SHIVAJI UNIVERSITY, KOLHAPUR

REVISED STRUCTURE AND SYLLABUS

SECOND YEAR (B. Tech) CBCS

ELECTRICAL ENGINEERING

To be introduced from the academic year 2019-20

(i.e. from June 2019) onwards

SHIVAJI UNIVERSITY, KOLHAPUR

CBCS STRUCTURE FOR ELECTRICAL ENGINEERING

(Semester III and Semester IV 2nd Year)

SEMESTER – III (Duration – 6 Months)

Sr. No.	Course (SubjectTitle)	TEACHING SCHEME									EXAMINATION SCHEME								
		THEORY			Tutorial			PRACTICAL			THEORY					PRACTICAL			
																TW		POE	
		Credits	No. of lectures	Hours	Credits	No. of lectures	Hours	Credits	No. of lectures	Hours	Hours	Mode	Marks	Total Marks	Min	Max	Min	Max	Min
1	BSC-EE	4	4	4	1	1	1	-	-	-		CIE	30	100	40	25	10	-	-
												ESE	70						
2	PCC-EE	3	3	3	-	-	-	-	-	-		CIE	30	100	40	25	10	-	-
												ESE	70						
3	PCC-EE	4	4	4	-	-	-	1	2	2		CIE	30	100	40	25	10	50	20
												ESE	70						
4	PCC-EE	4	4	4	1	1	1	1	2	2		CIE	30	100	40	50	20	-	-
												ESE	70						
5	PCC-EE	4	4	4	-	-	-	1	2	2		CIE	30	100	40	25	10	50	20
												ESE	70						
6	PCC-EE	-	-	-	-	-	-	1	2	2	-	-	-	-	-	50	20	-	-
TOTAL		**19**	**19**	**19**	**2**	**2**	**2**	**4**	**8**	**8**				**500**		**200**		**100**	

SHIVAJI UNIVERSITY, KOLHAPUR

CBCS STRUCTURE FOR ELECTRICAL ENGINEERING

(Semester III and Semester IV 2nd Year)

SEMESTER – IV (Duration – 6 Months)																				
Sr. No.	Course (Subject Title)	TEACHING SCHEME									EXAMINATION SCHEME									
		THEORY			Tutorial			PRACTICAL			THEORY					PRACTICAL			
																TW		POE	
		Credits	No. of lectures	Hours	Credits	No. of lectures	Hours	Credits	No. of lectures	Hours	Hours	Mode	Marks	Total Marks	Min	Max	Min	Max	Min
1	PCC-EE	4	4	4	-	-	-	1	2	2		CIE	30	100	40	25	10	50	20
												ESE	70						
2	PCC-EE	3	3	3	-	-	-	1	2	2		CIE	30	100	40	25	10	50	20
												ESE	70						
3	PCC-EE	4	4	4	-	-	-	1	2	2		CIE	30	100	40	50	20	-	-
												ESE	70						
4	PCC-EE	3	3	3	1	1	1	-	-	-		CIE	30	100	40	-	-	-	-
												ESE	70						
5	PCC-EE	3	3	3	-	-	-	1	2	2		CIE	30	100	40	50	20	-	-
												ESE	70						
6	MC-EE	2	2	2	-	-	-	1	-	-	-	CIE	30	100	40			-	-
												ESE	70						
TOTAL		**20**	**20**	**20**	**1**	**1**	**1**	**4**	**8**	**8**				**600**		**150**		**100**	

CIE- Continuous Internal Evaluation
ESE – End Semester Examination

• Candidate contact hours per week : 30 Hours (Minimum)	• Total Marks for S.E. Sem III & IV : **1650**
• Theory and Practical Lectures : 60 Minutes Each	• Total Credits for S.E. Sem III & IV : **50**
• In theory examination there will be a passing based on separate head of passing for examination of CIE and ESE.	
• There shall be separate passing for theory and practical (term work) courses.	

Note :

1. **BSC-EE**: Basic Science Course- Electrical Engineering are compulsory.
2. **PCC-EE :**Professional Core course –Electrical Engineering are compulsory.
3. **MC-EE :**Mandatory Course **:** Environmental Studies which is compulsory for theory 70 marks and project work 30 marks.

Shivaji University, Kolhapur

S.Y. B. Tech in Electrical Engineering Syllabus

w.e.f. June 2019-2020

Semester III

Sr. No	Code No.	Subject	Credits
1.	BSC-EE	Engg.M-III	5
2.	PCC-EE	EEMEC	3
3.	PCC-EE	AEE	5
4.	PCC-EE	BCT	6
5.	PCC-EE	EM	5
6.	PCC-EE	C	1
			25

Semester IV

Sr. No	Code No.	Subject	Credits
1.	PCC-EE	DCMT	5
2.	PCC-EE	PE	4
3.	PCC-EE	PS-I	5
4.	PCC-EE	EME	4
5.	PCC-EE	CS-I	4
6.	PCC-EE	ENV	3
		Total=	25

SHIVAJI UNIVERSITY, KOLHAPUR

SECOND YEAR B.TECH (ELECTRICAL) SEMESTER -I

ENGINEERING MATHEMATICS-III

Course	Teaching Scheme					Evaluation Scheme			
						Theory (Marks)		Practical(Marks)	
	L	T	P	Credit	Scheme	Max.	Min. for Passing	Max.	Min. for passing
Engineering Mathematics-III	04	01	-	05	ISE	-	-	25	40%
					MSE	30	40%	-	-
					ESE	70	40%	-	-

ISE: In Semester Evaluation MSE: Mid Semester Evaluation ESE: End Semester Evaluation

Objectives:

1. To introduce the concept of linear differential equations of higher and their applications.
2. To introduce concept of vector calculus.
3. To learn the concept of Fourier series.
4. To familiarize the students with concepts and applications of Laplace Transforms.
5. To understand the concept of Z-transform.

Course Outcomes: After completion of this course students will be able to:

1) Liner differential equations and problems related to applications of differential equation.
2) Perform vector differentiation and integration.
3) Find Laplace transform and Inverse Laplace transform of various functions
4) Apply Laplace transform to solve Linear differential equations
5) Find Z-Transform and inverse Z-transform by using different properties.
6) Find Expansions of function by using Fourier series.

SECTION I

Unit 1: Linear Differential equations with constant coefficients: (8)

1.1 Linear Differential equations with constants coefficients and their methods of solutions

1.2 Applications of Linear Differential equations with constants coefficients to electrical engineering problems

Unit 2: Vector differential calculus (6)

2.1 Differentiation of vectors Consistency of linear system equations

2.2 Gradient of scalar point function and directional derivative

2.3 Divergence of vector point function and solenoidal vector fields

2.4 Curl of a vector point function and irrotational vector field

Unit 3: Fourier Series (7)

3.1 Definition, Euler's formulae

3.2 Expansions' of functions in the interval $((0,2\pi)$

3.3 Change of interval .

3.4 Expansion of Even and Odd functions

SECTION II

Unit 4: Laplace Transform **(8)**

4.1 Definition and transforms of elementary functions

4.2 Properties of Laplace transform

4.3 Inverse Laplace transform

Unit 5: Applications of Laplace transform: **(7)**

5.1 Laplace Transform of Periodic functions

5.2 Laplace Transform of Heaviside's Unit – Step functions

5.3 Laplace Transform of Unit Impulse function (Dirac-Delta function)

5.4Solution of Linear Differential equations with constants coefficients

Unit 6: Z-Transform: **(6)**

6.1. Definition, Z-Transform of standard functions

6.2 Properties of Z-Transform

6.3Inverse Z-Transform

General Instructions:

1. Batch wise tutorials are to be conducted. The number of students per batch should be as perthe university pattern for practical batches.
2. Minimum number of assignments should be 8 covering all topics.

Recommended Books:

1. A text book of Applied Mathematics, Vol.I by P. N. Wartikar& J. N. Wartikar, PuneVidyarthiGrihaPrakashan, Pune.
2. Higher Engineering Mathematics by Dr. B. S. Grewal, Khanna Publishers, Delhi.

Reference Books:

1. Advanced Engineering Mathematics by Erwin Kreyszig, Wiley India Pvt. Ltd.
2. Advanced Engineering Mathematics by H. K. Dass, S. Chand, New Delhi.
3. A text book of Engineering Mathematics Volume I by Peter V. O'Neil and Santosh K. Sengar, Cengage Learning.
4. Mathematical methods of Science and Engineering by Kanti B. Datta, Cengage Learning.
5. A text book of Engineering Mathematics by N. P. Bali, Iyengar, Laxmi Publications (P) Ltd., New Delhi.

SHIVAJI UNIVERSITY, KOLHAPUR

SECOND YEAR B.TECH (ELECTRICAL) – SEMESTER –I

ELECTRICAL ENGINEERING MATERIALS AND ENERGY CONVERSION

Course	Teaching Scheme					Evaluation Scheme			
						Theory (Marks)		Practical(Marks)	
	L	T	P	Credit	Scheme	Max.	Min. for Passing	Max.	Min. for Passing
EEMEC	03	-	-	03	ISE	-	-	25	40%
					MSE	30	40%	-	-
					ESE	70	40%	-	-

ISE: In Semester Evaluation MSE: Mid Semester Evaluation ESE: End Semester Evaluation

Objectives:

1. To classify different materials from Electrical Engineering application point of view.
1. To understand various properties and characteristics of different classes of materials.
2. To select materials for applications in various electrical equipment.
3. To impart knowledge of Materials for direct Energy conversion devices

Course Outcome:

At the end of this course, the students will be able to

1. Understand the types of engineering materials
2. Understand the principles of Electro-mechanical Energy Conversion
3. Use materials for energy conversion

SECTION I

Unit 1: Conductive materials (7)

General properties and specifications of conductor materials, Factors affecting resistivity, Thermal conductivity of metals, Conductor bimetals, Types of fuse, Electrical carbon materials, Superconductivity

Unit 2: Insulating Materials (5)

General properties of insulating materials, Thermal classification,Dielectricgases, Liquid & solid insulating materials, Insulation measurement, Insulating materials for electrical devices

Unit 3:Magnetic Materials (7)

Magnetic parameters, Classification of magnetic materials, Ferromagnetic behaviour below critical TemperatureFerromagnetic Materials at high temperature, Weiss theory of ferromagnetism, Magnetic materials for electric devices, Soft magnetic materials, Hard magnetic materials

SECTION II

Unit 4: Dielectrics: **(5)**

Dielectric parameters and dielectric losses, Different types of dielectric materials and their classificationDielectrics as electric field medium, Dielectric properties of insulators in static fields, Mechanism of polarization, ionic polarization, orientational polarization, Internal field in solids and liquids

Unit 5: Principles of Electro-mechanical Energy Conversion: **(7)**

Flow of energy in magnetic systems , Energy in magnetic systems (defining energy & Co-energy)Singly Excited Systems: Static Energization, Dynamic Energization, Instantaneous Movement, Transient Movement, Doubly excited systems, Energy stored in magnetic field , Electromagnetic torque

Unit 6: Materials for direct Energy conversion devices: **(5)**

Solar cells, MHD generation, Fuel cells ,Thermoelectric generator , Thermo ionic converters

General Instructions:

1. Minimum number of assignments should be 6 covering all topics.

Recommended Books:

1. A course in Electrical Engineering Materials, S.P. Seth, P.V. Gupta, DhanpatRai& Sons.
2. Electrical Engineering Materials, A.J. Dekker, PHI.
3. Electrical Engineering Materials, T.T.T.I, Madras.

Reference Books:

1. Materials Science for Electrical & Electronics Engineers, Ian P. Jones, Oxford
2. Electrical Properties of Materials, L. Solymar& D. Walsh, Oxford
3. Introduction to material science for engineers, J.K. Shackelford &M.K. Muralidhara, Pearson.
4. Electrical Machines,D.P. Kothari and I.J. Nagrath

SHIVAJI UNIVERSITY, KOLHAPUR

SECOND YEAR B.TECH (ELECTRICAL) – SEMESTER -III

ANALOG ELECTRONICS ENGINEERING

Course	Teaching Scheme					Evaluation Scheme					
						Theory (Marks)		Practical(Marks)		POE	
	L	T	P	Credit	Scheme	Max.	Min. for Passing	Max.	Min. for Passing	Max.	Min. for Passing
Analog Electronics Engineering	04	00	01	05	ISE	-	-	25	40%	-	-
					MSE	30	40%	-	-	-	-
					ESE	70	40%	-	-	50	40%

ISE: In Semester Evaluation MSE: Mid Semester Evaluation ESE: End Semester Evaluation

Course Objectives:

1. Understand various semiconductor devices
2. Describe BJT and JFET operation
3. Classify feedback amplifiers & analyze various oscillators
4. List ideal op amp characteristics and explain configuration
5. Explain op-amp applications
6. Describe applications of IC 555 timer.

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

1. **Explain** various semiconductor devises and its applications.
2. **Illustrate**&**Compare**BJT and JFET.
3. **Classify** feedback amplifiers &**analyze** various oscillators
4. **List** op-amp characteristics and **distinguish** its configurations
5. **Explain** applications of op-amp.
6. **Interpret** applications of IC 555 timers.

SECTION I

Unit 1: Applications of semiconductor devices (9)

1. Review of diode
2. Construction, characteristics and applications of special purpose diodes- LED, Photo diode, Zener diode, Tunnel diode, Varactordiode, Schotkky diode
3. Types of rectifiers and its analysis: - Half wave rectifier, center tapped full wave rectifier and full wave bridge rectifier.
4. Filters
5. Series and shunt voltage regulators(Numerical on rectifiers expected)

Unit 2: Small Signal Analysis (7)

1. Review of transistors,
2. Load line and operating point of BJT
3. Bias stability

4. Biasing circuits of transistors
5. Thermal runaway and use of heat sink
6. Cascade amplifier
7. Construction and working of JFET and MOSFET

Unit 3: Feedback Amplifiers **(5)**

1. Introduction to positive and negative feedback amplifiers
2. Barkhausen criterion
3. Voltage /current, series / shunt feedback amplifiers,
4. Operation and analysis of oscillators: - RC phase shift, Wien bridge, Hartley, colpitts and crystal oscillators.

SECTION II

Unit 4: Op-amp Fundamentals and its characteristics **(7)**

1. Introduction to op-amp: definition, symbol, block diagram
2. Op-amp characteristics: - ideal and practical
3. Op-amp parameters- Input offset voltage, Input bias current, input offset current, Output offset voltage, CMRR, SVRR etc.
4. DC and AC characteristics-
5. Thermal drift
6. Slew rate and slew rate equation
7. Op-amp configuration: - open loop and closed loop
8. Inverting, non-inverting and differential amplifier, voltage gain derivation (Numerical expected)

Unit 5: Applications of Op-amp **(8)**

1. Summing, scaling and averaging amplifier
2. Instrumentation amplifier
3. Integrator
4. Differentiator
5. Log and antilog amplifiers
6. Peak detector
7. Basic comparator
8. Schmitt trigger
9. Precision rectifiers: - Half wave and Full wave
10. Triangular and Square wave generator

Unit 6: Special IC Applications **(6)**

1. Introduction of timer and its need.
2. IC 555 Timer functional diagram
3. IC 555 as Monostable multi-vibrator and its application
4. IC 555 as Astable multi-vibrator and its application
5. Phase Locked Loops – operating principles, PLL IC 565 and its applications.

Recommended Books:

1. "Electronic Devices and Circuit Theory", Robert L. Boylestad and Louis Nashelsky, PHI/Pearson Education. 9th Edition
2. "Op-amps & Linear Integrated Circuits", Ramakant A. Gayakwad, PHI Publication New Delhi, 2013, 4th Edition

Reference Books:

1. "Operational amplifiers and linear ICs", David A Bell, Oxford University Press, 2010
2. "Electronic Devices and circuits" Jacob Millman, Christos C.HalkiascTata McGraw Hill, 3rdedition,2013
3. "Principle of Electronics", V.K.Mehata, RohitMehata, S. Chand
4. "Electronic Principles", Albert Malvino and David J Bates, Tata McGraw Hill, 7thedition,2014.
5. "Electronic Devices and circuits", Allen Mottershead, PHI publication,

List of Experiments

Minimum 8 experiments shall be performed from the following list

1. Study of Full Wave Rectifier with and without filter
2. Study of Zener diode as shunt voltage regulator
3. Study of transistorized series voltage regulator
4. Study of frequency response of RC coupled amplifier
5. Study of transistor biasing circuit
6. Study of transistorized oscillator
7. Study of Inverting and Non-inverting amplifier
8. Study of op-amp based adder and subtractor circuits
9. Study of Schmitt trigger circuit
10. Study of integrator circuit
11. Study of differentiator circuit
12. Study of op-amp based oscillator
13. Study of IC 555 as astablemulti-vibrator
14. Study of IC 555 as mono stable multi-vibrator

SHIVAJI UNIVERSITY, KOLHAPUR

SECOND YEAR B.TECH (ELECTRICAL) – SEMESTER -I

BASIC CIRCUIT THEORY

Course	Teaching Scheme					Evaluation Scheme			
						Theory (Marks)		Practical(Marks)	
	L	T	P	Credit	Scheme	Max.	Min. for Passing	Max.	Min. for Passing
BasicCircuit Theory	04	01	01	06	ISE	-	-	50	40%
					MSE	30	40%	-	-
					ESE	70	40%	-	-

ISE: In Semester Evaluation MSE: Mid Semester Evaluation ESE: End Semester Evaluation

Objectives:

To make students ready to

1. Analyze the A. C and D.C. Circuit
2. Apply network theorems to solve problems
3. Solve problem on coupled circuit
4. Solve problem on two port network
5. Solve problem on Laplace Transformation

Course Outcome:

At the end of this course, the students will be able to

1. Analyze the A. C and D.C. Circuit
2. Apply network theorems to solve problems
3. Solve problem on coupled circuit
4. Solve problem on two port network
5. Solve problem on Laplace Transformation

SECTION I

Unit 1: Analysis of D. C. Circuit (8)

Types of Sources, Dependent and Independent Sources, Source transformation, Star/delta Transformation, Ladder Network, Nodal and Mesh Analysis.

Unit 2:Network Theorems (6)

Superposition theorem, Millman's theorem, Norton's theorem, Thevenin's theorem, Maximum power transfer theorem, Reciprocity theorem, compensation theorem, Tellegen's Theorem

Unit 3:First order and Second Order Circuit (10)

Source free R-C Circuit, Source free R-L Circuit, Step Response of R-C Circuit, Step Response of R-L Circuit, Transient analysis. Initial condition of switched circuits,, unit step, ramp and impulse function. Response of R-C, R-L series circuit to these signals. Second order circuits: Source free Series RLC circuit, Step response of series R-L-C Circuit, General second order circuits

SECTION II

Unit 4: Sinusoidal Steady State Analysis (08)

Sinusoidal steady state analysis: Properties of sinusoidal functions, Phasor, Impedance and admittance, Series and parallel resonance, Q factor, Selectivity and band width, A.C. network solution using Norton's theorem, Thevenin's theorem, Superposition theorem

Unit 5: Two Port Network(8)

Single port and two port networks, Driving point function, Transfer function of two port network. Z parameters, Y parameters, Hybrid parameters, ABCD parameters, Inter relation between parameters, parameters of interconnected two port networks

Unit 6: .Network Solution using Laplace transform(8)

Introduction to Laplace transform, Properties of Laplace transforms, impulse function, application to solution of differential equation describing volatage-current relationship for circuit in time domain, transformed circuit, transfer function, Determination of Initial Conditions.

General Instructions:

1. Minimum number of assignments should be 6 covering all topics.

Recommended Books:

1. C. K. Alexander, M. N. O. Sadiku: Electrical Circuits, Second Edition Tata McGraw-Hill References.
2. Van Valkenburg: Network Analysis, Third Edition, PHI publication

Reference Books:

1. L.P. Huelsman, Basic circuit theory, Third edition, PHI Publication.2. Electrical Properties of Materials, L. Solymar& D. Walsh, Oxford
2. William H. Hayt, Jack E. Kemmerly, "Engineering Circuit Analysis", McGraw Hill international, fifth edition

SHIVAJI UNIVERSITY, KOLHAPUR

SECOND YEAR B.TECH (ELECTRICAL) – PART-II, SEMESTER -III

ELECTRICAL MEASUREMENT

Course	TEACHING SCHEME					EVALUATION SCHEME					
	L	T	P	Credit	Scheme	Theory (Marks)		Practical(Marks)			
								TW		POE	
						Max.	Min. for Passing	Max.	Min. for Passing	Max.	Min. for Passing
Electrical Measurement	04	-	01	05	ISE	-	-	25	40%	-	-
					MSE	30	40%	-	-	-	-
					ESE	70	40%	-	-	50	40%

ISE: In Semester Evaluation MSE: Mid Semester Evaluation ESE: End Semester Evaluation

Course Objectives:

1. **To Identify** errors in the instruments.
2. **To Identify** unknown electrical parameters by using various methods.
3. **To Solve** the numerical on range extension of meters.
4. **To Discuss**various methods of measurement of Power & Energy.
5. **To Demonstrate** digital and advance instruments.
6. **To Examine** theoretically the performance of CT's and PT's.

Course Outcomes:

1. **Explain**various concepts of measuring instruments
2. **Explain** different types of secondary instruments.
3. **Determine** different methods for measurement of resistance, inductance & Capacitance.
4. **Describe** various methods for measurement of Power & energy.
5. **Illustrate & Explain** concept of displacement measurement.
6. **Describe** various modern techniques used in measurement.

SECTION I

Unit 1: Principle of Measuring Instruments (8Hrs)

Types of Error in Measurement, Absolute and secondary instruments, Types of Secondary Instruments: Indicating, Integrating Instruments Difference between Indicating and Integrating Instruments. Construction, working principle, torque equation, advantages and disadvantages of Moving Iron (MI) (attraction andrepulsion), Permanent Magnet Moving Coil (PMMC) & Dynamometer type instruments. Shunts, multipliers (Numerical Expected)

Unit 2: Measurement of Resistance, Inductance & Capacitance (9Hrs)

Measurement of low, medium and .high resistance Wheatstone bridge, Kelvin's double bridge, ammeter-voltmeter method, Megger, Earth tester for earth resistance measurement .Maxwell's Inductance bridge, Maxwell's Inductance & Capacitance Bridge, Hay's bridge, Anderson's bridge, Campbell's Bridge ,Owen's bridge, Schering Bridge (Numerical on Maxwell Bridge)

Unit 3: Measurement of Power (6Hrs)

Power & Its types (Active, Reactive & Apparent Power), Power in DC & AC Circuits, Power factor. Construction, working principle, torque equation, errors and their compensation, advantages and disadvantages of dynamometer type wattmeter, low power factor wattmeter, poly-phase wattmeter. Active & reactive power measurement in three phase system for balanced and unbalanced load using three wattmeter method, two wattmeter method & one wattmeter method.

SECTION II

Unit 4: Measurement of Energy (6 Hrs)

Energy meter- Construction, working principle, torque equation, errors and adjustments of single phase conventional (induction type) energy meter, Calibration of energy meter. Digital Energy Meter, Block diagram and operation of electronic energy meter. Three phase energy meters. Testing of energy Meters.

Unit 5: Transducers & Displacement Measurement (9 Hrs)

Construction and working principle of CRO& DSO,advantages and disadvantages of DSO over CRO.

Transducers: Introduction, classification, basic requirements for transducers. Selection of Transducer, Electrical transducer, Resistive transducer, Resistive position transducer, Resistance thermometer, inductive transducer, Pressure inductive transducer, capacitive transducer(pressure), High pressure measurement using electric methods,Piezzo-electric & photo electric transducer, temperature transducers.

Displacement Measurement- LVDT&RVDT construction, working, application, advantages, disadvantages.

Unit 6: Recent Development in Measurements (4 Hrs)

Wave Analysers & Harmonic Distortion, Power Analyser, Computer aidedmeasurements, Instrument Transformers: Construction, connection of CT & PT in the circuit.

Recommended Books:

Sr. No.	Title	Author	Publisher	Edition	Year
1	A Course in Electrical and Electronic Measurements & Instrumentation	A. K. Sawhney	DhanpatRai& Co.	9th	2014
2	A Course in Electronics & Electrical Measurements & Instrumentation	J. B. Gupta,	S. K. Kataria& Sons.	8th	2012

Reference Books:

Sr. No.	Title	Author	Publisher	Edition	Year
1	Electrical Measurements & Measuring Instruments	E. W. Golding F. C. Widdies	Reem Publications	3rd	2011
2	Electrical Measurement & Instrumentation	RS SirohiRadhakrisnan	New Age International	3rd	2010

List of Experiments:

The term work shall consist of any 8 experiments(excluding study experiments) from list givenbelow:

1. Demonstration of various analog measuring instruments
2. Measurement of Active & reactive power in three phase circuit using two wattmetermethod
3. Calibration of Single phase Induction type energy meter at different power factors
4. Measurement of resistance by ammeter voltmeter method.
5. Measurement of resistance using Whetstone's/Kelvin's bridge.
6. Measurement of inductance using Maxwell's/Hay's/Anderson's bridge.
7. Measurement of capacitance using Schering's bridge
8. Measurement of earth resistance using earth tester.
9. Displacement measurement by LVDT.
10. Study of Digital Meters and Oscilloscopes.
11. Study of Power Analysers.
12. Study of C.T. and P.T.

SHIVAJI UNIVERSITY, KOLHAPUR

SECOND YEAR B.TECH (ELECTRICAL) – SEMESTER -I

C PROGRAMMING

Course	Teaching Scheme					Evaluation Scheme			
						Theory (Marks)		Practical(Marks)	
	L	T	P	Credit	Scheme	Max.	Min. for Passing	Max.	Min. for Passing
C Programming	-	-	01	01	ISE	-	-	50	40%
					MSE			-	-
					ESE			-	-

1) **C Fundamentals:** Operators & expression, data I/P & O/P, Control statements, (2) functions, Program structure, arrays.
2) **Pointers**
   a. Fundamentals
   b. Point Declaration
   c. Passing Pointer to Function
   d. Pointer & One Dimensional Array
   e. Operation Pointers
   f. Pointer & multidimensional array
   g. Passing Function to other Function
   h. More about pointer declaration
3) **Structure & Pointer**
   a. Passing Structures to functions
   b. Self-referential structures
   c. Unions
4) **Data Files**
   a. Opening & Closing of Data Files
   b. Creating & Processing Data Files
   c. Unformatted Data Files
5) **Low Level Programming**
   a. Register Variables
   b. Bitwise Operator
   c. Bit Fields
6) **Additional Features of C**
   a. Enumeration
   b. Command Line Parameter
   c. Macros
   d. C Preprocessor
   e. MATLAB with C
   f. File Handling in MATLAB with C codes.

TERM WORK: Minimum TEN Programs covering all Topics with One Small Project.

REFERENCE BOOKS: -

1. Programming With C Bryan Gottfried ,Schaum's Outline
2. Programming in Ansi C E Balguruswamy(TMH)
3. Let us C YashwantKanetkar[BPB]
4. C Made easy Herbert Schield
5. Understanding pointers in C YashwantKanetkar[BPB]
6. Getting started with MATLABRUDRAPRATAP[OXFORD]

SHIVAJI UNIVERSITY, KOLHAPUR

SECOND YEAR B. TECH. (ELECTRICAL) SEMESTER –IV

DCMT

Course	Teaching Scheme					Evaluation Scheme					
						Theory (Marks)		Practical(Marks)		POE	
	L	T	P	Credit	Scheme	Max.	Min. for Passing	Max.	Min. for Passing	Max.	Min. for Passing
DCMT	04	00	01	05	ISE	-	-	25	40%	-	-
					MSE	30	40%	-	-	-	-
					ESE	70	40%	-	-	50	40%

Objectives:

1. To understand art of operation and performance of DC machines and transformers
2. To evaluate ratings of DC machines & transformers for various applications
3. To evaluate the performance of DC machines and Transformers as per IS

SECTION I

Unit 1: DC Machines: (8)

Constructional Details:,power flow diagram of D.C. machines. Construction of D.C. machines, magnetic circuit of DC machines, commentator and brush arrangement, EMF equation, torque equation

Armature Winding: Simple lap winding and wave winding, winding diagram and tables, brush position, dummy coils.

Armature Reaction: MMF due to armature winding, flux distribution due to armature current and resultant flux distribution in a machine. Demagnetization and cross magnetization ampere turns, principle of compensation, compensating winding and its use in machines.

Unit 2: D.C. Motors: (7)

Concept of back e.m.f., characteristics of D.C. motors, Method of speed controls, electro braking, parallel and series operation of motor. Testing of D.C. Machines:

Losses and efficiency, Break test, Swinburn's test, Hopkinson's test, Retardation test, Field test on D.C. series motor. Applications of DC Machines

Unit3 : Universal Motor: (6)

Development of torque & power, rotational and transformer emf in commutator winding, commutation in universal motor, complex or diagram, circle diagram, operation on A.C. and D.C. supply, compensated winding, applications.

SECTION II

Unit 4: **Single Phase Transformer: (7)**

Construction and type, EMF equation phasor diagram, equivalent circuit, efficiency, losses, regulation, Experimental determination of equivalent circuit parameters and calculation of efficiency and regulation, parallel operation.

Unit 5: Poly Phase Transformer: (7)

Construction, single phase bank, polarity test, transformer winding, Grouping YD1, YD11, DY1, DY11, DZ1, DZ11,YZ1, YZ11, Parallel operation of Dy1 and Dy11.

Unit 6: Performance of Three Phase Transformers: (7)

Switching inrush current, Harmonics in exciting current causes and effects, Harmonics with different transformer connections, tertiary winding, oscillating neutral, Testing of transformers as per IS2026 , heat run test, Sumpner's test, Equivalent delta test.

Text Books:

1. S. J. Chapman, "Electrical Machines", McGraw Hill publication, 3rd Edition.
2. M. G. Say. "Performance Design of AC Machines".
3. O. E. Taylor, "Performance Design of AC commutator motors".

References Books :

1. SK Bhattacharya, "Electrical Machines", Tata McGraw Hill, New Delhi.
2. J. B. Gupta, "Electrical Machines", SK Kataria and Sons, New Delhi.
3. Fitzerald and Kingsley,"Electric Machine", Tata McGraw Hill.

SHIVAJI UNIVERSITY, KOLHAPUR

SECOND YEAR B. TECH. (ELECTRICAL) SEMESTER –IV

POWER ELECTRONICS

Course	Teaching Scheme					Evaluation Scheme					
						Theory (Marks)		Practical(Marks)		POE	
	L	T	P	Credit	Scheme	Max.	Min. for Passing	Max.	Min. for Passing	Max.	Min. for Passing
Power Electronics	03	-	01	04	ISE	-	-	25	40%	-	-
					MSE	30	40%	-	-	-	-
					ESE	70	40%	-	-	50	40%

Objectives:

1. This course intends to provide basic knowledge of different power electronic devices, rectifiers, converters, inverters and choppers.
2. It is aimed to impart skills of analysis for different types of converters such as rectifiers, controlled converters, inverters and choppers.
3. Make the students acquainted with design of different types of converters such as rectifiers, controlled converters, inverters, choppers and their associated control circuit

SECTION I

Unit 1: Power Semiconductor Switches (6)

Characteristics of an ideal switch. Characteristics, Rating, protection and cooling of power semiconductor devices such as power diodes, transistor, MOSFET, IGBT and GTO, Study of the driver circuits for thyristor, GTO and IGBT, Introduction to smart power modules, Comparative study of MOSFET, thyristor, GTO, BJT and IGBT.

Unit 2: Single phase and three phase Rectifiers (5)

Single phase half wave and single phase full wave diode bridge. Three phase half wave and three phase full wave diode bridge, Transformer power rating for above configurations waveforms of source current , DC current and output DC voltage waveforms .

Unit 3 :Phase Controlled AC to DC Converters: (10)

Classification of converters, Single phase half controlled and fully controlled thyristor converters, Three pulse and six pulse controlled converters, operation of converter with freewheeling diode. Effect of source inductance on the performance of the converter,

overlap – angle. Performance factors for the converter such as displacement factor, distortion factor, total harmonic distortion, ripple factor and transformer utilization factor. Introduction to 12 pulse converter, single phase and three phase dual converter, firing scheme for 1 phase and three phase converter.

SECTION II

Unit 4: DC to DC Converters (7)

Control of DC to DC converters, step down (buck) converter, Analysis of buck converter with RLE load, step up converter, buck – boost converter, full bridge DC to DC converter, concept of multiphase choppers, cuk converter.

Unit 5: Switch Mode DC – AC Inverters (8)

Basic concepts of switch mode inverters, single phase half bridge and full bridge inverter, three phase six step inverter, 1200 mode of conduction, 180 degree mode of conduction, three phase PWM Inverter, sinusoidal PWM and selective harmonics elimination methods of PWM. Voltage and frequency control, Effect of blanking time on output voltage in PWM inverters. Applications of three phase and single phase inverters

Unit 6: Cyclo- converters and Matrix Converter (6)

Introduction to Single phase and three phase cyclo-converters. Working and topologies of Matrix converter, control methods, performance analysis of matrix converter. Applications ofCyclo- converters and Matrix Converter

Text Books:

1. H. Rashid "Power Electronics, Circuits, Devices and Applications", Pearson Education Inc., 3rd Edition.
2. P. S. Bhimra, "Power Electronics", 2nd edition, Khanna Publishers

References Books:

1. B.K. Bose, "Modern Power Electronics and A.C. Drives", Prentice Hall of India Pvt. Ltd. Publication.
2. Ned Mohan, Undeland and Robins, "Power Electronics, Converter Applications and Design", John Wiley and sons (Asia) Pvt. Ltd.
3. G. K. Dubey and Others "Thyristorised Power Controller", Wiley Eastern Ltd.

SHIVAJI UNIVERSITY, KOLHAPUR

SECOND YEAR B. TECH. (ELECTRICAL) SEMESTER –IV

POWER SYSTEM - I

Course	Teaching Scheme					Evaluation Scheme			
						Theory (Marks)		Practical(Marks)	
	L	T	P	Credit	Scheme	Max.	Min. for Passing	Max.	Min. for Passing
Power System I	04	-	01	05	ISE	-	-	-	-
					MSE	30	40%	-	-
					ESE	70	40%	50	20

Course Objectives:

The objectives of the course are to

1. Provide the knowledge to typical A.C. and D.C. Power Supply Scheme.
2. To teach the knowledge to understand line constants.
3. Analyze sending end voltage, receiving end voltage, transmission efficiency and regulationin case of transmission line and cables.
4. Recognize the common cause of voltages drops and faults in power system.

1. Supply System

Electric Supply System, Typical A.C. Power Supply Scheme, Comparison of D.C. and A.C. Transmission—Advantages of High Transmission Voltage—Various Systems of Power Transmission— Comparison of Conductor Material in Overhead System—Comparison of Conductor Material in Underground System—Comparison of Various Systems of Transmission—Elements of a Transmission Line—Economics of Power Transmission—Economic Choice of Conductor Size—Economic Choice of Transmission Voltage—Requirements of satisfactory electric supply.

2. Electrical Design of overhead lines

Constants of a Transmission Line—Resistance of a Transmission Line—Skin effect—Flux Linkages—Inductance of a Single Phase Overhead Line—Inductance of a 3-Phase Overhead Line—Concept of self-GMD and mutual GMD—Inductance Formulas in terms of GMD—Electric Potential—Capacitance of a Single Phase Overhead Line—Capacitance of a 3-Phase overhead Line.

3. Mechanical Design of Overhead Lines.

Main components of Overhead Lines—Conductor Materials—Line Supports—Insulators—Type of Insulators—Potential Distribution over Suspension Insulator String—String Efficiency—Methods of Improving String Efficiency—Important Points—Corona—Factors affecting Corona—Important Terms—Advantages and Disadvantages of Corona—Methods of Reducing Corona Effect—Sag in Overhead Lines—Calculation of Sag—Some Mechanical principles.

4. Performance of Transmission Line.

Classification of overhead Transmission Lines—Important Terms—Performance of Single Phase Short Transmission Lines—Three-Phase Short Transmission Lines—Effect of load p.f.on Regulation and Efficiency—Medium Transmission Lines—End Condenser Method—Nominal T Method—Nominal π Method— Long Transmission Lines—Analysis of Long Transmission Line—Generalised Constants of a Transmission Line— Determination of Generalised Constants for Transmission Lines.

5. Underground Cables

Construction of Cables—Insulating Materials for Cables—classification of Cables—Cables for 3-Phase Service—Laying of Underground Cables—Insulation Core Cable—Dielectric Stress in a Single Core Cable—Most Economical Conductor Size in a Cable—Grading of Cables—Capacitance Grading—Intersheath Grading—Capacitance of 3-Core Cables—Measurement of Cc and Ce—Current carrying capacity of underground cables—Thermal resistance—Thermal resistance of dielectric of single-core cable—Permissible current loading—Types of cable faults—Loop tests for location of faults in underground cables.

6. Distribution System General

Distribution systems – classification and arrangement of distribution systems –Voltage dropcalculations in radial and ring mains – comparison of different systems - DC, AC - single phase,three phase 3 wire - 4 wire systems

TEXT AND REFERENCE BOOKS:

1. C. L. Wadhawa , “Electrical Power System”, John Wiley & Sons.
2. HadiSaadat, “ Power System Analysis”, Tata McGraw-Hill.
3. I.J. Nagrath&D.P.Kothari, “Modern Power System Analysis”, Tata McGraw-Hill.
4. W.D. Stevenson and J.J. Grainger, “Power System Analysis”, McGraw-Hill.
5. W.D. Stevenson, “Elements of Power System Analysis”, McGraw-Hill.

SHIVAJI UNIVERSITY, KOLHAPUR
SECOND YEAR B.TECH (ELECTRICAL) – SEMESTER -II

ELECTROMAGNETIC

Course	Teaching Scheme					Evaluation Scheme			
						Theory (Marks)		Practical(Marks)	
	L	T	P	Credit	Scheme	Max.	Min. for Passing	Max.	Min. for Passing
Electromagnetic	03	01	-	04	ISE	-	-	-	-
					MSE	30	40%	-	-
					ESE	70	40%	-	-

ISE: In Semester Evaluation MSE: Mid Semester Evaluation ESE: End Semester Evaluation

Course Outcome:

At the end of this course, the students will be able to

1. To differentiate different types of coordinate systems and use them for solving the problems of electromagnetic field theory.
2. To describe static electric and magnetic fields, their behavior in different media, associated laws, boundary conditions and electromagnetic potentials.
3. To use integral and point form of Maxwell`s equations for solving the problems of electromagnetic field theory.
4. To describe time varying fields, propagation of electromagnetic waves in different media, pyonting theorem, their sources & effects and to apply the theory of electromagnetic waves in practical problems.

SECTION I

UNIT 1: Vector Analysis: (06 Hrs)

Introduction, Coordinate systems and Transformations, Line, surface and volume integrals, Vector calculus, concept of gradient, divergence and curl

UNIT 2: Electrostatics: (10 Hrs)

Coulomb's law, Electric field intensity due to point Charge, line charge, surface charge and volume charge distribution, Electric flux density, Gauss's law and Divergence theorem, Energy, potential energy and work done, potential gradient, dipole and its electric field, dipole movement, energy density in electrostatic field

UNIT 3: Conductor, Dielectrics and Capacitance: (8 Hrs)

Current and current density, Continuity equation of current, properties of conductors, boundary conditions, Energy stored in capacitors, Poisson's and Laplace's equations, Capacitance between parallel plates and co-axial cable using Laplace's equation

SECTION II

UNIT 4: Steady Magnetic Field: (10Hrs)

BiotSavert's law, Magnetic field due to infinitely long current carrying conductor, Magnetic Field due to infinite sheet of charge, Ampere's circuital law, Application to co-axial cable. Curl operator, Magnetic flux density, Stoke's theorem. Scalar and vector magnetic potential, Lorentz's force equation. Energy stored in magnetic field, boundary conditions

5. Time varying fields and Maxwell's Equations: (06 Hrs)

Faraday's law, General case of Induction, Displacement Current, Modified Amper's Law, Maxwell's equations (Differential, Integral, Phasor forms),

Unit 6: .Electromagnetic Waves (8)

Uniform plane wave, wave equation for free space, wave equation for lossymedia, wave propagation in good conductor and good dielectric, Pointing vector and power flow, Skin effect,

General Instructions:

1. Minimum number of assignments should be 6 covering all topics.

Recommended Books:

1. Engineering Electromagnetic, W. Hayt, Tatat McGraw Hill (7th Edition)
2. Electromagnetic field theory fundamental, Guru and Hizirogli,, Thomson Publication
3. Electromagnetic, J.D. Kraus, McGraw Hill, 4th Edition

Reference Books:

1. Antenna and Wave Propagation, K .D. Prasad, SatyaPrakashan
2. Electromagnetic Engineering, Ryder

SHIVAJI UNIVERSITY, KOLHAPUR
SECOND YEAR B.TECH (ELECTRICAL) – SEMESTER -II

CONTROL SYSTEM –I

Course	Teaching Scheme					Evaluation Scheme			
						Theory (Marks)		Practical(Marks)	
	L	T	P	Credit	Scheme	Max.	Min. for Passing	Max.	Min. for Passing
Control System -I	03	-	01	04	ISE	-	-	50	40%
					MSE	30	40%	-	-
					ESE	70	40%	-	-

ISE: In Semester Evaluation MSE: Mid Semester Evaluation ESE: End Semester Evaluation

Course Objectives
The course aims:

1. To provide an introduction and basic understanding of Control System
2. To develop time & frequency domain analysis
3. To analyze & compare different control systems
4. To understand the concept of stability & state space variables

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

1. Apply knowledge of mathematics, science, and engineering to design, analyze and control the different systems
2. Explain time & frequency domain analysis for different control systems
3. Demonstrate & compare different control systems
4. Describe state variables 5 Design model for control system

Unit I

Introduction Need & classification of control system, Effects of feedback, Mathematical models – (Mechanical & Electrical systems) Differential equations, Transfer function – Armature & field control of DC servo motor, Block diagram algebra – Block diagram reduction, Representation by Signal flow graph – Reduction using Mason's gain Formula.

Unit II

Time Response Analysis Standard test signals – Time response of first& second order systems –Design specifications of 2nd order system & error compensation, Characteristic Equation of Feedback control systems, Transient response of second order systems – Time domain specifications, Steady state response – Steady state errors and error constants.

Unit III

Stability Analysis In S-Domain The concept of stability – Routh's stability criterion – qualitative stability and conditional stability – limitations of Routh's stability. Root Locus Technique: The root locus concept – construction of root loci-effects of adding poles and zeros to G(s) H(s) on the root locus.

Unit IV

Frequency Response Analysis Introduction, Frequency domain specifications-Bode plots, Determination of Frequency domain specifications and transfer function from the Bode Plot – Phase margin and Gain margin-Stability Analysis from Bode Plots, Polar Plots, Nyquist Stability Criterion, Nyquist plot & stability analysis.

Unit V

Classical Control Design Techniques Compensation techniques –Lag, Lead, Lead-Lag Controllers design in frequency Domain, Design of PID control system.

Unit VI

State Variable Analysis and Design Concept of state, state variable & state model, state model for linear continuous time systems, state variable & linear discrete time system.

General Instructions:

Term Work: Minimum 04 experiments and 04 assignment on MATLABbased on above syllabus should be performed.

Recommended Books:

Reference Books:

1. Control System Engineering, Norman S. Nise, 4th Edition, John Wiley and Sons, 2004
2. Control Systems Engineering, I.J. Nagrath and M. Gopal, 5th Edition, Anshan Publishers, 2008
3. Feedback Control Dynamic system, Franklin Powel 5th Edition Pearson Education, 2002
4. Modern Control system, Dorf and Bishop, 8th Edition Adison Wesley Longman 1998
5. Modern Control Engineering, Eastern Economy, K. Ogata, 4th Edition, 2002
6. Control System Principles and Design, M. Gopal, Tata McGraw Hill 3rd Edition, 2008.

SHIVAJI UNIVERSITY, KOLHAPUR
SECOND YEAR B.TECH (ELECTRICAL) – SEMESTER -II

ENVIRONMENTAL STUDIES

Course	Teaching Scheme					Evaluation Scheme			
	L	T	P	Credit	Scheme	Theory (Marks)		Practical(Marks)	
						Max.	Min. for Passing	Max.	Min. for Passing
Environmental studies	03	-	-	03	ISE	-	-	-	-
					MSE	30	40%	-	-
					ESE	70	40%		