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DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

4 Years B.Tech. (Electrical & Electronics Engineering) Course Structure : (2020-21)

I YEAR I SEMESTER

S. No.	Subject Code	Course Category	Subject Title	Periods per week			C
				L	T	P	
1		BSC	Mathematics-I	3	0	0	3
2		BSC	Engineering Chemistry	3	0	0	3
3		HSMC	Communicative English - I	3	0	0	3
4		ESC	Electro Magnetic Fields	1	0	4	3
5		ESC	Basic Electrical and Electronics Engineering	3	0	0	3
6		BSC	Engineering Chemistry Laboratory	0	0	3	1.5
7		ESC	Basic Electrical and Electronics Engineering Laboratory	0	0	3	1.5
8		ESC	Electrical Engineering Workshop	0	0	3	1.5
TOTAL CREDITS							19.5

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DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

4 Years B.Tech. (Electrical & Electronics Engineering) Course Structure : (2020-21)

I YEAR II SEMESTER

S. No.	Subject Code	Course Category	Subject Title	Periods per week			C
				L	T	P	
1		BSC	Mathematics-II	3	0	0	3
2		BSC	Applied Physics	3	0	0	
3		ESC	Fundamentals of Computer Programming	3	0	0	3
4		ESC	Electrical Circuit Analysis	3	0	0	3
5		ESC	Engineering Graphics	1	0	4	3
6		BSC	Applied Physics Laboratory	0	0	3	1.5
7		ESC	Fundamentals of Computer Programming Laboratory	0	0	3	1.5
8		HSMC	Communicative English Laboratory	0	0	3	1.5
9		MC	Environmental Science	2	0	0	0
TOTAL CREDITS							19.5

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DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

4 Years B.Tech. (Electrical & Electronics Engineering) Course Structure : (2020-21)

II YEAR I SEMESTER

S. No.	Course Type	Course Title	Periods per week			C	Scheme of Examination Maximum Marks		
			L	T	P		Int.	Ext.	Total
1	BSC	Mathematics – III	3	0	0	3	30	70	100
2	PCC	Fundamentals of Electronic Devices and circuits	3	0	0	3	30	70	100
3	PCC	Electrical Circuit Analysis –II	3	0	0	3	30	70	100
4	PCC	DC Machines and Transformers	3	0	0	3	30	70	100
5	PCC	Electrical measurements	3	0	0	3	30	70	100
6	PCC	Electrical Circuits Lab	0	0	3	1.5	50	50	100
7	PCC	Electrical measurements and machines lab-I	0	0	3	1.5	50	50	100
8	PCC	Fundamentals of Electronic Devices and circuits Lab	0	0	3	1.5	50	50	100
9	SC	Skill oriented course- Design of Electrical Circuits using Engineering Software Tools	2	0	0	2	-	50	50
10	MC	Constitution of India	2	0	0	0	30	70	100
TOTAL			17	1	11	21.5	330	620	950

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DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

4 Years B.Tech. (Electrical & Electronics Engineering) Course Structure : (2020-21)

II YEAR II SEMESTER

S. No.	Course Type	Course Title	Periods per week			C	Scheme of Examination Maximum Marks		
			L	T	P		Int.	Ext.	Total
1	ESC	Introduction to Python Programming	3	0	0	3	30	70	100
2	ESC	Digital Electronics	3	0	0	3	30	70	100
3	PCC	Power systems-1	3	0	0	3	30	70	100
4	PCC	Induction and Synchronous Machines	3	0	0	3	30	70	100
5	BSC	Managerial Economics & Financial Analysis	3	0	0	3	30	70	100
6	ESC	Python Programming Lab	0	0	3	1.5	50	50	100
7	PCC	Electrical measurements and machines lab-II	0	0	3	1.5	50	50	100
8	ESC	Digital Electronics Lab	0	0	3	1.5	50	50	100
9	SC	Skill oriented course -IoT Applications of Electrical Engineering	0	1	2	2	-	50	50
TOTAL			15	1	11	21.5	300	550	850

***** At the end of II year II semester, students must complete summer internship**

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DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

4 Years B.Tech. (Electrical & Electronics Engineering) Course Structure : (2020-21)

HONORS DEGREE COURSES

SI.NO	ENERGY SYSTEMS	POWER SYSTEMS	CONTROL SYSTEMS	POWER ELECTRONICS	L	T	P	C
1	Solar energy	Deregulated Power Systems	Digital control systems	Advanced power electronic converters	4	0	0	4
2	Wind Energy	Advanced power system protection	PLC & Automation	Industrial Electronics				
3	Energy Storage Devices	Design of Substations	Robust control	Analysis of inverters				

NPTEL COURSES FOR HONORS DEGREE

SI.NO	NAME OF THE COURSE	LINK	DURATION	CREDITS
1	Control and Tuning Methods in Switched Mode Power Converters (IITKGP)	https://onlinecourses.nptel.ac.in/noc21_ee104/preview	12 weeks	4
2	Applied Electromagnetics For Engineers (IITK)	https://nptel.ac.in/courses/108/104/108104099/	12 weeks	4
3	Advances in UHV Transmission and Distribution (IISc)	https://nptel.ac.in/courses/108/108/108108099/	08 weeks	2
4	Introduction to Smart Grid (IITR)	https://nptel.ac.in/courses/108/107/108107113/	08 weeks	2

NOTE:

1. Students have to acquire 16 credits with minimum one subject from each pool.
2. Concerned BOS can add or delete the subjects as per the decision of the board.
3. Compulsory MOOC/NPTEL courses for 04 credits (02 courses @ 2 credits each.
4. For MOOC/NPTEL courses, depending on the availability of the courses in that semester, the student may choose subjects other than the ones mentioned above after approval of BOS chairman.

MINOR DEGREE COURSES

SI.NO	NAME OF THE COURSE	L	T	P	C
1	Electrical Energy and Its Applications	4	0	0	4
2	Electrical design estimation and costing				
3	Introduction to electrical power systems				
4	Principles of power electronics and its applications				
5	Electrical measuring instruments				
6	Electrical machines				
7	Energy management				
8	Alternative energy sources				

NPTEL COURSES FOR MINOR DEGREE

SI.NO	NAME OF TE COURSE	LINK	DURATION	CREDITS
1	Electric vehicles and renewable energy (IIT MADRAS)	https://onlinecourses.nptel.ac.in/noc21_ee112/preview	12 weeks	4
2	Fundamentals of electrical engineering (IITKGP)	https://nptel.ac.in/courses/108/105/108105112/	12 weeks	4
3	Electrical Distribution System Analysis (IITR)	https://nptel.ac.in/courses/108/107/108107112/	08 weeks	2
4	Dc Microgrid and Control System (IITR)	https://nptel.ac.in/courses/108/107/108107143/	08 weeks	2

NOTE:

1. A student can opt 04 subjects from 08 subjects @ 04 credits per subject
2. Concerned BOS can add or delete the subjects as per the decision of the board.
3. Compulsory MOOC/NPTEL courses for 04 credits (02 courses @ 2 credits each.
4. For MOOC/NPTEL courses, depending on the availability of the courses in that semester, the student may choose subjects other than the ones mentioned above after approval of BOS chairman.

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III YEAR I SEMESTER

S. No.	Course Type	Course Title	Periods per week			C	Scheme of Examination Maximum Marks		
			L	T	P		Int.	Ext.	Total
1	PCC	Control Systems	3	0	0	3	30	70	100
2	PCC	Power systems - II	3	0	0	3	30	70	100
3	PCC	Power electronics	3	0	0	3	30	70	100
4	PEC	**Professional Elective - I**	3	0	0	3	30	70	100
		Special Electrical Machines							
		Electrical Distribution Systems							
		High Voltage Engineering							
		Digital Control Systems							
5	OEC	**Open elective – I**	3	0	0	3	30	70	100
6	SAC	English for Career	1	0	2	2	50	50	100
7	PCC	Control systems laboratory	0	0	3	1.5	50	50	100
8	PCC	Power electronics laboratory	0	0	3	1.5	50	50	100
9	MC	IPR and Patents	2	0	0	0	30	70	100
10	PR	Summer internship/ Mini Project-I	0	0	3	1.5	100	0	100
		TOTAL	**18**	**0**	**11**	**21.5**	**430**	**570**	**1000**

***** At the end of II year II semester, students must complete summer internship. This will be considered in III-I for 1.5 credits.**

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III YEAR II SEMESTER

S. No.	Course Type	Course Title	Periods per week			C	Scheme of Examination Maximum Marks		
			L	T	P		Int.	Ext.	Total
1	PCC	Switchgear and protection	3	0	0	3	30	70	100
2	PCC	Power system analysis	3	0	0	3	30	70	100
3	PCC	Microprocessors & Micro controllers and applications	3	0	0	3	30	70	100
4	PEC	Power system operation and control **(Professional Elective – II)**	3	0	0	3	30	70	100
		Power semiconductor drives							
		Flexible AC transmission systems							
		Extra high voltage transmission							
5	OEC	**Hybrid and Electric Vehicles (Open elective – II)**	3	0	0	3	30	70	100
		Fundamentals of databases	3	0	0	3	30	70	100
		Internet of things and it's applications	3	0	0	3	30	70	100
		Operations management	3	0	0	3	30	70	100
		Solid waste management	3	0	0	3	30	70	100
		Introduction to MEMS	3	0	0	3	30	70	100
		Open Pit Slope Analysis and Design	3	0	0	3	30	70	100
		Basic Concepts in Petroleum Drilling Engineering	3	0	0	3	30	70	100
6	SAC	Optimization through electrical software	1	0	2	2	-	50	50
7	PCC	Microprocessors and Microcontrollers laboratory	0	0	3	1.5	50	50	100
8	PCC	Electrical simulation laboratory	0	0	3	1.5	50	50	100
9	PCC	Power systems laboratory	0	0	3	1.5	50	50	100
10	MC	Quantitative Aptitude and Reasoning	2	0	0	0	30	70	100
		TOTAL	**18**	**0**	**11**	**21.5**	**330**	**620**	**950**

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IV YEAR I SEMESTER

S. No.		Course Type	Course Title	Periods per week			C	Scheme of Examination Maximum Marks		
				L	T	P		Int.	Ext.	Total
1		PEC	**Professional Elective - III**	3	0	0	3	30	70	100
			Grid integration of renewable energy sources							
			Smart grid communication and cyber security							
			Solar PV and micro energy technologies							
			Energy audit, conservation and management.							
2		PEC	**Professional Elective - IV**	3	0	0	3	30	70	100
			Power quality							
			Power system reforms							
			Utilization of electrical energy							
			Programmable Logic Controllers and Applications							
3		PEC	**Professional Elective - V**	3	0	0	3	30	70	100
			Power Converters for Battery Charging							
			Energy management systems and SCADA							
			Switched mode power converters							
			High voltage DC transmission							
4		OEC	**Open elective – III**	3	0	0	3	30	70	100
5		OEC	**Open elective – IV**	3	0	0	3	30	70	100
6		HSSE	Universal Human values II-Understanding Harmony	3	0	0	3	30	70	100
7		SAC	Simulation studies on electromagnetic transients software	1	0	2	2	-	50	50
8		PR	Industrial/Research internship	0	0	0	3	100	0	100
			TOTAL	**19**	**0**	**2**	**23**	**330**	**470**	**800**

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IV YEAR II SEMESTER

S. No.	Course Code	Course Type	Course Title	Periods per week			C	Scheme of Examination Maximum Marks		
				L	T	P		Int.	Ext.	Total
1		PR	Project work	0	0	0	12	60	140	200
			TOTAL	**0**	**0**	**0**	**12**	**60**	**140**	**200**

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	I B.Tech			
Course Code	**BASIC ELECTRICAL AND ELECTRONICS ENGINEERING LABORATORY (Common for Mech, CE, AME, PET, MM, ECE, EEE)**				
Teaching	Total contact hours - 30	L	T	P	C
Prerequisite(s): Basics of Physics		0	0	3	1.5

Course Objectives:

1. To verify the Kirchhoff's laws & Ohm's law
2. To calculate the efficiencies of transformers, DC motors, Three-phase Induction Motor
3. To plot the characteristics of PN junction diode & operational amplifier
4. To plot the characteristics of Transistor

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Analyze the various electrical networks
C02:	Understand the operation or DC machines,3 -point starter and conduct the Swinburne's Test.
C03:	Analyze the performance oi transformer, operation of 3-phase alternator and 3-phase induction motors.
C04:	Analyze the operation of half Wave, full wave rectifiers, op-amps.
C05:	Explain the single stage CE amplifier and concept of feedback amplifier.

List of Experiments:

1. Verification of Kirchhoff's laws
2. Verification of Ohm's laws
3. Study of various wiring components (wires, switches, fuses, sockets, plugs, Lamp holders, lamps etc. their uses and ratings)
4. Measurement of current, voltage, power in R-L-C series circuit excited by single phase supply
5. Verification of voltage & current relations in Star & delta connections
6. Swinburne's test on a DC shunt machine.
7. Transistor common base characteristics
8. Speed control of D.C. Shunt motor by Armature Voltage control and Field flux control method
9. Efficiency and regulation of a single phase transformer by direct loading method.
10. Brake test on a three phase induction motor

11. PN junction Diode characteristics a). Forward bias b).Reverse bias. (Cut in voltage & Resistance calculations)
12. Zener diode characteristics
13. Half wave rectifier
14. Full wave Rectifier
15. Transistor common emitter characteristics.

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	2	1	3	-		2		1		1
CO2	2	3			3			2	3			1
CO3	2	3	-		3			2	3			1
CO4	2	1	2		3			2	2			1
CO5	2	1			3			2		1		1

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	I B.Tech			
Course Code	**BASIC ELECTRICAL AND ELECTRONICS ENGINEERING (Common for Mech, CE, AME, PET, MM, ECE, EEE)**				
Teaching	Total contact hours-45	L	T	P	C
Prerequisite(s): Basics of Physics		3	0	0	3

Course Objective:

1. To learn the basic principles of electrical law's and analysis of networks.
2. To understand the principle of operation and construction details of DC machines.
3. To learn the principle of operation and constructional details of transformers, alternator and induction motors.
4. To study the operation of PN junction diode, half wave, full Wave rectifiers and OP-AMPS
5. To study operation of PNP and NPN transistors and various amplifiers.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Analyze the various electrical networks
CO2:	Understand the operation of DC machines,3-point starter and conduct the Swinburne's Test.
CO3:	Analyze the performance of transformer, operation of 3-phase alternator and 3-phase induction motors.
CO4:	Analyze the operation of half Wave, full wave rectifiers, op-amps.
CO5:	Explain the single stage CE amplifier and concept of feedback amplifier.

Syllabus:

UNIT –I Introduction to Electrical Circuits

Basic definitions, Electrical circuit elements (R, L and C), Ohm's Law, Series & Parallel circuits, Kirchhoff's Laws, Simple problems.

UNIT- II DC Generator

Generator-Principle of Operation, Construction, EMF equation, Classification, O.C.C, internal and external characteristics of shunt generator, Applications.

UNIT- III DC Motor

Motor-principle of operation, Torque equation, Classification Speed Control Methods, Operation of 3 point starter, Applications.

UNIT –IV Rectifiers & Linear Integrated Circuits

PN junction diodes, diode applications - Half wave and bridge rectifiers. Characteristics of operation amplifiers (OP-AMP) - application of OP-AMPS (inverting, non-inverting, integrator and differentiator).

UNIT –V Transistors

PNP and NPN junction transistor, transistor as an amplifier, single stage CE amplifier, frequency response of CE amplifier, concepts of feedback amplifier.

Text books:

1. Principles of Electrical and Electronics Engineering by V.K.Mehta, S.Chand& Co.

2. Introduction to Electrical Engineering – M.S Naidu and S. Kamakshaiah, TMH Publ.

3. Electronic Devices and Circuits, R.L. Boylestad and Louis Nashelsky, 9th edition, PEI/PHI 2006.

4. Electrical Technology by Surinder Pal Bali, Pearson Publications.

5. Electrical Circuit Theory and Technology by John Bird, Routledge Taylor &Francis Group

Reference Books:

1. Basic Electrical Engineering by M.S.Naidu and S.Ka1nakshiah, TMH Publications

2. Fundamentals of Electrical Engineering by Rajendra Prasad, PHI Publications, 2th edition

3. Basic Electrical Engineering by Nagsarlcar, Sukhija, Oxford Publications,2nd edition

4. Industrial Electronics by GK. Mittal, PHI

Web Links:

1. www.electrical4u.com

2. www.nptel.com

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	2	1	3	-	-	2	-	1	-	1
CO2	2	3	-	-	3	-	-	2	3	-	-	1
CO3	2	3	-	-	3	-	-	2	3	-	-	1
CO4	2	1	2	-	3	-	-	2	2	-	-	1
CO5	2	1	-	-	3	-	-	2	-	1	-	1

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	I B.Tech II Sem			
Course Code	**ELECTRICAL CIRCUIT ANALYSIS**				
Teaching	Total contact hours - 45	L	T	P	C
Prerequisite(s): Mathematics		3	0	0	3

Course Objective:

1. To study the various network reduction techniques and the concept of source transformation.
2. To understand the applications of network topology to electrical circuits.
3. To study the concept of magnetic coupled circuit.
4. To understand the behavior of RLC networks for sinusoidal excitations.
5. To study the performance of R-L, R-C and R-L-C circuits with variation of one of the parameters and to understand the concept of resonance.
6. To understand the applications of network theorems for analysis of electrical networks.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Analyse electrical networks in presence of active and passive elements.
CO2:	Analyse magnetic circuit with various dot conventions.
CO3:	Analyse steady state circuits
CO4:	Analyze series and parallel resonant circuits.
CO5:	Analyze electric circuits using Network Theorems.

Syllabus:

UNIT –I Network reduction techniques

Series, Parallel, Series - parallel, Star-to- delta and Delta-to-star transformation, source transformation technique, nodal analysis and mesh analysis to DC networks with dependent and independent voltage and current sources.

UNIT –II Network theorems (DC & AC Excitations)

Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum Power Transfer theorem, Reciprocity theorem, Millman's theorem and compensation theorem.

UNIT –III Magnetic Circuits

Basic definition of MMF, flux and reluctance, analogy between electrical and magnetic circuits,

Faraday's laws of electromagnetic induction – concept of self and mutual inductance, Dot convention, coefficient of coupling and composite magnetic circuit, analysis of series and parallel magnetic circuits.

UNIT –IV Single Phase A.C Systems

Periodic waveforms (determination of rms, average value and form factor), concept of phase angle and phase difference – waveforms and phasor diagrams for lagging, leading networks, complex and polar forms of representations. Steady state analysis of R, L and C circuits, power factor and its significance, real, reactive and apparent power, waveform of instantaneous power and complex power

UNIT –V Analysis of AC Networks

Extension of node and mesh analysis to AC networks, series and parallel resonance, selectively band width and Quality factor, introduction to locus diagram.

Text Books:

1. Engineering Circuit Analysis by William Hayt and Jack E.Kemmerley,McGraw Hill

Company,6 th edition

2. Fundamentals of Electrical Circuits by Charles K.Alexander and Mathew N.O.Sadiku,

McGraw Hill Education (India)

3. Networks and Systems by D. Roy Choudhury, New Age International publishers

Reference Books:

1. Network synthesis: Van Valkenburg; Prentice-Hall of India Private Ltd

2. Introduction to circuit analysis and design by TildonGlisson. Jr, Springer Publications.

3. Circuits by A.Bruce Carlson , Cengage Learning Publications

4. Network Theory Analysis and Synthesis by SmarajitGhosh, PHI publications

5. Electric Circuits by David A. Bell, Oxford publications

6. Circuit Theory (Analysis and Synthesis) by A.Chakrabarthi,Dhanpat Rai&Co.

Web Links:

1. www.elecrtical4u.com
2. www.nptel.ac.in

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	
CO2	3	-	-	2	-	-	-	-	-	2	2	1
CO3	3	3	3	-	-	-	-	-	-	-	-	-
CO4	3	-	3	-	-	-	-	-	-	-	-	-
CO5	3	3		-	-	-	-	-	-	-	-	-

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	I B.Tech			
Course Code	**Electrical Engineering Workshop**				
Teaching	Total contact hours - 30	L	T	P	C
Prerequisite(s): Basics of Electricity		0	0	3	1.5

Course Objective:

1. To demonstrate the usage of measuring equipment.
2. To train the students in setting up simple wiring circuits.
3. To impart methods in electrical machine wiring.
4. To identify the types of different suitable devices for conducting of experiment.
5. To understand Kirchhoff's laws.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Explain the limitations, tolerances, safety aspects of electrical systems & wiring.
CO2:	Select wires/cables and other accessories used in different types of wiring.
CO3:	Make simple lighting and power circuits.
CO4:	Measure current, voltage and power in a circuit.
CO5:	Make disassembling and assembling of PC.

List of Experiments:

1. Study of various electrical tools and symbols.
2. Identify different types of cables/wires and switches, fuses & fuse carriers, MCGB and ELCB, MCCB with ratings and usage.
3. Identification of types of resistors and capacitors.
4. Wiring of light/fan circuit using two way/ three way control (stair case wiring)
5. Go-down wiring/Tunnel wiring
6. Wiring of power distribution arrangement using single phase MCB distribution board with ELCB, main switch and energy.
7. Measurement of voltage, current, resistance in DC circuit.
8. Measurement of voltage, calculate the power factor of the circuit.
9. Wiring of backup power supply including inverter, battery and load for domestic.
10. Types of earthing, physical implementation.
11. Identification of terminals of different semiconductor devices.
12. Identification of the peripherals of a computer. To prepare a report containing the block diagram of the CPU along with the configuration of each peripheral and its functions. Description of various I/O devices, power rating of computers.
13. A practice on disassembling the components of a PC and Assembling them to back to working condition.

14. Hardware trouble shooting (Demonstration): Identification of a problem and fixing a defective PC (improper assembly of peripherals).
15. Software troubleshooting (Demonstration): Identification of a problem and fixing the PC for any software issues.

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	3	2	-	-	-	-	-	-	-	-	
CO2	-	-	2	-	-	-	-	-	-	-	-	
CO3	1	-	-	-	-	-	-	-	-	-	3	
CO4	-	-	-	-	-	-	-	-	2	-	-	
CO5	-	3	-	-	-	-	-	-	2	-	-	

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	I B.Tech. I Sem (1 semester)			
Course Code PCC	**ELECTROMAGNETIC FIELDS**				
Teaching	Total contact hours - 45	L	T	P	C
Prerequisite(s): semi conductor Physics , mathematics		3	0	0	3

COURSE OBJECTIVES:

1. To introduce the basic mathematical concepts related to electromagnetic vector fields

2. To impart the concepts of Electrostatic fields, electrical potential, energy density and their applications. Magneto static fields, magnetic flux density, vector potential and its applications.

3. Different methods of emf generation and Maxwell's equations

4.Electromagnetic waves and characterizing parameters

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Analyze field potentials due to static changes and static magnetic fields
CO2:	Explain how materials affect electric and magnetic fields.
CO3:	Analyze the relation between the fields under time varying situations.
CO4:	Discuss the principles of propagation of uniform plane waves.
CO5:	Justify the concepts of electromagnetic waves, means of transporting energy or information, in the form of radio waves, TV signals, radar beams and light rays.

UNIT I Coulomb's Law, Electric Field Intensity and Flux density

Experimental law of Coulomb, Electric field intensity, Field due to continuous volume charge distribution, Field of a line charge, Electric flux density.

UNIT II Gauss's law and Divergence

Gauss' law, Divergence. Maxwell's First equation (Electrostactics), Vector Operator ▼and divergence theorem. Energy expended in moving a point charge in an electric field, The line integral, Definition of potential difference and potential, The potential field of point charge, Current and Current density, Continuity of current.

UNIT III Poisson's and Laplace's Equations

Derivation of Poisson's and Laplace's Equations,Uniqueness theorem, Examples of the solution of Laplace's equation. Biot-Savart Law, Ampere's circuital law, Curl, Stokes' theorem, Magnetic flux and magnetic flux density, Scalar and Vector Magnetic Potentials.

UNIT IV Magnetic Forces

Force on a moving charge, differential current elements, Force between differential current elements. Magnetisation and permeability, Magnetic boundary conditions, Magnetic circuit, Potential Energy and forces on magnetic materials.

UNIT V Time-varying fields and Maxwell's equations

Farday's law, displacement current, Maxwell's equations in point form, Maxwell's equations in integral form. Wave propagation in free space and good conductors. Poynting's theorem and wave power, Skin Effect.

TEXT BOOKS:

1. Mathew N. O. Sadiku, 'Principles of Electromagnetics', 6th Edition, Oxford University

Press Inc. Asian edition, 2015.

2. William H. Hayt and John A. Buck, 'Engineering Electromagnetics', McGraw Hill Special

Indian edition, 2014.

3.Kraus and Fleish, 'Electromagnetics with Applications', McGraw Hill International

Editions, Fifth Edition, 2010.

REFERENCES

1. V.V.Sarwate, 'Electromagnetic fields and waves', First Edition, Newage Publishers,

1993.

2. J.P.Tewari, 'Engineering Electromagnetics – Theory, Problems and Applications',

Second Edition, Khanna Publishers.

3. Joseph. A.Edminister, 'Schaum's Outline of Electromagnetics, Third Edition (Schaum's

Outline Series), McGraw Hill, 2010.

4. S.P.Ghosh, Lipika Datta, 'Electromagnetic Field Theory', First Edition, McGraw Hill

Education(India) Private Limited, 2012.

5. K A Gangadhar, 'Electromagnetic Field Theory', Khanna Publishers; Eighth Reprint :2015

Web Links:

1. www.electrical4u.com

2. www.nptel.com

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	1	-	-	2	-	-	-	-	2
CO2	3	-	2	2	-	1	2	1	1	-	1	2
CO3	2	1	2	1	-	-	2	-	1	-	-	2
CO4	1	2	2	2	-	2	1	1	-	-	-	2
CO5	2	2	2	1	1	1	2	-	1	1	2	3

(AUTONOMOUS)
Approved by AICTE, Accredited by NBA & NAAC 'A' Grade, Recognized under 2(f) and 12(b) of UGC, Permanently Affiliated to JNTUK, Kakinada.

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

4 Years B.Tech. (Electrical & Electronics Engineering) Course Structure : (2020-21)

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	II B.Tech. I Sem			
Course Code	**CONSTITUTION OF INDIA**				
Teaching	Total contact hours - 45	L	T	P	C
Prerequisite(s): Basic Knowledge of Indian Constitution		2	0	0	0

Course Objective:

1. To enable the student to understand the importance of constitution
2. To understand the structure of executive, legislature and judiciary
3. To understand philosophy of fundamental rights and duties
4. To understand the autonomous nature of constitutional bodies like Supreme Court and high court controller and auditor general of India and election commission of India.
5. To understand the central and state relation financial and administrative.

Unit I:

Introduction to Indian Constitution:

Constitution meaning of the term, Indian Constitution - Sources and constitutional history, Features - Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy.

Unit II:

Union Government and its Administration Structure of the Indian Union:

Federalism, Centre- State relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, LokSabha, RajyaSabha,-The Supreme Court and High Court: Powers and Functions;

Unit III:

State Government and its Administration:

State Government and its Administration- Governor - Role and Position - CM and Council of ministers, State Secretariat: Organization, Structure and Functions.

Unit IV:

Local Administration

District's Administration Head - Role and Importance, Municipalities - Mayor and role of Elected Representatives - CEO of Municipal Corporation, PachayatiRaj: Functions

PRI: ZillaPanchayat, Elected officials and their roles, CEO ZillaPanchayat: Block level Organizational Hierarchy - (Different departments), Village level - Role of Elected and Appointed officials - Importance of grass root democracy

Unit V:

Election Commission:

Election Commission- Role of Chief Election Commissioner and Election Commissionerate State Election Commission:, Functions of Commissions for the welfare of SC/ST/OBC and women

Course Outcomes:

1. Understand historical background of the constitution making and its importance for building a democratic India
2. Understand the functioning of three wings of the government i e., Executive, Legislative and Judiciary.
3. Understand the value of the Fundamental rights and duties for becoming good citizen of India
4. Analyse the decentralization of power between central, state and local self-government
5. Apply the knowledge in strengthening of the constitutional institutions like CAG, Election Commission and UPSE for sustaining Democracy.

Text Books:

1. DurgadasBasu, Introduction to the Constitution of India- Prentice – hall of India Pvt. Ltd. New Delhi
2. Indian Polity – M. Laxmikanth – McGraw Hill
3. PM Bakshi – The Constitution of India – Universal LexisNexis
4. SubashKashyap – Indian Constitution – National Book Trust
5. D.C. Gupta – Indian Government and Politics

Reference Books

1. J.A. Siwach – Dynamics of Indian Government & Politics
2. J.C.Johari - Indian Government and Politics , Hans
3. M.V. Pylee, Indian Constitution Durga Das Basu, Human Rights in Constitutional Law, Prentice – Hall of India Pvt. Ltd.. New Delhi
4. Noorani, A.G., (South Asia Human Rights Documentation Centre), Challenges to Civil Right), Challenges to Civil Rights Guarantees in India, Oxford University Press

Web Links:

1. 1. nptel.ac.in/courses/109104074/8
2. 2. nptel.ac.in/courses/109104045/
3. 3. nptel.ac.in/courses/101104065/
4. 4. www.hss.iitb.ac.in/en/lecture-details
5. 5. www.iitb.ac.in/en/event/2nd-lecture-institute-lecture-series-indian-constitution.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		✓								✓		
CO2			✓								✓	
CO3			✓									
CO4				✓								
CO5					✓							

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	II B.Tech. I Sem			
Course Code	**DC Machines and Transformers**				
Teaching	Total contact hours – 45	L	T	P	C
Prerequisite(s): Electrical circuit analysis-I		3	0	0	3

Course Objectives:

1. To Understand the construction, principle of operation and performance of DCmachines.
2. To Learn the characteristics, performance, methods of speed control and testingmethods of DC motors.
3. To predetermine the performance of single phase transformers with equivalent circuitmodels.
4. To Understand the methods of testing of single-phase transformer.
5. To Analyze the three phase transformers and achieve three phase to two phaseconversion.

UNIT - I

Electromechanical Energy Conversion and introduction to DC machines
Principles of electromechanical energy conversion - singly excited and multi excited systems-calculation of force and torque using the concept of co-energy**.**

Construction and principle of operation of DC machines – EMF equation for generator – Excitation techniques– characteristics of DC shunt generator –applications of DC Generators

UNIT - II

Operation of DC motors
Back-emf and torque equations of dc motors – Armature reaction and commutation – characteristics of separately-excited, shunt, series and compound motors – losses and efficiency – applications of dc motors. Necessity of a starter – starting by 3 point and 4-point starters.

UNIT - III

Speed Control of motors and Testing of DC Machines
Speed control by armature voltage and field control – testing of DC machines – brake test, Swinburne's method – principle of regenerative or Hopkinson's method – retardation test – field's test- separation of losses.

Single-phase Transformers

Types and constructional details – principle of operation –emf equation – operation on no load and on load – lagging, leading and unity power factors loads –phasor diagrams of transformers – equivalent circuit.

UNIT - IV

Performance and testing of transformers and auto transformers:

Regulation – losses and efficiency – effect of variation of frequency and supply voltage on losses – all day efficiency.

Tests on single phase transformers – open circuit and short circuit tests – Sumpner's test – separation of losses – parallel operation with equal voltage ratios – auto transformer – equivalent circuit – comparison with two winding transformers.

UNIT - V

3-Phase Transformer:

Polyphase connections- Y/Y, Y/ Δ, Δ/Y, Δ/ Δ and open Δ- third harmonics in phase voltages

three winding transformers- transients in switching –off load and on load tap changers-Scott connection.

Course Outcomes:

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

1. Assimilate the concepts of electromechanical energy conversion.
2. Mitigate the ill-effects of armature reaction and improve commutation in dc machines.
3. Understand the torque production mechanism and control the speed of dc motors.
4. Analyze the performance of single phase transformers.
5. Predetermine regulation, losses and efficiency of single phase transformers

Text Books:

1. Electrical Machines by P.S. Bhimbra, Khanna Publishers,7th edition, 2011.
2. Electric Machinery by A.E.Fitzgerald, Charleskingsley, Stephen D.Umans, TMH,6th edition, 2003.

Reference Books:

1. Electrical Machines by D. P.Kothari, I. J. Nagarth, McGraw Hill Publications, 4th edition, 2010.
2. Electrical Machines by R.K.Rajput, Lakshmi publications, 5th edition.
3. Electrical Machinery by Abijith Chakrabarthi and Sudhipta Debnath, McGraw Hill, 1stedition.
4. Electrical Machinery Fundamentals by Stephen J Chapman McGraw Hill education,4th edition, 2010.
5. Electric Machines by MulukutlaS.Sarma & Mukeshk Pathak, CENGAGE Learning,1st edition, 2008.

6. Theory & Performance of Electrical Machines by J.B.Guptha. S.K.Kataria& Sons, 1st edition, 2009.

CO-PO Mapping:

(1:Slight[Low]; 2:Moderate[Medium]; 3:Substantial[High], '-' : NoCorrelation)

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	PO11	P012
C01		✓								✓		
C02			✓								✓	
C03			✓									
C04				✓								
C05					✓							

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	II B.Tech. I Sem			
Course Code	**SKILL ORIENTED COURSE** **DESIGN OF ELECTRICAL CIRCUITS USING ENGINEERING SOFTWARE TOOLS**				
Teaching	Total contact hours - 45	L	T	P	C
Prerequisite(s): DC Machines & Transformers		0	1	2	2

Course Objectives:

1. To Learn the fundamentals of MATLAB Tools
2. To generate various waveform signals and sequences
3. To verify and simulate various electrical circuits using Mesh and NodalAnalysis
4. To verify and simulate various theorems
5. To Verify series resonance and parallel resonance using simulation

List of Experiments

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

Note: MATLAB/SMULINK fundamentals shall be explained during the first weekbefore starting of the Lab course

1. Generation of various signals and sequences (Periodic and Aperiodic), such as unitImpulse, Step, Square, Saw tooth, Triangular, Sinusoidal, Ramp.
2. Operations on signals and sequences such as Addition, Multiplication, Scaling, Shifting,Folding, Computation of Energy, and Average Power
3. Verification of Kirchhoff's current law and voltage law using simulation tools.
4. Verification of mesh analysis using simulation tools.
5. Verification of nodal analysis using simulation tools.
6. Determination of average value, rms value, form factor, peak factor of sinusoidalwave, square wave using simulation tools.
7. Verification of super position theorem using simulation tools.
8. Verification of reciprocity theorem using simulation tools.

9. Verification of maximum power transfer theorem using simulation tools.
10. Verification of Thevenin's theorem using simulation tools.
11. Verification of Norton's theorem using simulation tools.
12. Verification of compensation theorem using simulation tools.
13. Verification of Milliman's theorem using simulation tools.
14. Verification of series resonance using simulation tools.
15. Verification of parallel resonance using simulation tools.
16. Verification of self inductance and mutual inductance by using simulation tools.

Course Outcomes:

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

1. write the MATLAB programs to simulate the electrical circuit problems
2. simulate various circuits for electrical parameters
3. simulate various wave form for determination of wave form parameters
4. simulate RLC series and parallel resonance circuits for resonant parameters
5. simulate self inductance and mutual inductance circuits

CO-PO Mapping:

(1:Slight[Low]; 2:Moderate[Medium]; 3:Substantial[High], '-' : NoCorrelation)

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	PO11	P012
C01		✓								✓		
C02			✓								✓	
C03			✓									
C04				✓								
C05					✓							

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	II B.Tech. I Sem			
Course Code	**ELECTRICAL CIRCUITS LAB**				
Teaching	Total contact hours - 45	L	T	P	C
Prerequisite(s): Electrical Circuit Analysis –I & II		0	0	3	1.5

Course Objectives:

1. To verify and demonstrate various theorems and resonance.
2. To draw the locus diagram of series circuits
3. To determine the various parameters of a two port networks
4. To determine self and mutual inductance of a magnetic circuit, parameters of agiven coil.
5. To measure 3-phase power by two wattmeter method for unbalanced loads

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

1. Verification of Kirchhoff's circuit laws.
2. Verification of Superposition theorem
3. Verification of Thevenin's and Norton's Theorems
4. Verification of Maximum power transfer theorem
5. Verification of Compensation theorem
6. Verification of Reciprocity and Millman's Theorems
7. Locus diagrams of R-L(L Variable) and R-C (C Variable) series circuits
8. Series and parallel resonance
9. Determination of self, mutual inductances and coefficient of coupling
10. Determination of Impedance (Z) and Admittance (Y) Parameters for a two port network
11. Determination of Transmission and Hybrid parameters
12. Determination of Parameters of a choke coil.
13. Determination of cold and hot resistance of an electric lamp.
14. Measurement of 3-phase power by two wattmeter method for unbalanced loads

Course Outcomes:

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

1. Apply various theorems
2. Determination of self and mutual inductances
3. Two port parameters of a given electric circuits
4. Draw locus diagrams
5. Measurement of 3-phase power

CO-PO Mapping:

(1:Slight[Low]; 2:Moderate[Medium]; 3:Substantial[High], '-' : NoCorrelation)

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	PO11	P012
C01		✓								✓		
C02			✓								✓	
C03			✓									
C04				✓								
C05					✓							

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	II B.Tech. I Sem			
Course Code	**ELECTRICAL CIRCUIT ANALYSIS –II**				
Teaching	Total contact hours - 45	L	T	P	C
Prerequisite(s): Electrical Circuit Analysis –I		3	0	0	3

Course Objectives:

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

UNIT - I

Balanced and Unbalanced Three phase circuits:
Analysis of three phase balanced circuits:
Phase sequence, star and delta connection of sources and loads, relation between line and phase voltages and currents, analysis of balanced three phase circuits, measurement of active and reactive power.

Analysis of three phase unbalanced circuits:
Loop method, Star-Delta transformation technique, two-wattmeter method for measurement of three phase power.

UNIT - II

Transient Analysis in DC Circuits
Transient response of First order (R-L, R-C) and second order (R-L-C) circuits usingdifferential equations.

Transient response of First order (R-L, R-C) and second order (R-L-C) circuits using Laplace transforms.

UNIT - III

Transient Analysis in AC circuits
Transient response of First order (R-L, R-C) and second order (R-L-C) circuits usingdifferential equations.

Transient response of First order (R-L, R-C) and second order (R-L-C) circuits using Laplace transforms.

UNIT - IV

Two Port Networks

Two port network parameters – Z, Y, ABCD and Hybrid parameters and their relations, cascaded networks.

UNIT - V

Filters

Need of Filters – Classification -Characteristic impedance- Low Pass Filter, High Pass Filter, Band Pass Filter, Band Stop or Band Elimination Filter, m-Derived Filter, Composite filters– Design of Filters.

Course Outcomes:

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

1. Understand the concepts of balanced and unbalanced three-phase circuits.
2. Know the transient behavior of electrical networks with DC excitations.
3. Learn the transient behavior of electrical networks with AC excitations.
4. Estimate various parameters of a two port network.
5. Understand the significance of filters in electrical networks

Text Books:

1. Engineering Circuit Analysis by William Hayt and Jack E.Kemmerley, McGraw Hill Company,9th edition, 2018.
2. Network analysis: Van Valkenburg: Prentice-Hall of India Private Ltd, 3rd edition, 2019.

Reference Books:

1. Fundamentals of Electrical Circuits by Charles K.Alexander and Mathew N.O.Sadiku, McGraw Hill Education (India), 6th edition, 2019.
2. Introduction to circuit analysis and design by Tildon H Glisson. Jr, Springer Publications, 1st edition, 2011.
3. Circuits by A.Bruce Carlson, Cengage Learning Publications, 1st edition, 2008.
4. Network Theory Analysis and Synthesis by SmarajitGhosh, PHI publications, ninth print, 2015.
5. Networks and Systems by D. Roy Choudhury, New Age International publishers, 2nd
6. edition, 2013.

CO-PO Mapping:

(1:Slight[Low]; 2:Moderate[Medium]; 3:Substantial[High], '-' : NoCorrelation)

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	PO11	P012
C01		✓								✓		
C02			✓								✓	
C03			✓									
C04				✓								
C05					✓							

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	II B.Tech. I Sem			
Course Code	**ELECTRONIC DEVICES AND CIRCUITS LAB**				
Teaching	Total contact hours - 45	L	T	P	C
Prerequisite(s): Electronic devices and circuits		0	0	3	1.5

Course Objectives: The student is able

1. To study the characteristics of electronic components and measuring instruments.
2. To understand the characteristics of PN, Zener diode, design rectifiers with and withoutfilters
3. To understand the characteristics of BJT, FET, MOSFET, SCR, UJT
4. To understand the biasing of transistors
5. To understand the frequency response of amplifiers, measure frequency, phase of signals.

Electronic Workshop Practice:

1. Identification, Specifications, Color Codes for resistor, R, L, C Components,Potentiometers, Coils, Gang condensers, Relays, Bread Boards.
2. Identification, Specifications and Testing of active devices, Diodes, BJTs, JFETs,LEDs, LCDs, SCR, UJT.
3. Soldering Practice- Simple circuits using active and passive components.
4. Study and operation of Ammeters, Voltmeters, Transformers, Analog and Digital
5. Multimeter, Function Generator, Regulated Power Supply and CRO.

List of Experiments

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

1. P.N Junction Diode Characteristics
   Part A: Germanium Diode (Forward bias& Reverse bias)Part B: Silicon Diode (Forward Bias only)
2. Zener Diode Characteristics
   Part A: V-I Characteristic
   Part B: Zener Diode as Voltage Regulator
3. Rectifiers (without and with c-filter)
   Part A: Half-wave Rectifier Part B : Full-wave Rectifier
4. BJT Characteristics (CE Configuration)
   Part A: Input Characteristics

Part B: output Characteristics5.FET

5. Characteristics

Part A: Drain Characteristics Part B:
Transfer Characteristics

6. SCR Characteristics

7. UJT Characteristics

8. 8.MOSFET Characteristics

9. Transistor Biasing
10. Measurement of electrical quantities using CRO
11. BJT-CE Amplifier
12. Emitter Follower –CC Amplifier13.FET-CS Amplifier

Note: The students are required to perform the experiment to obtain the V-I characteristicsand to determine the relevant parameters from the obtained graphs.

Equipment required:

1. Regulated Power supplies
2. Analog/Digital Storage Oscilloscopes
3. Analog/Digital Function Generators
4. Digital Multi-meters
5. Decade Résistance Boxes/Rheostats
6. Decade Capacitance Boxes
7. Ammeters (Analog or Digital)
8. Voltmeters (Analog or Digital)
9. Active & Passive Electronic Components

Course Outcomes:

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

1. Analyze the characteristics of diodes, transistors and other devices
2. Design and implement the rectifier circuits, SCR and UJT in the hardware circuits.
3. Design the biasing and amplifiers of BJT and FET amplifiers
4. Measure electrical quantities using CRO in the experimentation
5. Understand the frequency response of amplifiers, measure frequency, phase of signals.

CO-PO Mapping:

(1:Slight[Low]; 2:Moderate[Medium]; 3:Substantial[High], '-' : NoCorrelation)

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	PO11	P012
C01		✓								✓		
C02			✓								✓	
C03			✓									
C04				✓								
C05					✓							

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	II B.Tech. I Sem			
Course Code	**ELECTRONIC DEVICES AND CIRCUITS**				
Teaching	Total contact hours - 45	L	T	P	C
Prerequisite(s): Engineering physics		3	0	0	3

Course Objectives:
The main objectives of this course are:

1. The basic concepts of semiconductor physics are to be reviewed.
2. Study the physical phenomena such as conduction, transport mechanism and electricalcharacteristics of different diodes.
3. The application of diodes as rectifiers with their operation and characteristics with andwithout filters are discussed.
4. The principal of working and operation of Bipolar Junction Transistor and Field Effect Transistor and their characteristics are explained.
5. The need of transistor biasing and its significance is explained. The quiescent point oroperating point is explained.

UNIT - I

Semi-Conductor Physics: Insulators, Semiconductors, and Metals, classification using energy band diagrams, mobility and conductivity, electrons and holes in intrinsic semiconductors, extrinsic semiconductors, drift and diffusion, charge densities in semiconductors, Hall effect, continuity equation, law of junction, Fermi Dirac function, Fermi level in intrinsic and extrinsic Semiconductors

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

UNIT - II

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

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

UNIT - III

BJT: Junction transistor, transistor current components, transistor equation, transistor configurations, transistor as an amplifier, characteristics of transistor in Common Base, Common Emitter and Common Collector configurations, Ebers-Moll model of a transistor, punch through/ reach through, Photo transistor, typical transistor junction voltage values.

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

UNIT - IV

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

UNIT –V

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

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

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

1. Understand the basic concepts of semiconductor physics.
2. Understand the formation of p-n junction and how it can be used as a p-n junction as diode in different modes of operation.
3. Know the construction, working principle of rectifiers with and without filters with relevant expressions and necessary comparisons.
4. Understand the construction, principle of operation of transistors, BJT and FET withtheir V-I characteristics in different configurations.
5. Know the need of transistor biasing, various biasing techniques for BJT and FET and stabilization concepts with necessary expressions.

CO-PO Mapping:

(1:Slight[Low]; 2:Moderate[Medium]; 3:Substantial[High], '-' : NoCorrelation)

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	PO11	P012
C01		✓								✓		
C02			✓								✓	
C03			✓									
C04				✓								
C05					✓							

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	II B.Tech. I Sem			
Course Code	**ELECTRICAL MEASUREMENTS AND MACHINES LAB-I**				
Teaching	Total contact hours - 45	L	T	P	C
Prerequisite(s): DC Machines & Transformers		0	0	3	1.5

Course Objectives:

1. To plot the magnetizing characteristics of DC shunt generator and understand the mechanism of self-excitation.
2. To control the speed of DC motors.
3. To determine and predetermine the performance of DC machines.
4. To predetermine the efficiency and regulation of transformers and assess their performance.
5. To Calibrate LPF wattmeter and dynamometer wattmeter.

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

1. Determination of critical field resistance and critical speed of DC shunt generator byusing Magnetization characteristics
2. Predetermination of efficiency of DC Machine by conducting Swinburne's test
3. Performance characteristics of a DC shunt motor by conducting Brake test.
4. Predetermination of efficiency of two DC shunt machines by conducting Hopkinson'stest
5. Speed control of DC shunt motor by Field and armature Control methods
6. Determination of constant losses of DC shunt motor by conducting Retardation test
7. Separation of losses (Eddy current and Hysteresis) in a DC shunt motor.
8. Predetermination of efficiency, regulation and to obtain the parameters of the equivalent circuit of a single phase transformer by conducting OC & SC tests.
9. Predetermination of efficiency, regulation and to obtain the parameters of the equivalent circuit of a single phase transformer by conducting Sumpner's test.
10. Conversion of three phase to two phase supply by using Scott connection of transformers
11. Parallel operation of two Single phase Transformers under no-load and loadconditions
12. Separation of core losses of a single phase transformer
13. Calibration of dynamometer wattmeter using phantom loading UPF
14. Crompton D.C. Potentiometer – Calibration of PMMC ammeter and PMMC voltmeter
15. Calibration of LPF wattmeter – by direct loading

Course Outcomes:

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

1. Determine and predetermine the performance of DC machines and Transformers.
2. Control the speed of DC motor.
3. Obtain three phase to two phase transformation.
4. Predetermine the efficiency and regulation of transformers and assess their performance.
5. Calibrate LPF wattmeter and dynamometer wattmeter.

CO-PO Mapping:

(1:Slight[Low]; 2:Moderate[Medium]; 3:Substantial[High], '-' : NoCorrelation)

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	PO11	P012
C01		✓								✓		
C02			✓								✓	
C03			✓									
C04				✓								
C05					✓							

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	II B.Tech. I Sem			
Course Code	**ELECTRICAL MEASUREMENTS**				
Teaching	Total contact hours – 45	L	T	P	C
Prerequisite(s): Electrical circuit analysis-I		3	0	0	3

Course Objective:

1. To Know principles of different electrical measurement instruments and to measure voltage and current
2. To understand different types of instruments for measurement of Power and Energy.
3. To understand about different types of A.C and D. C Potentiometers. And to Measure resistance, capacitance, inductance and frequency by using various bridges.
4. To Know about the magnetic measurements
5. To Know about Digital Meters

UNIT-I

Measuring Instruments

Classification – deflecting, control and damping torques – Ammeters and Voltmeters – PMMC, moving iron type instruments – expression for the deflecting torque and control torque – Errors and compensations. Extension of range using shunts and series resistance -CT and PT: Ratio and phase angle errors – design considerations

UNIT –II

Measurement of Power and Energy

Single phase and three phase dynamometer wattmeter, LPF and UPF, expression for deflecting and control torques – Extension of range of wattmeter using instrument transformers – Measurement of active and reactive powers in balanced and unbalanced systems. . Type of P.F. Meters – single phase and three phase dynamometer and moving iron type. Single phase induction type energy meter – driving and braking torques – errors and compensations –testing by phantom loading using R.S.S. meter. Three phase energy meter – trivector meter, maximum demand meters.

UNIT – III

Potentiometers

Principle and operation of D.C. Crompton's potentiometer – standardization – Measurement of unknown resistance, current, voltage. A.C. Potentiometers: polar and coordinate types - standardization – applications

Measurement of Parameters

Method of measuring low, medium and high resistance – sensitivity of Wheatstone's bridge – Carey Foster's bridge- Kelvin's double bridge for measuring low resistance– loss of charge method for measurement of high resistance. Measurement of inductance, Quality Factor -

Maxwell's bridge, Hay's bridge, Anderson's bridge, Owen's bridge. Measurement of capacitance and loss angle - Desauty bridge-Wien's bridge – Schering Bridge- Wagner's erthing device.

UNIT – IV
Magnetic Measurements:
Ballistic galvanometer – equation of motion – flux meter – constructional details. Determination of B-H Loop methods of reversals six point method – A.C. testing – Iron loss of bar samples– core loss measurements by bridges and potentiometers.

UNIT-V Digital Meters
Digital Voltmeter-Successive approximation, ramp and integrating type-Digital frequency meter-Digital multimeter-Digital Tachometer

Course Outcomes:

1. Know principles of different electrical measurement instruments and to measure voltage and current and different types of instruments for measurement of Power and Energy.
2. Understand about different types of A.C and D. C Potentiometers.
3. Measure resistance, capacitance, inductance and frequency by using various bridges.
4. Know about the magnetic measurements
5. Know about digital meters

Text Books

1. Electrical Measurements and measuring Instruments – by E.W. Golding and F.C. Widdis, fifth Edition,Wheeler Publishing.
2. Electrical & Electronic Measurement & Instruments by A.K.SawhneyDhanpatRai& Co. Publications.
3. Electrical Measurements: Fundamentals, Concepts, Applications – by Reissland, M.U, New Age International (P) Limited, Publishers.

Reference Books

1. Electrical Measurements – by Buckingham and Price, Prentice – Hall
2. Electrical Measurements by Harris.
3. Electronic Instrumentation-by H S Kalsi, Tata McGraw-Hill Education

Web-Resources:

1. www.electrical4u.com

2. www.nptel.com

CO-PO Mapping:

(1:Slight[Low]; 2:Moderate[Medium]; 3:Substantial[High], '-' : NoCorrelation)

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	PO11	P012
C01		✓								✓		
C02			✓								✓	
C03			✓									
C04				✓								
C05					✓							

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	II B.Tech. I Sem			
Course Code	**MATHEMATICS-III** **(Common to ECE, EEE, AME, MECH, PET, MM, CE)**				
Teaching	Total contact hours - 48	L	T	P	C
Prerequisite(s): Derivatives, integration and complex numbers		1	0	2	2

Course Objective:

- To familiarize the techniques in partial differential equations and complex variables.
- To equip the students to solve application problems in their disciplines.
- To familiarize the transform techniques and complex variables.

Syllabus:

Unit I: Beta and Gamma function **8hrs**

Beta and Gamma functions and their properties, relation between Beta and Gamma functions, evaluation of improper integrals.

Unit II: Laplace Transforms **10 hrs**

Definition of Laplace transform, existence conditions, properties of Laplace transforms, inverse Laplace transforms, transforms of derivatives, transforms of integrals, multiplication by t^n, division by t, convolution theorem, periodic functions, unit step function, unit impulse function, (without proofs). Applications to ordinary linear differential equations with constant coefficients.

Unit III: Fourier series and Fourier Transforms **10 hrs**

Dirichlet's conditions, Fourier series, functions of any period, odd and even functions - half range series. Fourier integrals, Fourier cosine and sine integrals, Fourier transform, sine and cosine transform.

Unit IV: First Order Partial Differential Equations **10 hrs**

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions. Solutions of first order linear (Lagrange) partial differential equation and nonlinear (Standard types) equations.

Unit V: Higher Order Partial Differential Equations **10hrs**

Solutions of linear partial differential equations with constant coefficients. RHS term of the type e^{ax+by}, $\sin(ax+by)$, $\cos(ax+by)$, $x^m y^n$. Method of separation of variables. Solutions of one dimensional wave, Heat and two-dimensional Laplace equation.

Text books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 43/e, 2010.
2. Erwin kreyszig, Advanced Engineering Mathematics, 9/e, John Wiley & Sons, 2006.

Reference Books:

1. W. E. Boyce and R. C. DiPrima, Elementary Differential Equations and Boundary Value Problems, 9/e, Wiley India, 2009.
2. E. A. Coddington, An Introduction to Ordinary Differential Equations, Prentice Hall India,1995.
3. J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7/e, Mc-Graw Hill, 2004.
4. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, 2008.

Web Links:

1. https://nptel.ac.in/courses/111103070/
2. https://nptel.ac.in/courses/111/106/111106084/

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		✓								✓		
CO2			✓								✓	
CO3			✓									
CO4				✓								
CO5					✓							

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	II B.Tech. I Sem (3 semester)			
Course Code	**Network Analysis Lab**				
Teaching	Total contact hours-36	L	T	P	C
Prerequisite(s):Knowledge of Engineering Mathematics, Network analysis		-	-	3	2

Course Objective:

1. To Observe the working nature of different electrical measuring equipments
2. To Verify different theorems in networks.
3. To Observe the pattern of series and parallel resonance.
4. To Calculate different parameters of the given two-port networks

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Understand the working nature of different electrical measuring equipment
CO2:	Verify the working of different theorems like Norton's ,Thevinen's Etc.
CO3:	Observe the concept of parallel and series resonance.
CO4:	Understand the concept of two-port networks and calculate the parameters.

Syllabus:

List of Experiments:

1. Verification of Thevinen's and Norton's theorem.
2. Verification of super position theorem of Maximum power transfer theorem.
3. Verification of compensation theorem and reciprocity theorem.
4. Verification of Milliman's theorem.
5. Calculation of Z-parameters.
6. Series and parallel resonance.
7. Determination of self, mutual induction and co-efficient of coupling.
8. Calculation of Y-parameters.
9. Tansmision line parameters and hybrid parameters calculation.
10. Measurement of active power for star and delta connected balanced loads.
11. Measurement of re-active power for star and delta connected balanced loads.
12. Measurement of 3 phases power by 2 watt meter method for unbalanced loads.

Web Links:

1. www.iitkgp.ac.in
2. www.electronic4u.com
3. www.nptel.com
4. http://www.satishkashyap.com/

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	-	3	2	-	-	-	-	1	-
CO2	3	2	2	2	-	1	-	-	-	-	-	-
CO3	3	2	2	3	-	1	-	-	-	-	-	-
CO4	3	3	2	3	-	1	-	-	-	-	-	-

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	II B.Tech. I Sem (3rd semester)			
Course Code	**NETWORK ANALYSIS**				
Teaching	Total contact hours – 50	L	T	P	C
Prerequisites: Knowledge of Engineering Physics and Basic electronic engineering.		3	1	-	3

Course Objectives:

1. Familiarize with the fundamentals of electrical circuits and basic electrical laws.
2. Familiarize with various analysis techniques for AC circuits.
3. Understand different types of theorems
4. Understand the concept of two port network and their relations.
5. Study the concept of transient and steady state analysis.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Analyze the basic concepts of circuits and different models of laws
CO2:	Apply the outputs of different elements in complex RLC circuits and get the response
CO3:	Apply the rules of different dot notation and solve the coupled network output, understand the concept of resonance and hence design the circuits under resonance.
CO4:	Understand and apply the different theorems in circuits, evaluating the values of two-port networks parameters by the basic concepts of two-port networks.
CO5:	Understand the concept of transient circuits and apply the concept for problem solving

Syllabus:

UNIT-1 Basic Circuit Fundamentals:

Network elements classification, Energy sources - Independent and dependent sources, Source transformation, Kirchhoff's laws, Mesh analysis and Nodal analysis .

AC Fundamentals : Definitions of terms associated with periodic functions: Time period, Angular velocity and freqency, RMS value, Average value, Form factor and peak factor-numerical problems, Phase angle, Phasor representation, Addition and subtraction of phasor, mathematical representation of sinusoidal quantities, explanation with relevant theory, numerical problems. Principal of Duality with examples.

UNIT- 2 Steady State Analysis of AC Circuits:

Response to sinusoidal excitation - Impedance concept,series R,L,C circuits numerical problems. Complex impedance and phasor notation for R,L,C, Star-Delta conversion, numerical problems.Resonance: Introduction, Definition of Q, Series resonance, Bandwidth

of series resonance, Parallel resonance, Condition for maximum impedance, current in anti resonance, Bandwidth of parallel resonance, anti resonance at all frequencies.

UNIT- 3 Network Theorems:

Thevenin's, Norton's, Superposition, Milliman's, Reciprocity, Compensation, Substitution, Max Power Transfer, Tellegens- dependent and independent sources- both with DC & AC excitation.

UNIT- 4 Two-port networks:

Z-parameters, Y-parameters, h-parameters ,Relationship between parameter sets, Parallel connection of two port networks, Cascading of two port networks, series connection of two port networks

UNIT- 5 Transients:

First order differential equations, Definition of time constants, R-L circuit, R-C circuit with DC excitation, Evaluating initial conditions procedure, second order differential equations, homogeneous, non-homogenous, problem solving using R-L-C elements with DC excitation and AC excitation,

Text Books:

1. Hayt W. H., Kemmerly J. E. and Durbin S. M., "Engineering Circuit Analysis", 6th Ed., TataMcGraw-Hill Publishing Company Ltd.,2008.
2. M.E. Van Valkenburg, "Network Synthesis," PHI 2007.
3. A. Chakrabarti , Circuit Theory- Analysis and Synthesis, Dhanpat Rai & Co.

References:

1. Circuits and Networks by A.Sudhakar and Shyammohan S palli 5th edition TataMcGraw- Hill Publishing Company Ltd.,2008.
2. Network Analysis – N C Jagan, C Lakshminarayana

Web Links:

1. NPTEL online courses.
2. MOOCS online courses by JNTUK

CO-PO Mapping:
(1: Slight [Low]; 2: Moderate [Medium]; 3: Substantial [High], '-': No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	-	-	-	-	-	-	-	-	-	-
CO2	1	2	-	-	-	-	-	-	-	-	-	-
CO3	-	2	3	1	-	-	-	-	-	-	-	-
CO4	1	2	-	**1**	-	-	-	-	-	-	-	-
CO5	-	**1**	1	-	-	-	-	-	-	-	-	-

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	II B.Tech. II Sem			
Course Code	**INTRODUCTION TO PYTHON PROGRAMMING** EEE				
Teaching	Total contact hours - 48	L	T	P	C
Prerequisite(s): Knowledge of any programming language		3	0	0	3

Course Objective(s):

- Acquire knowledge on different data structures technique.
- To develop solutions for problems demonstrating usage of control structures, modularity, I/O and other standard language constructs.

UNIT-1

Introduction to Python: History Features, Installing Python, Running Python, Comments, Operators, Identifiers, Variables, Indentation, Data Types: Initializing values to variables, Multiple assignment, Multiple statement in a single line.

UNIT-2

Data Types and Control Structures: Data Types: Integers, Booleans, Strings. Expressions and order of evaluation control flow of Conditional Statements: if-statement, if-else statement, Nested-if statement, if-elif-else statement, Loops: for, while, Nested loops,Break statement, continue statement and Pass statement.

UNIT-3

Data Structures: Array, Lists- operations, Slicing, Methods, Cloning. Tuples- creating tuple, updating, utility of tuples, Methods. Sets- creating. Dictionaries-creating, accessing values, modifying, deleting sorting, nested dictionaries, Sequences.

UNIT-4

Functions: Functions declaration, definition, function call, function parameters, variable scope, return statement, Lambda function, Anonymous functions.
Modules: Modules- import statement, name of modules, Making own module, python module

UNIT-5

Python Classes: Thinking about Objects, Class Variables and Methods, Creating Objects with Instance Data, Instance Methods, Managing Objects

Course Outcomes:

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

CO-1: Understand the basic datatypes in python

CO-2: understand the use of control statementsin real time application

CO-3: Implement various data structures and their operations.

CO-4: Implement functions and modules.

CO-5: Understand the importance of classes and objects in python

Text Books

1. Wesley J. Chun "Core Python Programming" Prentice Hall

Reference Books

1. Mark Lutz "Programming Python, 4th Edit O'ReillyMedia
2. David Beazley and Brian K. Jones"PythonCokboo'Reilly

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High]; '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		✓								✓		
CO2			✓								✓	
CO3			✓									
CO4				✓								
CO5					✓							

(AUTONOMOUS)
Approved by AICTE, Accredited by NBA & NAAC 'A' Grade, Recognized under 2(f) and 12(b) of UGC, Permanently Affiliated to JNTUK, Kakinada.

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING
4 Years B.Tech. (Electrical & Electronics Engineering) Course Structure : (2020-21)

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	II B.Tech. II Sem			
Course Code	**POWER SYSTEMS-I**				
Teaching	Total contact hours – 45	L	T	P	C
Prerequisite(s): Electrical circuit analysis-I &II		3	0	0	3

Course Objectives:

1. To study the principle of operation of different components of a thermal powerstations.
2. To study the principle of operation of different components of a Nuclear powerstations.
3. To study the constructional and operation of different components of an Air andGas Insulated substations.
4. To study the constructional details of different types of cables.
5. To study different types of load curves and tariffs applicable to consumers.

UNIT - I

Hydroelectric Power Stations:

Selection of site, general layout of a hydroelectric power plant with brief description of majorcomponents and principle of operation

Thermal Power Stations

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

UNIT - II

Nuclear Power Stations

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

UNIT - III

Classification of Air and Gas Insulated substations

Air Insulated Substations – indoor & outdoor substations, substations layouts of 33/11 kV showing the location of all the substation equipment.

Bus bar arrangements in the sub-stations: simple arrangements like single bus bar, sectionalized single bus bar, double bus bar with one and two circuit breakers, main and transfer bus bar system with relevant diagrams.

Gas Insulated Substations (GIS) – advantages of gas insulated substations, constructional aspects of GIS, installation and maintenance of GIS, comparison of air insulated substations and gas insulated substations.

UNIT- IV

Underground Cables

Types of cables, construction, types of insulating materials, calculation of insulation resistance,stress in insulation and power factor of cable.

Capacitance of single and 3-Core belted Cables. Grading of cables: capacitance grading and intersheath grading.

UNIT - V

Economic Aspects of Power Generation & Tariff

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

Tariff Methods– costs of generation and their division into fixed, semi-fixed and running costs, desirable characteristics of a tariff method, tariff methods: simple rate, flat rate, block-rate, two-part, three–part, and power factor tariff methods.

Course Outcomes:

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

1. Identify the different components of thermal power plants.
2. Identify the different components of nuclear Power plants.
3. Identify the different components of air and gas insulated substations.
4. Identify single core and three core cables with different insulating materials.
5. Analyse the different economic factors of power generation and tariffs.

Text Books:

1. A Text Book on Power System Engineering by M.L.Soni, P.V.Gupta, U.S.Bhatnagarand A. Chakrabarti, DhanpatRai& Co. Pvt. Ltd, 2016.
2. Generation, Distribution and Utilization of Electric Energy by C.L.Wadhawa, New ageInternational (P) Limited, Publishers, 3rd edition.

Reference Book:

1. Elements of Electrical Power Station Design by M V Deshpande, PHI, New Delhi, 2009.

CO-PO Mapping:

(1:Slight[Low]; 2:Moderate[Medium]; 3:Substantial[High], '-' : NoCorrelation)

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	PO11	P012
C01		✓								✓		
C02			✓								✓	
C03			✓									
C04				✓								
C05					✓							

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	II B.Tech. II Sem			
Course Code	**DIGITAL ELECTRONICS**				
Teaching	Total contact hours - 45	L	T	P	C
Prerequisite(s): Electronics Devices and Circuits		3	0	0	3

Course Objectives:

1. To solve a typical number base conversion and analyze new error coding techniques.
2. Theorems and functions of Boolean algebra and behavior of logic gates.
3. To optimize logic gates for digital circuits using various techniques.
4. To understand concepts of combinational circuits.
5. To develop advanced sequential circuits

UNIT - I
Review of Number Systems & Codes:

Representation of numbers of different radix, conversion from one radix to another radix, r- 1's complements and r's complements of signed members. Gray code,4 bit codes; BCD, Excess-3, 2421, 84-2-1 code etc., Error detection & correction codes: parity checking, even parity, odd parity, Hamming code.

Boolean theorems and logic operations
Boolean theorems, principle of complementation & duality, De-Morgan theorems. Logic operations; Basic logic operations -NOT, OR, AND, Universal Logic operations, EX-OR, EX-NOR operations. Standard SOP and POS Forms, NAND-NAND and NOR-NOR realizations.

UNIT - II
Minimization Techniques:

Minimization and realization of switching functions using Boolean theorems, K-Map (up to 6 variables) and tabular method.

Combinational Logic Circuits Design:
Design of Half adder, full adder, half subtractor, full subtractor, applications of full adders; 4- bit adder-subtractor circuit, BCD adder circuit, Excess 3 adder circuit and carry look-a-head adder circuit

UNIT - III
Combinational Logic Circuits Design Using MSI &LSI:

Design of encoder, decoder, multiplexer and demultiplexers, Implementation of higher order circuits using lower order circuits. Realization of Boolean functions using decoders and

multiplexers. Design of Priority encoder, 4-bit digital comparator and seven segment decoder

Introduction of PLD's:

PLDs: PROM, PAL, PLA -Basics structures, realization of Boolean functions.

UNIT - IV

Sequential Circuits-I:

Classification of sequential circuits (synchronous and asynchronous) , operation of NAND & NOR Latches and flip-flops; truth tables and excitation tables of RS flip-flop, JK flip- flop, T flip-flop, D flip-flop with reset and clear terminals. Conversion from one flip-flop to another flip-flop. Design of ripple counters, design of synchronous counters, Johnson counter, ring counter. Design of registers - Buffer register, control buffer register, shift register, bi-directional shift register, universal shift register.

UNIT - V

Sequential Circuits -II:

Finite state machine; state diagrams, state tables, reduction of state tables. Analysis of clocked sequential circuits Mealy to Moore conversion and vice-versa. Realization of sequence generator and sequence detector circuits, Races and Hazards.

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

1. Classify different number systems and apply to generate various codes.
2. Use the concept of Boolean algebra in minimization of switching functions
3. Design different types of combinational logic circuits.
4. Apply knowledge of flip-flops in designing of Registers and counters
5. The operation and design methodology for synchronous sequential circuits andalgorithmic state machines

Text Books:

1. Switching and finite automata theory:ZviKohavi, Niraj K. Jha,Cambridge UniversityPress, 3rd Edition, 2009.
2. Digital Design by Morris Mano, Prentice Hall India, 5th Edition.

Reference Books:

1. Digital Principles and Applications by Leach , Malvino , Saha, Mc-Graw Hill, 8th Edition, 2014.
2. Switching Theory and Logic Design by A. Anand Kumar, PHI learning, 3rd edition.
3. Introduction to Switching Theory and Logic Design – Fredriac J Hill, Gerald R Peterson, 3rdEdition, John Willey and Sons Inc,
4. Fundamentals of Logic Design by Charles H. RothJr., Cengage Learning, 7th edition,2013.

CO-PO Mapping:

(1:Slight[Low]; 2:Moderate[Medium]; 3:Substantial[High], '-' : NoCorrelation)

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	PO11	P012
C01		✓								✓		
C02			✓								✓	
C03			✓									
C04				✓								
C05					✓							

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	II B.Tech. II Sem			
Course Code	**INDUCTION AND SYNCHRONOUS MACHINES**				
Teaching	Total contact hours - 45	L	T	P	C
Prerequisite(s): DC Machines & Transformers		3	0	0	3

Course Objectives:

1. Understand the principle of operation and performance of 3-phase induction motor.
2. Quantify the performance of induction motor and induction generator in terms oftorque and slip.
3. To understand the torque producing mechanism of a single phase induction motor.
4. To understand the principle of emf generation, the effect of armature reaction andpredetermination of voltage regulation in synchronous generators.
5. To study parallel operation and control of real and reactive powers for synchronous generators.

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UNIT - I

1- phase induction motors

Construction details of squirrel cage and slip ring induction motors – production of rotating magnetic field – principle of operation – Equivalent circuit –phasor diagram- slip speed-rotor emf and rotor frequency – rotor current and pf at standstill and during running conditions – rotor power input, rotor copper loss and mechanical power developed and their interrelationship.

UNIT - II

Characteristics and testing methods of induction motors

Torque equation – expressions for maximum torque and starting torque – torque slip characteristic – double cage and deep bar rotors – crawling and cogging – speed control of induction motor with V/f control method – no load and blocked rotor tests – circle diagram for predetermination of performance – induction generator operation (Qualitative treatment only)

UNIT - III

Starting methods of 3-phase induction motors

Methods of starting of three phase Induction motors: DOL, Auto transformer, Star-Delta and rotor resistance methods.

Single phase induction motors:
Constructional features- equivalent circuit- problem of starting-double revolving field theory-Methods of starting. AC series motors.

UNIT - IV

Construction, operation, voltage regulation and parallel operation of synchronous generator:
Constructional features of non-salient and salient pole machines –types of armature windings – distribution, pitch and winding factors – E.M.F equation –improvements of waveform and armature reaction –phasor diagrams- voltage regulation by synchronous impedance method – MMF method and Potier triangle method– two reaction analysis of salient pole machines and phasor diagram.
Parallel operation with infinite bus and other alternators – synchronizing power – load sharing – control of real and reactive power – numerical problems.

UNIT - V

Synchronous motor – operation, starting and performance
Synchronous motor principle and theory of operation – phasor diagram – starting torque – variation of current and power factor with excitation – capability curves - synchronous condenser – mathematical analysis for power developed – hunting and its suppression – methods of starting – applications.

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

1. Explain the operation and performance of three phase induction motor.
2. Analyze the torque-speed relation, performance of induction motor and inductiongenerator.
3. Implement the starting of single phase induction motors.
4. Develop winding design and predetermine the regulation of synchronous generators.
5. Explain hunting phenomenon, implement methods of staring and correction of powerfactor with synchronous motor

Text Books:

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

Reference Books:

1. Performance and design of AC machines – M.G. Say
2. Alternating Current Machines by A.F.Puchstein, T.C. Lloyd, A.G. Conrad, ASIAPublishing House
3. Electrical Machinery Fundamentals by Stephen J Chapman McGraw Hill education,2010.

5. Electrical Machines by R.K.Rajput, Lakshmi publications, 5th edition

CO-PO Mapping:

(1:Slight[Low]; 2:Moderate[Medium]; 3:Substantial[High], '-' : NoCorrelation)

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	PO11	P012
C01		✓								✓		
C02			✓								✓	
C03			✓									
C04				✓								
C05					✓							

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	II B.Tech. II Sem			
Course Code	**SKILL ORIENTED COURSE - IOT APPLICATIONS OF ELECTRICAL ENGINEERING**				
Teaching	Total contact hours - 45	L	T	P	C
Prerequisite(s): IOT, Digital Electronics		0	1	2	2

Course Objectives:

1. To understand fundamentals of various technologies of Internet of Things.
2. To know various communication technologies used in the Internet of Things.
3. To know the connectivity of devices using web and internet in the IoT environment.
4. To understand the implementation of IoT by studying case studies like Smart Home,Smart city, etc
5. To know Analog Input & Digital Output

List of Experiments:

Any TEN of the following Experiments are to be conducted

1. Familiarization with Arduino/Raspberry Pi and perform necessary softwareinstallation.
2. To interface LED/Buzzer with Arduino/Raspberry Pi and write a program to turn ONLED for 1 sec after every 2 seconds.
3. To interface Push button/Digital sensor (IR/LDR) with Arduino/Raspberry Pi and write a program to turn ON LED when push button is pressed or at sensor detection.
4. To interface temperature sensor with Arduino/Raspberry Pi and write a program toprint temperature and humidity readings.
5. To interface Organic Light Emitting Diode (OLED) with Arduino/Raspberry Pi
6. To interface Bluetooth with Arduino/Raspberry Pi and write a program to send sensordata to smartphone using Bluetooth.
7. To interface Bluetooth with Arduino/Raspberry Pi and write a program to turn LEDON/OFF when '1'/'0' is received from smartphone using Bluetooth.

8. Write a program on Arduino/Raspberry Pi to upload and retrieve temperature andhumidity data to thing speak cloud.
9. 7 Segment Display
10. Analog Input & Digital Output
11. Night Light Controlled & Monitoring System
12. Fire Alarm Using Arduino
13. IR Remote Control for Home Appliances
14. A Heart Rate Monitoring System
15. Alexa based Home Automation System

Course Outcomes:

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

1. apply various technologies of Internet of Things to real time applications.
2. apply various communication technologies used in the Internet of Things.
3. connect the devices using web and internet in the IoT environment.
4. implement IoT to study Smart Home, Smart city, etc.
5. Apply concept of analog Input & Digital Output

CO-PO Mapping:

(1:Slight[Low]; 2:Moderate[Medium]; 3:Substantial[High], 4: '-' : No (Correlation)

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	PO11	P012
C01		✓								✓		
C02			✓								✓	
C03			✓									
C04				✓								
C05					✓							

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	II B.Tech. II Sem			
Course Code	**MANAGERIAL ECONOMICS & FINANCIAL ANALYSIS**				
Teaching	Total contact hours - 45	L	T	P	C
Prerequisite(s):		3	0	0	3

Course Objective:

1. The Learning objectives of this paper are to understand the concept and nature of Managerial Economics and its relationship with other disciplines and also to understand the Concept of Demand and Demand forecasting.
2. To familiarize about the Production function, Input Output relationship, Cost-Output relationship and Cost-Volume-Profit Analysis.
3. To understand the nature of markets, Methods of Pricing in the different market structures and to know the different forms of Business organizations and the concept of Business Cycles.
4. To learn different Accounting Systems, preparation of Financial Statements and uses of different tools for performance evaluation.
5. Finally, it is also to understand the concept of Capital, Capital Budgeting and the techniques used to evaluate Capital Budgeting proposals.

Unit I:

Introduction to Managerial Economics and Demand Analysis:

Definition of Managerial Economics –Scope of Managerial Economics and its relationship with other subjects –Concept of Demand, Types of Demand, Determinants of Demand- Demand schedule, Demand curve, Law of Demand and its limitations- Elasticity of Demand, Types of Elasticity of Demand and Measurement- Demand forecasting and Methods of forecasting.

Unit II:

Theories of Production and Cost Analysis:

Theories of Production function- Law of Variable proportions-Isoquants and Isocosts and choice of least cost factor combination-Concepts of Returns to scale and Economies of scale-Different cost concepts: opportunity costs, explicit and implicit costs-Fixed costs, Variable Costs and Total costs, Cost –Volume-Profit analysis-Determination of Breakeven point(problems)- Managerial significance and limitations of Breakeven point.

Unit III:

Introduction to Markets, Theories of the Firm & Pricing Policies:

Market Structures: Perfect Competition, Monopoly, Monopolistic competition and Oligopoly – Features – Price and Output Determination- Methods of Pricing: Average cost pricing, Limit

Pricing, Market Skimming Pricing, Internet Pricing: (Flat Rate Pricing, Usage sensitive pricing) and Priority Pricing, Business Cycles : Meaning and Features – Phases of a Business Cycle. Forms of Business organizations - Sole Trader, Partnership- Joint Stock Company – State/Public Enterprises.

Unit IV:

Introduction to Accounting & Financial Analysis:

Introduction to Double Entry System, Journal, Ledger, Trail Balance and Preparation of Final Accounts with adjustments – Preparation of Financial Statements-Analysis and Interpretation of Financial Statements-Ratio Analysis.

Unit V:

Capital and Capital Budgeting: Capital Budgeting:

Meaning of Capital-CapitalizationMeaning of Capital Budgeting-Time value of money- Methods of appraising Project profitability: Traditional Methods (payback period, accounting rate of return) and modern methods (Discounted cash flow method, Net Present Value method, Internal Rate of Return Method and Profitability Index)

Course Outcomes:

1. Estimate the Demand and demand elasticitiesfor a product
2. Understand the Input-Output-Cost relationships and estimation of the least cost combination of inputs.
3. Understand the nature of different markets and Price Output determination under various market conditions and also to have the knowledge of different Business Units.
4. Prepare Financial Statements and the usage of various Accounting tools for Analysis.
5. Evaluate various investment project proposals with the help of capital budgeting techniques for decision making.

Text Books:

1. Dr. N. AppaRao, Dr. P. Vijay Kumar: 'Managerial Economics and Financial Analysis',
2. Dr. A. R. Aryasri – Managerial Economics and Financial Analysis, TMH
3. Prof. J.V.Prabhakararao, Prof. P. Venkatarao. 'Managerial Economics and Financial Analysis

Reference Books

1. Varshney R.L, K.L Maheswari, Managerial Economics, S. Chand & Company Ltd,

2. JL Pappas and EF Brigham, Managerial Economics, Holt, R & W; New edition edition

3. N.P Srinivasn and M. SakthivelMurugan, Accounting for Management, S. Chand & Company Ltd,
4. MaheswariS.N,AnIntroduction to Accountancy, Vikas Publishing House Pvt Ltd
5. I.M Pandey, Financial Management ,Vikas Publishing House Pvt Ltd

6. V. Maheswari, Managerial Economics, S. Chand & Company Ltd

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	-	-	-	-	3	-	-	-	-	-	-
CO2	-	-	-	-	2	2	-	-	1	-	-	2
CO3	-	-	2	-	2	3	3	-	-	-	-	2
CO4	-	-	3	-	-	-	-	-	3	-	-	3
CO5	-	-	3	-	3	-	-	-	3	-	-	3

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	II B.Tech. II Sem			
Course Code	**Electrical Measurements and machines lab-II**				
Teaching	Total contact hours - 45	L	T	P	C
Prerequisite(s): Electrical Measurements, Induction and synchronous machines		0	0	3	1.5

Course Objectives:

The students are able to understand the,

1. Speed control methods of three-phase induction motors.
2. Performance characteristics of three-phase and single-phase induction motors.
3. Principles of power factor improvement of single-phase induction motor.
4. Voltage regulation calculations of three–phase alternator by various methods
5. Dielectric oil testing using H.T. testing Kit

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

1. Performance characteristics of a three- phase Induction Motor by conducting Braketest
2. Determination of equivalent circuit parameters, efficiency and regulation of a threephase Induction motor by conducting No–load & Blocked rotor tests
3. Determination of Regulation of a three–phase alternator by using synchronousimpedance & m.m.f. methods
4. Determination of Regulation of a three–phase alternator by using Potier trianglemethod
5. Determination of V and Inverted V curves of a three phase synchronous motor.
6. Determination of X_d and X_q of a salient pole synchronous machine
7. Determination of equivalent circuit parameters of single phase induction motor
8. Determination of efficiency of three-phase alternator by loading with three phase induction motor.
9. Determination of efficiency of a single-phase Induction Motor by conducting Brake test.

10. Calibration and Testing of single phase energy meter
11. Kelvin's double Bridge – Measurement of resistance – Determination of Tolerance
12. Capacitance Measurement using Schering bridge
13. Inductance Measurement using Anderson bridge
14. Resistance strain gauge – strain measurements and Calibration
15. Measurement of Power by 3 Voltmeter and 3 Ammeter methods
16. Dielectric oil testing using H.T. testing Kit

Course Outcomes:

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

1. Assess the performance of single phase and three phase induction motors.
2. Control the speed of three phase induction motor.
3. Predetermine the regulation of three–phase alternator by various methods.
4. Find the Xd/Xq ratio of alternator and asses the performance of three–phasesynchronous motor.
5. Dielectric oil testing using H.T. testing Kit

CO-PO Mapping:

(1:Slight[Low]; 2:Moderate[Medium]; 3:Substantial[High], '-' : NoCorrelation)

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	PO11	P012
C01		✓								✓		
C02			✓								✓	
C03			✓									
C04				✓								
C05					✓							

(AUTONOMOUS)
Approved by AICTE, Accredited by NBA & NAAC 'A' Grade, Recognized under 2(f) and 12(b) of UGC, Permanently Affiliated to JNTUK, Kakinada.

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING
4 Years B.Tech. (Electrical & Electronics Engineering) Course Structure : (2020-21)

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	II B.Tech. II Sem			
Course Code	**DIGITAL ELECTRONICS LAB**				
Teaching	Total contact hours - 45	L	T	P	C
Prerequisite(s): Digital Electronics		0	0	3	1.5

Course Objectives:

1. To know the concept of Boolean laws for simplifying the digital circuits.
2. To understand the concepts of flip flops.
3. To understand the concepts of counters.
4. To analyze and design various circuits.
5. To design ripple counter and synchronous counter

List of Experiments:

Any TEN of the following Experiments are to be conducted

1. Verification of truth tables of Logic gates: Two input (i) OR (ii) AND (iii) NOR (iv) NAND (v) Exclusive OR (vi) Exclusive NOR
2. Design a simple combinational circuit and obtain minimal SOP expression and verifythe truth table using Digital Trainer Kit
3. Verification of functional table of 3 to 8 line Decoder / De-multiplexer
4. 4 variable logic function verification using 8 to 1 multiplexer.
5. Design full adder circuit and verify its functional table.
6. Design full Subtractor circuit and verify its functional table.
7. Verification of functional tables of Flip-Flops
8. Design a four bit ring counter using D Flip – Flops / JK Flip Flop and verify output
9. Design a four bit Johnson's counter using D Flip-Flops / JK Flip Flops and verifyoutput
10. Draw the circuit diagram of MOD-8 ripple counter and construct a circuit using T- Flip-Flops and Test it with a low frequency clock and Sketch the output waveforms.
11. Design MOD – 10 ripple counter using T- Flip-Flop and verify the result and Sketchthe output

waveforms

12. Design MOD – 8 synchronous counter using D Flip-Flop and verify the result andSketch the output waveforms.

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

1. Learn the basics of gates, filp-flops and counters.
2. Construct basic combinational circuits and verify their functionalities
3. Apply the design procedures to design basic sequential circuits
4. Understand the basic digital circuits and to verify their operation
5. Design ripple counter and synchronous counter

CO-PO Mapping:

(1:Slight[Low]; 2:Moderate[Medium]; 3:Substantial[High], '-' : NoCorrelation)

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	PO11	P012
C01		✓								✓		
C02			✓								✓	
C03			✓									
C04				✓								
C05					✓							

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	II B.Tech. II Semester			
CourseCode	**Python Programming Lab EEE**				
Teaching	Total contact hours –48	L	T	P	C
Prerequisite(s): Knowledge of any programming language		0	0	3	1.5

Course Objective(s):

- To acquire programming skills in core Python.
- To acquire knowledge over strings in Python
- To apply python in algebraic expressions.
- To implement various list operations in Python

1) Write a program that asks the user for a weight in kilograms and converts it to pounds. There are 2.2 pounds in a kilogram.
2) Write a program that asks the user to enter three numbers (use three separate input statements). Create variables called total and average that hold the sum and average of the three numbers and print out the values of total and average.
3) Write a program that uses a for loop to print the numbers 8, 11, 14, 17, 20, . . . , 83, 86,89.
4) Use a for loop to print a triangle like the one below. Allow the user to specify how high the triangle should be.

```
*
**
***
****
```

5) Write a program that asks the user to enter a word and prints out whether that word contains any vowels.

6) Write a program that asks the user to enter two strings of the same length. The program should then check to see if the strings are of the same length. If they are not, the program should print an appropriate message and exit. If they are of the same length, the program should alternate the characters of the two strings. For example, if the user enters abcde and ABCDE the program should print outAaBbCcDdEe.
7) Write a program that asks the user for a large integer and inserts commas into it according to the standard American convention for commas in large numbers. For instance, if the user enters 1000000, the output should be1,000,000.
8) In algebraic expressions, the symbol for multiplication is often left out, as in 3x+4y or 3(x+5). Computers prefer those expressions to include the multiplication symbol, like 3*x+4*y or 3*(x+5). Write a program that asks the user for an algebraic expression and then inserts multiplication symbols where appropriate.
9) Write a program that generates a list of 20 random numbers between 1 and100.
   (a) Print the list.
   (b) Print the average of the elements in the list.

(c) Print the largest and smallest values in the list.
(d) Print the second largest and second smallest entries in the list
(e) Print how many even numbers are in the list.

10) Write a program that asks the user for an integer and creates a list that consists of the factors of that integer.
11) Write a program that removes any repeated items from a list so that each item appears at most once. For instance, the list [1,1,2,3,4,3,0,0] would Become [1,2,3,4,0].
12) Write a program that asks the user to enter a length in feet. The program should then give the user the option to convert from feet into inches, yards, miles, millimeters, centimeters, meters, or kilometers. Say if the user enters a 1, then the program converts to inches, if they enter a 2, then the program converts to yards, etc. While this can be done with if statements, itis much shorter with lists and it is also easier to add new conversions if you use lists.
13) Write a function called sum_digits that is given an integer num and returns the sum of the digits of num.
14) Write a function called first_diff that is given two strings and returns the firstlocation in which the strings differ. If the strings are identical, it should return-1.
15) Write a function called is_sorted that is given a list and returns True if the list is sorted and False otherwise.
16) Write a function called primes that is given a number n and returns a list of the first n primes. Let the default value of n be100.
17) Write a function called merge that takes two already sorted lists of possibly different lengths, and merges them into a single sorted list
(a) Do this using the sort method. (b) Do this without using the sort method.
18) Write a program that asks the user for a word and finds all the smaller words that can be made from the letters of that word. The number of occurrences of a letter in a smaller word can't exceed the number of occurrences of the letter in the user's word.
19) Write a Python class to reverse a string word byword.

Course Outcomes:

CO 1: Write, Test and Debug Python Programs
CO 2: Use Conditionals and Loops for Python Programs
CO 3: Use functions and represent Compound data using Lists.
CO 4: Use python classes in applications
CO 5: Implement various string operations

CO-PO Mapping:
(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	-	-	1	-	-	-	-	-	-	-
CO2	3	1	-	-	2	-	-	-	-	-	4	-
CO3	-	2	-	-	3	-	-	-	-	-	-	-
CO4	-	2	-	-	3	-	-	-	2	-	-	-
CO5	-	1	-	-	2	-	-	-	-	-	1	-

Regulation GRBT-20	**Godavari Institute of Engineering & Technology (Autonomous)**	**III B.Tech. I Sem (5th semester)**			
Course Code	**CONTROL SYSTEMS**				
Teaching	Total contact hours – 45	L	T	P	C
Prerequisite(s): Mathematics- I		3	0	0	3

Course Objectives:

The objectives of the course are to make the student learn about

1. To derive the transfer function of physical systems and determination of overall transfer function using block diagram algebra and signal flow graphs.
2. To formulate different types of analysis in frequency domain to explain the nature of stability of the system
3. To develop understanding on Lag and Lead Compensators
4. To learn about the Routh Hurwitz Criterion, Nyquist plot and Bode plots
5. To understand State space analysis of continuous systems

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Derive the transfer function of physical systems and determination of overall transfer function using block diagram algebra and signal flow graphs.
CO2:	Determine time response specifications of second order systems and to determine error constants
CO3:	Analyze absolute and relative stability of LTI systems using Routh's stability criterion and the root locus method
CO4:	Analyze the stability of LTI systems using frequency response methods
CO5:	Understand State space analysis of continuous systems

UNIT – I

Mathematical modeling of control systems: Introduction of control systems, Classification of control systems, Open Loop and closed loop control systems and their differences, Feed-Back Characteristics, transfer function of linear system, Differential equations of electrical networks, Translational and Rotational mechanical systems, Transfer Function of DC Servo motor - AC Servo motor- Synchro Transmitter and Receiver, Block diagram algebra – Representation by Signal flow graph - Reduction using Mason's gain formula.

UNIT-II

Time response analysis: Standard test signals - Time response of first order systems –Time response of second order systems - Time domain specifications - Steady state errors and error constants – Effects of P, PI, PD, PID controllers.

UNIT – III

Stability and Rootlocus technique: The concept of stability – Routh's stability criterion – limitations of Routh's stability – The root locus concept - construction of root loci (Simple problems).

UNIT–IV

Frequency response analysis and Classical control design techniques: Introduction, Frequency domain specifications-Bode diagrams- transfer function from the Bode Diagram-Phase margin and Gain margin-Stability Analysis from Bode Plots, Polar Plots, Nyquist Stability criterion-compensators and its design – using Bode plots.

UNIT–V

State space analysis of continuous systems: Concepts of state, state variables and state model, state space representation of transfer function, Diagonalization- Solving the Time invariant state Equations- State Transition Matrix and it's Properties – Concepts of Controllability and Observability.

Text Books

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

Reference Books

1. Control Systems, ManikDhanesh N, Cengagepublications .
2. Control Systems principles and design, M.Gopal, Tata McGraw Hill education Pvt Ltd., 4th Edition.
3. Control Systems Engineering, S.Palani, Tata McGraw Hill Publications.

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	PO11	P012
C01		✓								✓		
C02						✓					✓	
C03												
C04			✓								✓	
C05		✓										

Regulation GRBT-20	**Godavari Institute of Engineering & Technology (Autonomous)**	**III B.Tech. I Sem (5th semester)**			
Course Code	**POWER SYSTEMS-II**				
Teaching	Total contact hours - 45	L	T	P	C
Prerequisite(s): Power Systems-I, Mathematics- I		3	0	0	3

Course Objectives:

The objectives of the course are to make the student learn about

6. To understand the electrical power plant operation and control with respect to its economic aspect
7. To expose the students to the different electrical & mechanical aspects of the power network along with its environmental and safety constraints.
8. To know the importance of compensation in power system and study the different compensating techniques
9. Study about different transients and their protection those are introduced in power system
10. To understand sag and Tension Calculations and Overhead Line Insulators:

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Understand the parameters of various types of transmission lines and to understand the performance of short, medium, long transmission lines
CO2:	Understand the effects of skin, proximity, Ferranti, corona effects on transmission lines
CO3:	Understand the power system transients & sag, mechanical design of overhead lines and insulators
CO4	Understand different methods of generation, distribution, control and compensation involved in the operation of power systems
CO5:	Understand Sag and Tension Calculations and Overhead Line Insulators

UNIT–I

Transmission Line Parameters: Types of conductors – Calculation of resistance for solid conductors – Calculation of inductance for single phase and three phase– Single and double circuit lines– Concept of GMR and GMD–Symmetrical and asymmetrical conductor configuration with and without transposition– Numerical Problems–Calculation of capacitance for 2 wire and 3 wire systems – Effect of ground on capacitance – Capacitance calculations for symmetrical and asymmetrical single and three phase–Single and double circuit lines–Numerical Problems.

UNIT–II

Performance of Short and Medium Length Transmission Lines: Classification of Transmission Lines – Short, medium, long line and their model representations –Nominal-T–Nominal-Pie and A, B, C, D Constants Mathematical Solutions to estimate regulation and efficiency of all types of lines – Numerical Problems.

UNIT–III

Performance of Long Transmission Lines: Long Transmission Line–Rigorous Solution – Evaluation of A,B,C,D Constants–Interpretation of the Long Line Equations – Incident, Reflected and Refracted Waves –Surge Impedance and SIL of Long Lines–Wave Length and Velocity of Propagation of Waves – Representation of Long Lines – Equivalent-T and Equivalent Pie network models (Numerical Problems).

UNIT–IV

Performance of transmission lines under transients: Types of System Transients – Travelling or Propagation of Surges – Termination of lines with different types of conditions – Open Circuited Line–Short Circuited Line – T-Junction– Lumped Reactive Junctions-Skin and Proximity effects – Description and effect on Resistance of Solid Conductors –Ferranti effect – Charging Current – Effect on Regulation of the Transmission Line–Corona – Description of the phenomenon–Factors affecting corona–Critical voltages and power loss – Radio Interference- Shunt Compensation – Power factor improvement methods-numerical problems.

UNIT–V

Sag and Tension Calculations and Overhead Line Insulators: Sag and Tension calculations with equal and unequal heights of towers– Effect of Wind and Ice on weight of Conductor–Numerical Problems – Stringing chart and sag template and its applications–Types of Insulators – String efficiency and Methods for improvement–Numerical Problems – Voltage distribution–Calculation of string efficiency–Capacitance grading and Static Shielding.

Text Books

1. Electrical power systems – by C.L. Wadhwa, New Age International (P) Limited, Publishers, 1998.
2. Modern Power System Analysis by I.J. Nagarath and D.P.Kothari, Tata McGraw Hill, 2nd Edition.
3. Electrical Power Systems by P.S.R. Murthy, B.S. Publications.

Reference Books

1. Power system Analysis–by John J Grainger William D Stevenson, TMC Companies, 4th edition
2. Power System Analysis and Design by B.R. Gupta, Wheeler Publishing.
3. A Text Book on Power System Engineering by M.L.Soni, P.V.Gupta, U.S. Bhatnagar A .Chakrabarthy, DhanpatRai& Co Pvt. Ltd.

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	PO11	P012
C01		✓					✓					
C02			✓									
C03				✓								
C04								✓				
C05					✓							

Regulation GRBT-20	**Godavari Institute of Engineering & Technology (Autonomous)**	**III B.Tech. I Sem (5th semester)**			
Course Code	**POWER ELECTRONICS**				
Teaching	Total contact hours - 45	L	T	P	C
Prerequisite(s): Electronic devices & circuits		3	0	0	3

Course Objectives:

The objectives of the course are to make the student learn about

1. To understand and acquire knowledge about various power semiconductor devices
2. To prepare the students to analyze and design different power converter circuits.
3. To understand, simulate and design single-phase and three-phase thyristor converter
4. To understand inverters and application of PWM techniques
5. To understand the working of AC-AC voltage regulators and cycloconverters

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Demonstrate the characteristics of various power semiconductor devices
CO2:	Analyse different electrical parameters of single phase AC-DC converters and semi converters for different loads and to evaluate the converters performance.
CO3:	Analyse different DC-DC converters for different loads and to evaluate the converters performance.
CO4	Understand inverters and application of PWM techniques
CO5:	Understand the working of AC-AC voltage regulators and cycloconverters

UNIT–I:

Power Semi-Conductor Devices: Thyristors– static characteristics of Silicon controlled rectifiers (SCR's) and TRIAC Turn on and turn off Methods–Dynamic characteristics of SCR– Snubber circuit design– Basic requirements of Gating circuits for SCR – series and parallel operation of SCR Characteristics of power MOSFET and Power IGBT – SCR gate driving circuits.

UNIT–II:

Phase-controlled converters

2-pulse, 3-pulse and 6-pulse converters– performance parameters –Effect of source inductance– Firing Schemes for converters–Dual converters

UNIT–III:

DC–DC Converters

Introduction to Choppers – Classification - Analysis of buck, boost, buck-boost converters in Continuous Conduction Mode (CCM) and Discontinuous conduction Modes (DCM) – Output

voltage equations using volt-sec balance in CCM & DCM, output voltage ripple & inductor current, ripple for CCM only

UNIT–IV:

DC–AC Converters: Inverters – classification – types of inverters - 1- Phase half-bridge and full bridge inverters with R and RL - loads – 3-phase square wave Inverters – 120^0 conduction and 180^0 conduction modes of operation – PWM inverters

UNIT – V:

AC-AC Converters: 1-phase AC - AC regulators – types - phase angle control and integrated cycle control with R and RL - load – For continuous and discontinuous conduction-
3-Phase AC-AC regulators with R - load only – Cycloconverters – classification of cycloconverters – 1-phase cycloconverters- introduction to solid state transformers

Text Books

1. Power Electronics: Circuits, Devices and Applications – by M. H. Rashid, Prentice Hall of India, 2nd edition, 1998
2. Power Electronics: converters, applications & design -by Ned Mohan, Tore M. Undeland, and Robbins by Wiley India Pvt. Ltd.
3. Power Converter Circuits -by William Shepherd, Li zhang, CRC Taylor & Francis Group.

Reference Books

1. Power Electronics – Devices, Converters and Applications", by Vedam Subramanyam Revised 2nd edition, New Age Publications
2. Power electronics By M D Singh and K B Khanchandani by TMH publication 2 edition.

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	PO11	P012
C01		✓								✓		
C02			✓								✓	
C03			✓									
C04				✓								
C05		✓										

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Regulation GRBT-20	**Godavari Institute of Engineering & Technology (Autonomous)**	**III B.Tech. I Sem (5th semester)**			
Course Code	**SPECIAL ELECTRICAL MACHINES**				
Teaching	Total contact hours - 45	L	T	P	C
Prerequisite(s): Basic Knowledge on Electrical Machines		3	0	0	3

Course Objectives:

The objectives of the course are to make the student learn about

11. To learn about the principle of Operation of different types of Special Electrical Machines
12. To learn about the theory of torque production in brushless DC motor
13. To know about the features of electric motors for traction application
14. To learn about the control aspect of special electrical machines
15. To understand the operation and characteristics of Linear motors

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Explain theory of operation and control of switched reluctance motor
CO2:	Explain the performance and control of stepper motors, and their applications
CO3:	Describe the operation and characteristics of permanent magnet dc motor
CO4	Understand the operation and characteristics of brush less dc motor**.**
CO5:	Understand the operation and characteristics of Linear motors

UNIT I

Stepper Motors: Construction – Principle of operation – Theory of torque production – Hybrid stepping motor –Variable reluctance stepping motor – Open loop and closed loop control.

UNIT II

Switched Reluctance Motor: Principle of operation – Design of stator and rotor pole arc – Power converter for switched reluctance motor – Control of switched reluctance motor.

UNIT III

Permanent Magnet DC Motors: Construction – Principle of working – Torque equation and equivalent circuits – Performance characteristics – Moving coil motors.

UNIT IV

Permanent Magnet Brushless DC (BLDC) Motor: Construction – Principle of operation – Theory of brushless DC motor as variable speed synchronous motor – sensor based and Sensor less control of BLDC motors

UNIT V

Linear motors: Linear induction motor: Construction– principle of operation– applications. Linear synchronous motor: Construction – principle of operation– applications.

Text Books:

1. Special Electrical Machines, K.Venkata Ratnam, University press, 2009, New Delhi.
2. Brush less Permanent magnet and Reluctance Motor Drives, Clarenden press, T.J.E. Miller, 1989, Oxford.
3. Special Electrical Machines, E.G. Janardhanan, PHI learning private limited, 2014.

Reference Books:

1. Fractional and Sub fractional HP electric motors- Cyril G. Veinott - TMH Intrrnational 1987

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	PO11	P012
C01		✓								✓		
C02			✓								✓	
C03				✓								
C04				✓								
C05		✓										

Regulation GRBT-20	**Godavari Institute of Engineering & Technology (Autonomous)**	**III B.Tech. I Sem (5th semester)**			
Course Code	**ELECTRICAL DISTRIBUTION SYSTEMS**				
Teaching	Total contact hours - 45	L	T	P	C
Prerequisite(s): POWER SYSTEMS		**3**	**0**	**0**	**3**

Course Objectives:

The objectives of the course are to make the student learn about

1. To learn the basic concepts in distribution systems
2. To learn the design of substations and feeders
3. To learn the calculations of voltage drop in distribution lines
4. To learn the operation of various protective and coordinating equipment
5. To understand the compensation methods for Power Factor Improvement

Course Outcomes:

After successful completion of the course, a successful student will be able to	
C01:	Understand the various factors of distribution system.
C02:	Design the substation and feeders.
CO3:	Determine the voltage drop and power loss.
CO4	Understand the operation of various protective and coordinating equipment
CO5:	Understand the compensation methods for Power Factor Improvement

Syllabus:

UNIT-I: General Concepts

Introduction to distribution systems, Load modeling and characteristics – Coincidence factor – Contribution factor - loss factor – Relationship between the load factor and loss factor – Classification of loads (Residential, commercial, Agricultural and Industrial) and their characteristics.

UNIT-II: Substations

Location of substations: Rating of distribution substation – Service area within primary feeders – Benefits derived through optimal location of substations.

Distribution Feeders: Design Considerations of distribution feeders**:** Radial and loop types of primary feeders – Voltage levels – Feeder loading – Basic design practice of the secondary distribution system.

UNIT-III: System Analysis

Voltage drop and power–loss calculations**:** Derivation for voltage drop and power loss in lines – Manual methods of solution for radial networks – Three phase balanced primary lines.

UNIT-IV: Protection

Objectives of distribution system protection – Types of common faults and procedure for fault calculations – Protective devices: Principle of operation of fuses – Circuit reclosures – Line

sectionalizes and circuit breakers. Coordination: Coordination of protective devices: General coordination procedure, fuse - fuse, recloser - fuse, circuit breaker - fuse, circuit breaker - recloser, recloser – recloser.

UNIT-V: Compensation for Power Factor Improvement

Capacitive compensation for power–factor control – Different types of power capacitors – shunt and series capacitors – Effect of shunt capacitors (Fixed and switched) – Power factor correction – Capacitor allocation – Economic justification – Procedure to determine the best capacitor location.

Voltage Control: Equipment for voltage control – Effect of series capacitors– Effect of AVB/AVR –Line drop compensation.

Text Books:

1. "Electric Power Distribution system, Engineering" – by Turan Gonen, McGraw–hill Book Company.

Reference Books:

1. Electrical Distribution Systems by Dale R. Patrick and Stephen W. Fardo, CRC press.
2. Electric Power Distribution – by A.S. Pabla, Tata McGraw–hill Publishing Company, 4th edition, 1997.
3. Electrical Power Distribution Systems by V. Kamaraju, Right Publishers.

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], 4 : No Correlation)

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	PO11	P012
C01	✓											
C02			✓									
C03					✓							
C04	✓		✓									
CO5		✓										

Regulation GRBT-20	**Godavari Institute of Engineering & Technology (Autonomous)**	**III B.Tech. I Sem (5th semester)**			
Course Code	**HIGH VOLTAGE ENGINEERING**				
Teaching	Total contact hours - 45	L	T	P	C
Prerequisite(s):	Power Systems, Switchgear & Protection	3	0	0	3

Course Objectives:

The objectives of the course are to make the student learn about

1. To get a fair knowledge about the generation of high voltages and currents
2. To understand the generation and measurement of high voltages and currents.
3. To understand the concept of solid, liquid and gaseous dielectrics.
4. To gain knowledge in testing of high voltage equipments.
5. To know the various methods of high voltage testing on electrical apparatus

Course Outcomes:

After successful completion of this course, a student will be able to:	
CO1:	Understand theory of breakdown and withstand phenomena of all types of dielectric Materials.
CO2:	Acquaint with the techniques of generation of AC,DC and Impulse voltages
CO3:	Know the techniques of testing various equipment's used in HV engineering.
CO4	Transient voltages and their propagation characteristics
CO5:	Know the various methods of high voltage testing on electrical apparatus

Syllabus:

UNIT–I

Introduction to High Voltage Technology: Electric Field Stresses – Uniform and non–uniform field configuration of electrodes – Estimation and control of electric Stress – Numerical methods for electric field computation.

UNIT–II

Break down phenomenon in gaseous, liquid and solid insulation: Gases as insulating media – Collision process – Ionization process – Townsend's criteria of breakdown in gases – Paschen's law – Liquid as Insulator – Pure and commercial liquids – Breakdown in pure and commercial liquid – Intrinsic breakdown – Electromechanical breakdown – Thermal breakdown –Breakdown of solid dielectrics in practice – Breakdown in composite dielectrics used in practice.

UNIT–III

Generation of High voltages and High currents: Generation of high DC voltages – Generation of high alternating voltages – Generation of impulse voltages – Generation of impulse currents – Tripping and control of impulse generators.

Measurement of high voltages and High currents: Measurement of high AC, DC and Impulse voltages – Voltages and measurement of high currents – Direct, alternating and Impulse.

UNIT–IV

Non–destructive testing of material and electrical apparatus: Measurement of DC resistivity – Measurement of dielectric constant and loss factor – Partial discharge measurements.

UNIT–V

High voltage testing of electrical apparatus: Testing of insulators and bushings – Testing of isolators and circuit breakers– Testing of cables – Testing of transformers – Testing of surge arresters – Radio interference measurements.

Text Books:

1. High Voltage Engineering by M.S.Naidu and V. Kamaraju – TMH Publications, 3rd Edition.
2. High Voltage Engineering : Fundamentals by E.Kuffel, W.S. Zaengl, J. Kuffel by Elsevier, 2nd Edition.
3. High Voltage Engineering and Technology by Ryan, IET Publishers.

Reference Books:

1. High Voltage Engineering by C.L.Wadhwa, New Age Internationals(P) Limited, 1997.
2. High Voltage Insulation Engineering by Ravindra Arora, Wolfgang Mosch, New.Age International (P) Limited, 1995.

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	PO11	P012
C01		✓								✓		
C02						✓					✓	
C03			✓									
C04			✓					✓				
C05		✓										

Regulation GRBT-20	**Godavari Institute of Engineering & Technology (Autonomous)**	**III B.Tech. I Sem (5th semester)**			
Course Code	**DIGITAL CONTROL SYSTEMS**				
Teaching	Total contact hours - 45	L	T	P	C
Prerequisite(s): Control Systems		3	0	0	3

Course Objectives:

The objectives of the course are to make the student learn about

4. To develop knowledge about principles and techniques of A/D and D/A conversions and basics of Z-transform
5. To understand stability analysis of digital control systems
6. To design digital control systems for different engineering model
7. To understand the conventional and state space methods of design
8. To design discrete–time control systems by conventional methods

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Learn the advantages of discrete time control systems and the "know how" of various associated accessories
CO2:	Understand z–transformations and their role in the mathematical analysis of different systems (like Laplace transforms in analog systems).
CO3:	Learn stability criterion for digital systems and methods adopted for testing
CO4:	Understand the conventional and state space methods of design
CO5:	Design discrete–time control systems by conventional methods

UNIT – I:

Introduction to signal processing: Introduction to analog and digital control systems – Advantages of digital systems – Typical examples – Signals and processing – Sample and hold devices – Sampling theorem and data reconstruction – Frequency domain characteristics of zero order hold.

UNIT–II:

Z–transformations: Z–Transforms – Theorems – Finding inverse z–transforms – Formulation of difference equations and solving – Block diagram representation – Pulse transfer functions and finding open loop and closed loop responses.

UNIT–III:

State space analysis and the concepts of Controllability and observability: State space representation of discrete time systems – State transition matrix and methods of evaluation – Discretization of continuous – Time state equations – Concepts of controllability and observability – Tests(without proof).

UNIT – IV:

Stability analysis: Mapping between the s–Plane and the z–Plane – Primary strips and Complementary strips – Stability criterion – Modified Routh's stability criterion and Jury's stability test.

UNIT – V:

Design of discrete–time control systems by conventional methods: Transient and steady state specifications – Design using frequency response in the w–plane for lag and lead compensators – Root locus technique in the z–plane. State feedback controllers: Design of state feedback controller through pole placement – Necessary and sufficient conditions – Ackerman's formula.

Text Book:

1. Discrete–Time Control systems – K. Ogata, Pearson Education/PHI, 2nd Edition.
2. Digital Control and State Variable Methods by M.Gopal, TMH, 4th Edition.

Reference Books:

1. Digital Control Systems, Kuo, Oxford University Press, 2nd Edition, 2003.

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	PO11	P012
C01		✓								✓		
C02			✓								✓	
C03			✓									
C04				✓								
C05		✓										

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Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	B.Tech. II I			
Course Code	ENGLISH FOR CAREER (ECE, AME)				
Teaching	Total contact hours	L	T	P	C
Prerequisite(s): Learner should be equipped with Functional Grammatical skills and interactive ability		01	0	2	2

Course Objective: This course aims

- **To achieve proficiency in formal English usage**
- **To improve both written and spoken communication in connection with professional needs**
- **To make them industry ready in terms of grooming, speaking in in-formal occasions**

Course Outcomes

On Completion of the course, the students will be able to-	
CO1:	Understand the necessity to improve four language skills
CO2:	Acquire knowledge about public speaking ability
CO3:	Strengthen their grammatical skills in the language
CO4:	Improve necessary vocabulary and academic writing skills
CO5:	Improve academic writing skills

Syllabus:

Unit-1

Technical Communication: Report writing: Importance, structure, drafting of reports, Types of reports-formal-informal reports-Business Writing: Sales letters, notices, agenda and minutes of the meeting-Information Transfer

Unit-2

Communication Practice -Debating and Role Playing-Meaning-Do's and don'ts-Voice modulation-fluency-Keep it short and sweet-formal discussions-summarizing techniques- Group discussion-do's and don'ts -JAM sessions

Unit-3

Grammar In Use-Tense and aspect-Verb patterns-usage of progressive tense- Types and kinds of sentences -Question tags-Usage of Auxiliaries- Common errors

Unit-4

Vocabulary Building-Affixes- synonyms and antonyms-Phrasal verbs-Homonyms-Eponyms-Idioms-verbal Analogies-one word substitutes-Collocations

Unit-5

(a)Occupational competency- Interview skills- self introduction-performance management planning-strategic planning-Negotiation techniques-visual communication- - delegation-filling personal information-C.V.preparation-Mock Interviews

(b) LSRW Skills-Selected lessons from UNLOCK-2 published by Cambridge University Press, mobile etiquette, table manners, dressing style

Prescribed Text Books: UNLOCK SERIES from Cambridge University Press

Unlock Book-2: Reading and Writing

Listening and Speaking

Web references: https://www.englishclub.com/

http://www.world-english.org/

http://learnenglish.britishcouncil.org/

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate [Medium]; 3: Substantial [High], '-': No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	2	3	2	-	-	-	-
CO2	-	-	-	-	-	3	3	3	-	-	-	1
CO3	-	-	-	-	-	2	3	3	-	-	-	-
CO4	-	-	-	-	--	3	3	3	-	-	-	1
CO5	-	-	-	-	-	2	2	2	-	-	-	-

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Regulation GRBT-20	**Godavari Institute of Engineering & Technology (Autonomous)**	**III B.Tech. I Sem (5th semester)**			
Course Code	**CONTROL SYSTEMS LAB**				
Teaching	Total contact hours - 30	L	T	P	C
Prerequisite(s): Control Systems		0	0	3	1.5

Course Objectives:

The objectives of the course are to make the student learn about

16. To learn about the modeling of dynamical systems and characteristics of control components.
17. To Formulate different types of analysis in frequency domain to explain the nature of stability of the system
18. To know about Lag and Lead Compensators
19. To learn about the Routh Hurwitz Criterion, Nyquist plot and Bode plots
20. To study about the Effect of controllers on second order systems

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Derive the transfer function of physical systems and determination of overall transfer function using block diagram algebra and signal flow graphs.
CO2:	Determine time response specifications of second order systems and to determine error constants
CO3:	Analyze absolute and relative stability of LTI systems using Routh's stability criterion and the root locus method
CO4:	Analyze the stability of LTI systems using frequency response methods
CO5:	Study about the Effect of controllers on second order systems

Any 8 experiments are to be done compulsorily from each cycle.

CYCLE-1

1. Lag compensation – Magnitude and phase plot
2. Lead compensation – Magnitude and phase plot
3. To study the Characteristics of magnetic amplifier-series connection
4. To study the Characteristics of magnetic amplifier-parallel connection
5. To study the Characteristics of magnetic amplifier-self saturated
6. Study of DC position control system
7. Effect of P controller on a second order system
8. Effect of PD controller on a second order system
9. Effect of PI controller on a second order system
10. Effect of PID Controller on a second order system

CYCLE-2

11. Potentiometer as an error detector
12. Time response of Second order system
13. Study the Temperature controller using PID
14. Experimentally determine Transfer function of DC motor
15. To study Characteristics of DC servo motor
16. Study the effect of feedback on DC servo motor
17. To study the characteristics of AC servo motor
18. To study the characteristics of Synchros
19. Programmable logic controller – characteristics of stepper motor
20. Frequency response of second order system

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	PO11	P012
C01		✓								✓		
C02			✓								✓	
C03			✓									
C04				✓								
CO5		✓										

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Regulation GRBT-20	**Godavari Institute of Engineering & Technology (Autonomous)**	**III B.Tech. I Sem (5th semester)**			
Course Code	**POWER ELECTRONICS LAB**				
Teaching	Total contact hours - 30	L	T	P	C
Prerequisite(s): Power Electronics		0	0	3	1.5

Course Objectives:

The objectives of the course are to make the student learn about

9. To know the characteristics of various power electronic devices
10. To make the students to design triggering circuits of SCR
11. To introduce power electronics components from which the characteristics of SCR, TRIAC, IGBT and MOSFET are obtained.
12. To perform the experiments on various converters
13. To perform commutation techniques

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Know the characteristics of various power electronic devices
CO2:	Analyze firing circuit and commutation circuits of SCR
CO3:	Analyze the performance of single–phase and three–phase full– wave bridge converters, single–phase dual converter with both resistive and inductive loads
CO4	Understand the operation of AC voltage controller and cycloconverter with resistive and inductive loads.
CO5:	Understand the working of Buck converter, Boost converter, single–phase bridge inverter and PWM inverter.

Any 8 experiments are to be done compulsorily from each cycle.

CYCLE-1

1. Experimental study of input output Characteristics of SCR,
2. Experimental study of input output Characteristics of MOSFET
3. Experimental study of input output Characteristics of IGBT
4. Experimental study of different types of Gate firing circuits for SCR's- half wave triggering
5. Experimental study of different types of Gate firing circuits for SCR's- full wave triggering
6. Experimental study of different types of Gate firing circuits for SCR's-UJT
7. Experimental study of Single -Phase Half controlled converter with R and RL loads
8. Experimental study of Single -Phase fully controlled bridge converter with R and RL loads
9. Experimental study of Single -Phase Cyclo–converter with R and RL loads

CYCLE-2

10. Experimental study of Single -Phase AC Voltage Controller with R and RL loads
11. Experimental study of Single -Phase Bridge Inverter with R and RL Loads
12. Experimental study of Single -phase PWM inverter.
13. Experimental study of Single -Phase dual converter with R and RL loads
14. Experimental study of Three -Phase half controlled bridge converter with R and RL loads
15. Experimental study of Three- Phase full converter with R and RL loads
16. Experimental study of DC–DC buck converter.
17. Experimental study of DC–DC boost converter.
18. Experimental study of DC Jones chopper with R and RL loads

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	PO11	P012
C01		✓								✓		
C02			✓								✓	
C03			✓									
C04				✓								
C05		✓										

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Regulation GRBT-20	**Godavari Institute of Engineering & Technology (Autonomous)**	**III B.Tech. II Sem (6th semester)**			
Course Code	**SWITCHGEAR & PROTECTION**				
Teaching	Total contact hours - 45	L	T	P	C
Prerequisite(s): Power Systems- I		3	0	0	3

Course Objectives:

The objectives of the course are to make the student learn about

14. To understand the need of protection of electric equipment and their protection schemes
15. To understand operations & characteristics of various electromagnetic and static relays.
16. To understand the operations of various types of circuit breakers and their ratings
17. To understand the unit protection and over voltage protection of different apparatus in power system
18. To understand about over voltage protection

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Understand the principles of arc interruption for application to high voltage circuit breakers of air, oil, vacuum, SF_6 gas type.
CO2:	Understand the working principle and constructional features of different types of electromagnetic protective relays
CO3:	Knowledge of faults that is observed to occur in high power generator and transformers and protective schemes used for all protections.
CO4:	Understand about static relays and various types of protective schemes used for feeders and bus bar protection
CO5	Understand about over voltage protection

UNIT–I

Circuit Breakers: Elementary principles of arc interruption– Restrike Voltage and Recovery voltages– Restrike phenomenon– Average and Max. RRRV– Current chopping and Resistance switching– Miniature Circuit Breaker (MCB) – Introduction to Oil circuit breakers– Description and operation of Air-Blast, Vacuum and SF6 circuit breakers– CB ratings and specifications– Auto reclosing

UNIT–II

Electromagnetic Protection: Principle of operation and construction of attracted armature– Balanced beam– induction disc and induction cup relays– Relays classification– Instantaneous– DMT and IDMT types– Applications of relays**:** Over current/under voltage relays– Directional relays– Differential relays and percentage differential relays– Universal torque equation– Distance relays**:** Impedance – Reactance – Mho and Offset Mho relays – Characteristics of distance relays and comparison.

UNIT–III

Generator and Transformer Protection: Protection of generators against stator faults– Rotor faults and abnormal conditions – restricted earth fault and inter turn fault protection– Numerical examples. Transformer Protection: Protection of transformers**:** Percentage differential protection– Design of CT's ratio– Buchholz relay protection–Numerical examples.

UNIT–IV

Feeder and Bus bar Protection: Over current– Carrier current and three zone distance relay using impedance relays – Translay relay – Protection of bus bars – Differential protection.
Static and Digital Relays**:** Static relay components– Static over current relay– Static distance relay– Micro processor based digital relays.

UNIT–V

Protection against over voltage and Grounding: Generation of over voltages in power systems– Protection against lightning over voltages– Valve type and Zinc–Oxide lightning arresters– Insulation coordination– BIL– impulse ratio– Standard impulse test wave – volt~time characteristics– Grounded and ungrounded neutral systems–Effects of ungrounded neutral on system performance– Methods of neutral grounding**:** Solid–Resistance–Reactance–Arcing grounds and grounding Practices.

Text Books

1. Protection and SwitchGear by BhaveshBhalja, R.P. Maheshwari, NileshG. Chothani, Oxford University Press, 2013
2. Power system protection- Static Relays with microprocessor applications. by T.S. Madhava Rao, TMH
3. Electrical Power System Protection by C. CHRISTOPOULOS and A. Wright, Springer publications

Reference Books

1. Power System Protection and Switchgear by Badari Ram, D.N Viswakarma, TMH Publications.
2. Fundamentals of Power System Protection by Paithankar and S.R. Bhide, PHI, 2003.
3. Art & Science of Protective Relaying – by C R Mason, Wiley Eastern Ltd.

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	PO11	P012
C01	✓									✓		
C02											✓	
C03		✓										
C04			✓	✓								
C05		✓										

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Regulation GRBT-20	**Godavari Institute of Engineering & Technology (Autonomous)**	**III B.Tech. II Sem (6th semester)**			
Course Code	**POWER SYSTEM ANALYSIS**				
Teaching	Total contact hours - 45	L	T	P	C
Prerequisite(s): Basic Knowledge on Mathematics, Electric Circuit Theory		3	0	0	3

Course Objectives:

The objectives of the course are to make the student learn about

19. Solve power flow problems by application of the Newton method
20. Represent elements of a power system including generators, transmission lines, and transformers.
21. Understand the functioning of a synchronous machine and represent it with simple models.
22. Generate the elements of the impedance matrix from the elements of the admittance matrix without a matrix inversion.
23. To gain Knowledge on Power System Stability Analysis

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Draw an impedance diagram and SLD for a power system network and form a Y_{bus} matrix for a power system network with or without mutual couplings.
CO2:	Find out the load flow solution of a power system network using different types of load flow methods.
CO3:	Formulate the Zbus for a power system network.
CO4:	Find out the fault currents for all types faults with a view to provide data for the design of protective devices
CO5	Knowledge on Power System Stability Analysis

UNIT –I:

Graph Theory Concepts: Per Unit Quantities–Single line diagram– Impedance diagram of a power system–Graph theory definition – Formation of element node incidence and bus incidence matrices – Primitive network representation – Formation of Y–bus matrix by singular transformation and direct inspection methods.

UNIT –II:

Power Flow Studies: Necessity of power flow studies – Derivation of static power flow equations – Power flow solution methods: Gauss-Seidel Method – Newton Raphson Method (Rectangular and polar coordinates form) –Decoupled and Fast Decoupled methods – Algorithmic approach – Numerical Problems (3–bus system only).

UNIT –III:

Z–Bus formulation: Formation of Z–Bus**:** Partial network– Algorithms for the Modification of Z_{bus} Matrix under addition of link and branch (Derivations and Numerical Problems) – Modification of Z–Bus for the changes in network (Problems).

UNIT – IV:

Symmetrical Fault Analysis: Transients on a Transmission line-Short circuit of synchronous machine (on no-load) - 3– Phase short circuit currents and reactance's of synchronous machine – Short circuit MVA calculations -Series reactors – selection of reactors.

Symmetrical Components & Unsymmetrical Fault analysis: Definition of symmetrical components - symmetrical components of unbalanced three phase systems – Power in symmetrical components – Sequence impedances – Synchronous generator – Transmission line and transformers – Sequence networks – Various types of faults LG– LL– LLG on unloaded alternator – unsymmetrical faults on power system.

UNIT – V:

Power System Stability Analysis: Elementary concepts of Steady state, Dynamic and Transient Stabilities– Description of Steady State Stability Power Limit–Transfer Reactance – Synchronizing Power Coefficient – Power Angle Curve and Determination of Steady State Stability –Derivation of Swing Equation – Determination of Transient Stability by Equal Area Criterion Methods to improve steady state and transient stability.

Text Books

1. Electrical Power Systems by P.S.R.Murthy, B.S.Publications
2. Modern Power system Analysis – by I.J.Nagrath&D.P.Kothari: Tata McGraw–Hill Publishing Company, 2nd edition.
3. Power System Analysis by Grainger and Stevenson, Tata McGraw Hill.
4. Power System Analysis and Design by J.Duncan Glover, M.S.Sarma, T.J. Overbye – CengageLearning publications.

Reference Books

1. Power System Analysis by B.R.Gupta, Wheeler Publications.
2. Power System Analysis – by A.R.Bergen, Prentice Hall, Inc.
3. Power System Analysis by HadiSaadat – TMH Edition.

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	PO11	P012
C01		✓								✓		
C02			✓								✓	
C03			✓									
C04			✓	✓								
C05			✓									

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Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	III B.Tech. II Sem (6th semester)			
Course Code	**MICROPROCESSORS & MICRO CONTROLLERS AND APPLICATIONS LAB**				
Teaching	Total contact hours - 30	L	T	P	C
Prerequisite(s): MPMC		0	0	3	1.5

Course Objectives:

The objectives of the course are to make the student learn about

24. To Study the Architecture of 8085 & 8086 microprocessor.
25. To Learn the design aspects of I/O and Memory Interfacing circuits
26. Study the Architecture of 8051 microcontroller
27. To Understand the concepts related to I/O and memory interfacing
28. To understand the use of external interrupts

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Do assembly language programming.
CO2:	Do interfacing design of peripherals like I/O, A/D, D/A, timer etc.
CO3:	Develop systems using different microcontrollers
CO4:	learn hardware and software interaction and integration
CO5	Understand the use of external interrupts

Any 8 experiments are to be done compulsorily from each cycle.

CYCLE-1

1. Unsigned arithmetic operation
2. Arithmetic operation – Multi byte addition and subtraction
3. ASCII – Arithmetic operation
4. Multiplication and division – Signed
5. Logic operations – Shift and rotate
6. Converting packed BCD to unpacked BCD, BCD to ASCII conversion
7. By using string operation and Instruction prefix**:** Move block, Reverse string, Length of the string, String comparison
8. String manipulations: Sorting
9. String manipulations: Inserting and Deleting
10. Dos/BIOS programming: Reading keyboard (Buffered with and without echo)

CYCLE-2

11. Interfacing 8255–PPI
12. Programs using special instructions like swap, bit/byte, set/reset etc
13. Programs based on short, page, absolute addressing
14. Interfacing 8259 – Interrupt Controller
15. Interfacing 8279 – Keyboard Display
16. Stepper motor control using 8253/8255
17. Reading and Writing on a parallel port
18. Timer in different modes
19. Serial communication implementation.
20. Understanding three memory areas of 00 – FF (Programs using above areas).Using external interrupts

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	PO11	P012
C01		✓								✓		
C02			✓								✓	
C03			✓									
C04				✓								
C05		✓										

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Regulation GRBT-20	**Godavari Institute of Engineering & Technology (Autonomous)**	**III B.Tech. II Sem (6th semester)**			
Course Code	**POWER SYSTEM OPERATION & CONTROL**				
Teaching	Total contact hours – 45	L	T	P	C
Prerequisite(s): Power System Analysis		3	0	0	3

Course Objectives:

The objectives of the course are to make the student learn about

1. Understand the solution methods of economic dispatch and static state estimation and explain the automatic generation control of a multi-area system;
2. Understand the solution methods of economic dispatch and static state estimation and explain the automatic generation control of a multi-area system;
3. Apply the Lagrange's method to the economic dispatch of thermal units;
4. Explain the automatic generation control and carry out a small-signal analysis of a multi-area system;
5 Apply the concept of reactive power control

Course Outcomes:

After successful completion of this course, a student will be able to:	
CO1:	Compute optimal scheduling of Generators
CO2:	Understand hydrothermal scheduling
CO3:	Understand importance of the frequency
CO4:	Understand the automatic generation control and carry out a small signal analysis of multi area system
CO5	Understand the concept of reactive power control

UNIT–I

Economic Operation of Power Systems: Optimal operation of Generators in Thermal power stations, – Heat rate curve– Cost Curve – Incremental fuel and Production costs – Input–output characteristics – Optimum generation allocation with line losses neglected – Optimum generation allocation including the effect of transmission line losses – Loss Coefficients – General transmission line loss formula.

UNIT–II

Hydrothermal Scheduling: Optimal scheduling of Hydrothermal System- Hydroelectric power plant models – Scheduling problems – Short term hydrothermal scheduling problem.

Unit Commitment: Optimal unit commitment problem – Need for unit commitment – Constraints in unit commitment – Cost function formulation – Solution methods – Priority ordering – Dynamic programming.

UNIT–III

Load Frequency Control (LFC): Modeling of steam turbine – Generator – Mathematical modeling of speed governing system – Transfer function – Modeling of Hydro turbine – Necessity of keeping frequency constant – Definitions of Control area – Single area control – Block diagram representation of an isolated power system – Steady state analysis – Dynamic response – Uncontrolled case – Load frequency control of two area system – Uncontrolled case and controlled case – Tie-line bias control.

UNIT–IV

Load Frequency Controllers: Proportional plus Integral control of single area and its block diagram representation – Steady state response – Load Frequency Control and Economic dispatch control.

UNIT–V

Reactive Power Control: Overview of Reactive Power control – Reactive Power compensation in transmission systems – Advantages and disadvantages of different types of compensating equipment for transmission systems – Load compensation – Specifications of load compensator – Uncompensated and compensated transmission lines**:** Shunt and series compensation – Need for FACTS controllers.

Text Books:

1. Electric Energy systems Theory – by O.I.Elgerd, Tata McGraw–hill Publishing Company Ltd., Second edition.
2. Power System stability & control, PrabhaKundur,TMH
3. Modern Power System Analysis – by I.J.Nagrath&D.P.Kothari Tata McGraw – Hill Publishing Company Ltd, 2nd edition.

Reference Books:

1. Power System Analysis and Design by J.Duncan Glover and M.S.Sarma, THOMPSON, 3rd Edition.
2. Power System Analysis by Grainger and Stevenson, Tata McGraw Hill.
3. Power System Analysis by HadiSaadat – TMH Edition.

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	PO11	P012
C01		✓										
C02			✓								✓	
C03		✓								✓		
C04			✓								✓	
C05		✓										

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Regulation GRBT-20	**Godavari Institute of Engineering & Technology (Autonomous)**	**III B.Tech. II Sem (6th semester)**			
Course Code	**POWER SEMICONDUCTOR DRIVES**				
Teaching	Total contact hours - 45	L	T	P	C
Prerequisite(s): Power Electronics, Electrical Machines- I & II		3	0	0	3

Course Objectives:

The objectives of the course are to make the student learn about

29. Understanding of power semiconductor drives operations, modes, characteristics.
30. Understanding How to control machines using power semiconductor drives.
31. Understanding to differentiate the classical and newly developed control methods.
32. Understanding motoring and braking operation.
33. Understanding the concept of Synchronous Motor Drives

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Know the fundamentals of electric drive and different electric braking methods
CO2:	Analyse the operation of three phase converter controlled dc motors and four quadrant operation of dc motors using dual converters.
CO3:	Know the converter control of dc motors in various quadrants
CO4:	Know the concept of speed control of induction motor by using AC voltage controllers and voltage source inverters
CO5	Know the concept of Synchronous Motor Drives

UNIT–I

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

UNIT–II

Three Phase Converter Controlled DC Motor Drives: Revision of speed control techniques – Separately excited and series motors controlled by full converters – Output voltage and current waveforms – Speed-torque expressions – Speed-torque characteristics – Numerical problems – Four quadrant operation using dual converters.

UNIT–III

DC-DC converters Controlled DC Motor Drives: Single quadrant – Two quadrant and four quadrant chopper fed separately excited and series excited motors – Continuous current operation– Output voltage and current waveforms – Speed–torque expressions – Speed–torque characteristics – Four quadrant operations – Closed loop operation (Block diagram only).

UNIT–IV

Control of Induction Motor Drives: Stator side**:** Variable voltage characteristics–Control of Induction Motor by AC Voltage Controllers – Waveforms –Speed torque characteristics– Variable Voltage Variable Frequency control of induction motor by voltage source inverter – PWM control – Closed loop operation of induction motor drives (Block Diagram Only).

Rotor side: Static rotor resistance control – Slip power recovery schemes – Static Scherbius drive – Static Kramer drive – Performance and speed torque characteristics – Advantages –Applications.

UNIT–V

Control of Synchronous Motor Drives: Separate control & Self-control of synchronous motor Drives – Operation of self-controlled synchronous motor by VSI– Closed Loop control operation of synchronous motor drives (Block Diagram Only) –Variable frequency control–Pulse width modulation

Text Books

1. Fundamentals of Electric Drives – by G K Dubey Narosa Publications
2. Power Semiconductor Drives, by S.B. Dewan, G.R.Slemon, A.Straughen, Wiley-India Edition.

Reference Books

1. Electric Motors and Drives Fundamentals, Types and Applications, by Austin Hughes and Bill Drury, Newnes.
2. Thyristor Control of Electric drives – Vedam Subramanyam Tata McGraw Hill Publications.
3. Power Electronic Circuits, Devices and applications by M.H. Rashid, PHI.
4. Power Electronics handbook by Muhammad H.Rashid, Elsevier.

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	PO11	P012
C01		✓								✓		
C02			✓								✓	
C03			✓									
C04				✓								
C05		✓										

Regulation GRBT-20	**Godavari Institute of Engineering & Technology (Autonomous)**	**III B.Tech. II Sem (6th semester)**			
Course Code	**FLEXIBLE ALTERNATING CURRENT TRANSMISSION SYSTEMS**				
Teaching	Total contact hours - 45	L	T	P	C
Prerequisite(s):	Basic knowledge on transmission systems	**3**	**0**	**0**	**3**

Course Objectives:

The objectives of the course are to make the student learn about

6. To learn various types of FACTS controllers
7. To learn the operation of VSC and CSC
8. To learn about reactive power compensation methods
9. To learn about series and shunt compensators
10. To learn combined controllers

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Learn the basics of power flow control in transmission lines by using FACTS controllers.
CO2:	Explain the operation and control of voltage source converter.
CO3:	Discuss compensation methods to improve stability and reduce power oscillations in the transmission lines.
CO4:	Learn the method of shunt compensation by using static VAR compensators.
CO5	Learn the method of series compensation by using Static series compensators

Syllabus:

UNIT-I: Introduction to FACTS

Power flow in an AC System – Loading capability limits – Dynamic stability considerations – Importance of controllable parameters – Basic types of FACTS controllers – Benefits from FACTS controllers – Requirements and characteristics of high power devices – Voltage and Current rating – Losses and speed of switching – Parameter trade–off devices.

UNIT-II: Voltage Source and Current Source Converters

Concept of voltage source converter (VSC) – Single phase bridge converter – Square–wave voltage harmonics for a single–phase bridge converter – Three–phase full wave bridge converter– Three–phase current source converter – Comparison of current source converter with voltage source converter.

UNIT-III: Compensation Methods

Objectives of shunt compensation – Mid–point voltage regulation for line segmentation – End of line voltage support to prevent voltage instability – Improvement of transient stability – Power oscillation damping.

Methods of controllable VAR generation - Variable impedance type static VAR generators – Thyristor Controlled Reactor (TCR) and Thyristor Switched Reactor (TSR).

UNIT-IV: Shunt Compensators

Thyristor Switched Capacitor (TSC) – Thyristor controlled Reactor (TCR). Static VAR compensator (SVC) and Static Compensator (STATCOM)**:** The regulation and slope transfer function and dynamic performance – Transient stability enhancement and power oscillation damping– Operating point control and summary of compensation control.

UNIT-V: Series Compensators

Static series compensators**:** Concept of series capacitive compensation – Improvement of transient stability – Power oscillation damping – Functional requirements. GTO Thyristor controlled Series Capacitor (GSC) – Thyristor Switched Series Capacitor (TSSC) and Thyristor Controlled Series Capacitor (TCSC).

Combined Controllers: Schematic and basic operating principles of unified power flow controller (UPFC) and Interline power flow controller (IPFC).

Text Books:

2. "Understanding FACTS" N.G. Hingorani and L. Guygi, IEEE Press. Indian Edition is available:—Standard Publications, 2001.
3. "Flexible ac transmission system (FACTS)" Edited by Yong Hue Song and Allan T Johns, Institution of Electrical Engineers, London.

Reference Books:

4. Thyristor-based FACTS Controllers for Electrical Transmission Systems, by R. Mohan Mathur and Rajiv K. Varma, Wiley.

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High],
'-' : No Correlafion)

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	PO11	P012
C01	✓											
C02			✓									
C03					✓							
C04					✓							
C05					✓							

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Regulation GRBT-20	**Godavari Institute of Engineering & Technology (Autonomous)**	**III B.Tech. II Sem (6th semester)**			
Course Code	**EXTRA HIGH VOLTAGE TRANSMISSION**				
Teaching	Total contact hours - 45	L	T	P	C
Prerequisite(s):	Basic knowledge on Transmission lines	**3**	**0**	**0**	**3**

Course Objectives:

1. To gain knowledge on basic concepts of Extra-high voltage transmission
2. To understand the concepts of Voltage Gradients of Conductors
3. To gain knowledge on Corona effects and Radio Interference
4. To understand the Basic Concepts of HVDC Transmission Systems
5. To apply knowledge about harmonics and filters

Course Outcomes

After successful completion of this course, a student will be able to:	
CO1:	Gain knowledge on basic concepts of Extra-high voltage transmission
CO2:	Understand the concepts of Voltage Gradients of Conductors
CO3:	Gain knowledge on Corona effects and Radio Interference
CO4:	Understand the Basic Concepts Of HVDC Transmission Systems
CO5	Apply knowledge about harmonics and filters

UNIT – I

Introduction of EHVAC Transmission: Necessity of EHV AC transmission – advantages and problems–power handling capacity and line losses, mechanical considerations – resistance of conductors – properties of bundled conductors – bundle spacing and bundle radius- Numerical problems

UNIT – II

Voltage Gradients of Conductors: Electrostatics – field of sphere gap – field of line changes and properties – charge – potential relations for multi-conductors – surface voltage gradient on conductors – distribution of voltage gradient on sub-conductors of bundle – Numerical problems

UNIT – III

Corona Effects : Power loss and audible noise (AN) – corona loss formula – charge voltage diagram – generation, characteristics - limits and measurements of AN – relation between 1-phase and 3-phase AN levels – Numerical problems

Radio interference (RI) - corona pulses generation, properties, limits – frequency spectrum – modes of propagation – excitation function – measurement of RI, Radio Influence Voltage (RIV) and excitation functions – Numerical problems

UNIT –I V

Basic Concepts of HVDC Transmission Systems: Types of HVDC Links – Apparatus required for HVDC Systems – Comparison of AC &DC Transmission, Application of DC Transmission System – Planning & Modern trends in D.C. Transmission.

UNIT – V

Harmonics and Filters : Generation of Harmonics –Characteristics of harmonics, calculation of AC Harmonics, adverse effects of harmonics – Calculation of voltage & Current harmonics – Effect of Pulse number on harmonics. Types of AC filters, Design of Single tuned filters –Design of High pass filters.

TEXT BOOKS:

1. EHVAC Transmission Engineering by R. D. Begamudre, New Age International (p) Ltd.

2. HVDC Transmission – J.Arrillaga.

3. Direct Current Transmission – by E.W.Kimbark, John Wiley & Sons.

REFERENCE BOOKS:

1. HVDC Power Transmission Systems: Technology and system Interactions – by K.R.Padiyar, New Age International (P) Limited, and Publishers.

2. EHVAC and HVDC Transmission Engineering and Practice – S.Rao.

3. Power Transmission by Direct Current – by E.Uhlmann, B.S.Publications

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlafion)

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	PO11	P012
C01	✓											
C02			✓									
C03					✓							
C04					✓							
C05			✓									

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Regulation GRBT-20	**Godavari Institute of Engineering & Technology (Autonomous)**	**III B.Tech. II Sem (6th semester)**			
Course Code	**HYBRID AND ELECTRIC VEHICLES**				
Teaching	Total contact hours – 45	L	T	P	C
Prerequisite(s):		3	0	0	3

Course Objectives:

1. Understanding various aspects of hybrid and electric drive trains such as their configuration, types of electric machines that can be used, energy storage devices, etc.
2. Get exposed to research and development challenges involved in various types of fuel cells.

Course Outcomes:

On Completion of the course, the students shall be able to-	
CO1:	Grade hybrid electric technology and electronic drive trains
CO2:	Construction of hybrid electric vehicles
CO3:	Demonstrate electric vehicle components
CO4:	Construction of Electric vehicle technology
CO5	Operate fuel cell technology and Identification of fuel cell based vehicles

Syllabus

UNIT I –ELECTRIC DRIVETRAINS

Basic concept of electric traction, introduction to various electric drive-train topologies. Electric Propulsion unit: Introduction to electric components used in electric vehicles, Configuration and control of DC Motor drives, Configuration and control of Induction Motor drives.

UNIT II – HYBRID ELECTRIC TECHNOLOGY

Impact of modern drive-trains on energy supplies. Basic concept of hybrid traction, introduction to various hybrid drive-train topologies, power flow control in hybrid drive-train topologies, fuel efficiency analysis, Plug-in hybrid electric vehicles.

UNIT III – HYBRID VEHICLE TECHNOLOGY

Sizing the drive system: Matching the electric machine and the internal combustion engine (ICE), Sizing
the propulsion motor, sizing the power electronics, selecting the energy storage technology, supporting
subsystems. Energy Management Strategies in hybrid and electric vehicles. Case Studies: Design of a Hybrid Electric Vehicle (HEV), Design of a Battery Electric Vehicle (BEV).

UNIT IV – ARCHITECTURE OF HYBRID ELECTRIC VEHICLES

Principles of Hybrid Electric Drive trains, Architectures – Electrical distribution, Hybrid control Strategies – Parallel Hybrid, Series Hybrid - Practical Models – Toyota Prius, Honda Insight. Heavy Vehicles - Hybrid Electric Heavy Duty Vehicles.

UNIT V – FUELCELL TECHNOLOGY

Structures, Operations and properties of Fuel cells – (Phosphoric Acid Fuel cell, Proton Exchange membrane Fuel cell, Direct Methanol fuel cell, Alkaline Fuel Cells, Solid Oxide Fuel Cell, Molten Carbonate Fuel Cell)

FUEL CELL BASED VEHICLES STRUCTURE

PEMFC: Operating principle DMFC: Operating principle – Methanol crossover.

TEXT BOOKS

1. Basu .S, *"Recent Trends in Fuel cell Science and Technology",* Anamaya Publishers, New Delhi.,2007.
2. Viswanathan, B. and Aulice Scibioh, M., *"Fuel Cells Principles and Applications*", Universities Press (India) Pvt. Ltd., Hyderabad, 2006.

REFERENCES

1. Larminie, J. and Dicks, A., "*Fuel Cell Systems Explained"* John Wiley & Sons, Ltd., New York, 2001.
2. Ali Emadi, Mehrdad Ehsani, John M. Muller, "*Vehicular Electric Power Systems"*, Marcel Dekker, Inc., 2004.

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High],
'-' : No Correlafion)

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	PO11	P012
C01		3		1								
C02	1	3		2		2		2	2	1		
C03	1		2	3			3			2		1
C04		1		3		2						
C05		1					3					1

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Regulation GRBT-20	GODAVARI INSTITUTE OF ENGINEERING & TECHNOLOGY (Autonomous)	IIIB.Tech II Semester			
Course Code 201CS604	**FUNDAMENTALS OF DATABASES** Open Elective-II: CSE, CSE (AI/ML), CSE (Cyber Security)				
Teaching	Total contact hours: 48	L	T	P	C
Prerequisite(s):---Basic knowledge of Data structures, Proportional logic		3	0	0	3

Course Objective(s):

1. To impart students with theoretical knowledge of databases and database management systems in information technology applications.
2. To instruct the student with practical skills in the use of databases and database management systems
3. **To apprehend the logical design, physical design and implementation of relational databases are covered.**

Course Outcome(s):

After successful completion of this course, a student will be able to-

CO-1: Obtain the knowledge about Database Management System

CO-2: Accorda description of the Database Management structure and comprehend the applications of Databases.

CO-3: Realize the advantages and disadvantages of the different models.

CO-4: Perceive the constraints and controversies associated with relational database.

CO-5: Explain the concept of data planning and Database design and Identify the various functions of Database Administrator

UNIT-1

Introduction: Data base System Applications, data base System VS file System, Advantages of a DBMS View of Data, Data Abstraction, instances and Schemas, data Models, the ER Model, Relational Model, Other Models, Database Languages: DDL, DML, DCL.

UNIT-2

ER Model**:** Data base design and ER diagrams, Beyond ER Design Entities, Attributes and Entity sets, Relationships and Relationship sets, Additional features of ER Model, Concept Design with the ER Model.

UNIT-3

Basic SQL Query: Basic SQL querying (select and project) using where clause, arithmetic & logical operations, Set, Comparison Operators, NULL values, Comparison using Null values, sub queries, grouping, aggregation, ordering, implementation of different types of joins.

UNIT-4

SQL and PL/SQL: Creating tables with relationship, implementation of key and integrity constraints, views. Introduction to PL/SQL

Schema Refinement (Normalization): Purpose of Normalization or schema refinement, concept of functional dependency, normal forms based on functional dependency (1NF, 2NF and 3NF).

Unit-5

Introduction to NoSQL:NoSQL Data Model Design, Feature Set, areas of applicability, Types of NoSQL – Key-Value, Document Type, Graph based

Text Books

1. Database System Concepts 6e By Abraham Silberschatz, Henry Korth and S Sudarshan
2. Database Management Systems, 3/e Raghuram Krishnan, Johannes Gehrke, TMH

Reference Books

1. Introduction to Database Systems, 8/e C J Date, PEA
2. The Database book principles & practice using Oracle/MySqlNarainGehani, University Press.
3. Oracle Database 11g. The complete reference (oracle press)

Web References:
https://nptel.ac.in/courses/106105175

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate [Medium]; 3: Substantial [High]; '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	-	3	-	-	-	-	1	-	3	-	2	-
CO2	2	2	-	2	-	-	-	2	2	-	2	-	1	2
CO3	1	1	-	2	2	2	-	-	1	-	2	3	-	1
CO4	2	-	3	1	1	-	-	-	-	3	1	-	-	1
CO5	2	1		2	-	-	1	-	-	-	-	-	1	1

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Regulation GRMT-20	Godavari Institute of Engineering & Technology (Autonomous)	IIM.Tech. IIISem (I semester)			
CourseCode	**INTERNET OF THINGS AND IT'S APPLICATIONS**				
Teaching	Totalcontacthours-45	L	T	P	C
Prerequisites: Knowledge of Logic Gates, Relays, Registers, Counter, Sensors, Microprocessors,Microcontrollers,Serial& Parallel communication		3	-	-	3

Course Objectives:

1. To understand the basic concepts of Internet of things
2. To develop understanding with layered Wired and Wireless protocols.
3. To develop understanding with Arduino board and Arduino IDE.
4. To develop understanding with Data analytics and supporting services.
5. To develop understanding with Big data services and Sensors.

Course Outcomes:

On Completion of the course, the students will be able to	
CO1:	Learn the Architecture of iot,Sensors,Actuators,ARM processors.
CO2:	Learn the various Communication protocols present in a network.
CO3:	Apply the practical knowledge to Arduino board
CO4:	Analyze the Machine learning and various network services.
CO5:	Learn the importance of Big data and Virtualization concepts.

UNIT – 1 FUNDAMENTALS OF IOT

Evolution of Internet of Things, Enabling Technologies, IoT Architectures, oneM2M, IoT World Forum (IoTWF) and Alternative IoT models, Simplified IoT Architecture and Core IoT Functional Stack, Fog, Edge and Cloud in IoT, Functional blocks of an IoT ecosystem, Sensors, Actuators, &Smart Objects .

IoTPlatfortri overview: Overview of IoT supported Hardware platforms such as: ARM Cortex Processors, Arduino and Intel Galileo boards.

UNIT – 2 IOTCOMMUNICATION PROTOCOLS

Access Technologies: Physical and MAC layers, topology and Security of IEEE 802.15.4, 802.15.49, 802.15.4e, 802.11ah and Lora WAN, Network Layer: IP versions, Constrained Nodes and Constrained Networks, Application Transport Methods: Supervisory Control and Data Acquisition, Application Layer Protocols: CoAP and MQTT.

UNIT – 3 DESIGN AND DEVELOPMENT ENVIRONMENT

Design Methodology, Embedded computing logic, Microcontroller, System on Chips, IoT system building blocks, Arduino, Nodemcu Board details, IDE programming.

UNIT – 4 DATAANALYTICS AND SERVICES

Structured Vs Unstructured Data and Data in Motion Vs Data in Rest, Role of Machine Learning — No SQL Databases, HadoopEcosystem, Apache Kafka, Apache Spark, Edge Streaming Analytics, Xively Cloud for IoT, Python Web Application.

UNIT – 5 CASE STUDIES/INDUSTRIAL APPLICATIONS

IoTapplications in home, Agriculture 3.0, buildings, security, Industries, Home appliances, other IoT electronic equipments. Use of Big Data and Visualization in IoT.

Text Books:

1.IoTFundamentals: Networking Technologies, Protocols arid Use Cases for Internet of Things, David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, Cisco Press,2017.

Reference Books:

1. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, StamatisKarnouskos, DavidBoyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1st Edition, Academic Press, 2014.
2. Internet of Things with Arduino and Bolt by AshwinPajankar.

Web Links:

1. https://thingspeak.com
2. https://www.blynk.cc/getting-started
3. http://www.arduino.cc
4. https://coap.technology

CO-PO Mapping:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) '-': No Correlation

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	3	-	1	1	1	-	-	-	1	3
CO2	2	1	1	-	-	-	1	2	-	2	-	-
CO3	2	-	3	2	1	2	2	-	3	-	2	-
CO4	1	2	-	-	-	2	3	3	2	1	-	3
CO5	3	-	-	2	-	1	-	2	-	2	-	-

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Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	B.Tech – III - II			
Course Code	**OPERATIONS MANAGEMANT (Common to all Branches)**				
Teaching	Total contact hours-45	L	T	P	C
Prerequisite(s):Basic knowledge of business production and operations system.		3	0	0	3

Course objectives:

1. It aims to provide students with a critical understanding of the scope and strategic importance of Operations management.
2. To make the students to know about role of operations managersand an appreciation of the interaction of operations with the organisation, employees and customers.
3. To impart the knowledge in the minds of the students how to maximize efficiency while producing goods.

Course outcomes:

On Completion of the course, the students will be able to-	
CO1:	Identify the elements of operations management and various transformation processes to enhance productivity and competitiveness.
CO2:	Analyze and evaluate various facility alternatives and their capacity decisions, develop a balanced line of production & scheduling and sequencing techniques in operation environments.
CO3:	Develop aggregate capacity plans and MPS in operation environment.
CO4:	Plan and implement suitable materials handling principles and practices in the operations.
CO5:	Plan and implement suitable quality control measures in Quality Circles to TQM.

UNITI

Introduction to Operation Management: Nature & Scope of Operation/ Production Management, Relationship with another functional areas, Recent trend in Operation Management, Manufacturing & Theory of Constraint, Types of Production System, Just in Time (JIT) & lean system.

UNIT II

Product Design & Process Selection :Stages in Product Design process, Value Analysis, Facility location & Layout: Types, Characteristics, Advantages and Disadvantages, Work measurement, Job design.

UNIT III

Forecasting & Capacity Planning: Methods of Forecasting, Overview of Operation Planning, Aggregate Production Planning, Production strategies, Capacity Requirement Planning, MRP, Scheduling, Supply Chain Management, Purchase Management, Inventory Management.

UNIT IV

Productivity Concept : Factors affecting Productivity – Job Design – Process Flow Charts – Work study-Methods Study – Work Measurement – Engineering and Behavioral Approaches.

UNIT V

Quality Management: Quality- Definition, Dimension, Cost of Quality, Quality Circles-Continuous improvement (Kaizen), Statistical Quality Control, Variable & Attribute, Process Control, Control Charts -Acceptance Sampling Total Quality Management (TQM)

References:

1. Krajewski&Ritzman (2004). Operation Management -Strategy and Analysis. Prentice Hall of India.
2. Panner Selvem, Production and Operation Management, Prentice Hall of India.
3. Chunnawals, Production & Operation Management Himalaya, Mumbai
4. Charry, S.N (2005). Production and Operation Management- Concepts, Methods Strategy. John Willy& Sons Asia Pvt Limited.
5. K Aswathappa& Sridhar Bhatt, Production & Operations Management, Himalaya, Mumbai

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Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	III B.Tech. II Sem (6th semester)			
Course Code	**SOLID WASTE MANAGEMENT (Open Elective-II)**				
Teaching	Total contact hours - 48	L	T	P	C
Prerequisite(s): Basics of Waste and Environmental Engineering		3	0	0	3

Course Objective:

a. ***To impart the knowledge the methods of collection and optimization of collection routing of municipal solid waste.***
b. ***To acquire the principles of treatment of municipal solid waste***
c. ***To know the impact of solid waste on the health of the living beings***
d. ***To learn the criterion for selection of landfill and its design***
e. ***To plan the methods of processing such as composting the municipal organic waste.***

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1	Understand the Objects of Solid waste management
CO2	Understand the elements of Solid waste management
CO3	Design the Transportation facility in Solid waste management
CO4	Characterise the solid waste and design a composting facility
CO5	Know the criteria for selection of landfill

Syllabus:

Unit – I

Introduction to Solid Waste Management: Goals and objectives of solid waste management, Classification of Solid Waste - Factors Influencing generation of solid waste - sampling and characterization –Future changes in waste composition, major legislation, monitoring responsibilities.

Unit – II

Basic Elements in Solid Waste Management: Elements and their inter relationship – principles of solid waste management- onsite handling, storage and processing of solid waste

Collection of Solid Waste: Type and methods of waste collection systems, analysis of collection system - optimization of collection routes– alternative techniques for collection system.

Unit – III

Transfer and Transport: Need for transfer operation, compaction of solid waste - transport means and methods, transfer station types and design requirements.

Separation and Transformation of Solid Waste: unit operations used for separation and transformation: shredding - materials separation and recovery, source reduction and waste minimization.

Unit – IV

Processing and Treatment: Processing of solid waste – Waste transformation through combustion and composting, anaerobic methods for materials recovery and treatment – Energy recovery – biogas generation and cleaning– Incinerators.

Unit – V

Disposal of Solid Waste: Methods of Disposal, Landfills: Site selection, design and operation, drainage and leachate collection systems –designated waste landfill remediation.

Text Books:

1. George Techobanoglous "Integrated Solid Waste Management", McGraw Hill Publication, 1993.

References:

1. Vesilind, P.A., Worrell, W., Reinhart, D. "Solid Waste Engineering", Cenage learning, New Delhi, 2004
2. Charles A. Wentz; "Hazardous Waste Management", McGraw Hill Publication, 1995.

Web-Resources: www.nptel.com

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	-	-	2	-	-
CO2	3	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	-	-	-	-	-	-	-	-
CO4	-	-	3	-	-	-	-	-	-	-	-	-
CO5	3	-	-	2	-	-	-	-	-	-	-	-

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Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	III B.Tech. II Sem (6^{th} semester)			
Course Code	**SOLID WASTE MANAGEMENT (Open Elective-II)**				
Teaching	Total contact hours - 48	L	T	P	C
Prerequisite(s): Basics of Waste and Environmental Engineering		3	0	0	3

Course Objective:

a. ***To impart the knowledge the methods of collection and optimization of collection routing of municipal solid waste.***
b. ***To acquire the principles of treatment of municipal solid waste***
c. ***To know the impact of solid waste on the health of the living beings***
d. ***To learn the criterion for selection of landfill and its design***
e. ***To plan the methods of processing such as composting the municipal organic waste.***

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1	Understand the Objects of Solid waste management
CO2	Understand the elements of Solid waste management
CO3	Design the Transportation facility in Solid waste management
CO4	Characterise the solid waste and design a composting facility
CO5	Know the criteria for selection of landfill

Syllabus:

Unit – I

Introduction to Solid Waste Management: Goals and objectives of solid waste management, Classification of Solid Waste - Factors Influencing generation of solid waste - sampling and characterization –Future changes in waste composition, major legislation, monitoring responsibilities.

Unit – II

Basic Elements in Solid Waste Management: Elements and their inter relationship – principles of solid waste management- onsite handling, storage and processing of solid waste

Collection of Solid Waste: Type and methods of waste collection systems, analysis of collection system - optimization of collection routes– alternative techniques for collection system.

Unit – III

Transfer and Transport: Need for transfer operation, compaction of solid waste - transport means and methods, transfer station types and design requirements.

Separation and Transformation of Solid Waste: unit operations used for separation and transformation: shredding - materials separation and recovery, source reduction and waste minimization.

Unit – IV

Processing and Treatment: Processing of solid waste – Waste transformation through combustion and composting, anaerobic methods for materials recovery and treatment – Energy recovery – biogas generation and cleaning– Incinerators.

Unit – V

Disposal of Solid Waste: Methods of Disposal, Landfills: Site selection, design and operation, drainage and leachate collection systems –designated waste landfill remediation.

Text Books:

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2. Charles A. Wentz; "Hazardous Waste Management", McGraw Hill Publication, 1995.

Web-Resources: www.nptel.com

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	-	-	2	-	-
CO2	3	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	-	-	-	-	-	-	-	-
CO4	-	-	3	-	-	-	-	-	-	-	-	-
CO5	3	-	-	2	-	-	-	-	-	-	-	-

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Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	III B. Tech. II Sem. (6th Semester)			
Course Code	**Introduction to MEMS (Open Elective-II)**				
Teaching	Total contact hours-45	L	T	P	C
Prerequisite(s):	Engineering Physics.	3	0	0	3

Course Objectives:

Students undergoing this course will be able to:

- Understand the operation of major classes of MEMS sensors and actuators.
- Familiarize with the principles and concepts related to the micro electro mechanical systems.
- Learn the required properties of a material used for fabrication of micro systems.
- Learn the fundamentals of standard micro fabrication techniques and processes.
- Understand the unique demands, environments and applications of MEMS devices.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Discuss the principles and various steps of different micro machining and fabrication techniques.
CO2:	Explain the working principle and fabrication methods of Micro mechanical sensors and actuators.
CO3:	Describe the working principles and construction of various thermal sensor and actuators.
CO4:	Discuss the working principles and fabrication techniques of Magnetic sensors and actuators, and MOEMS devices.
CO5:	Identify different micro fluid actuation techniques and explain the working and construction of BioMEMS devices.

Syllabus

UNIT – I

INTRODUCTION: Definition of MEMS, MEMS history and development – micro machining – lithography principles & methods, photolithography – structural and sacrificial materials, thin film deposition – impurity doping – etching – surface micro machining – wafer bonding – LIGA.

UNIT – II

MICRO MECHANICAL SENSORS AND ACTUATORS: Principles of sensing and actuation, beam and cantilever, capacitive sensors, piezo-electric sensors and actuators – measurement of strain, pressure and flow, pressure measurement by micro phone – MEMS gyroscopes, shear mode piezo actuator, gripping piezo actuator, Inchworm technology.

UNIT – III

THERMAL SENSORS AND ACTUATORS: Thermal energy basics and heat transfer processes, – thermisters, thermo devices – thermo couple, micro machined thermo couple probe – Peltier effect heat pumps – thermal flow sensors – micro hot plate gas sensors – MEMS thermo vessels – pyro electricity – shape memory alloys (SMA), – U-shaped horizontal and vertical electro thermal actuator – thermally activated MEMS relay – micro spring thermal actuator – data storage cantilever.

UNIT – IV

MAGNETIC SENSORS AND ACTUATORS: Magnetic materials for MEMS and properties – magnetic sensing and detection – magneto resistive sensor, Hall Effect – magneto diodes, magneto transistor – MEMS magnetic sensor – magnetic probe based storage device.

MICRO-OPTO-ELECTRO MECHANICAL SYSTEMS: Principle of MOEMS technology – properties of light – light modulators, beam splitter, micro lens, micro mirrors – digital micro mirror device (DMD) – light detectors – grating light valve (GLV) – optical switch

UNIT – V

MICRO FLUIDIC SYSTEMS: Applications – considerations on micro scale fluid – fluid actuation methods. Dielectrophoresis (DEP), Electro wetting, Electro thermal flow, thermo capillary effect, electro osmosis flow, Opto-electro wetting (OEW) – typical micro fluidic channel, – microfluid dispenser – micro needle – molecular gate – micro pumps.

CHEMICAL AND BIO MEDICAL MICRO SYSTEMS: Sensing mechanism & principle – membrane-transducer materials – chem.-lab-on-a-chip (CLOC) – chemoresistors, chemocapacitors– electronic nose (E-nose) – mass sensitive chemosensors

Text Books:

1. MEMS, Nitaigour Premchand Mahalik, TMH Publishers, 1st Edition, 2008.
2. Foundation of MEMS, Chang Liu, Prentice Hall Ltd., 2009.

References:

1. MEMS and Micro Systems: Design and Manufacture, Tai-Ran Hsu, TMH Publishers, 2002.
2. Introductory MEMS, TM Adams, R A Layton, Springer International Publishers, 2007
3. Fundamentals of Micro fabrication, Marc Madou, CRC press 2002.

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	-	-	-	-	-	-	-	-	1
CO2	2	-	-	1	-	2	-	-	-	-	-	1
CO3	2	1	2	-	-	-	-	-	-	-	-	1
CO4	2	3	3	-	-	2	-	-	-	-	-	1
CO5	2	2	3	-	-	2	-	-	-	-	-	1

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Regulation GRBT-20	**Godavari Institute of Engineering & Technology (Autonomous)**	**III B.Tech. II Sem (6th semester)**			
Course Code	Open Pit Slope Analysis and Design				
Teaching	Total contact hours - 45	L	T	P	C
Prerequisite(s): Power Systems- I		3	0	0	3

Course Objectives

1. To impart the knowledge on slopes, slope failures and factors that influence slopes.
2. To discuss the geotechnical parameters required for stability studies of a slope.
3. To elaborate the shear strength of intact rock mass and jointed rock mass.
4. To explain the impacts of water in slope stability.
5. To inculcate various methods and techniques used to assess the slope stability.

Course Outcomes

On Completion of the course, the students will be able to-	
CO1:	Classify various modes of slope failure
CO2:	Comprehend and analyse the geotechnical parameters required for slope stability analysis.
CO3:	Interpret the shear strength of intact rock mass and jointed rock mass.
CO4:	Analyse the flow of water in slope stability.
CO5	Summarize various methods and techniques used to assess the slope stability.

Syllabus

UNIT-I

Introduction

Types and formation of slopes in surface mines; Mechanism of common modes of slope failure; Factors influencing stability of slopes and planning of slope stability investigations.

UNIT-II

Geotechnical Information

Geotechnical data required for high wall slope stability studies; Collection of geological data and their interpretation for stability studies of high wall slopes.

UNIT-III

Slope Stabilization methods

Construction and Stabilization of Slopes, Construction and Stabilization of dumps, Construction of gabion wall, wire netting, preventing landslides, preventing debris from falling.

On Completion of the

UNIT-IV

Slope Monitoring Instruments

Conventional slope monitoring system; Automatic deformation system; Sub-lateral movement monitoring system; Real-time monitoring system.

UNIT-V

Analysis and Design of Pit Slopes and Waste Dumps

Slope stability assessment methods and techniques; Analysis and design criteria and methodology for high wall slopes and backfill and waste dumps; Introduction to Slope Stability Software.

Textbook(s)

1. Hoek and Bray, Rock Slope Engineering, The Institution of Mining and Metallurgy, 1981.
2. G.B. Mishra, Surface Mining, Dhanbad Publishers, 1978.

Reference(s)

1. R.T. Deshmukh, Opencast Mining, M. Publications, Nagpur, 1996.
2. S. K. Das, Surface Mining Technology, Lovely Prakashan, Dhanbad, 1994.

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Regulation GRBT-20	**Godavari Institute of Engineering & Technology (Autonomous)**	**III B.Tech. II Sem (6th semester)**			
Course Code	**Basic Concepts in Petroleum Drilling Engineering**				
Teaching	Total contact hours - 45	L	T	P	C
Prerequisite(s): Power Systems- I		3	0	0	3

Course Objectives

The objectives of this course are to

1. Understand the different types of drilling.
2. Impart knowledge on drilling rig components.
3. Illustrate mud circulating system.
4. Identify well borehole problems

Course Outcomes

On Completion of the course, the students shall be able to-	
CO1:	Understand overview of drilling and rig components
CO2:	Understand selection of drill string and drill bit
CO3:	Understand mud circulation system
CO4:	Understand basics of casing and cementing
CO5	Understand borehole problems

Syllabus

UNIT-I

Overview of Drilling

Drilling planning approaches, drilling team, types of drilling, power systems.

Hoisting System

Derrick & substructure, steel derricks, making a connection, tripping operation, draw-works.

Travelling Assembly

Crown block, travelling block & hook, drilling line, static crown load.

UNIT-II

Drill String

Drill string, drill string components, and design, stretch of drilling pipe, drill pipe maintenance

Drill Bits

Types of bits, standard classification of bits, failure mechanism of bits, bit selection and evaluation

UNIT-III

Drilling Mud Engineering

Introduction, functions, types of mud, fundamental properties of mud, mud circulation, mud conditioning system

Unit-VI

Casing & Cementing

Casing, functions, types, casing policy, casing design basics, cementing, functions of cement, cement classes, casing accessories, setting casing, single stage and two stage cementing.

Unit-V

Borehole Problems

Introduction, pipe sticking, differential sticking, mechanical sticking, and key seating; sloughing shale, lost circulation zones.

Text Book(s)

1. Neal Adams and Tommie Charrier, "Drilling Engineering: A Complete Well Planning Approach" PennWell Pub. Co., (1985).
2. Formulas and Calculation for Drilling, Production and workover, Norton J. Lapeyrouse, 2nd Edition, Gulf Publishing, (2002).

Reference(s)

1. Heriot Watt, "Drilling Engineering Handbook".
2. Economides, M. J., "Petroleum Well Construction" John Wiley & Sons, (1998).
3. Drilling Engineering- A complete Well Planning Approach, Neal J. Adams
4. Drilling Operation Practices Manual, IDT, ONGC

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Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	III B.Tech. II Sem (6th semester)			
Course Code	SKILL ADVANCED COURSE Optimization through electrical software tools				
Teaching	Total contact hours - 30	L	T	P	C
Prerequisite(s): Basic knowledge on Renewable energy sources		1	0	2	2

Course Objectives:

1. To develop an understanding the software and its usage.
2. To know various tools used for optimization.
3. To know the Estimation of energy resources and economics of power system..
4. To design various components used in power system using software tools
5. To know the applications of the software tools studied.

Course Outcomes:

After successful completion of this course, a student will be able to:	
CO1:	Develop an understanding of the software tools and their usage.
CO2:	Know various tools used for optimization
CO3:	Know the Estimation of energy resources and economics of power system
CO4:	Design various components used in power system using software
CO5	Know the applications of the software tools studied

List of Experiments:

All of the following Experiments are to be conducted

1. Estimation of load profile
2. Estimation of energy resources
3. Economics of power system
4. Design of Components used in power system
5. Simulation of power system
6. Sensitivity analysis of power system
7. Optimization of power system
8. Applications of the software

CO-PO Mapping:

(1:Slight[Low]; 2:Moderate[Medium]; 3:Substantial[High], 4: '-' : No (Correlation)

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	PO11	P012
C01		✓								✓		
C02			✓								✓	
C03			✓									
C04				✓								
C05					✓							

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Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	III B.Tech. II Sem (6th semester)			
Course Code	**MICROPROCESSORS & MICRO CONTROLLERS AND APPLICATIONS LAB**				
Teaching	Total contact hours - 30	L	T	P	C
Prerequisite(s): MPMC		0	0	3	1.5

Course Objectives:

The objectives of the course are to make the student learn about

34. To Study the Architecture of 8085 & 8086 microprocessor.
35. To Learn the design aspects of I/O and Memory Interfacing circuits
36. Study the Architecture of 8051 microcontroller
37. To Understand the concepts related to I/O and memory interfacing
38. To understand the use of external interrupts

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Do assembly language programming.
CO2:	Do interfacing design of peripherals like I/O, A/D, D/A, timer etc.
CO3:	Develop systems using different microcontrollers
CO4:	learn hardware and software interaction and integration
CO5	Understand the use of external interrupts

Any 8 experiments are to be done compulsorily from each cycle.

CYCLE-1

21. Unsigned arithmetic operation
22. Arithmetic operation – Multi byte addition and subtraction
23. ASCII – Arithmetic operation
24. Multiplication and division – Signed
25. Logic operations – Shift and rotate
26. Converting packed BCD to unpacked BCD, BCD to ASCII conversion
27. By using string operation and Instruction prefix**:** Move block, Reverse string, Length of the string, String comparison
28. String manipulations: Sorting
29. String manipulations: Inserting and Deleting
30. Dos/BIOS programming: Reading keyboard (Buffered with and without echo)

CYCLE-2

31. Interfacing 8255–PPI
32. Programs using special instructions like swap, bit/byte, set/reset etc
33. Programs based on short, page, absolute addressing
34. Interfacing 8259 – Interrupt Controller
35. Interfacing 8279 – Keyboard Display
36. Stepper motor control using 8253/8255
37. Reading and Writing on a parallel port
38. Timer in different modes
39. Serial communication implementation.
40. Understanding three memory areas of 00 – FF (Programs using above areas).Using external interrupts

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	PO11	P012
C01		✓								✓		
C02			✓								✓	
C03			✓									
C04				✓								
C05		✓										

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Regulation GRBT-20	**Godavari Institute of Engineering & Technology (Autonomous)**	**III B.Tech. II Sem (6th semester)**			
Course Code	**ELECTRICAL SIMULATION LAB**				
Teaching	Total contact hours -30	L	T	P	C
Prerequisite(s): MAT LAB		0	0	3	1.5

Course Objectives:

The objectives of the course are to make the student learn about

1. To present a problem oriented knowledge of power system analysis methods.
2. To address the underlying concepts & approaches behind analysis of power system network using software tools.
3. To identify & formulate solutions to problems relevant to power system using software tools.
4. To understand Load flow studies
5. To simulate transmission line models

Course Outcomes:

After successful completion of this course, a student will be able to:	
CO1:	Simulate control systems & machine models
CO2:	Simulate transmission line with losses
CO3:	Perform transient analysis of RLC circuit and single machine connected to infinite bus
CO4:	Simulate power electronic converters
CO5	Simulate lossless transmission line

Any 8 experiments are to be done compulsorily from each cycle.

CYCLE-1

1. Simulation of step response of RLC circuits
2. Simulation of impulse response of RLC circuits
3. Simulation of transient response of RLC circuits to sinusoidal input
4. Plotting of Bode plots for the transfer functions of systems up to 5^{th} order
5. Plotting of Root locus for the transfer functions of systems up to 5^{th} order
6. Plotting of Nyquist plots for the transfer functions of systems up to 5^{th} order
7. Integrator circuit using op–amp.
8. Differentiator circuits using op–amp.
9. Simulation of separately excited DC motor using transfer function approach
10. Analysis of three phase circuit representing the generator transmission line and load.

CYCLE-2

11. Power system load flow using Newton–Raphson technique.
12. Modelling of transformer and simulation of transmission line with losses.
13. Transient analysis of single machine connected to infinite bus (SMIB).
14. Simulation of three phase full converter with RL & RLE load
15. Simulation of Boost converter
16. Simulation of single phase inverter with PWM control
17. Simulation of single–phase full converter using RLE loads
18. Simulation of single phase AC voltage controller using RL loads.
19. Simulation of Buck converter
20. Modelling of transformer and simulation of lossless transmission line

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	PO11	P012
C01		✓								✓		
C02			✓								✓	
C03		✓								✓		
C04			✓								✓	
C05									✓			

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	III B.Tech. II Sem (6th semester)			
Course Code	POWER SYSTEMS LAB				
Teaching	Total contact hours – 30	L	T	P	C
Prerequisite(s): Power Systems-II, Power System Analysis		0	0	3	1.5

Course Objectives:

The objectives of the course are to make the student learn about

1. To analyze the performance of transmission lines and relays
2. To calculate the steady-state power flow in a power system.
3. To analyze different types of short-circuit faults which occur in power systems
4. To analyze Load frequency control of single area and Double area systems
5. To understand about Transient Stability Analysis

Course Outcomes:

After successful completion of this course, a student will be able to:	
CO1:	Understand the parameters of various types of transmission lines and to understand the performance of short, medium, long transmission lines.
CO2:	Understand the effects of skin, proximity, Ferranti, corona effects on transmission lines
CO3:	Understand about Load frequency controls
CO4:	Understand about the different types of faults identification in transformers and alternators
CO5	Understand about Transient Stability Analysis

Any 8 experiments are to be done compulsorily from each cycle.

CYCLE-1

1. Economic load dispatch without considering losses
2. Economic load dispatch with considering losses
3. Load flow study using GS method
4. Load flow study by Fast decoupled method
5. Comparison of different Load flow methods.
6. Determination of ABCD parameters of Transmission line
7. Dielectric strength of Transformer oil.
8. Calibration of Tong Tester.
9. Study of corona phenomenon

CYCLE-2

10. Determination of Sequence impedances of three phase alternator by direct method
11. Determination of Sequence impedances of three phase alternator by fault analysis
12. Determination of Sequence impedances of three phase transformer
13. Load frequency control without controller
14. Load frequency control with controller
15. Active power control of synchronous machine connected to infinite bus
16. Reactive power control of synchronous machine connected to infinite bus
17. Voltage control by capacitor compensation and tap changing transformers
18. Power Angle Characteristics of 3 phase Alternator with infinite bus bars.
19. Transient Stability Analysis

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	PO11	P012
C01		✓								✓		
C02			✓								✓	
C03		✓								✓		
C04			✓								✓	
C05			✓									

(AUTONOMOUS)
Approved by AICTE, Accredited by NBA & NAAC 'A' Grade, Recognized under 2(f) and 12(b) of UGC, Permanently Affiliated to JNTUK, Kakinada.

Regulation GRBT-20	**Godavari Institute of Engineering & Technology (Autonomous)**	**IV B.Tech. I Sem (7th semester)**			
Course Code	**Grid Integration of Renewable Energy Sources**				
Teaching	Total contact hours - 45	L	T	P	C
Prerequisite(s): **Renewable Energy Sources**		3	0	0	3

Course Objectives:

1. To understand the Principle of PV- Grid integration control
2. To understand principles for wind power integration control
3. To understand the power quality challenges in grid integration of renewable energy
4. To understand challenges in grid integration of multiple renewable sources
5. To analyse the storage system for grid integration of multiple renewable sources

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Apply the control principles for PV - grid integration control
CO2:	Apply the control principles for wind power integration control
CO3:	Identify power quality challenges in grid integration of renewable energy
CO4:	Identify challenges in grid integration of multiple renewable sources
CO5:	Analyse the storage system for grid integration of multiple renewable sources

UNIT–I

PV Integration Technology: Photovoltaic (PV) inverter topologies- configurations and control strategies, Grid codes and technical regulations of Solar PV integration

UNIT–II

Wind Power Integration Technology: Wind power and voltage control for synchronous and induction generators-based integration; active and reactive power control, Grid codes and technical regulations of Wind power integration

UNIT–III

Power quality management: THD, voltage sag, voltage swell, frequency change and its effects, network voltage management, frequency management, effects on system stability

UNIT–IV

Challenges: Integrating multiple renewable energy sources; DC link integration; AC link integration; HFAC link integration; islanding and interconnection

UNIT–V

Effects on the grid by RE systems integration: Interfacing techniques; Innovations required in technology and policy Economics: Grid-connected energy storage schemes; response requirement, capacity assessment, cost considerations

Text Books:

1. Renewable Energy Grid Integration, Marco H. Balderas, Nova Science Publishers, New York, 2009

   S. Borlase, "Smart Grids, Infrastructure, Technology and Solutions", CRC Press, 1st Edition, 2013

Reference Books:

1. Grid integration of solar photovoltaic systems, Majid Jamil, M. Rizwan, D.P.Kothari, CRC Press (Taylor & Francis group), 2017
2. Wind Power Integration connection and system operational aspects, B. Fox, D. Flynn L. Bryans, N. Jenkins, M. O' Malley, R. Watson and D. Milborrow, IET Power and Energy Series 50 (IET digital library), 2007

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	PO11	P012
C01	✓									✓		
C02											✓	
C03		✓										
C04			✓	✓								
CO5	✓									✓		

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Regulation GRBT-20	**Godavari Institute of Engineering & Technology (Autonomous)**	**IV B.Tech. I Sem (7th semester)**			
Course Code	**Smart Grid Communication and Cyber Security**				
Teaching	Total contact hours - 45	L	T	P	C
Prerequisite(s): **Smart Grid**		3	0	0	3

Course Objectives:

1. To understand the power quality management in smart grid communications
2. To understand the various communication technologies that is essential in the evolution of a Smart Grid.
3. To understand the types of cyber attacks on the Smart Grid, privacy and security issues and their possible solutions.
4. To understand the communication and security aspects of a Smart Grid.
5. To analyze the hacking and cyber security aspects in smart grids

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Understand the power quality management in smart grid communications
CO2:	Understand the communication technologies for smart grid
CO3:	Analyze the information security of smart grid and measurement technologies
CO4:	lerstand the substation standards for communication
CO5:	lyze the hacking and cyber security aspects in smart grids

UNIT–I

Power Quality Management in Smart Grid: Power Quality & EMC in Smart Grid, Power Quality issues of Grid connected Renewable Energy Sources, Power Quality Conditioners for Smart Grid, Web based Power Quality monitoring, Power Quality Audit. Smart Grid & Distribution: Advances in storm response, Distributed renewable & storage

UNIT–II

Communication Technologies for the Smart Grid: Different types of Communication technologies for the smart grid. Standards for information exchange, DNP3. Fiber Optical Networks, WAN based on Fiber Optical Networks, IP based Real Time data Transmission

UNIT-III

Information Security for the Smart Grid and Measurement Technology: Introduction – Encryption and Decryption Authentication, Digital signature, Message digest, cyber security standards. Communication and Measurement - Monitoring, Advanced metering infrastructure-GIS and Google Mapping Tools, Multi Agent Systems (MAS) Technology for Smart Grid Implementations.

UNIT–IV

Interoperability and Standards: Introduction-Benefits and Challenges Of Interoperability, Model For Smart Grid Network Interoperability, Approach to Smart Grid Interoperability Standards, IEC61850, GOOSE.

UNIT–V

Hacking and Cyber-security: Identifying a target-Vulnerability- Attack tools-Attack methods-Cyber security architecture, SGCG reference architecture - ISA-62443: zones and conduits and Smart Grids.

Text Books:

1. Janaka Ekanayake ,Kithsiri Liyanage , Jianzhong Wu , Nick Jenkins, "Smart Grid: Technology and Applications" first Edition, John Wiley & sons Limited (2012).
2. James Momoh "Smart grid: Fundamental of Design and analysis" ,John Wiley & sons Limited IEEE Press (2012).

Reference Books:

1. Eric D. Knapp,RajSamani "Applied Cyber Security and the Smart Grid", Elsevier Inc.
2. Clark W. Gellings, "The Smart Grid: Enabling Energy Efficiency and Demand Response", CRC Press.

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	PO11	P012
C01	✓									✓		
C02											✓	
C03		✓										
C04			✓	✓								
CO5		✓				✓						

Regulation GRBT-20	**Godavari Institute of Engineering & Technology (Autonomous)**	**IV B.Tech. I Sem (7th semester)**			
Course Code	**Solar PV and Micro Energy Technologies**				
Teaching	Total contact hours - 45	L	T	P	C
Prerequisite(s): **Renewable energy sources**		3	0	0	3

Course Objectives:

The objectives of the course are to make the student learn about

1. To understand the principles and control of Solar PV Energy system
2. To understand the Analyze the Solar PV energy system components
3. To Understand the Solar Photo Voltaic System Testing
4. To Understand the Energy and environment correlations
5. To understand the micro-energy conversion technologies

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Interpret the principles and control of Solar PV Energy system
CO2:	Analyze the Solar PV energy system components
CO3:	lerstand the Solar Photo Voltaic System Testing
CO4:	lerstand the Energy and environment correlations
CO5:	ntify the micro-energy conversion technologies

UNIT–I

Solar PV energy conversion: Generic Photovoltaic Cell, Equivalent Circuits, Cells to Modules to Arrays, I –V Curve, P-V Curve, Mathematical models of PV cell, Impacts of Temperature and Insolation, Shading impacts on I–V curves, I–V Curves for different loads

UNIT–II

Modelling of Solar PV system components: PV Array, Battery pack, dc-dc converter, System sizing, System Performance, Economics, Different MPPT techniques – Perturbation and Observation (P & O) Method, Incremental Conductance (IC) Method, DC bus voltage regulation

UNIT-III

Solar Photo Voltaic System Testing: Sun Simulator, Testing and performance assessment of Solar PV generator, Electronic Control and Regulation, Power Conditioning, Converters and inverter, Concentrating system, System design and configuration

UNIT–IV

Energy and environment correlations: Environmental degradation due to energy production and utilization, global warming; Environmental Impact Assessment, Life cycle analysis (LCA) and sustainability issues

UNIT–V

Micro Energy Sources: Ocean Thermal energy conversion, Geo-thermal energy conversion, Tidal Energy conversion, Biomass energy, Bio gas plants

Text books:

1. H.P. Garg & J. Prakash, "Solar Energy - Fundamentals and Applications", Indian Edition - First Revised Edition, Mc Graw Hill Education.
2. M. H. Nehrir, C. Wang, "Modeling and Control of Fuel Cells: Distributed Generation Applications", Wiley-IEEE Press, 1st Edition, 2009.

Reference books:

1. Solar Photovoltaics, Fundamentals, Technologies and Applications, Second Edition, Chetan Singh Solanki, PHI Learning Private Limited (2012).
2. Hand Book of Fuel Cells - Fundamentals and Technology and Application, Wiley & Sons Publishers.
3. MichealBoxwell, "Solar Electricity Handbook", Green Stream publishing.

G.D.Rai, "Non conventional Energy", Khanna Publishers

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	PO11	P012
C01	✓									✓		
C02											✓	
C03		✓										
C04			✓	✓								
CO5	✓						✓					

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Regulation GRBT-20	**Godavari Institute of Engineering & Technology (Autonomous)**	**IV B.Tech. I Sem (7th semester)**			
Course Code	**ENERGY AUDIT, CONSERVATION & MANAGEMENT**				
Teaching	Total contact hours - 45	L	T	P	C
Prerequisite(s): **Energy Management**		3	0	0	3

Course Objectives:

The objectives of the course are to make the student learn about

1. To provide students with a general awareness on the importance of energy and its conservation,
2. To provide students on its impact on society, various energy sources
3. To provide students on energy conversion processes, energy management
4. To provide energy audit and energy conservation measures.
5. To provide understanding on different energy efficient devices.

Course Outcomes:

After successful completion of this course, a student will be able to:	
CO1:	Understand the current energy scenario and importance of energy conservation.
CO2:	Understand the concepts of energy management.
CO3:	Understand the Basics of Energy Audit
CO4:	Understand the methods of improving energy efficiency in different electrical systems.
CO5	Understand the concepts of different energy efficient devices.

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, energy security, energy conservation and its importance, restructuring of the energy supply sector, energy strategy for the future, air pollution, climate change. Energy Conservation Act-2001 and its features.

UNIT 2:

Basics of Energy and its various forms

Electricity tariff, load management and maximum demand control, power factor improvement, selection & location of capacitors, 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.

UNIT 3:

Energy Management & Audit

Definition, energy audit, need, types of energy audit. Energy management (audit) approach-understanding energy costs, bench marking, energy performance, maximizing system efficiencies,

optimizing the input energy requirements, fuel & energy substitution, energy audit instruments. Material and Energy balance: Facility as an energy system, methods for preparing process flow, material and energy balance diagrams.

UNIT 4:

Energy Efficiency in Electrical Systems

Electrical system: Electricity billing, electrical load management and maximum demand control, performance assessment of PF capacitors, distribution and transformer losses. Electric motors: Types, losses in induction motors, motor efficiency, factors affecting motor performance, rewinding and motor replacement issues, energy saving opportunities with energy efficient motors.

UNIT 5:

Energy Efficient Technologies in Electrical Systems

Maximum demand controllers, automatic power factor controllers, energy efficient motors, soft starters with energy saver, variable speed drives, energy efficient transformers, electronic ballast, occupancy sensors, energy efficient lighting controls, energy saving potential of each technology.

Text/Reference Books

1. Guide books for National Certification Examination for Energy Manager / Energy Auditors Book-1, General Aspects (available online)
2. Guide books for National Certification Examination for Energy Manager / Energy Auditors Book-3, Electrical Utilities (available online)
3. S. C. Tripathy, "Utilization of Electrical Energy and Conservation", McGraw Hill, 1991. Success stories of Energy Conservation by BEE, New Delhi (www.bee-india.org)

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	PO11	P012
C01		✓								✓		
C02											✓	
C03			✓									
C04				✓								
CO5	✓							✓				

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Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	**IV B.Tech. I Sem (7th semester)**			
Course Code	**POWER QUALITY**				
Teaching	Total contact hours - 45	L	T	P	C
Prerequisite(s): Power systems		3	0	0	3

Course Objectives:

The objectives of the course are to make the student learn about

6. To impart knowledge about the power quality and its assessments.
7. To enable the students to understand how power quality studies are carried out in a distribution system.
8. To enable the students to understand the factors that causes the harmonics and their effect on the power system.
9. To understand the necessity of power quality and its importance in the power system
10. To understand power quality monitoring and Instrumentation:

Course Outcomes:

fter successful completion of this course, a student will be able to:	
C01:	Understand the concepts of power quality and voltage imperfections in power systems and power factor improvement
C02:	Know the concepts of harmonic distortion and distributed generation and power quality issues
C03:	Know the power quality monitoring and instrumentation, applications of intelligence systems
C04:	Proper assessment of power quality through different measurement techniques.
C05:	Understanding on power quality monitoring and Instrumentation

UNIT–I

Introduction: Overview of power quality – Concern about the power quality – General classes of power quality and voltage quality problems – Transients – Long– duration voltage variations – Short–duration voltage variations – Voltage unbalance – Waveform distortion – Voltage fluctuation – Power frequency variations.

UNIT–II

Voltage imperfections in power systems: Power quality terms – Voltage sags – Voltage swells and interruptions –Sources of voltage sag, swell and interruptions – Nonlinear loads – IEEE and IEC standards. Source of transient over voltages – Principles of over voltage protection – Devices for over voltage protection – Utility capacitor switching transients.

UNIT–III

Voltage Regulation and power factor improvement: Principles of regulating the voltage – Device for voltage regulation – Utility voltage regulator application – Capacitor for voltage regulation – End–user capacitor application – Regulating utility voltage with distributed resources – Flicker – Power factor penalty – Static VAR compensations for power factor improvement.

UNIT– IV

Harmonic distortion and solutions: Voltage distortion vs. Current distortion – Harmonics vs. Transients – Harmonic indices – Sources of harmonics – Effect of harmonic distortion – Impact of capacitors, transformers, motors and meters – Point of common coupling – Passive and active filtering – Numerical problems.

UNIT–V

Distributed Generation and Power Quality: Resurgence of distributed generation – DG technologies – Interface to the utility system – Power quality issues and operating conflicts – DG on low voltage distribution networks.

PQ Monitoring and Instrumentation: Power quality monitoring and considerations – Historical perspective of PQ measuring instruments – PQ measurement equipment – Assessment of PQ measuring data – Application of intelligent systems – PQ monitoring standards.

Textbooks:

1. Electrical Power Systems Quality, Dugan R C, McGranaghan M F, Santoso S, and Beaty H W, Second Edition, McGraw–Hill, 2012, 3rd edition.
2. Electric power quality problems –M.H.J. Bollen IEEE series-Wiley india publications, 2011.
3. Power Quality Primer, Kennedy B W, First Edition, McGraw–Hill, 2000.

Reference Books:

1. Understanding Power Quality Problems: Voltage Sags and Interruptions, Bollen M HJ, First Edition, IEEE Press; 2000.
2. Power System Harmonics, Arrillaga J and Watson N R, Second Edition, John Wiley & Sons, 2003.
3. Electric Power Quality control Techniques, W. E. Kazibwe and M. H. Sendaula, Van Nostrad Reinhold, New York.
4. Power Quality C.Shankaran, CRC Press, 2001
5. Harmonics and Power Systems –Franciso C.DE LA Rosa–CRC Press (Taylor & Francis).

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium] 3: Substantial[High], '-' : No Correlation)

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	PO11	P012
C01	✓			✓			✓			✓		
C02		✓			✓			✓			✓	
C03		✓			✓			✓			✓	
C04			✓			✓			✓			✓
CO5	✓						✓					

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Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	IV B.Tech. I Sem (7th semester)			
Course Code	**POWER SYSTEM REFORMS**				
Teaching	Total contact hours - 45	L	T	P	C
Prerequisite(s): Power System		3	0	0	3

Course Objectives

1. To impart knowledge about the restructuring of power sector.
2. To impart knowledge about the deregulation of power sector.
3. To introduce the fundamental concepts relevant to OASIS, congestion management etc.
4. To impart knowledge about Electricity Pricing
5. To enable the students to understand the factors related with deregulation of power industry in different countries.

Course Outcomes

After successful completion of this course, a student will be able to:	
CO1:	Identify various concepts of deregulation and restructuring of power sector.
CO2:	Describe important concepts related with deregulation like market power and system operator of deregulated market.
CO3:	To know about the control strategy and management including OASIS, congestion management etc.
CO4:	Apply principal to explain various problems related with deregulation of power sector.
CO5	Assess and capable of getting some knowledge about load forecasting and the results obtained by solving problems.

Unit – I

Introduction: Basic concept and definitions, privatization, restructuring, transmission open access, wheeling, deregulation, components of deregulated system, advantages of competitive system. – Restructuring models – Independent system operator (ISO) – Power Exchange – Market operations – Market Power – Standard cost – Transmission Pricing – Congestion Pricing – Management of Inter zonal/Intra zonal Congestion.

Unit – II

Deregulation of Power Sector: Separation of ownership and operation, Deregulated models, pool model, pool and bilateral trades model, Multilateral trade model. Power system operation in competitive environment: Introduction – Operational planning activities of ISO – The ISO in pool markets – The ISO in bilateral markets – Operational planning activities of a GENCO.

Unit – III

OASIS: Open Access Same–Time Information System Structure of OASIS – Processing of Information – Transfer capability on OASIS – Definitions Transfer Capability Issues – ATC – TTC – TRM – CBM calculations – Methodologies to calculate ATC.

Unit – IV

Electricity Pricing: Introduction – Electricity price volatility electricity price indexes – Challenges to electricity pricing – Construction of forward price curves – Short–time price forecasting.

Unit – V

Congestion Management: Introduction to congestion management –Methods to relieve congestion Ancillary Services Management: Introduction – Reactive power as an ancillary service – A review – Synchronous generators as ancillary service providers.

Text Books

1. Kankar Bhattacharya, Math H.J. Boller, Jaap E.Daalder, 'Operation of Restructured Power System' Klum,er Academic Publisher – 2001
2. Loi Lei Lai; "Power system Restructuring and Deregulation", Jhon Wiley & Sons Ltd., England
3. Mohammad Shahidehpour, and Muwaffaq alomoush, – "Restructured electrical Power systems" Marcel Dekker, Inc. 2001
4. Electrical Power Distribution Case studies from Distribution reform, upgrades and Management (DRUM) Program, by USAID/India, TMH.

CO-PO Mapping:

(1:Slight[Low]; 2:Moderate[Medium]; 3:Substantial[High], '-' : No Correlation)

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	PO11	P012
C01	✓	✓										
C02								✓				
C03					✓							
C04	✓		✓									
C05					✓							

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Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	IV B.Tech. I Sem (7th semester)			
Course Code	**UTILIZATION OF ELECTRICAL ENERGY**				
Teaching	Total contact hours - 45	L	T	P	C
Prerequisite(s): Power Systems		3	0	0	3

Course Objectives:

The objectives of the course are to make the student learn about

1. To Understanding of selection of drives for industrial application.
2. To Understanding the heating and welding methods for industrial applications.
3. To Understanding of the concepts of Electrolysis processes and illumination engineering.
4. To Understanding of electric traction system and drives.
5. Identify the various types of Industrial loads

Course Outcomes:

On Completion of the course, the students will be able to-	
C01:	Identify most appropriate heating or welding techniques for suitable applications
C02:	understand various level of luminosity produced by different illuminating sources
C03:	Identify a suitable motor for electric drives and industrial applications
C04:	Identify the various types of Industrial loads
C05:	Understanding the concepts of Electric Traction

UNIT – I

Electric Heating: Advantages and methods of electric heating–Resistance heating, induction heating and dielectric heating.

Electric Welding: Electric welding–Resistance and arc welding–Electric welding equipment–Comparison between AC and DC Welding

UNIT – II

Illumination Fundamentals: Introduction, terms used in illumination–Laws of illumination–Polar curves– Integrating sphere–Lux meter–Sources of light

Various Illumination Methods: Discharge lamps, MV and SV lamps – Comparison between tungsten filament lamps and fluorescent tubes–Basic principles of light control– Types and design of lighting and flood lighting–LED lighting.

UNIT – III

Selection of Motors: Choice of motor, type of electric drives, starting and running characteristics–Speed control–Temperature rise–Applications of electric drives–Types of industrial loads–continuous–Intermittent and variable loads–Load equalization.

UNIT – IV

Electric Traction – I: System of electric traction and track electrification– Review of existing electric traction systems in India– Special features of traction motor– Mechanics of train movement–Speed–time curves for different services – Trapezoidal and quadrilateral speed time curves.

UNIT – V

Electric Traction – II: Calculations of tractive effort– power –Specific energy consumption for given run–Effect of varying acceleration and braking retardation–Adhesive weight and braking retardation adhesive weight and coefficient of adhesion– Principles of energy efficient motors.

Text Books:

1. Utilization of Electric Energy – by E. Openshaw Taylor, Orient Longman.
2. Art & Science of Utilization of electrical Energy – by Partab, DhanpatRai& Sons.

Reference Books:

1. Utilization of Electrical Power including Electric drives and Electric traction – by N.V.Suryanarayana, New Age International (P) Limited, Publishers, 1996.
   Generation, Distribution and Utilization of electrical Energy – by C.L. Wadhwa, New Age

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	PO11	P012
C01	✓	✓										
C02								✓				
C03					✓							
C04	✓		✓									
CO5								✓				

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Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	IV B.Tech. I Sem (7th semester)			
Course Code	**PROGRAMMABLE LOGIC CONTROLLERS AND APPLICATIONS**				
Teaching	Total contact hours - 45	L	T	P	C
Prerequisite(s): Power Systems		3	0	0	3

Course Objectives:

The objectives of the course are to make the student learn about

1. To understand the typical components of a Programmable Logic Controller.
2. To understand the basic concepts of a Programmable Logic Controller.
3. To understand the basic PLC terminology and electrical ladder logic, its history, and its relationship to programmed PLC instruction.
4. To understand the use of timer, counter, and other intermediate programming functions.
5. To understand the design and program basics of PLC circuits for entry-level PLC applications.

Course Outcomes:

fter successful completion of this course, a student will be able to:	
C01:	Gain knowledge on programmable logic controllers
C02:	Understand various types of PLC registers
C03:	Create ladder diagrams for process control
C04:	Use different types of data handling functions
C05:	Understand analog PLC operations

UNIT – I:

PLC Basics: PLC system, I/O modules and interfacing, CPU processor, programming Equipment, programming formats, construction of PLC ladder diagrams, Devices connected to I/O modules. PLC Programming: Input instructions, outputs, operational procedures, programming examples using contacts and coils. Drill press operation.

UNIT–II:

Digital logic gates: Programming in the Boolean algebra system, conversion examples Ladder Diagrams for process control: Ladder diagrams & sequence listings, ladder diagram construction and flowchart for spray process system.

UNIT–III:

PLC Registers: Characteristics of Registers, module addressing, holding registers, Input Registers, Output Registers. PLC Functions: Timer functions & Industrial applications, counters, counter function industrial applications, Arithmetic functions, Number comparison functions, number conversion functions

UNIT – IV:

Data Handling functions: SKIP, Master control Relay, Jump, Move, FIFO, FAL, ONS, CLR & Sweep functions and their applications Bit Pattern and changing a bit shift register, sequence functions and applications controlling of two-axis & three axis Robots with PLC, Matrix functions

UNIT – V:

Analog PLC operation: Analog modules& systems, Analog signal processing, Multi bit Data Processing,Analog output Application Examples, PID principles, position indicator with PID control, PID Modules, PID tuning, PID functions.

Text Book:

1. Programmable Logic Controllers- Principles and Applications by John W. Webb & Ronald A. Reiss, Fifth Edition, PHI

2. Programmable Logic Controllers- Programming Method and Applications –JR. Hackworth &F.D Hackworth Jr. –Pearson, 2004

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	PO11	P012
C01	✓	✓										
C02		✓						✓				
C03					✓		✓					
C04	✓		✓									
CO5	✓							✓				

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	IV B.Tech. I Sem (7th semester)			
Course Code	**Power Converters for Battery Charging**				
Teaching	Total contact hours - 45	L	T	P	C
Prerequisite(s):	**Power Electronics, Basics of Electric Vehicles**	3	0	0	3

Course Objectives:

The objectives of the course are to make the student learn about

1. To develop an understanding on different charger topologies
2. To interpret Power electronic converters for electric vehicle charging
3. To apply control algorithms for various electric vehicle charging modes
4. To understand charging station infrastructure
5. To demonstrate installation of charging station

Course Outcomes:

fter successful completion of this course, a student will be able to:	
C01:	Understand different charger topologies
C02:	Interpret Power electronic converters for electric vehicle charging
C03:	Develop control algorithms for various electric vehicle charging modes
C04:	Demonstrate charging station infrastructure
C05:	Demonstrate installation of charging station

UNIT-1:

Charger Topologies

Charging time and charging speed, Defining power levels- Normal charging, Semi-fast charging, Overview of power levels ,DC conductive charging, AC conductive charging, Low power Charger, Automotive standard charger, High power topologies, Multi-port Charger.

UNIT-2:

Power Electronics for EV Battery Charging

Forward/ Flyback Converters**,** Half-Bridge DC–DC Converter**,** Full-Bridge DC–DC Converter**,** Power Factor Correction**,** Bidirectional Battery Chargers**,** Dual active bridge dc-dc converter, Solar charging station

UNIT-3:

Control techniques for charging

Constant-current charging, Constant-voltage charging, Pulse Charging, Reflex charging, Float charge, Trickle Charge, Load management at charging station and peak load management

UNIT-4:

Charging Infrastructure

Charger - Existing National & International Charger Architecture Standards - SAE J1773, VDE-AR-E 2623-2-2, JEVS G105-1993 (CHAdeMO), CCS, Type-1 AC, Type-2 AC, Bharat DC-001, Bharat AC-001. Cords and Cables, Earthing, Fault Protection, Testing, Charging Safety, Protection against electric shock, Digital Communication between EV and Charging Station.

UNIT-5:

Installation

Govt. of India guideline on Public Charging Stations, IEC Standards- 60068-2(1, 2, 14, 30), 61683, 60227, 60502, 60947 part I,II, III and 61215.

Site assessment, EVSE Typical Site Plans, Design Guidelines and Site Drawings, Planning Considerations, Station Configuration, Selection and erection of electrical equipment - Isolation, switching and control.

Text books:

1. Power Electronics by Daniel W.Hart.
2. Power Electronics for Renewable Energy Systems, Transportation and industrial Applications by Haitham Abu-Rub, Mariusz Malinwoski, Kamal Al-Haddad.

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	PO11	P012
C01	✓	✓										
C02		✓						✓				
C03					✓		✓					
C04	✓		✓									
C05										✓		✓

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Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	IV B.Tech. I Sem (7th semester)			
Course Code	**Energy Management Systems and SCADA**				
Teaching	Total contact hours - 45	L	T	P	C
Prerequisite(s): **Renewable energy sources, energy management**		3	0	0	3

Course Objectives:

The objectives of the course are to make the student learn about

1. To understand SCADA and its architecture.
2. To understand the application of SCADA in various utilities.
3. To analyze various real time applications on transmission side.
4. To analyze various real time applications on distribution side.
5. To analyze various real time applications on load side.

Course Outcomes:

ter successful completion of this course, a student will be able to:	
C01:	Understand SCADA and its architecture.
C02:	Understand the application of SCADA in various utilities.
C03:	ly the knowledge in analyzing various real time applications on transmission side.
C04:	ly the knowledge in analyzing various real time applications on distribution side.
C05:	Apply the knowledge in analyzing various real time applications on load side.

UNIT-1:

Introduction to SCADA: Data acquisition systems, Evolution of SCADA, Communication technologies, Monitoring and supervisory functions, SCADA applications in Utility Automation, Industries, SCADA System Components. SCADA Architecture: Various SCADA architectures, advantages and disadvantages of each system - single unified standard architecture -IEC 61850. SCADA Communication.

UNIT-2:

SCADA Applications: Utility applications, Transmission and Distribution sector -operations, monitoring, analysis and improvement. Industries - oil, gas and water.

UNIT-3:

Energy Management Systems (EMS): Introduction- Smart substations - Substation Automation - Feeder Automation, SCADA – Remote Terminal Unit – Intelligent Electronic Devices – Protocols, Phasor Measurement Unit – Wide area monitoring protection and control, Smart integration of energy resources – Renewable, intermittent power sources – Energy Storage.

UNIT-4:

Distribution Management System (DMS): Introduction – Volt / VAR control – Fault Detection, Isolation and Service Restoration, Network Reconfiguration, Outage management System, CIS & GIS,

UNIT-5:

Load Management Systems (LMS): Introduction –functions of load management systems: Load analysis and forecasting, remote automatic meter reading, electricity purchase management and electricity theft prevention.

Text Books:

1. Handschin, E. "Energy Management Systems", Springer Verlag, 1990.
2. Clarke, Gordon, Deon Reynders, and Edwin Wright. Practical modern SCADA protocols: DNP3, 60870.5 and related systems. Newnes, 2004.

Reference Books:

1. Turner, W. C, " Energy Management Handbook", 5 th Edition, 2004.
2. Wiebe, Michael, "A Guide to Utility Automation: AMR, SCADA, and IT Systems,"Pennwell Books, 1999.
3. Bailey, D., and E. Wright, "Practical SCADA for industry," illustrated ed. Great Britain: Newnes, 2003.

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	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	PO11	P012
C01	✓	✓										
C02		✓						✓				
C03					✓		✓					
C04	✓											
CO5										✓		

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Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	IV B.Tech. I Sem (7th semester)			
Course Code	**SWITCHED MODE POWER CONVERTERS**				
Teaching	Total contact hours - 45	L	T	P	C
Prerequisite(s): **Power Electronics**		3	0	0	3

Course Objectives:

The objectives of the course are to make the student learn about

1. To study and analyze various types of switched mode dc- dc converters, inverters and resonant converters and its switching techniques
2. To analyze resonant converters and their control techniques.
3. To understand the concepts of Converter Transfer Functions
4. To design DC-DC converters and evaluate the stability of the system
5. To design feedback loops for the power converters.

Course Outcomes:

?ter successful completion of this course, a student will be able to:	
C01:	Analyze the operation of DC-DC converters with current and voltage mode control
C02:	Analyze resonant converters and their control techniques
C03:	Understand the concepts of Converter Transfer Functions
C04:	Design DC-DC converters and evaluate the stability of the system
C05:	Design feedback loops for the power converters.

UNIT-1:

DC/DC Converters and Current Mode and Current Fed Topologies

Basic topologies of buck, boost converters, buck-boost converters and cuk converter, isolated DC/DC converter topologies: forward, and fly-back converters, half and full bridge topologies, modeling of switching converters. Voltage mode and current mode control of converters, peak and average current mode control, its advantages and limitations, voltage and current fed converters.

UNIT-2:

Resonant Converters

Need for resonant converters, types of resonant converters, methods of control, phase-modulation technique with ZVS in full-bridge topology, series resonant converter and resonant transition converter.

UNIT-3:

Converter Transfer Functions

Application of state-space averaging to switching converters, derivation of converter transfer functions for buck, boost, and fly-back topologies.

UNIT-4:
Power Converter Design
Design of filter inductor & capacitor, and power transformer, Ratings for switching devices, current transformer for current sensing, design of drive circuits for switching devices, considerations for PCB layout.

UNIT-5:
Controller Design
Introduction, mechanisms of loop stabilization, shaping E/A gain vs. frequency characteristic, conditional stability in feedback loops, stabilizing a continuous mode forward converter and discontinuous mode fly- back converter, feed-back loop stabilization with current mode control, the right-half plane zero.

TEXT BOOKS:

1. Ned Mohan Tore M. Undeland: Power Electronics: Converters, Applications, and Design, 3rdEdition, John Wiley & Sons, 2007.
2. Abraham I. Pressman, "Switching Power Supply Design", Mc Graw Hill International, Third Edition, 2009.
3. P.C. Sen: Modern Power Electronics, S.Chand-2005.
4. Andrzej M. Trzynadlowski Introduction to Modern Power Electronics, 2nd Edition, illustrated Publisher John Wiley & Sons, 2010.
5. Muhammad H. Rashid, Power electronics hand book, ISBN: 81 8147 3671.
6. Bin Wu: High-power Converters and AC Drives, IEEE Press, John Wiley & Sons, 2006.

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	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	PO11	P012
C01	✓	✓										
C02		✓						✓				
C03					✓		✓					
C04	✓		✓									
C05										✓		

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Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	IV B.Tech. I Sem (7th semester)			
Course Code	**HIGH VOLTAGE DC TRANSMISSION**				
Teaching	Total contact hours - 45	L	T	P	C
Prerequisite(s): **Power Electronics**		3	0	0	3

Course Objectives:

The objectives of the course are to make the student learn about

1. To introduce students with the concept of HVDC Transmission system.
2. To familiarize the students with the HVDC converters and their control system.
3. To expose the students to the harmonics and faults occur in the system and their prevention.
4. To understand the control strategies used in HVDC transmission system.
5. To understand the improvement of power system stability using an HVDC system.

Course Outcomes:

?ter successful completion of this course, a student will be able to:	
C01:	Understand the advantages of DC transmission over ac transmission.
C02:	Understand the operation of Line Commutated Converters and Voltage Source Converters.
C03:	Analyze the various components used in HVDC systems
C04:	Understand the control strategies used in HVDC transmission system.
C05:	Understand the improvement of power system stability using an HVDC system.

UNIT 1: DC Transmission Technology:

Comparison of AC and DC Transmission (Economics, Technical Performance and Reliability). Application of DC Transmission. Types of HVDC Systems. Components of a HVDC system. Line Commutated Converter and Voltage Source Converter based systems.

Line Commutated Converters (LCCs): Six pulse converter, Analysis neglecting commutation overlap, harmonics, Twelve Pulse Converters. Inverter Operation. Effect of Commutation Overlap Expressions for average DC voltage, AC current, Reactive power absorbed by the converters. Effect of Commutation Failure, Misfire and Current Extinction in LCC links

UNIT 2: Analysis of Voltage Source Converters:

Voltage Source Converters (VSCs): Two and Three-level VSCs. PWM schemes: Selective Harmonic Elimination, Sinusoidal Pulse Width Modulation. Analysis of a six pulse converter. Equations in the rotating frame. Real and Reactive power control using a VSC.

UNIT 3: Control of HVDC Converters:

Principles of Link Control in a LCC HVDC system. Control Hierarchy, Firing Angle Controls – Phase-Locked Loop, Current and Extinction Angle Control, Starting and Stopping of a Link. Higher level Controllers Power control, Frequency Control, Stability Controllers. Reactive Power Control. Principles of Link Control in a VSC HVDC system: Power flow and DC Voltage Control. Reactive Power Control/AC voltage regulation.

UNIT 4: Components of HVDC systems:

Smoothing Reactors, Reactive Power Sources and Filters in LCC HVDC systems DC line: Corona Effects. Insulators, Transient Over-voltages. DC line faults in LCC systems. DC line faults in VSC systems. DC breakers. Monopolar Operation. Ground Electrodes.

UNIT 5:Stability Enhancement using HVDC Control:

Basic Concepts: Power System Angular, Voltage and Frequency Stability. Power Modulation: basic principles – synchronous and asynchronous links. Voltage Stability Problem in AC/DC systems.

Text/References:

1. K. R. Padiyar, "HVDC Power Transmission Systems", New Age International Publishers, 2011.
2. J. Arrillaga, "High Voltage Direct Current Transmission", Peter Peregrinus Ltd., 1983.
3. E. W. Kimbark, "Direct Current Transmission", Vol.1, Wiley-Interscience, 1971.

CO-PO Mapping:

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'-' : No Correlation)

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	PO11	P012
C01	✓	✓										
C02								✓				
C03					✓							
C04	✓		✓									
C05					✓							

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Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	IV B.Tech. I Sem (7th semester)			
Course Code	SKILL ADVANCED COURSE Simulation studies on electromagnetic transients software				
Teaching	Total contact hours - 30	L	T	P	C
Prerequisite(s): Power systems		1	0	2	2

Course Objectives:

1. To visit a local substation and understand the various equipments in it.
2. To understand concept of Transmission Line and its Modeling
3. To understand concept of transformer modeling
4. To study about synchronous generators
5. To know about switching Over-Voltages and Modeling of Surge Arresters

List of Experiments:

All of the following Experiments are to be conducted

1. Study of substation layout
2. Introduction to the software tools
3. Transmission Line and Modeling
4. Transformer modeling and energization studies
5. Including an HVDC Transmission Line for Power Flow
6. Power Quality issues and mitigation
7. Synchronous Generators
8. Switching Over-Voltages and Modeling of Surge Arresters.

Course Outcomes:

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

1. Understand the various equipments in a power system.
2. Understand the concept of Transmission Line and its Modeling
3. Understand the concept of Transformer modeling
4. Know about synchronous generators
5. Know about switching Over-Voltages and Modeling of Surge Arresters

CO-PO Mapping:

(1:Slight[Low]; 2:Moderate[Medium]; 3:Substantial[High], 4: '-' : No (Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C01		✓								✓		
C02			✓								✓	
C03			✓									
C04				✓								
C05					✓							

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Regulation GRBT-20	**Godavari Institute of Engineering & Technology (Autonomous)**	**IV B.Tech. I Sem (7th semester)**			
Course Code	Industrial/Research internship				
Teaching	Total contact hours - 30	L	T	P	C
Prerequisite(s): Power systems		1	0	2	2

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Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	IV B.Tech. II Sem (7th semester)			
Course Code	Project work				
Teaching	Total contact hours - 30	L	T	P	C
Prerequisite(s): Power systems		1	0	2	2