	2010
4	Electrical Design: Estimation & Costing	Raina & Battacharya,	Wiley Eastern	Second	2009.

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
1	Estimating and Costing	S.K Bhattacharya	Tata McGraw Hill	Third	2006.
2	Estimating and Costing	S.L Uppal,	Khanna Publishers	Second	2004.
3	Electrical Estimating and Costing	N Alagappan	TMH,	Second	2006
4	I.E. rules for wiring, Electricity supply act-1948.	Bureau of Indian Standards	Electricity supply act	--	1948

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B.Tech-E/e 44/45

Class	B. Tech. Semester-VIII
Lab Code and Lab Title	**0EEPC458, High Voltage Engineering Laboratory**
Prerequisite/s	0EEPC253, 0EEPC452
Teaching Scheme: Lecture/Tutorial/Practical	00/00/02
Credits	01
Evaluation Scheme: ISE / ESE	50/00

Course Objectives: The course aims to:	
01	Get familiar with measurement of insulation strength of dielectric materials
02	Understand construction and working of impulse generator
03	Understand field mapping using electrolyte tank
04	Observe breakdown voltage of air for DC & AC high voltage supply
05	Measure breakdown voltage of transformer oil

Course Outcomes (COs):- After successful completion of this course, the student will be able to,	
0EEPC458_1	**Illustrate** generation and measurement of high voltage and current (K^4)
0EEPC458_2	**Demonstrate** electrical breakdown voltage of air & transformer oil (S^3)
0EEPC458_3	**Implement** field mapping using Electrolyte Tank (S^3)
0EEPC458_4	**Demonstrate** insulation strength of any solid dielectric material, cables (S^3)
0EEPC458_5	**Communicate** effectively, both orally and in writing journals (S^3)
0EEPC458_6	**Follow** professional and ethical principles during laboratory work (A^3)

Expt. No.	Title of Experiment
1	To study & draw of impulse wave shape of sample impulse wave
2	To study of 5-stage, 150kV, and 225J impulse generator and to measure wave shape of impulse wave
3	Measurement of DC breakdown voltage of air, using sphere gap assembly
4	Measurement of AC breakdown voltage of air, using sphere gap assembly
5	To determine breakdown voltage of transformer oil
6	Field mapping using electrolyte tank
7	5 kV AC Insulation Test
8	To Measurement of Insulation Resistance by Megger
9	Simulation of voltage doubler circuit for generation of high DC voltages using MATLAB
10	Simulation of cockroft walton voltage multiplier circuit for generation of high voltages using MATLAB

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