



SU/BOS/Sci & Tech/ 315

Date: 16/05/2025

To,

The Principal / Director,
All Concerned Affiliated Colleges / Institutions,
Shivaji University, Kolhapur.

Subject: Regarding revised syllabus of **B. Tech. Part - II (Sem- III - IV)** degree **Programme (Affiliated College)** under the Faculty of Science and Technology as per NEP 2020.

Sir/Madam,

With reference to the subject mentioned above, I am directed to inform you that the university authorities have accepted and granted approval to the revised syllabi, Nature of Question paper and equivalence of B. Tech. Part - II (Sem - III & IV) under the Faculty of Science & Technology as per NEP 2020.

No.	Course Syllabus
1	Civil Engineering
2	Mechanical Engineering
3	Mechanical and Mechatronic Engineering (Additive Manufacturing)
4	Electrical Engineering and Technology
5	Electrical and Computer Engineering
6	Electronics and Telecommunication Engineering
7	Electronics & Computer Science Engineering
8	Computer Science and Engineering
9	Artificial Intelligence & Machine Learning (AIML)
10	Data Science (DS)
11	Artificial Intelligence & Data Science (AIDS)

This Syllabus, shall be implemented from the academic year **2025-26** onwards. A soft copy containing the syllabus is attached herewith and it is available on university website www.unishivaji.ac.in **NEP-2020@suk (Online Syllabus)**

The question papers on the pre-revised syllabi of above-mentioned course will be set for the examinations to be held in October/ November 2025 & March / April 2026. These chances are available for repeater students, if any

You are, therefore, requested to bring this to the notice of all students and teachers concerned.

Thanking you,

Yours faithfully,

(Signature)
Dr. S.M. Kubal
Dy. Registrar

Copy to: for Information and necessary action

1	The I/c Dean, Faculty of Science & Technology	6	Appointment Section A & B
2	Director, Board of Examinations & Evaluation	7	Affiliation Section (T.1) (T.2)
3	The Chairperson, Respective Board of Studies	8	P.G.Admission Section, /P.G Seminar Section
4	OE 4 Exam Section,	9	Computer Centre, /IT Cell
5	Eligibility Section,	10	Internal Quality Assurance Cell (IQAC)



Shivaji University Kolhapur

Revised Syllabus
as per
National Education Policy-2020
(NEP-2.0)

S.Y.B.Tech.
Electrical Engineering

To be Implemented from
Academic Year 2025-26



First Year Exit: Teaching Methodology, Assessment and Evaluation

[I] As per R. R. B. Tech. 12.1 Rule: Award of Degree

If a student passes all the courses of first year and earns the requisite number of credits, the student will become entitled to Undergraduate Certificate (One year or two semesters) in the programme of his/her major subject. If he/she wants to exit, can exit the programme with UG Certificate. However, for the award of one year UG Certificate in Major with 44 credits, an additional 8 credits are required to earn.

[II] First Year Exit Course:

Methodology 1:

1. The students should complete two online certification courses (NPTEL) related to their programme, each of 3 credits. In addition to this, they will also need to complete 2 credits worth of two Virtual Lab work related to online certification courses. These additional 8 credits earn by students shall be based upon skill based vocational courses or internship/Apprenticeship.
2. The NPTEL courses are likely to be available online and can be completed at the student's own pace. The content will be specific to the student's field of study or programme. The skill based vocational courses shall be analogous to the Baskets/Areas provided by the concerned BoS.
3. The student must complete two virtual lab work that adds 2 credits to simulate practical or experimental learning experiences in a controlled virtual environment.

4. **Examination scheme:** The marks gained from the two NPTEL Courses (3 credits each) are converted to a total of 100 marks. The report for the two Virtual Lab work of 2 credits will be evaluated for 25 marks. The report should include a detailed write-up and analysis of the virtual lab experiments conducted, encompassing the methodology, results, and conclusions.
5. There may be uncertainty in availability of the NPTEL courses offered by concerned BoS as there is continuous updation of the NPTEL courses. The students can choose equivalent NPTEL course of the required duration with prior permission from the concerned institute. The concerned institute should communicate to Concerned BoS for their permission. For NPTEL course registration, the students are required to visit to website <https://swayam.gov.in> and create their account. Log in the account and join the required course and follow the instructions to complete the course. Similarly, for Virtual Lab, the students are required to visit to website <https://www.vlab.co.in> and create their account. Log in the account and join the required lab and follow the instructions to complete the course (need to perform all listed experiments under that Lab). To fulfill the requirement of 06 credits, students can go for two courses each of 12 weeks.

Methodology 2:

1. The students should complete two online certification courses (NPTEL) related to their programme, each carrying 2 credits. In addition to this, they will also need to complete 4 credits worth of two physical internship/Apprenticeship (each of 40 hrs) work from relevant

industry. These additional 8 credits earned by the students shall be based upon skill based vocational courses or internship/Apprenticeship.

2. The NPTEL courses are likely to be available online and can be completed at the student's own pace. The content will be specific to the student's field of study/programme. The skill-based vocational courses shall be analogous with the list provided by the concerned BoS.
3. The student should complete two physical internship/Apprenticeship (each of 40 hrs) work from relevant industrial practices that adds 4 credits to simulate practical or experimental learning experiences in a controlled virtual environment.
4. **Examination scheme:** The marks gained from the two NPTEL Courses (2 credits each) are converted to a total of 100 marks. The report for the performed two physical internship/Apprenticeship (each of 40 hrs) work from relevant industrial practices of 4 credits will be evaluated for 25 marks. The report should include a detailed write-up and analysis of two physical internship/Apprenticeship (each of 40 hrs) work along with certificate of internship/Apprenticeship from relevant industrial practices conducted, encompassing the methodology, results, and conclusions.
5. There may be uncertainty in availability of the NPTEL courses offered by concerned BoS as there is continuous updation of the NPTEL courses. The students can choose equivalent NPTEL course of the required duration with prior permission from the concerned institute.

The concerned institute should communicate to Concerned BoS for their permission. For NPTEL course registration, the students are required to visit to website <https://swayam.gov.in> and create their account. Log in the account and join the required course and follow the instructions to compete the course.

Direct Second Year Entry: Teaching Methodology, Assessment and Evaluation

[I] For the students admitted directly into the second year of a programme (at the entry level) from a different programme, earning of an additional 2 credits is mandatory.

[II] As per R. R. B. Tech. 13.3 Rule, For direct second year admitted students (at entry level) to concern programme, the earning of additional 2 credits is mandatory. It is required to conduct examination and evaluation for same at institute level at the time of third semester ESE examination. The evaluation report must be submitted to The Director, Board of Examination and Evaluation, Shivaji University, Kolhapur.

[III] Examination scheme:

Students admitted directly into the second year of a programme from another programme are required to complete a 2-credit entry-level course as per the prescribed curriculum. This course should be completed at their own pace to ensure alignment with the programme foundational requirements. End Semester Examination (ESE) of 100 marks will be conducted at the institute level. It is mandatory to organize the examination and evaluate the performance of such students at the institute level during the third semester ESE. The evaluation report must be submitted to The Director, Board of Examination and Evaluation, Shivaji University, Kolhapur.

Open Elective Courses: Teaching Methodology, Assessment and Evaluation

Open Elective (OE) courses other than faculty of Science and Technology through Massive Open Online Courses (MOOCs) allowing students to engage with a broad spectrum of ideas and knowledge areas. The OE courses are likely to be available online and can be completed at the student's own pace within a set timeframe. For OE course, students are required to visit to the website <https://swayam.gov.in> for registration and create an account. Afterward, students should Login the account and join the course assigned by the course coordinator and follow the instructions to complete the course. Minimum 25 students can register for one OE course in the concerned institute. There will be only one course coordinator for one OE course.

1. **For Semester-III**, OE theory course of 3 credits consists of Mid Semester Examination (MSE) of 30 Marks, In Semester Evaluation/Continuous Assessment (ISE/CA) of 10 Marks and End Semester Examination (ESE) of 60 Marks.
2. **For Semester-III**, OE practical lab course of 1 credit consists of In Semester Evaluation/Continuous Assessment (ISE/CA) of 25 Marks and End Semester Examination-Practical Oral Examination (ESE-POE) of 25 Marks. Course Coordinator assigned by Institute should complete the selected course practical through expert of that course.
3. **For Semester-IV**, OE theory course of 2 credits consists of Mid Semester Examination (MSE) of 30 Marks, In Semester

Evaluation/Continuous Assessment (ISE/CA) of 10 Marks and End Semester Examination (ESE) of 60 Marks.

4. The Mid Semester Examination (MSE) of 30 Marks based on selected OE Course will be conducted by Concerned Departmental Course Coordinator. The course expert of concerned faculty should set question paper of MSE and evaluate the same.
5. Online submitted assignments by students using SWAYAM platform for concerned OE course will be used for In Semester Evaluation/Continuous Assessment (ISE/CA) of 10 Marks by Concerned Departmental Course Coordinator appointed for particular course by Principal of the Institute. Assignments may be of varied in nature for OE course.
6. The setting of ESE question paper of Concerned OE Course should be done through course expert of concerned faculty as per University rules and is responsibility of Institute/ Departmental Course Coordinator.
7. Student may get failure in the said OE course or the examination may get delayed by SWAYAM, in either cases, ESE of the said course will be conducted as per the University rules.

Note: One OE course is to be floated by the institute for 60 intake.

Second Year Exit: Teaching Methodology, Assessment and Evaluation

[I] As per R. R. B. Tech. 12.2 Rule: Award of Degree

If a student passes all the courses of first year, second year and earns the requisite number of credits, the student will become entitled to Undergraduate Diploma (Two years or four semesters) in the programme of his/her major subject. If he/she wants to exit, can exit the programme with UG Diploma certificate. However, for the award of two years UG Diploma Certificate in Major with 88 credits, an additional 8 credits from Exit Courses are required to earn.

[II] Second Year Exit Course:

Methodology 1:

1. The students should complete two online certification courses (NPTEL) related to their programme, each of 3 credits. In addition to this, they will also need to complete 2 credits worth of two Virtual Lab work related to online certification courses. These additional 8 credits earn by students shall be based upon skill based vocational courses or internship/Apprenticeship.
2. The NPTEL courses are likely to be available online and can be completed at the student's own pace. The content will be specific to the student's field of study or programme. The skill based vocational courses shall be analogous to the Baskets/Areas provided by the concerned BoS.

3. The student must complete two virtual lab work that adds 2 credits to simulate practical or experimental learning experiences in a controlled virtual environment.
4. **Examination scheme:** The marks gained from the two NPTEL Courses (3 credits each) are converted to a total of 100 marks. The report for the two Virtual Lab work of 2 credits will be evaluated for 25 marks. The report should include a detailed write-up and analysis of the virtual lab experiments conducted, encompassing the methodology, results, and conclusions.
5. There may be uncertainty in availability of the NPTEL courses offered by concerned BoS as there is continuous updation of the NPTEL courses. The students can choose equivalent NPTEL course of the required duration with prior permission from the concerned institute. The concerned institute should communicate to Concerned BoS for their permission. For NPTEL course registration, the students are required to visit to website <https://swayam.gov.in> and create their account. Log in the account and join the required course and follow the instructions to complete the course. Similarly, for Virtual Lab, the students are required to visit to website <https://www.vlab.co.in> and create their account. Log in the account and join the required lab and follow the instructions to complete the course (need to perform all listed experiments under that Lab). To fulfill the requirement of 06 credits, students can go for two courses each of 12 weeks.

Methodology 2:

1. The students should complete two online certification courses (NPTEL) related to their programme, each carrying 2 credits. In addition to this, they will also need to complete 4 credits worth of two physical internship/Apprenticeship (each of 40 hrs) work from relevant industry. These additional 8 credits earned by the students shall be based upon skill based vocational courses or internship/Apprenticeship.
2. The NPTEL courses are likely to be available online and can be completed at the student's own pace. The content will be specific to the student's field of study/programme. The skill-based vocational courses shall be analogous with the list provided by the concerned BoS.
3. The student should complete two physical internship/Apprenticeship (each of 40 hrs) work from relevant industrial practices that adds 4 credits to simulate practical or experimental learning experiences in a controlled virtual environment.
4. **Examination scheme:** The marks gained from the two NPTEL Courses (2 credits each) are converted to a total of 100 marks. The report for the performed two physical internship/Apprenticeship (each of 40 hrs) work from relevant industrial practices of 4 credits will be evaluated for 25 marks. The report should include a detailed write-up and analysis of two physical internship/Apprenticeship (each of 40 hrs) work along with certificate of internship/Apprenticeship from

relevant industrial practices conducted, encompassing the methodology, results, and conclusions.

5. There may be uncertainty in availability of the NPTEL courses offered by concerned BoS as there is continuous updation of the NPTEL courses. The students can choose equivalent NPTEL course of the required duration with prior permission from the concerned institute. The concerned institute should communicate to Concerned BoS for their permission. For NPTEL course registration, the students are required to visit to website <https://swayam.gov.in> and create their account. Log in the account and join the required course and follow the instructions to complete the course.

Department of Electrical Engineering
Exit Course for Electrical Engineering after 1st Year

Exit option: Award of UG Certificate in Major with 44 credits and an additional 8 credits from following Exit Courses				
Sr.No	Course Code	Course Title	Mode	Credits
1	EE-EC-0301	Certificate Course in Electrical Maintenance and Electrical Audit	Analogous Online/offline certification Course or industrial training of total 8 credits	8
		OR		
2	EE-EC-0302	Certificate Course on Electricity Law of India and Abroad		8

1. Students may select multiple courses from the list provided to fulfill the required credits.
2. To enroll in an NPTEL course, visit <https://swayam.gov.in>, register, and create an account. After logging in, join the desired course and follow the provided instructions to complete it.
3. Please note that the availability of NPTEL courses is subject to change due to regular updates. If a listed course is unavailable, students may opt for an equivalent course of similar duration and subject matter, with prior approval from the concerned institute.
4. If a student is unable to complete the NPTEL/MOOC online course, they are required to appear for a Computer-Based Examination (MCQ and MSQ format) conducted by Shivaji University, based on the content of the NPTEL/MOOC course selected by the student.

Examination scheme for first year exit:

- The marks obtained from the MOOCs will be scaled to a total of 100 marks.

List of NPTEL/MOOCs Course

Certificate Course in Electrical Maintenance and Electrical Audit and Certificate Course on Electricity Law of India and Abroad

Sr.No.	NPTEL Course Title	Duration	Credits
01	Energy Conservation and Audit Laboratory	08 weeks	02
02	Condition Monitoring and Maintenance Management	08 weeks	02
03	Renewable Energy Power Plants Laboratory	08 weeks	02
04	Basic Principles of Energy Management & Energy Audit	12 weeks	04
05	Electricity & Safety Measures	12 weeks	04

Earning of additional 2 mandatory credits for direct second year admitted students to Electrical Engineering branch.

Sr.No.	Semester	Subject	Credit
1	III	General Electrical Engineering	2

ShivajiUniversity,Kolhapur					
SecondYear(Sem.–III) B.Tech.ElectricalEngineering					
GeneralElectricalEngineering					
TeachingScheme			ExaminationScheme		
Lectures	2Hrs./week		MSE	30Marks	
Tutorials	00 Hrs./week		ISE	10Marks	
TotalCredits	02		ESE	60Marks	
			DurationofESE	02 Hrs.30Min	
Prerequisite:					
CourseOutcomes(CO):Attheendofsuccessfulcompletionofthecourse,thestudentwill be					
CO1	Explainthebasicelectricand magneticcircuits.				
CO2	Interpretthefundamentals ofsingle-phasealternatingquantities.				
CO3	Examinerectionbetweenlineandphasequantitiesforthreephase connection.				
CO4	Explaintheworkingprincipleoftransformer and calculate theeconomy.				
Units	CourseContents			CO	Hours
Unit1	D.C.circuits&Magnetic Circuit: Concept ofE.M.F, PotentialDifference, Current, Resistance, Ohm’s Law,Kirchhoff’s laws, Concept of mmf, reluctance,magneticflux,MagneticFluxdensity,Magneticfieldstrength,BHcurve,magneticleakage, ComparisonofElectricandMagnetic circuit.			CO1	08
Unit2	SinglephaseAC Circuits Fundamentals of Alternating quantities,Faraday’sLaw,Types of Induced E.M.F,Generation of sinusoidal voltage, concept of R.M.S. & Average value, form factor, Peak Factor, powers, power factor.			CO2	07
Unit3	ThreephaseA.C. Circuits Advantagesof3phasesystem,Generationof3phaseACsupply,balanced3phase load,relationbetweenline and phase quantities for star connected circuit and delta connected circuit.			CO3	07
Unit4	Transformer:SinglephaseTransformer:Construction,OperatingPrinciple,TypesandApplications,EMF Equation,RatiosofVoltageandCurrent,Losses,EfficiencyandVoltageRegulation			CO4	08

Unit5	Motors: IntroductiontoACandDCmotors,typesofACmotors,Constructionandoperationofservomotor, Typesandapplications.	CO5	04
Unit6	BasicElectricalMeasurement: TypesofInstruments,TypesofErrorin,Measurement,Absoluteand secondary instruments, Types of Secondary Instruments: Indicating, Integrating Instruments, deflecting torque, controllingtorqueandddampingtorque. IntroductiontoCROandDSO.	CO6	06
TextBooks			
1.	BasicElectricalEngineering,NagrathI.J.andD.P.Kothari,TataMcGrawHill,2009.		
2.	BasicElectricalEngineering,V.KMehta,RohitMehta,S.Chand,2008.		
ReferenceBooks			
1.	B.LTheraja,“ElectricalTechnology”VolIII,S.Chand&Co.Ltd, India.		
2.	BharatiDwivediandAnuragTripathi,“FundamentalsofElectricalEngineering”WileyPRECISETextBook.		
3.	V.K.Mehta,“PrinciplesofElectricalEngineering”S.Chand&Co.Ltd,India.		
4.	P.V.PrasadandS.Shivanaraju,“ElectricalEngineeringConceptsandApplications”CENGAGELearning.		
5.	VincentDelToro,“ElectricalEngineering”PrenticeHall,Inc.EnglewoodCliffs,NewJersey.		
6.	AshfaqHusain,“FundamentalsofElectricalEngineering”DhanpatRai&Co.		
7.	NagrathI.J.andD.P.Kothari,“BasicElectricalEngineering”TataMcGrawHill.		
UsefulLinks			
1.	https://onlinecourses.nptel.ac.in/noc22_ee113/preview ByProf.DebapriyaDas,IITKharagpur		
2.	https://archive.nptel.ac.in/courses/108/102/108102185 byProf.BhimSingh,IITDelhi		
3.	https://nptel.ac.in/courses/108108076 byProf.L. Umanand,Bangalore.		

SCHEME OF INSTRUCTION & SYLLABI

Name of Programme: Electrical Engineering

Scheme of Instructions: Second Year B.Tech. in Electrical Engineering

Semester-III

Sr. No.	Course Category	Course Code	Course Title	L	T	P	Contact Hrs/Wk	Course Credits	EXAM SCHEME			
									MSE	ISE/CA	ESE	TOTAL
1	PCC	EE0331	Electrical Circuit Analysis	3	--	--	3	3	30	10	60	100
2	PCC	EE0332	Signals and Systems	3	1	--	4	4	30	10	60	100
3	PCC	EE0333	Electrical Measurement and Instrumentation	3	--	--	3	3	30	10	60	100
4	FP	EE0334	Electrical Measurement and Instrumentation Lab.	--	--	2	2	1	--	50	25	75
5	MDM	EE0335	Multi-disciplinary Minor-01	2	--	--	2	2	30	10	60	100
6	OE	EE0336	Open Elective-01	3	--	--	3	3	30	10	60	100
7	HSSM	EE0337	Universal Human Values	2	--	--	2	2	--	50	--	50
8	FP	EE0338	Electrical Circuit Analysis Lab.	--	--	2	2	1	--	50	25	75
9	HSSM	EE0339	Soft Skill Development	2	--	--	2	2	--	50	--	50
10	OE	EE03310	Open Elective-01 Lab	--	--	2	2	1	--	25	25	50
			Total	18	1	6	25	22	150	275	375	800

L-Lecture

T-Tutorial

P-Practical

MSE-Mid Semester Examination ISE/CA-In Semester Evaluation/Continuous Assessment

ESE-End Semester Examination (For Laboratory End Semester performance)

Course Category	Basic Science Courses (BSC)	Engineering Science Courses (ESC)	Programme Core Course (PCC)	Programme Elective Course (PEC)	Open Elective other than particular Programme (OE/MDM)	Vocational and Skill Enhancement Course (VSEC)	Humanities Social Science and Management (HSSM)	Experiential Learning (EL)	Co-curricular and Extracurricular Activities (CCA)
Last Sem. Cumulative Sum	16	16	--	--	--	06	04	--	02
Semester Credits	--	--	10	--	06	--	04	02	--
Cumulative Sum	16	16	10	--	06	06	08	02	02

PROGRESSIVE TOTAL CREDITS: 44+22=66

Second Year(Sem.–III)B. Tech. Electrical Engineering					
(PCC-EE0331)Electrical Circuit Analysis					
Teaching Scheme			Examination Scheme		
Lectures	03Hrs/week		MSE	30	
Tutorials	00Hrs/week		ISE	10	
Total Credits	03		ESE	60	
			Duration of ESE	02Hrs.30Min.	
Prerequisite: BEE					
Course Outcomes(CO):Students will be able to					
CO1	Determinevoltages, currents,powers,andequivalenceofA.C.andD.C. circuitsusingelectricalcircuit theorems.				
CO2	Calculatethetransientandsteadystateresponseoffirstand secondordercircuits.				
CO3	Analyzetheparametersoftwoportelectricalcircuits andnetworks.				
CO4	Analyzeacircuitinthes-domain.				
	CourseContents			CO	Hours
Unit1	DC Circuits Ohm'slaw,Kirchhoff'slaw,dependent andindependent sources,nodes,branches,loops,voltageandcurrent division, Wye Delta transformations, nodal analysis,mesh analysis,linearity property, superposition theorem, sourcettransformation, Thevenin's and Norton's theorem, maximumpower transfer.			CO1	08
Unit2	FirstOrderCircuits Capacitors,SeriesandParallelCapacitors,Inductors,SeriesandParallel Inductors,SourcefreeRC,RLcircuits, stepresponseofRC,RL,circuits			CO2	07
Unit3	SecondOrderCircuits Findinginitialandfinalvalues,sourcefreeriesandparallelRLCcircuits,stepresponseofseriesandparallel RLCcircuits,generalsecond ordercircuits.			CO2	05
Unit4	ACCircuitsAnalysis Sinusoids,phasors,impedanceandadmittance,sinusoidalsteadystateanalysis,nodalandmeshanalysis, superpositiontheorem,sourcettransformation,Thevenin'sandNorton'sequivalentcircuit.			CO3	07
Unit5	TwoPortNetwork Impedanceparameters,admittanceparameters,hybridparameters,transmissionparameters,seriesconnectionof			CO4	06

	twotwo-portnetwork,parallelconnectionoftwotwo-portnetwork,cascadeconnectionoftwotwo-port network.		
Unit6	AdvancedCircuitAnalysis Introduction,ApplicationofLaplace transformto linear integro-differentialequation,circuit element modelsfor time to s-domain transformation and circuit analysis, transfer function, state variable method, network stability.	CO4	07
TextBooks			
1.	C.K.AlexandarandM.O.Sadiku,“Fundamentals ofElectricCircuits”,McGrawHillEducationMH,6thEdition,2018,ISBN:9780078028229		
ReferenceBooks			
1.	JamesW.NilssonandSusanA.Riedel“ElectricCircuits”PrenticeHall,10thEdition,2015,ISBN:0131989251		
2.	L.P.Huelsman,“BasicCircuitTheory”,PrenticeHall,3rdEdition,2009,ISBN:9788120309715		
UsefulLinks			
1.	https://nptel.ac.in/courses/108/104/108104139/		
2.	https://nptel.ac.in/courses/108/104/108104139/		
3.	https://nptel.ac.in/courses/108/105/108105159/		

Mapping of Cos and POs

PO → CO↓	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	PO11	PO12
CO1	3	2										2
CO2	2	2										2
CO3	2	1										1
CO4	1	1										1

1:Slight(Low)

2:Moderate(Medium)

3:Substantial(High)

Shivaji University, Kolhapur			
Second Year(Sem.III)B. Tech. Electrical Engineering			
(PCCEE0332)Signals and Systems			
Teaching Scheme		Examination Scheme	
Lectures	03 Hrs/week	MSE	30Marks
Tutorials	01 Hr/week	ISE/CA	10Marks
Total Credits	04	ESE	60Marks
DurationofESE:02Hrs.30Min.			
Prerequisite:BasicElectricalEngineering,EngineeringMathematics,ControlSystem,			
Course Objectives:			
1. Toprovidestudentwithaclearunderstanding ofdifferenttypesandclassificationsofsignalsandsystems, including continuous- time and discrete-time signals. 2. TodeveloptheabilitytodeterminetheresponseofLinear Time-Invariant(LTI)systemsusingconvolutiontechniques. 3. Toemphasisetherelationshipbetweentime-domainandfrequency-domainrepresentationsofdiscrete signals.			
Course Outcomes:			
Attheendofsuccessfulcompletionofthecourse,thestudentwillbe: CO1. Determine the Class of the Signal and System. CO2. Determine the response of the LTI system using convolution. CO3.ExaminesystempropertiesbasedonimpulseresponsetheFourier CO4. Apply the Laplace – -transform to analyze the Continuous-time signals CO5.ApplytheZ–transformtoanalyzethediscrete-timesignalsandsystems. CO6.Analyzetheirimpactonsignalreconstructionquality.			

UnitNo.	Course Content	CO	Hours
Unit1	Introduction to Signals and Systems 1) Introduction to Signals: Continuous and Discrete Signals, Elementary Continuous Time and Discrete Time Signals (Unit step, Unit Ramp, Unit Parabolic, Impulse, Rectangular, Triangular, Gaussian and Sinusoidal Functions), Basic Operations on Signals (Time Shifting, Time Reversal, Amplitude Scaling, Time Scaling), Classification of Signals 2) Introduction to Systems: Classification of Systems (Continuous and discrete-time systems, Lumped and distributed systems, Static and dynamic systems, Causal and non-causal systems, Linear and non-linear systems, Stable and Unstable systems)	CO1	07
Unit2	Time Domain Analysis of Discrete and Continuous-Time Systems Zero State Response, Zero input Response, Convolution sum and Convolution integral Graphical representation of Convolution, Properties of Convolution, BIBO stability criteria and Correlation.	CO2	07
Unit3	Fourier analysis of continuous and discrete signals Fourier series representation, Properties of continuous-time Fourier series, Fourier spectrum, Gibbs' phenomenon, Fourier transform and its properties, Parseval's theorem, exponential Fourier spectra, DTFT, Properties and symmetrical properties of DTFT, Convergence of DTFT.	CO3	07
Unit4	System analysis using Laplace transform A brief introduction to Laplace transforms, the relation between Fourier and Laplace transforms, ROC & its properties (problems on ROC), properties of Laplace transform (problems) and inverse Laplace transform (problems), transfer function analysis, solution of LTI differential equation with and without initial condition.	CO4	07
Unit5	System analysis using Z-transform A brief introduction to Z-transform, properties of ROC (problems on ROC) properties of Z-transforms, inversion of Z-transform methods - power series and partial expansion, Transforms	CO5	07

	analysis of LTI systems, transfer function (system function), stability and causality, solution of difference equations.		
Unit 6	Sampling Introduction to Sampling process, Sampling theorem, Reconstruction of signals from its sample's, aliasing, Sampling in the frequency domain.	CO6	07
		Total Hours	42hrs
Text Books: 1. "Signal & System Analysis", by Dr. J.S. Chitode, Uday A. Bakshi. 2. "Signals & Systems", by Tarun Kumar Rawat. 3. "Signal & System", by Alan V. Oppenheim, Alan S. Willsky.			
Reference Books: 1. "Linear Systems and Signals", B.P. Lathi, Oxford University Press, 2nd edition, 2005 2. "Signals and systems", Simon Haykin, Wiley Publications 3. H.P. Hsu, R. Ranjan, "Signals and Systems", Schaum's outlines, TMH, 2006. 4. B.P. Lathi, "Linear Systems and Signals", Oxford University Press, 2005. 5. Ganesh Rao and Satish Tunga, "Signals and Systems", Pearson/Sanguine. 6. Alan V. Oppenheim, Alan S. Willsky, S. Hamid Nawab – "Signals & system", - II Ind Edition - Pearson Education. 7. "Signals and Systems", by S. Palani, Ane Books Pvt. Ltd			
Useful Link/NPTEL Course:			
1.	Principles of Signals and Systems By Prof. Aditya K. Jagannatham, IIT Kanpur		
2.	Signals and Systems By Prof. Hitesh Shrimali, Prof. Kushal K. Shah, IIT Mandi, IISER Bhopal		

Mapping of COs and Pos

PO→ CO↓	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	-	-	-	-	-	-	-	-	2
CO2	3	3	3	2	2	-	-	-	-	-	-	2
CO3	3	3	2	2	2	-	-	-	-	-	-	2
CO4	3	3	2	3	2	-	-	-	-	-	-	2
CO5	3	3	2	3	3	-	-	-	-	-	-	2
CO6	3	3	2	3	2	2	2	-	-	-	-	2

1:Slight(Low)2:Moderate(Medium)3:Substantial(High)

Shivaji University, Kolhapur			
Second Year (Sem. III) B. Tech. Electrical Engineering			
EE0333: Electrical Measurement and Instrumentation			
Teaching Scheme		Examination Scheme	
Lectures	03 Hrs./week	MSE	30
Tutorials	00 Hrs./week	ISE/CA	10
Total Credits	03	ESE	60
		Duration of ESE	02 Hrs. 30 Min
Prerequisite: Basic Electrical Engineering, Physics, Engineering mathematics and science stream			
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 (CO):			
At the end of successful completion of the course, the student will be			
CO1	Explain various concepts of measuring instruments.		
CO2	Explain different types of secondary instruments.		
CO3	Determine different methods for measurement of resistance, inductance & Capacitance.		
CO4	Describe various methods for measurement of Power & energy.		
CO5	Illustrate & Explain concept of displacement measurement.		
CO6	Describe various modern techniques used in measurement.		
Unit No.	Course Contents	CO	Hours
Unit 1	Basic of Measuring Instruments: Types of Instruments, Types of Error in Measurement, Absolute and secondary instruments, Types of Secondary Instruments: Indicating, Integrating Instruments, Construction, working principle, torque equation, advantages and disadvantages of Moving Iron (MI), Permanent Magnet Moving Coil (PMMC), Shunts, multipliers (Numerical Expected).	CO1	07

Unit2	Measurement of Electrical Parameters: Measurement of low, medium and high resistance using following bridges. Wheatstone bridge, Kelvin's double bridge, ammeter-voltmeter method, Megger, Earth tester, Maxwell's Inductance bridge, Maxwell's Inductance & Capacitance Bridge, Hay's bridge, (Numerical on Maxwell Bridge), Power & Its types (Active, Reactive & Apparent Power), Power factor, low power factor wattmeter, poly-phase wattmeter.	CO2	07
Unit3	Measurement of Power and Energy Active & reactive power measurement in three phase system for balanced and unbalanced load using three wattmeter method, two wattmeter method & one wattmeter method. Single Phase and Three Phase Induction Type Energy meter- Construction, working principle, advantages and disadvantages.	CO3	07
Unit4	Measurement of Electronic Instruments: Digital Energy Meter, Block diagram and operation of electronic energy meter. Three phase energy meters. Testing of energy meters. Construction and working principle of CRO & DSO, advantages and disadvantages of DSO over CRO. Electronic Multi meters, Electronic Ohmmeter.	CO4	07
Unit5	Transducers & Displacement Measurement: Transducers: Introduction, classification, basic requirements for transducers. Selection of Transducer, Electrical transducer, Resistive transducer, Resistance thermometer, capacitive transducer, Piezo electric & photo electric transducer, temperature transducers. Displacement Measurement- LVDT & RVDT	CO5	07
	construction, working, application, advantages, disadvantages. Hall effect Transducers, Wave Analyzers & Harmonic Distortion, and Power Analyzer.		
Unit6	Instrument Transformers and Measurement of Non-Electronic Quantities: Construction, working and application of CT & PT, Potentiometers, Strain Gauge and its types, Thermistors, Thermocouples, Measurement of pH Value.	CO6	07
		Total Hours	35hrs.

TextBooks	
1.	A Course in Electrical and Electronic Measurements & Instrumentation A.K. Sawhney Dhanpat Rai & Co. 9th 2014.
2.	A Course in Electronics & Electrical Measurements & Instrumentation J.B. Gupta, S.K. Kataria & Sons. 8th 2012
ReferenceBooks	
1.	Electrical Measurements & Measuring Instruments E. W. Golding F. C. Widdies Reem Publications 3rd 2011.
2.	Electrical Measurement & Instrumentation R.S. Sirohi Radhakrishnan New Age International 3rd 2010.
Useful Links/NPTEL course:	
1.	https://nptel.ac.in/courses/108105153 by Prof. Avishek Chatterjee IIT Kharagpur.

COs and POs Mapping

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

1:Slight (Low)

2:Moderate(Medium)

3:Substantial(High)

Shivaji University, Kolhapur			
Second Year (Sem. III) B. Tech. Electrical Engineering			
EE0334: Electrical Measurement and Instrumentation Lab			
Teaching Scheme		Examination Scheme	
Lectures	--Hrs./week	MSE	--
Tutorials	--Hrs./week	ISE/CA	50
Practical	02	ESE	25
Total Credits	01	Duration of ESE	--
Prerequisite: Basic Electrical Engineering, Physics, Engineering Mathematics and Science Stream			
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 (CO):			
At the end of successful completion of the course, the student will be			
CO1	Understand the working of various measuring instruments.		

CO2	Able to analyse various power measurement methods.		
CO3	Able to use various test and measuring instruments.		
CO4	Able to measure physical quantities using transducers.		
CO5	Able to recognize the instruments for each measurement and their connections.		
CO6	Demonstrate the working of Instrument Transformers and special purpose meters.		
	Course Contents	CO	Hours
1.	Demonstration of various analog measuring instruments.	CO1	02
2.	Measurement of Active & reactive power in three phase circuit using two watt meter method.	CO2	02
3.	Calibration of Single-phase Induction type energy meter at different power factors.	CO3	02
4.	Measurement of resistance by ammeter voltmeter method.	CO3	02

5.	Measurement of resistance using Wheatstone's/Kelvin's bridge.	CO5	02
6.	Measurement of inductance using Maxwell's/Hay's/Anderson's bridge.	CO5	02
7.	Measurement of capacitance using Schering's bridge.	CO5	02
8.	Measurement of earth resistance using earth tester.	CO3	02
9.	Displacement measurement by LVDT.	CO4	02
10.	Study of Digital Meters and Oscilloscopes.	CO5	02
11.	Study of Power Analyzer's.	CO5	02
12.	Study of C.T. and P.T.	CO6	02

Text Books

1.	"A Course in Electrical and Electronic Measurements & Instrumentation", A.K. Sawhney Dhanpat Rai & Co. 9th 2014.
2.	"A Course in Electronics & Electrical Measurements & Instrumentation J.B. Gupta", S.K. Kataria & Sons. 8th 2012

Reference Books

1.	"Electrical Measurements & Measuring Instruments", E. W. Golding F. C. Widdies Reem Publications 3rd 2011.
2.	"Electrical Measurement & Instrumentation", R.S. Sirohi Radhakrishnan New Age International 3rd 2010.

Useful Links/NPTEL course:

1.	https://nptel.ac.in/courses/108105153 by Prof. Avishek Chatterjee IIT Kharagpur.
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Mapping of COs and POs

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

1: Slight (Low)

2: Moderate (Medium)

3: Substantial (High)

Shivaji University, Kolhapur			
Second Year (Sem.-III) B. Tech. Electrical Engineering			
(EE0335) MDM01-Introduction to Electrical and Electronics Circuits			
Teaching Scheme		Examination Scheme	
Lectures	02 Hrs./week	MSE	30
Tutorials	00 Hrs./week	ISE	10
Total Credits	02	ESE	60
		Duration of ESE	02 Hrs. 30 Min
Prerequisite: Basic Electrical Concepts, Mathematics and Physics.			
Course Objectives: By the end of this course, students should be able to:			
1. Understand Basic Concepts like fundamental electrical quantities (voltage, current, resistance, power, energy).			
2. Analyze AC Circuits like sinusoidal waveforms, phase relationships, resonance and power factor correction in AC circuits.			
3. Understand the transient responses like RL and RC transient.			
4. Understanding the operation of semiconductor diodes, including their characteristics and applications.			
5. Understand Basic Components like BJT, FET and MOSFET.			
6. Learn about advanced courses in digital, analog and power electronics.			
Course Outcomes (CO): At the end of successful completion of the course, the student will be			
CO1	Understanding of Circuit Fundamentals of Current, Voltage, Power etc.,		
CO2	Analyze the AC Circuits using phasor techniques.		
CO3	Analyze the transient response of RC and RL Circuits.		
CO4	Analyze the semiconductor components like diodes, PN junction etc.,		
CO5	Understand the operation of transistors.		
CO6	Understand the basics of digital, embedded and IoT systems.		
Units	Course Contents		CO
Unit1	Fundamentals of Electrical Circuits, Network Theorems and Circuit Analysis: Basic electrical quantities: Charge, Current, Voltage, Power and Energy, Ohm's Law and Kirchhoff's Laws (KCL & KVL), Series and Parallel Circuits, Resistance, Conductance, and Electrical Materials, Voltage and Current Division, Superposition Theorem, Thevenin's and Norton's Theorems, Maximum Power Transfer Theorem, Star-Delta (Y-Δ) Transformation, Mesh and Nodal Analysis.		CO1
Unit2	AC Circuits and Phasors: Sinusoidal Waveforms: RMS and Average Values, Phasor Representation of AC Signals, Impedance and Admittance (RLC Elements), Resonance in Series and Parallel Circuits, Power in AC Circuits: Active, Reactive, and Apparent Power, Power Factor Correction.		CO2
Unit3	Transient Analysis of Electrical Circuits: First-Order Circuits: RL and RC Transients, Second-Order Circuits: RLCTransients, Time Constants and Natural Response, Forced Response and Step Response.		CO3
Unit4	Introduction to Semiconductor Devices: Overview of Semiconductors: Conductors, Insulators, and Semiconductors, PN Junction Diode: Characteristics and Applications, Zener Diode: Voltage Regulation, Light Emitting Diodes (LEDs) and Photodiodes		CO4

Unit5	BipolarJunctionTransistors(BJT)s,FieldEffectTransistors(FET)s,MOSFETsandApplications:Structure and Working of BJTs, Biasing of BJTs: Fixed, Voltage-Divider, and Emitter Stabilized Bias, BJT as an Amplifier and Switch, Load Line Analysis and Small Signal Model. Introduction to FETs: JFETs and MOSFETs, CharacteristicsandBiasingofMOSFETs,MOSFETasaSwitch,ComparisonbetweenBJTsandMOSFETs.	CO5	05
Unit6	BasicofDigitalElectronics,EmbeddedSystemsandIoT:NumberSystemsandBooleanAlgebra,LogicGates andTruthTables, CombinationalCircuits:Multiplexers, Encoders, Decoders, SequentialCircuits:Flip-Flops and Registers. Basics of Microcontrollers (Arduino, RaspberryPi), Sensors and Actuators, IoT in Smart Electronics	CO6	05
		Total Hours	45hrs
TextBooks			
1.	"FundamentalsofElectricCircuits"—CharlesK.AlexanderandMatthewN.O.Sadiku		
2.			
Reference Books			
1.	"ElectricCircuits"—JamesW.NilssonandSusanA. Riedel		
2.	"IntroductoryCircuitAnalysis"—RobertL.Boylestad		
3.			
UsefulLinks			
1.	https://archive.nptel.ac.in/courses/117/106/117106108/ byProf.NagendraKrishnapura,IITMadras.		
2.	https://onlinecourses.nptel.ac.in/noc22_ee109/preview byProf.BhimSingh,IITDelhi		

Mapping of COs and POs

PO → CO↓	PO1	PO2	PO3	PO4	PO5	PO6	PO6	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1														
CO2														
CO3														
CO4														
CO5														
CO6														

1:Slight(Low)

2:Moderate(Medium)

3:Substantial(High)

Shivaji University, Kolhapur			
B.Tech.Electrical Engineering			
(EE0336)Open Elective-01-Energy Storage Systems			
Teaching Scheme		Examination Scheme	
Lectures	03 Hrs./week	MSE	30Marks
Tutorials	00 Hrs./week	ISE/CA	10Marks
Total Credits	03	ESE	60Marks
Total=100 Marks			
Duration of ESE 02 Hrs. 30 Min			
Prerequisite: 1. Basic Electrical Engineering 2. Power System 3. General Science			
Course Objectives:			
The objectives of the course is: 1. Discuss the energy storage as a structure unit of power system 2. Compare various energy storage technology for power system 3. Apply battery energy storage and management for power system 4. Describe hydrogen in the storage for power system 5. Discuss short term and long term applications of fuel cell system 6. Analyze economic and reliability of energy storage system			
Course Outcomes:			
At the end of successful completion of the course, the student will be: CO1 Acquire the knowledge of working, constructional details of Energy Storage Structure. CO2 Understand the working of Energy Storage Technologies. CO3 Understand the Battery Management System. CO4 Understand the Energy Storage Based on hydrogen.			

CO5 Understand the applications of Energy Storage.			
CO6 Analyse the Economics and Reliability of Electric Energy Storage System.			
Unit No.	Content	CO	Hours
Unit1	Introduction of Energy Storage: Energy Storage as structural unit of a power system, General considerations, Definitions of Energy, power, storage form of energy, Technical Definitions, capacity, Depth of Discharge, State of Charge. Round-Trip Efficiency under Normal, Ideal and Real Conditions, Charge and Discharge Losses Energy and power balance in storage unit, Mathematical model of storage, Econometric model of storage, Characteristics of storage system, Storage applications, Static duties of storage plant, Storage at user's level.	CO1	07
Unit2	Energy Storage Technologies: Pumped Hydroelectric Storage, Compressed Air Energy Storage the flywheel energy storage system super capacitor in a storage system.	CO2	07
Unit3	Battery Energy Storage: Introduction, different types of battery energy storage, Conventional Batteries and Flow Batteries, Basic Concepts, Lead-acid batteries, Nickel-Cadmium batteries, Sodium-Sulphur batteries, Lithium-based batteries, Flow Battery Energy Storage System, Battery Management System (BMS), modelling of batteries, battery management systems, aging of batteries.	CO3	07
Unit4	Energy Storage Based on hydrogen: Introduction, Structure of a storage system based on hydrogen, electrolysis of water, storage of hydrogen, conversion, efficiency considerations.	CO4	07
Unit5	Applications of Energy Storage: Short-term applications of Energy Storage, fluctuation suppression, Low Voltage Ride-Through (LVRT), Voltage Control Support, Oscillation Damping, Primary Frequency Control, an example of Fluctuation suppression, mid and long-term applications, Load Following, Peak Shaving, Transmission Curtailment, Time Shifting, Unit Commitment, Seasonal Storage.	CO5	07
Unit6	Economics and Reliability of Electric Energy Storage System: Economics and Reliability of Electric Energy Storage System, Electric Energy Storage Economics, cost analysis, investment and operation costs analysis of EES, reliability in power energy systems, Grid-reliability calculation, and storage system reliability.	CO6	07
		Total Hours	42hrs
Text Books:			
1. Frank S. Barnes & Jonah G. Levine, Large Energy Storage System Handbook, CRC Press, 2011.			

ReferenceBooks:	
1. A.Ter-Gazarian1994, “EnergyStorageforPowerSystems,”PeterPeregrinusLtd.London.	
2. FranciscoDiaz-Gonazalez,AndreasSumper,“EnergyStorageinPowerSystem”Wiley,2016. 3	
Alfred Rufer , “EnergyStorage System and Components,” CRC Press 2018.	
UsefulLink/NPTELCourse:	
1.	EnergyStorageSystembyDr.SanjibGanguly,IITGuwahati.

MappingofCOsandPOs

PO→ CO↓	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	1	-	1	1	-	-	1	-	-
CO2	3	2	-	1	-	1	1	-	-	1	-	-
CO3	3	2	-	1	-	1	1	-	-	1	-	-
CO4	3	2	-	1	-	1	1	-	-	1	-	-
CO5	3	2	-	1	-	1	1	-	-	1	-	-
CO6	3	2	-	1	-	1	1	-	-	1	-	-

1:Slight(Low)2:Moderate(Medium) 3:Substantial(High)

Shivaji University, Kolhapur			
Second Year (Sem. III) B. Tech. Electrical Engineering			
(EE0337) HSSM-Universal Human Values			
Teaching Scheme		Examination Scheme	
Lectures	02 Hrs./week	MSE	--
Tutorials	00 Hrs./week	ISE/CA	50
Practical	00	ESE	--
Total Credits	02	Duration of ESE	--
Prerequisite: Yoga, Professional Communication, Indian Knowledge System.			
Course Outcomes: After the successful completion of this course the student will be able to			
CO1	Describe the concept of value education and its significance in shaping personal and professional life.		
CO2	Analyze the relationship between fundamental human aspirations such as happiness and prosperity and their influence on personal development.		
CO3	Evaluate practices that promote harmony between the self and the body for holistic well-being.		
CO4	Demonstrate ethical values and effective communication in interpersonal and professional relationships.		
CO5	Assess the interconnection between individuals, society, universal order, and nature to promote sustainable living.		
CO6	Develop ethical decision-making frameworks for a smooth transition from academic to professional life.		
Unit	Course Contents	CO	Hours
Unit 1	Introduction to Value Education: Right understanding, relationship, and physical facility (holistic development and the role of education), understanding value education, self-exploration as the process for value Education.	CO1	03
Unit 2	Fundamental Human Aspirations: Continuous happiness and prosperity – the basic human aspirations, happiness and prosperity – current scenario, method to fulfill the basic human aspirations.	CO2	05
Unit 3	Harmony between Self and Body: Understanding human being as the co-existence of the self and the body. Distinguishing between the needs of the self and the body, the body as an instrument of the self, Understanding harmony in the self, harmony of the self with the body.	CO3	05
Unit 4	Values in Human Interaction: Harmony in the Family – the Basic Unit of Human Interaction, 'Trust' – the Foundational Value in Relationship, 'Respect' – as the Right Evaluation, Other Feelings, Justice in Human-to-Human Relationship	CO4	05
Unit 5	Society, Universal Order, and Nature: Understanding Harmony in the Society, Vision for the Universal Human Order and Understanding Harmony in the Nature, Interconnectedness, self-regulation and Mutual Fulfillment among the Four Orders of Nature, Realizing Existence as Co-existence at all levels.	CO5	04
Unit 6	Ethical Conduct and Professional Transition: Natural Acceptance of Human Values, Definitiveness of (Ethical) Human Conduct, A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order, Competence in Professional Ethics, Holistic Technologies, Production Systems and Management Models.	CO6	04

TextBooks	
1	R.R.Gaur,R.Asthana,G.P.Bagaria,“TheTextbookAFoundationCourseinHumanValuesandProfessionalEthics”, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034- 47-1
2	R.R.Gaur,R.Asthana,G.P.Bagaria,“TheTeacher’s ManualTeachers:ManualforAFoundationCourseinHumanValuesand Professional Ethics”, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93 87034-53-2.
ReferenceBooks	
1	DRKiran,“Professionalethicsandhumanvalues”,McGrawHillEducation(India)PrivateLimitedP-24,2ndedition,2014, GreenParkExtension,NewDelhi110 016
2	V.Jayakumar,“ProfessionalethicsandHumanvaluesinEngineering”
3	R.S.Naagarazan,“ATextbookonProfessionalEthicsandHumanValues”,NewAgeInternationalPvt.LtdPublishers,Year: 2007 ISBN: 8122419380,9788122419382,9788122423013
4	RudolfSteiner,“HumanValuesinEducation(TheFoundationsofWaldorfEducation,20)”,AnthroposophicPress,Year:2004, ISBN: 0880105445,9780880105446
UsefulLinks	
1	https://nptel.ac.in/courses/109104068ExploringHumanValues:VisionsofHappinessandPerfectSociety,IITKanpur,Prof.A.K. Sharma
2	https://onlinecourses.nptel.ac.in/noc23_hs89/previewMoralThinking:AnIntroductionToValuesAndEthics,ByProf.Vineet Sahu IIT Kanpur.
3	https://uhv.org.in/course

MappingofCOsandPOs

PO→ CO↓	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	1	1	1	1	2	-	-	1	2	-	1
CO2	-	-	2	-	-	3	-	2	-	3	-	2
CO3	-	-	2	1	-	3	1	3	-	-	-	2
CO4	-	1	-	-	-	-	1	2	1	3	1	1
CO5	-	-	1	2	-	2	-	3	-	2	1	-
CO6	-	-	1	3	-	-	-	-	-		1	-

1:Slight(Low)2:Moderate(Medium)3:Substantial (High)

Shivaji University, Kolhapur				
Second Year (Sem. III) B. Tech. Electrical Engineering				
(EE0338) Electrical Circuit Analysis Lab				
Teaching Scheme			Examination Scheme	
Lectures	--Hrs/week		MSE	--
Tutorials	--Hrs/week		ISE/CA	50
Practical	02		ESE	25
Total Credits	01		Duration of ESE	--
Prerequisite: Basic Electrical Engineering.				
Course Objectives:				
To make students demonstrate electrical circuit theorems through various experiments.				
To develop skills for experimenting with first and second order electrical circuits.				
To develop skill to measure two port electrical networks.				
Course Outcomes (CO):				
At the end of successful completion of the course, the student will be				
CO1	Verify AC and DC circuit theorems through experiments and simulation.			
CO2	Analyze first and second order circuits through simulations.			
CO3	Analyze first and second order circuits through experiments.			
CO4	Measure parameter of any two port network.			
	Course Contents		CO	Hours
1.	Simulation and experimental verification of Nodal and Mesh Analysis.		CO1	02
2.	Simulation and experimental verification of Superposition Theorem.		CO1	02
3.	Simulation and experimental verification of Thevenin's and Norton's Theorem.		CO1	02
4.	Simulation and experimental verification of Maximum Power transfer Theorem.		CO1	02
5.	Analysis of transient and steady state behavior of first order circuit.		CO2	02
6.	Simulation and experimental Validation on step response of second order circuit.		CO3	02
7.	Compute Z, Y, ABCD and hybrid parameters using MATLAB software.		CO4	02

8.	Analysis of AC circuits using Mesh and Nodal analysis.	CO1	02
9.	Simulation of three phase balanced and unbalanced star and delta networks using MATLAB software.	CO1	02
10.	Simulation of state space model of an electrical circuit using MATLAB software.	CO4	02
Text Books			
1.	C.K. Alexandar and M.O. Sadiku, "Fundamentals of Electric Circuits", McGraw Hill Education MH, 6th Edition, 2018, ISBN: 9780078028229		
Reference Books			
1.	James W. Nilsson and Susan A. Riedel "Electric Circuits" Prentice Hall, 10th Edition, 2015, ISBN: 0131989251		
2.	L.P. Huelsman, "Basic Circuit Theory", Prentice Hall, 3rd Edition, 2009, ISBN: 9788120309715		

Mapping of COs and POs

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

1: Slight (Low)

2: Moderate (Medium)

3: Substantial (High)

Shivaji University, Kolhapur			
Second Year (Sem. III) B.Tech. Electrical Engineering			
(EE0339) HSSM-Soft Skill Development			
Teaching Scheme		Examination Scheme	
Lectures	02 Hrs./week	MSE	--
Tutorials	00 Hrs./week	ISE/CA	50
Practical	00	ESE	--
Total Credits	02	Duration of ESE	--
Pre-requisites	First Year B.Tech. Level English language competency		
Course Objectives	The Course aimed at- 1. Enhancing communication, teamwork, problem-solving skills. 2. Fostering adaptability and resilience in engineering contexts.		
Course Outcomes	Upon completion of this course, students should be able to – 1. Proficient in oral and written communication. 2. Effective as regards teamwork and collaborations skills. 3. Able to apply critical thinking to industrial problems. 4. Able to demonstrate adaptability and resilience in profession		
Units	Course Contents	Hours	
Unit 1	Written communication 1. Email Writing 4. Technical Report	04	
Unit 2	Oral Communication 1. Presentation Skills	04	
Unit 3	Soft Skills 1. Importance of Soft Skills 2. Overview of Various Soft Skills	04	
Unit 4	Team Spirit & Leadership Ability 1. Understanding team dynamics and roles 2. Building trust and rapport with in team	04	
Unit 5	Time Management and Goal Setting 1. Prioritization Techniques 2. Work-Life Balance	04	
Unit 6	Assessment 1. Discussion on incorporating soft skills development into daily practice 2. Case Studies or Role-Play	06	
Text Books			
1	Soft Skills, 2015, Career Development Centre, Green Pearl Publications		
Reference Books			

1	SharmaR. & KrishnaMohan(2017), BusinessCorrespondenceandReportWriting, McGrawHillEducation.
2	P.D.Chaturvedi& MukeshChaturvedi(2013), BusinessCommunication: Skills, Concepts& Applications, Pearson Publications, New Delhi, 3rd Edition, Seventh Impression
3	K.K.Sinha(2006), BusinessCommunication, 2nd Edition (Reprint), GalgotiaPublishing, NewDelhi
4	Khera, S. (1998). "You Can Win: A Step by Step Tool for Top Achievers." New Delhi: Macmillan Publishers India
6	Bradberry, T., & Greaves, J. (2009). "Emotional Intelligence 2.0." San Diego, CA: TalentSmart
7	The 7 Habits of Highly Effective People by Stephen R. Covey, Publisher: Free Press, Publication Year: 1989, ISBN: 978-0743269513
8	Your Best Year Ever: A 5-Step Plan for Achieving Your Most Important Goals by Michael Hyatt Publisher: Baker Books Publication Year: 2018 ISBN: 978-0801075245
9	Carnegie, D. (2009). "How to Win Friends and Influence People." New York: Pocket Books.
10	Dweck, C. S. (2006). "Mindset: The New Psychology of Success." New York: Ballantine Books.

Mapping of COs and POs

PO→ CO↓	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1									3	3		
CO2									3			
CO3		2										
CO4												
CO5												2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Shivaji University, Kolhapur				
Second Year (Sem. III) B. Tech. Electrical Engineering				
(EE03310) Open Elective-01 - Energy Storage Systems Lab				
Teaching Scheme		Examination Scheme		
Lectures	00 Hrs./week		MSE	--
Tutorials	00 Hrs./week		ISE/CA	25
Practical	02		ESE	25
Total Credits	01		Duration of ESE	--
1.	Simulation-Based Experiments Requirement A minimum of eight (8) simulation-based experiments must be conducted. These experiments should align with the topics covered in Units 01 to 06 of the course syllabus. Allowable simulation platforms include, but are not limited to: MATLAB/Simulink, PSCAD, EMTDC, PSPICE, and Virtual Labs (Vlab).			

SCHEME OF INSTRUCTION & SYLLABI
Name of Programme: Electrical Engineering
Scheme of Instructions: Second Year B.Tech. in Electrical Engineering
Semester – IV

Sr. No.	Course Category	Course Code	Course Title	L	T	P	Contact Hrs./Wk	Course Credits	EXAM SCHEME			
									MSE	ISE/CA	ESE	TOTAL
1	PCC	EE0341	Analog and Digital Electronics	3	--	--	3	3	30	10	60	100
2	PCC	EE0342	DC Machine and Transformer	3	--	--	3	3	30	10	60	100
3	PCC	EE0343	Electromagnetic Engineering	3	1	--	4	4	30	10	60	100
4	MDM	EE0344	Multi-disciplinary Minor – 02	2	--	--	2	2	30	10	60	100
5	OE	EE0345	Open Elective -02	2	--	--	2	2	30	10	60	100
6	HSSM	EE0346	Strategic Management	2	--	--	2	2	--	50	--	50
7	HSSM	EE0347	Professional Ethics	2	--	--	2	2	--	25	--	25
8	PCC	EE0348	DC Machine & Transformer Lab	--	--	2	2	1	--	50	25	75
9	PCC	EE0349	Analog & Digital Electronics Lab	--	--	2	2	1	--	25	25	50
10	VEC	EE03410	Software Programming for Electrical Engineering	--	--	2	2	1	--	25	25	50
11	BSC	EE03411	Environmental Science	2	--	--	2	Audit	30	10	60	100
12	VSEC	EE03412	Computational Methods	--	--	2	2	1		50	--	50
			Total	19	1	8	28	22	180	285	435	800+100 (Audit)

L-Lecture

T-Tutorial

P-Practical

MSE-Mid Semester Examination ISE/CA-In Semester Evaluation/Continuous Assessment ESE-End Semester Examination (For Laboratory End Semester performance)

Course Category	Basic Science Courses (BSC)	Engineering Science Courses (ESC)	Programme Core Course (PCC)	Programme Elective Course (PEC)	Open Elective Other than Particular Programme (OE/MDM)	Vocational and Skill Enhancement Course (VSEC)	Humanities Social Science and Management (HSSM)	Experiential Learning (EL)	Co-curricular and Extracurricular Activities (CCA)
Last Sem. Cumulative Sum	16	16	10	--	06	06	08	02	02
Semester Credits	--	--	12	--	04	01	05	--	--
Cumulative Sum	16	16	22	--	10	07	13	02	02

PROGRESSIVE TOTAL CREDITS: 66+22=88

Shivaji University, Kolhapur			
Second Year (Sem.-IV) B. Tech. Electrical Engineering			
PCCEE0341 Analog and Digital Electronics			
Teaching Scheme		Examination Scheme	
Lectures	03 Hrs/week	MSE	30 Marks
Tutorials	---	ISE/CA	10 Marks
Total Credits	03	ESE	60 Marks
Duration of ESE 02 Hrs. 30 Min			
Prerequisite: Basic Electronics, Number System			
Course Objectives:			
The objectives of the course is: 1. To understand the different biasing circuits of transistor and their stability factor 2. To develop the concept of basics of operational Amplifier and its applications. 3. To learn basic techniques for the design of digital circuits and fundamental concepts used in the design of digital systems. 4. To understand the concept of combinational logic circuits and sequential circuits.			
Course Outcomes:			
At the end of successful completion of the course, the student will be: CO1. Analyze different biasing circuits of transistor and their stability factor CO2. Understanding the fundamentals of amplifiers and working of different oscillator CO3. Understanding the fundamentals of operational amplifiers and their different applications. CO4. Understanding Number systems, Basic digital systems and circuit simplification techniques. CO5. Design and analyze combinational and sequential circuits, utilizing tools like Karnaugh Maps, adders, subtractor, and flip-flops for practical digital logic applications. CO6. Understand the operation of shift registers, counters, memory systems and data converters			

Unit No.	Content	CO	Hours
Unit1	Transistor: Bipolar junction transistor- Input & output characteristic of BJT in CB, CE & CC configuration and α, β, γ parameters (derivation) and their relationship. Transistor Biasing and stabilization —operating point, the DC and AC load line, need for biasing, types: fixed bias, voltage divider bias, emitter bias, stabilization factors and thermal runaway.	CO 1	07
Unit2	Amplifiers: Concept of amplification, small signal amplifier using BJT, single stage CE amplifier, Positive and negative feedback in amplifier, Barkhausen criterion, Introduction to multistage amplifier. Working principle of oscillators: Colpitts, Hartley, crystal, RC phase shift and Wein bridge oscillator.	CO 2	07
Unit3	Fundamentals of Op-Amp (IC-741) and its application: Introduction to op-amp: block diagram of op-amp, ideal and practical specifications (such as Input offset voltage, Input offset current, output offset voltage, CMRR, SVRR, Slew rate input bias current etc) Op-Amp configuration: open loop and closed loop Application of op-amp as: Inverting, non-inverting and differential amplifier (Numerical expected), voltage follower, summing, averaging, integrator, differentiator, peak detector, triangular and square wave generator	CO 3	07
Unit4	Digital Electronics Fundamentals: Introduction to Digital Systems: Analog vs. Digital Signals Digital System Applications. Binary, Octal, Decimal, and Hexadecimal Signed Binary Numbers (1's and 2's complement) Binary Arithmetic (Addition, Subtraction, Multiplication, Division) Gray Code, BCD (Binary Coded Decimal), Excess-3 Logic Gates: AND, OR, NOT, NAND, NOR, XOR, XNOR Truth Tables, Logic Gate Symbols Boolean Algebra: Basic Laws and Theorems of Boolean Algebra, De Morgan's Theorems, Simplification of Boolean Expressions, Designing with AND, OR, and NOT gate simplification.	CO 4	07
Unit5	Combinational and Sequential Logic Circuits: Combinational Circuits: using Karnaugh Maps (2-variable and 3-variable maps) Half Adder, Full Adder, Half Subtractor, Full Subtractor, Multiplexers, Demultiplexers, Binary to Gray and Gray to Binary Conversions Sequential Circuits: Basics: Latches: Gated SR Latch, Gated D Latch Flip-Flops: SR, JK, D, T Flip-	CO 5	07

	Flops		
Unit6	Advanced Digital Electronics and Data Conversion Techniques : Registers: Shift Registers: Serial-In Serial-Out, Parallel-In Parallel-Out Counters: Up/Down Counters, Ring Counters Memory Systems: RAM, ROM, EPROM, EEPROM, and Flash Memory Data Converters: Digital-to-Analog Conversion (DAC) Analog-to-Digital Conversion (ADC)	CO 6	07
		Total Hours	42hrs.
Text Books:			
1. “Electronic Devices and Circuit Theory”, Robert L. Boylestad and Louis Nashelsky, PHI/Pearson Education, 9th Edition 2. “Principles of Electronics”, V.K. Mehata, Rohit Mehata, S. Chand 3. Electronics Analog and Digital by I.J. Nagrah, PHI Learning Pvt. Ltd., 2013 Edition 4. Anil K Maini, Varsha Agarwal: Electronic Devices and Circuits, Wiley, 2012. 5. Donald P Leach, Albert Paul Malvino & Goutam Saha: Digital Principles and Applications, 8th Edition, Tata McGraw Hill, 2015			
Reference Books:			
1. “Op-amps & Linear Integrated Circuits”, Ramakant A. Gayakwad, PHI Publication New Delhi, 2013, 4th Edition 2. “Electronic Devices and Circuits” Jacob Millman, Christos C. Halkias & Tata McGraw Hill, 3rd edition, 2013 3. Stephen Brown, Zvonko Vranesic: Fundamentals of Digital Logic Design with VHDL, 2nd Edition, Tata McGraw Hill, 2005. 4. R.D. Sudhaker Samuel: Illustrative Approach to Logic Design, Sanguine-Pearson, 2010. 5. M. Morris Mano: Digital Logic and Computer Design, 10th Edition, Pearson, 2008.			
Useful Link/NPTEL Course:			
1	NPTEL course on Digital Electronics Circuit, IIT, Kharagpur. https://nptel.ac.in/courses/108105132/		
2	NPTEL course on Integrated circuit, MOSFET, OPAMP and their applications IISc Bangalore. https://nptel.ac.in/courses/108/108/108108111/		

Mapping of COs and POs

PO→ CO↓	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	-	-	-	-	-	-	-	-	1
CO2	2	1	1	-	-	-	-	-	-	-	-	1
CO3	2	1	1	-	-	-	-	-	-	-	-	1
CO4	3	3	3	-	-	-	-	-	-	-	-	1
CO5	3	3	3	-	-	-	-	-	-	-	-	1
CO6	3	3	3	-	-	-	-	-	-	-	-	1

1:Slight(Low) 2:Moderate(Medium) 3:Substantial(High)

Shivaji University, Kolhapur			
Second Year (Sem. III) B. Tech. Electrical Engineering			
(PCCEE0342) DC Machines and Transformer			
Teaching Scheme	Examination Scheme		
Lectures	03 Hrs/week	MSE	30 Marks
Tutorials	-	ISE/CA	10 Marks
Total Credits	03	ESE	60 Marks
Duration of ESE: 02 Hrs. 30 Min			
Prerequisite: Basic Electrical Engineering			
Course Objectives:			
The objectives of the course is: 1. To understand the 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.			
Course Outcomes:			
At the end of successful completion of the course, the student will be: CO1. Acquire the knowledge of working, constructional details of DC machine. CO2. Understand the working principle of DC motor.			
CO3. Understand working principle of special motors. CO4. Understand the parameter of single phase transformer. CO5. Understand the poly phase transformer. CO6. Analyse the performance of three phase transformer.			

UnitNo.	Content	CO	Hours
Unit1	Construction of D.C. Machines. Electric DC motors: principles of operation of different motors construction and representation parts with their material schematic diagrams function of motors function of the various parts of different electric motor Types of DC motor, Fleming's left hand rule and principle of operation of motor back EMF and its significance voltage equation of DC motor. Torque and speed: armature torque, shaft torque, BHP, brake test, losses, efficiency. DC motor starter: necessity, two point and three point starter. Speed control of DC shunt and series motor: flux and armature control. 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.	CO1	07
Unit2	DC Generator Types of DC motor, Fleming's left hand rule Constructional Details: Power flow diagram of D.C. machines. Magnetic circuit of DC machines, commutator 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. Applications of DC Machines. Methods of speed control methods.	CO2	07
Unit3	Special Motor: Working principle and application of BLDC, Universal motor, Servomotor, Stepper motor.	CO3	07

Unit4	SinglePhaseTransformer Workingprinciple,ConstructionandClassification- constructionandworkingprincipleoftransformer,classificationoftransformers,constructionandworkingofcoretypeandshelltype transformers, necessity and conditions for parallel operation, advantages & disadvantages of transformer EMF Equation- EMF equation and transformation ratio, numerical on EMF equation. Regulation and Efficiency- various losses in a transformer, voltage regulation and efficiency in the transformer, equation for voltage regulation and efficiency, condition for maximum efficiency, all day efficiency. Autotransformer- advantages&disadvantages, applications	CO4	07
Unit5	Three-PhaseTransformers Construction of 3 phase transformers, three phase transformer groups, factors affecting the choice of connections, three phase transformer connections (delta-delta, star-star, star-delta and delta-star), open delta or V-V connection, Scott three-phase/two phase connection, three winding transformers,equivalentcircuitofthreewindingtransformer,determinationofparametersofthreewinding transformer,voltage regulation of threewinding transformer,numerical on threewinding transformer.		07
Unit6	PerformanceofThreePhase Transformer Inrushofmagnetizingcurrent,harmonicphenomenainthreephasetransformers,Harmonicswith different transformer connections, rating of the transformer, transformer name plate as per BIS 2026 Concept of basic design of transformer Coolingoftransformer- necessityofcoolingoftransformer,typesofcoolingoftransformer	CO6	07
		Total Hours	42hrs.
ReferenceBooks:			

1. R.Krishnan,SwitchedReluctanceMotorDrives–Modeling,Simulation,Analysis,DesignandApplication,,,CRCPress,New York, 2001. 2. P.P.Aearnley,SteppingMotors–AGuidetoMotorTheoryandPractice,,,PeterPerengrinusLondon, 1982. 3. T.KenjoandS.Nagamori,PermanentMagnetandBrushlessDCMotors,,,ClarendonPress, London,1988. 4. E.G.Janardanan,Specialelectricalmachines,,,PHIlearningPrivateLimited,Delhi,2014. 5. PermanentMagnetSynchronous&BrushlessDCMotorDrives,R.Krishnan,CRCPress.	
TextBooks:	
1. K.Venkataratnam,SpecialElectricalMachines,,,UniversitiesPress(India)PrivateLimited,2008 2. T.J.E.Miller,BrushlessPermanentMagnetandReluctanceMotorDrives,,,ClarendonPress,Oxford,1989. 3. T.Kenjo,SteppingMotorsandTheirMicroprocessorControls,,,ClarendonPressLondon,1984.	
UsefulLink/NPTEL Course:	
1.	ElectricalMachinesI ByProf.Suman Malati
2.	ElectricalMachinesI ByProf.G.SridharaRao,Prof.P.SasidharaRao

Mapping ofCOsandPOs

PO→ CO↓	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	2	-	1	-	1	1	-	-	1	-	-
CO2	3	2	-	1	-	1	1	-	-	1	-	-
CO3	3	2	-	1	-	1	1	-	-	1	-	-
CO4	3	2	-	1	-	1	1	-	-	1	-	-
CO5	3	2	-	1	-	1	1	-	-	1	-	-
CO6	3	2	-	1	-	1	1	-	-	1	-	-

1:Slight(Low)2:Moderate(Medium) 3:Substantial(High)

Shivaji University, Kolhapur			
Second Year (Sem.-IV) B. Tech. Electrical Engineering			
(PCCEE0343) Electromagnetic Engineering			
Teaching Scheme		Examination Scheme	
Lectures	03 Hrs/week	MSE	30 Marks
Tutorials	01 Hrs/week	ISE/CA	10 Marks
Total Credits	04	ESE	60 Marks
Prerequisite: Vector analysis, coordinate systems			
Course Objectives: 1. To understand concepts of vectors for engineering electromagnetic. 2. To understand the static electric and magnetic field 3. To understand and analyze the time-varying fields, Maxwell's equations, and electromagnetic wave propagation in different media.			
Course Outcomes:			
At the end of successful completion of the course, the student will be: CO1. Understand the basic mathematical concepts related to electromagnetic vector fields CO2. Analyze the static electric and magnetic fields, their behavior in different media, associated laws, boundary conditions and electromagnetic potentials. CO3. Apply integral and point form of Maxwell's equations for solving the problems of electromagnetic field theory. CO4. Analyze time-varying fields, propagation of electromagnetic waves in different media, Poynting theorem, their sources & effects			
Unit No.	Content		CO
Unit 1	Vector Analysis: Introduction to Co-ordinate Systems – Rectangular, Cylindrical and Spherical Co-ordinate Systems – Co-ordinate transformation; Gradient of a Scalar field, Divergence of a Vector field and Curl of a Vector field-their physical interpretation.		CO1
			06

Unit2	Electrostatics: Coulomb's law, Electric field intensity due to point Charge, infinite line charge, and infinite surface chargedistribution. Electric fluxdensity, Gauss'slaw andDivergence theorem, Energy, potentialenergy and work done, potential gradient, Electric dipole and its electric field, dipole movement, energydensity inelectrostaticfield	CO2	07
Unit3	Conductor, Dielectricsand Capacitance: Current and current density, Continuity equation of current, properties of conductors, boundary conditions,Energystoredincapacitors,Poisson'sandLaplace'sequations,Capacitancebetweenparallel plates and co-axial cable using Laplace's equation	CO2	07
Unit4	SteadyMagnetic Field: BiotSavert's law,Magneticfieldddueto infinitelylongcurrent carryingconductor,MagneticFieldddueto infinite sheet of charge, Ampere's circuital law, Application to co-axial cable. Curl operator, Magnetic fluxdensity,Stoke'stheorem.Scalarandvectormagneticpotential,Lorentz'sforceequation.Energy storedinmagneticfield,boundaryconditions.	CO2	08
Unit5	TimevaryingfieldsandMaxwell'sEquations: Faraday's law, General case of Induction, DisplacementCurrent, Modified Amper's Law, Maxwell'sequations (Differential, Integral, Phasor forms) for time varying field.	CO3	07
Unit6	ElectromagneticWaves: Uniformplanewave,waveequationforfreespace,waveequationforlossymedia,wavepropagationin goodconductorandgooddielectric, Poyntingvectorandpower flow	CO4	07
		Total Hrs.	42
TextBooks:			
1. MatthewN.O.Sadiku,PrinciplesofElectromagnetic,OxfordUniversityPress,6thEdition 2. HaytW.H.andJ. A.Buck,EngineeringElectromagnetic,McGraw-Hill,8thEdition			

Reference Books:	
1. “Joseph A. Edminister, Electromagnetics, Schaum’s Outline Series, Tata McGraw Hill, Revised 2nd Edition. 2. John Kraus and Daniel Fleisch, Electromagnetics with Applications, McGraw-Hill, 5th edition 3. Cheng DK, Fundamentals of Engineering Electromagnetics, Addison-Wesley. 4. Guru B.S. and H.R. Hizroglu, Electromagnetic Field Theory Fundamentals, PWS Publication Company, Boston, 1998. 5. Gangadhar K. A. and P.M. Ramanathan, Electromagnetic Field Theory, Khanna Publishers, 2009 6. Antenna and Wave Propagation, K.D. Prasad, Satya Prakashan	
General Instructions: 1. Minimum number of assignments should be 6 covering all topics.	
Useful Link/NPTEL Course:	
1	Electromagnetic Theory By Dr. Pradeep Kumar K
2	Electromagnetic Theory By Prof. D.K. Ghosh

Mapping of COs and Pos

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

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Shivaji University, Kolhapur			
Second Year (Sem. IV) B. Tech. Electrical Engineering			
EEE0344-MDM-2 Electrical Power System			
Teaching Scheme		Examination Scheme	
Lectures	02 Hrs.	MSE	30 Marks
Tutorials	00 Hrs.	ISE/CA	10 Marks
Total Credits	02	ESE	60 Marks
Duration of ESE 02 Hrs. 30 Min.			
Prerequisite: Basic Electrical Engineering			
Course Objectives:			
1. To develop a comprehensive understanding of the principles, site selection, and operational mechanisms of various power generating stations and renewable energy systems, including their design and efficiency considerations. 2. To equip students with the skills to analyze and design mechanical and electrical components of power systems, including overhead lines, electrical machines, and measurement techniques, ensuring reliability and accuracy. 3. To enable students to apply electrical engineering concepts to practical utilization systems, such as lighting, heating, cooling, and traction, while integrating modern technologies and control strategies for efficient performance.			
Course Outcomes:			
CO1 Evaluate principles and site selection for thermal, hydro, nuclear, gas, and diesel power stations. CO2 Analyse solar, wind energy systems, and modern storage for efficiency and applicability. CO3 Design reliable overhead power lines considering conductors, insulators, corona, and sag.			
CO4 Explain construction, characteristics, and control of DC machines, induction, and special motors. CO5 Apply analog/digital techniques to measure electrical parameters with accuracy. CO6 Design efficient lighting, heating, cooling, and traction systems with modern controls.			

UnitNo.	Course Content	CO	Hours
Unit1	Generating Stations Generating Stations, Thermal Power Station, and Choice of Site for Thermal Power Stations, Hydro-electric Power Station, and Choice of Site for Hydro-electric Power Stations, Nuclear Power Station, and Selection of Site for Nuclear Power Station, Gas Turbine Power Plant, and Diesel Power Station.	CO1	07
Unit2	Renewable Energy Sources Solar Energy Introduction to Renewable Energy sources, Solar potential, Solar radiation spectrum, Solar radiation geometry, Solar radiation data, Solar Collectors - flat plate, evacuated tube, Cylindrical parabolic, Concentrating paraboloid, Graphical representation of efficiency of various Collectors, Modern thermal energy storage - Ultracapacitors/Supercapacitors, Superconducting materials, New generation batteries. Wind Energy Wind parameters and wind data, Power from wind, Site selection, Wind energy conversion systems and their classification, Construction and working of typical wind mill, Introduction to OTEC	CO2	07
Unit3	Mechanical Design of Electrical Power System Main components of Overhead Line, 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.	CO3	07
Unit4	Electrical Machines Introduction to Electrical machines, DC Machines – Construction and principles, types, Characteristics, Speed control, Induction motor, types, construction & working principles, rmf, slip, Torque-speed characteristics, special motors	CO4	07

Unit5	ElectricalMeasurement Introduction to electrical measurement, measurement errors and accuracy, Analog measurement instruments,Digitalmeasurement instruments,measurementofresistanceand impedance, measurement of Power and Energy and modern measurement techniques.	CO5	07
Unit6	ElectricalUtilizationandTraction Introduction to electrical utilization, Electrical lighting systems, Electrical heating and cooling. IntroductiontoElectricTraction,Tractionmotorsandcontrol,Powersupplyfortractionsystems, Applications and emerging trends	CO6	07
ReferenceBooks:			
1. "PowerPlantEngineering"byP.K.Nag,PublisherTataMcGraw-Hill,2007ISBN 713,370,919,780,071,000,000			
2. "Renewable Energy Sourcesand Emerging Technologies" by D.P. Kothari, K.C. Singal, andRakesh Ranjan,Publisher			
3. PHI Learning Pvt. Ltd. ISBN 9389347904, 9789389347906,			
4. "ACourseinPowerSystems"byJ.B.Gupta, Publisher S.K.Kataria&Sons,2009,ISBN818845852X,9788188458523			
5. "ElectricalMachinery"byP.S.Bimbhra,PublisherKhannaPublishingHouse,ISBN13 978-93-89139-10-5			
6. "ElectricalandElectronic MeasurementsandInstrumentation"byA.K. Sawhney,Publisher:ShreeHariPublications,ASIN			
:B092TMDW24			
7. "UtilizationofElectricPowerandElectricTraction"by J.B.Gupta,Publisher:VISIONIAS,ASIN:B0CG3CGQR9			
UsefulLink/NPTELCourse:			
1. PowerSystemGeneration,TransmissionandDistribution(CoordinatedbyIITDelhi)			
2. Non-ConventionalEnergyResources(CoordinatedbyIITMadras)			
3. PowerSystemEngineering(CoordinatedbyIITKharagpur)			
4. ElectricalMachines-IandElectricalMachines-II(CoordinatedbyIITKharagpur)			
5. ElectricalandElectronicMeasurements(CoordinatedbyIITMadras)			
6. ElectricVehiclesandRenewableEnergy(CoordinatedbyIITDelhi)			

Shivaji University, Kolhapur			
Final Year (Sem.-IV) B.Tech. Electrical Engineering			
EE0345 Open Elective 02 Electrical Maintenance and Energy Audit			
Teaching Scheme		Examination Scheme	
Lectures	02 Hrs./week	MSE	30
Tutorials	00 Hrs./week	ISE	10
Total Credits	02	ESE	60
		Duration of ESE	02 Hrs. 30 Min
Prerequisite:			
Course Objectives:			
1. Identify a wider range of electrical equipment & devices and understand their principles of operation/connections			
2. Demonstrate an understanding of electrical systems, switchgear and circuit types.			
3. Recognize the most common industrial motor types and understand their operation, connections and maintenance requirements			
4. Perform electrical isolation, testing for a wider range of devices and circuit safely.			
5. Learn the methods of energy audit and usage of instruments.			
6. Analyze and report the outcome of energy audit.			
Course Outcomes (CO): At the end of successful completion of the course, the student will be			
CO1	Understand Types and Concepts of Electrical Maintenance		
CO2	Understand the importance of physical inspection to ensure transformers safety.		
CO3	Understand the importance of cleaning and insulating bus bars to maintain performance.		
CO4	Understand the purpose and function of various energy audit instruments.		
CO5	Understand the current methodologies used in energy audits.		
CO6	Evaluate and Recommend Energy Efficiency Measures.		
Course Contents			
		CO	Hours
Unit 1	Introduction to Electrical Maintenance Types of maintenance, maintenance schedules, procedures, Maintenance of Motors: Over hauling of motors, preventive maintenance, and trouble shooting of electric motors. Maintenance of Transmission and Distribution System, danger notice, caution notice permit to work, Patrolling and visual inspection of lines – points to be noted during patrolling from ground: special inspections and night inspections, Location of faults using Meggar.	CO1	05
Unit 2	Maintenance of Distribution Transformers: Transformer maintenance and points to be attended to in respect of various items of equipment, Checking of insulation resistance transformer oil level and BDV test of oil, measurement of earth resistance.	CO2	05
Unit 3	Maintenance of Grid Substations: Checking and maintenance of busbars, isolating switches, HT/LT circuit breakers, LT switches, Power Transformers.	CO3	04
Unit 4	General Aspects of Energy Management and Energy Audit Definition, Need and types of energy audit. Energy management (audit) approach- understanding energy costs, bench marking, energy performance, matching energy use to requirement, maximizing system efficiencies, optimizing the input energy requirements, fuel & energy substitution, energy audit instruments	CO4	05
Unit 5	Energy Audit Methodology & Recent Trends Current Practices, Integration of two or more systems, Switching of Energy Sources, Report writing, preparations and presentations of energy audit reports, Post monitoring of energy conservation projects, MIS , Case-studies / Report studies of	CO5	05

	Energy Audits. Guidelines for writing energy audit report, data presentation in report, findings recommendations, impact of renewable energy on energy audit recommendations. Case studies of implemented energy cost optimization projects in electrical utilities as well as thermal utilities.		
Unit 6	Energy Efficiency in Electrical Utilities Electrical system: Electricity billing, electrical load management and maximum demand control, selection and location of capacitors, 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. Fans and Blowers: Types, performance evaluation, efficient system operation, flow control strategies and energy conservation opportunities. Lighting System: Light source, choice of lighting, luminance requirements, and energy conservation avenues.	CO6	06
Text Books			
1.	Testing, Commissioning Operation and Maintenance of Electrical Equipment: S.Rao, Khanna Technical Publication, New Delhi.		
2.	Preventive Maintenance of Electrical Apparatus: S.K. Shartri, Katson Publishing House Ludhiana		
Reference Books			
1.	Electric Energy Generation, Utilisation and Conservation Sivaganaraju, S. Pearson, New Delhi, 2012		
2.	Energy Management: W.R. Murphy, G. McKay (Butterworths).		
3.	Industrial Energy Conservation: D.A. Reay (Pergamon Press)		
4.	Energy Management Handbook – W.C. Turner (John Wiley and Sons, A Wiley Interscience Publication).		
Useful Links			
1.			
2.			

Mapping of COs and POs

PO →CO↓	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	3	1	2	-	-	-	2	1	-	3	1	2
CO2	3	3	2	1	2	-	-	-	1	1	-	3	3	2
CO3	3	3	2	1	2	-	-	-	1	1	-	3	3	2
CO4	3	2	3	2	2	-	-	-	1	1	-	3	3	2
CO5	2	2	3	2	1	-	-	-	1	1	-	2	2	1
CO6	3	2	2	1	2	-	-	-	2	2	-	2	3	1
1:Slight (Low) 2:Moderate(Medium) 3:Substantial(High)														

Shivaji University, Kolhapur			
Second Year (Sem. IV) B. Tech. Electrical Engineering			
EE0346 HSSM Strategic Management			
Teaching Scheme		Examination Scheme	
Lectures	02 Hrs./week	MSE	-
Tutorials	-	ISE/CA	50 Marks
Total Credits	02	ESE	-
Total=50 Marks			
Prerequisite:			
Course Objectives:			
The objectives of the course is: 1) Explore student to the process that top executives usually follow in resolving strategic management and related issues faced by the firms. 2) Develop knowledge pertaining to the formulation and implementation of strategies. 3) Provide a practical frame of reference that can be followed in developing short and long term strategies. 4) Sharpen the students' conceptual, analytical, communication, and teamwork skills that are needed in analyzing business situations. 5) Develop and mature students' skills in critical thinking. 6) Provide an opportunity via an eclectic 'capstone' course for the students to integrate knowledge and concepts learnt throughout the curriculum.			
Course Outcomes: At the end of successful completion of the course, the student will be: CO1 : Analyze a company's external and internal environment; CO2: To provide information pertaining to Business, Corporate and Global Reforms CO 3 : Identify major strategic issues at the corporate- and business-levels Project CO 4: Formulate various international-level strategies. CO5: Propose actionable recommendations for corporate executives. CO6: Critically think about live business problems and find appropriate solutions.			

UnitNo.	Content	CO	Hours
Unit1	Introduction to Strategic Management Concept of Strategic Management, Strategic Management Process, Vision, Mission and Goals, Benefits and Risks of Strategic Management. Level of Strategies: Corporate, Business and Operational Level Functional Strategies: Human Resource Strategy, Marketing Strategy, Financial Strategy, Operational Strategy and Business Environment: Components of Environment, Micro and Macro and Environmental Scanning.	CO1	05
Unit2	The Nature of Competitive Advantages and Strategic Formulation Nature of competitive advantages and sustainability. Different levels of strategy. Low cost, differentiation and focus strategies. Factors affecting a nation's competitiveness. International expansion. International, multidomestic, global and transnational strategies. Creating value and diversification, outsourcing, acquisitions, internal new ventures, international	CO2	05
Unit3	Strategy Implementation Meaning & steps of strategy Implementation, what are functional strategies, its objective and its importance. Organisational structures for strategy implementation, importance of organisation culture in strategy implementation.	CO3	04
Unit4	Strategic Control-Guiding & evaluating the strategy Meaning of strategic Evaluation & control, Establishing strategic control, Methods of strategic control, stages of operating controls, Reward system Motivating execution & control.	CO4	04
Unit5	Business, Corporate and Global Strategies	CO5	05
	Corporate Restructuring Strategies: Concept, Need and Forms, Corporate Renewal Strategies: Concept, Internal and External factors and Causes, Strategic Alliance: Concept, Types, Importance, Problems of Indian Strategic Alliances and International Businesses, Public Private Participation: Importance, Problems and Governing Strategies of PPP Model.		
Unit6	Emerging Strategic Trends Business Process Outsourcing and Knowledge Process Outsourcing in India, Concept and Strategies. Reengineering Business Processes- Business , Reengineering, Process Reengineering and Operational Reengineering, Disaster Management: Concept, Problems and Consequences of Disasters, Strategies for Managing and Preventing disasters and Coping Strategies. Start-up Business Strategies and Make in India Model	CO6	05
Reference Books:			

1. Strategic Management, A Dynamic Perspective-Concepts and Cases–Mason A. Carpenter, Wm. Gerard Sanders, Prashant Salwan, Published by Dorling Kindersley (India) Pvt Ltd, Licensees of Pearson Education in south Asia	
2. Strategic Management and Competitive Advantage-Concepts-Jay B. Barney, William S. Hesterly, Published by PHI Learning Private Limited, New Delhi	
3. Globalization, Liberalization and Strategic Management-V.P. Michael	
Text Books:	
1. Business Policy and Strategic Management–Sukul Lomash and P. K. Mishra, Vikas Publishing House Pvt. Ltd, New Delhi	
2. Strategic Management–Fred R. David, Published by Prentice Hall International	
3. Public Enterprise Management and Privatisation–Laxmi Narain Published by S. Chand & Company Ltd, New Delhi	
4. Business Policy and Strategic Management–Sukul Lomash and P. K. Mishra, Vikas Publishing House Pvt. Ltd, New Delhi	
Useful Link/NPTEL Course:	
1.	
2.	

Mapping of COs and POs

PO→ CO↓	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	3	3	3	-	3
CO2	-	-	-	-	-	-	-	3	3	3	-	3
CO3	-	-	-	-	-	-	-	3	3	3	-	3
CO4	-	-	-	-	-	-	-	3	3	3	-	3
CO5	-	-	-	-	-	-	-	3	3	3	-	3
CO6	-	-	-	-	-	-	-	3	3	3	-	3

1:Slight(Low) 2:Moderate(Medium)3:Substantial(High)

Shivaji University, Kolhapur			
Second Year (Sem. III) B.Tech. Electrical Engineering			
HSSM0347 Professional Ethics			
Teaching Scheme		Examination Scheme	
Lectures	02 Hrs/week	MSE	-
Tutorials	-	ISE/CA	25 Marks
Total Credits	02	ESE	-
Total=25 Marks			
Prerequisite:			
Course Objectives:			
The objectives of the course is: 1. To connect the learner to their potential understanding moral professional and personal values 2. Introduce the learner to professional ethics and enable them towards decision-making skills. 3. To draw the learners attention towards business ethics. 4. To strengthen and enhance the professional attitude through a psychological approach. 5. To cultivate spirit of working in diverse work by understanding workplace ethics. 6. To install a sense of professional ethics which help them develop a safe, compatible, prosperous, and sustainable society.			
Course Outcomes:			
At the end of successful completion of the course, the student will be: CO1 Equip themselves with understanding of moral professional and personal values. CO2 Understand the need of ethics in shaping their profession the learner will honor their decision-making skills.			

CO3 Refund the business ethics based on a psychological and philosophical perspective. CO4
Have an age over the ethical systems in the workplace.
CO5 Assess the need for a balance between ecology, engineering and economy.
CO6 Equip themselves with a better understanding of themselves and the society they live in and responsibilities this should increase a sustainable word.

Unit No.	Content	CO	Hours
Unit1	Introduction to professional ethics morals, values and ethics- Personal and Professional- Sense of Engineering Ethics- Code of Ethics by NSPE- Making decisions with ethical dimensions-definition-roadmap to ethical decision making-common standards-internal obstacles-bias-empathy.	CO1	05
Unit2	Business Ethics Philosophical approaches to Business Ethics-ethical reasoning-ethical issues in business-Social Responsibility of Business- conflict of interest- cultural relativism- ethical leadership- Resisting unethical authority and domination- Global Business Ethics.	CO2	05
Unit3	Psychological approaches Ethical theories-psychological and philosophical approaches-myths about morality-conflict of interest in psychological perspective- courage integrity- ethical dilemma- emotional intelligence.	CO3	05
Unit4	Workplace ethics Ethics in changing domain of Research-academic integrity-intellectual honesty- Role of Engineers and Managers-Ethical issues in diverse workplace-competition-free will-confidentiality-employee rights- Intellectual property rights- discrimination.	CO4	05
Unit5	Safety, Responsibilities and Rights Ecology, Engineering, Economy-Risk benefit analysis and reducing risk SDGs-Corporate social responsibility and corporate Sustainability- CSR in India- Sustainability Case Studies.	CO5	03
Unit6	Global issues in professional ethics Introduction current scenario, technology globalization of MNC's, International Trade, World Summits issues, Business Ethics and Cooperate Governance, Sustainable Development, Ecosystem Energy Consumptions ozone depletion pollution it takes in manufacturing and marketing, Media Ethics, War Ethics,Bioethics, Intellectual Property Rights.	CO6	05

ReferenceBooks:	
1. MikeWMartinandRolandSchinzinger, “ <i>EthicsinEngineerin</i> ”g,4thedition, TataMcGrawHillPublishingCompanyPvt Ltd, New Delhi,2014 .	
TextBooks:	
1. Subramanian.R.“ProfessionalEthics”,OxfordPublication,2013.	
2. Nagarasan.R.S.“ <i>ProfessionalEthicsandHumanValue</i> ”s.NewAgeInternationalPublications,2006	
UsefulLink/NPTELCourse:	
1.	https://soaneemrana.org/onewebmedia/Professional%20Ethics%20and%20Human%20Values%20by%20R.S%20NAAGARAZAN.pdf
2.	https://www.nspe.org/resources/ethics/code-ethics
3.	https://www.toolshero.com/tag/ethical-decision-making/
4.	https://pagecentertraining.psu.edu/public-relations-ethics/introduction-to-public-relations-ethics/lesson-1/ethical-theories/
5.	https://www.ewh.ieee.org/soc/pes/switchgear/presentations/tp_files/2017-1_Thurs_Shiffbauer_Singer_Engineering_Ethics.pdf
6.	https://peer.asee.org/case-studies-in-engineering-ethics.pdf

MappingofCOsandPOs

PO→ CO↓	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	3	3	3	-	3
CO2	-	-	-	-	-	-	-	3	3	3	-	3
CO3	-	-	-	-	-	-	-	3	3	3	-	3
CO4	-	-	-	-	-	-	-	3	3	3	-	3
CO5	-	-	-	-	-	-	-	3	3	3	-	3
CO6	-	-	-	-	-	-	-	3	3	3	-	3

1:Slight(Low)2:Moderate(Medium)3:Substantial(High)

Shivaji University, Kolhapur			
Second Year (Sem. III) B.Tech. Electrical Engineering			
PCCEE0348DC Machines and Transformer Lab			
Teaching Scheme		Examination Scheme	
Practical's	02 Hrs./week	ISE/CA	50 Marks
Total Credits	01	ESE	25 Marks
Prerequisite: Basic Electrical Engineering			
Course Objectives -			
1 To conduct the experimental set of given circuits.			
2 To design and test the electrical motor with control technique.			
3 To study the performance of OC and SC test on transformer.			
Course Outcomes (CO)			
Students will be able to			
CO1. Select proper electrical motor with control technique for required applications.			
CO2. Analyze the advanced control techniques applicable for AC and DC motors in practice. CO3.			
Design, develop and simulate advanced control schemes for electrical motors.			
List of Experiments			
1. To perform speed control of DC shunt motor 1. Armature control method, 2. field control method		CO1	2 Hrs
2. To study the efficiency of the motor by using brake load test		CO1	2 Hrs
3. To obtain open circuit test characteristics of self-excited DC shunt generator and to find its critical resistance		CO1	2 Hrs
4. Determination of efficiency of DC motor by Swinburn test.		CO2	2 Hrs
5. Perform OC and SC test on single phase transformer and determine equivalent circuit parameter, efficiency.		CO2	2 Hrs
6. To recognize the load sharing of two similar transformer operation in parallel.		CO3	2 Hrs
7. To determine the efficiency and voltage regulation of single phase transformer by direct loading.		CO2	2 Hrs

8. To perform a polarity test in facing out test for a three phase.	CO3	2Hrs
9. Perform open circuit and short circuit test on single phase transformer to determine equivalent circuit constant with voltage regulation and efficiency	CO2	2Hrs
10. Perform phasing out test on three phase transformer whose phase markings are remarked.	CO3	2Hrs
Submission: ESE Minimum 8 experiments to be performed/simulated and evaluated in journal.		

Mapping of COs and POs

PO → CO ↓	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	1	-	1	-	-	-	1	-	-
CO2	3	2	-	1	-	1	-	-	-	1	-	-
CO3	3	2	-	1	-	1	-	-	-	1	-	-

1:Slight(Low) 2:Moderate(Medium) 3:Substantial(High)

Shivaji University, Kolhapur Second Year (Sem. IV) B. Tech. Electrical Engineering PCCEE0349 Analog And Digital Electronics Lab				
Teaching Scheme			Examination Scheme	
Lectures	00 Hrs./week		MSE	--
Tutorials	00 Hrs./week		ISE/CA	25 Marks
Practical	02 Hrs./week		ESE	25 Marks
Total Credits	01		Total	50 Marks
			Duration of ESE	--
Prerequisite: Basic electronics, Number system 1. Basic knowledge of breadboard connection methods 2. Detail of various elements like pin configuration of different logic gates, color code of resistor etc.				
Course Objectives: 1. To conduct experiment and plot input and output characteristics of BJT in different configurations. 2. To design and test different applications of op-amp 3. To study the simplification of Boolean expressions using logic gates. 4. To realize different Adders and subtractors circuits. 5. Demonstrate the operations and applications of Multiplexers.				
Course Outcomes (CO): At the end of successful completion of the course, the student will be able to				
CO1	Analyze the input and output characteristics of BJT in CE and CB configuration			
CO2	Design and test the performance of op-amp in different applications.			
CO3	Understand the concept of combinational logic circuits			
	Experiment List	CO	Hours	
1.	Determine the input and output Characteristics of BJT in CE & CB configuration	CO1	02	
2.	Design and analysis of op-amp based amplifiers such as Inverting, Non-inverting amplifiers for different types of inputs such as AC and DC signal	CO2	02	
3.	Design and analysis of the Differential Amplifier as adder and subtractor	CO2	02	
4.	Design and Analysis of the performance of op-amp as integrator & differentiator using op-amp for different types of AC signal.	CO2	02	
5.	Design and analysis of op-amp based RC Phase shift oscillator for a given frequency	CO2	02	
6.	Analysis of basic logic gates	CO3	02	
7.	Realization of half/Full adder and Half/Full Subtractors using logic gates	CO3	02	
8.	Analysis and implementation of 8:1 Mux	CO3	02	

9.	Analyse and implementation of 1:8 Mux	CO3	02
10.	Realization of Binary to Gray code conversion and vice versa.	CO3	02
Minimum 8 number of experiments need to be performed			
Text Books			
1.	“Electronic Devices and Circuit Theory”, Robert L. Boylestad and Louis Nashelsky, PHI/Pearson Education. 9th Edition		
2.	“Principle of Electronics”, V.K. Mehata, Rohit Mehata, S. Chand		
Reference Books			
1.	“Op-amps & Linear Integrated Circuits”, Ramakant A. Gayakwad, PHI Publication New Delhi, 2013, 4th Edition		
2.	“V Stephen Brown, Zvonko Vranesic: Fundamentals of Digital Logic Design with VHDL, 2nd Edition, Tata McGraw Hill, 2005.		
Useful Links/NPTEL course:			
1.	NPTEL course on Integrated circuit, MOSFET, OPAMP and their applications IISc Bangalore. https://nptel.ac.in/courses/108/108/108108111/		

Mapping of COs and POs

PO →CO↓	PO1	PO2	PO3	PO4	PO5	PO6	PO6	PO8	PO9	PO10	PO11	PO12
CO1	3	2	--	-	-	-	-	-	-	-	-	1
CO2	3	2	1	-	-	-	-	-	-	-	-	1
CO3	3	2	2	-	-	-	-	-	-	-	-	1

1: Slight (Low)

2: Moderate (Medium)

3: Substantial (High)

Shivaji University, Kolhapur	
Second Year (Sem. IV) B.Tech. in Electrical Engineering	
VECEE03410 Software Programming for Electrical Engineering	
Practical: 2 Hrs/Week	Examination Scheme
	ISE/CA: 25 Marks
Credit: 1	ESE: 25 Marks
	Total: 50 Marks
Objectives: Students are expected to solve Electrical Engineering problems using any available software tools such as MATLAB/Simulink, C, C++, PSIM, ETAP, PSCAD, MIPOWER, Power World Simulator, SKM PowerTools, VISIO, AUTOCAD, PSPICE, LABVIEW etc. Sample tasks are enlisted below.	

Course Outcome (CO): Student able to	
CO1	Understand the basic operation of MATLAB
CO2	Analyze the time domain and frequency domain signals
CO3	Apply various electric circuits in MATLAB simulation tool

Sr.No.	Title of Experiments	CO's	Hrs.
1.	Programming of at least 3 numerical methods for solving nonlinear equations.	CO2	2hrs
2.	Simulation of Electrical Machines such as transformers, DC machines and AC machines and evaluation of their performance parameters.	CO3	2hrs
3.	Basic plotting of signals: To study various MATLAB commands for creating two and three dimensional	CO1	2hrs

	plots. Write a MATLAB program to plot the following continuous time and discrete time Signals. i. Step Function ii. Impulse Function iii. Exponential Function iv. Ramp Function v. Sine Function		
4.	Simulation of electrical R-L-C networks, resonant circuits, filter circuits and plotting their input-output waveforms	CO1	2hrs
5.	Simulation of Half wave and Full wave Rectifier circuits and plotting their input-output waveforms	CO3	2hrs
6.	Simulation of power system networks and its performance analysis (load flow analysis, short circuit analysis, transient analysis, stability analysis, relay coordination etc.)	CO2	2hrs
7.	Simulation of DC-DC, DC-AC, AC-DC and AC-AC converter circuits, plotting their input output waveforms and performing their analysis	CO3	2hrs
8.	Measurement techniques for electrical engineering parameters using suitable software	CO2	2hrs
9.	Simulation of hybrid power system (Wind, Solar, Solar Series/Parallel)	CO1	2hrs
10.	Design of typical control panel for industrial application	CO3	2hrs

Recommended Books:

1. Agam Kumar Tyagi, "Matlab and Simulink for Engineers" Oxford Higher Education, Oxford University Press. ISBN: 9780198072447
2. Edward B. Magrab, Shapour Azarm, Balakumar Balachandran, James Duncan, Keith Herold, Gregory Walsh "An Engineers Guide to MATLAB, 3/E" ISBN-10: 0131991108 • ISBN-13: 9780131991101, Pearson Education Ltd.
3. Holly Moore, "MATLAB for Engineers", Global Edition, 5/E, ISBN-10: 1292231203 • ISBN-13: 9781292231204, Pearson Education Ltd.
4. L. Ashok Kumar, A. Kalaiarasi, Y. Uma, "Power Electronics with MATLAB" Cambridge University Press 2017
5. Viktor Perelmuter, "Renewable Energy Systems: Simulation with Simulink® and SimPowerSystems™" CRC Press, Taylor & Francis

Mapping of COs and POs

PO→ CO↓	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO
CO1	3	-	-	1	-	-	1	-	2	-	1	1	-
CO2	-	2	3	3	3	-	1	-	2	2	1	1	3
CO3	3	2	2	3	3	1	1	-	2	2	1	2	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Year and Semester	Second Year B.Tech -Semester IV (Common to all Branches of Engineering)				
Course Category	Basic Science Courses (BSC)				
Title of Course	Environmental Science			Contact Hrs./Week	Credits
Teaching Scheme	L	T	P		
	02	--	--	02	Audit
Examination Scheme	MSE	ISE/CA	ESE	Total	
	30	10	60	100	

Course Objectives: The objectives of the course is to		
1. Understand the scope & multidisciplinary nature of Environmental Studies. 2. Get acquainted with the problems associated with natural resources and their conservation. 3. Familiarize the environmental & social problems with global concern. 4. Recognize the importance of Biodiversity with respect to Western Ghats.		
Course Outcomes:		
COs	At the end of successful completion of the course, the student will be able to	Blooms Taxonomy
CO1	Understand the importance of Environmental Studies and recognize significance of ecosystem.	II
CO2	Classify the values of natural resources with associated problems for sustainable lifestyles.	II
CO3	Describe the social and global environmental issues	II
CO4	Make aware of Pollution issues with its mitigation measures.	II
CO5	Familiarize the basics of Biodiversity and concerned issues in the context of Western Ghats.	II
CO6	Acquaint with the role of environmental laws and regulations in conservation efforts.	I

SYLLABUS

UnitNo	Content	Hours
Unit1	NatureofEnvironmentalStudiesandImportanceofecosystems.	06 Hrs.
	• Definition,scopeandimportance. • Multidisciplinarynatureofenvironmentalstudies • Needforpublicawareness. Ecosystem • Conceptofanecosystem. • Structureand functionofanecosystem. • Producers,consumersanddecomposers. • Foodchains, foodwebsandecologicalpyramids • Introduction,types,characteristicsfeatures,structureandfunctionofthefollowingecosystem a) Forestecosystem,b)Grasslandecosystem,c)Desert ecosystem, - d)Aquaticecosystems(ponds,streams,lakes, rivers,oceans,estuaries) • Degradationoftheecosystemsand it"s impacts.	
Unit2	NaturalResourcesandAssociatedProblems.	06 Hrs.
	• Forestresources:Useandover-exploitation,deforestation,damsandtheireffectsonforestsandtribalpeople. • Waterresources:Use andover-utilization of surfaceandgroundwater,floods,drought,conflictsoverwater,dams- benefits and problems. • Mineralresources: Usageandexploitation.Environmentaleffectsofextractingandusingmineralresources. • Foodresources:Worldfoodproblem,changescausedbyagriculture,effectofmodernagriculture,fertilizer-pesticide	
	problems. • Energy resources:Growingenergyneeds,renewableandnon-renewableenergy resources,useofalternateenergy sources. Solar energy, Biomass energy. • Landresources:Landasaresource,landdegradation,maninducedlandslides,soilerosionanddesertification. • Roleofindividualsinconservationofnaturalresources.Equitableuseofresourcesforsustainablelifestyles.	
	SocialIssuesandtheEnvironment	

Unit3	• Humanpopulationgrowthandimpact onenvironment. • Environmentalethics: RoleofIndianreligioustraditionsandcultureinconservationoftheenvironment. • Environmentalmovements-ChipkoMovement,AppikoMovement,SilentValleyMovement. • Resettlementandrehabilitationofpeople;itsproblemsandconcerns. • Waterconservation,rainwaterharvesting. Disastermanagement:floods,earthquake,cyclone,tsunamiandlandslides,Casestudies.	04 Hrs.
Unit4	EnvironmentalPollution	
	• Definition:Causes,effectsandcontrolmeasuresof: Airpollution,Waterpollution,Soilpollution,Marinepollution, Noise pollution, Thermal pollution, Global warming, acid rain, ozone layer depletion. • SolidwasteManagement:Causes,effectsandcontrolmeasuresofurbanandindustrialwastes.Solidwaste management, control & rules, Role ofanindividualinpreventionofpollution	04 Hrs.
Unit5	Biodiversityand its conservation:	
	• Introduction-Definition:genetic,speciesandecosystemdiversity. • Bio-geographicalclassificationofIndia. • Valueofbiodiversity:consumptiveuse,productive use,social,ethical, aestheticandoptionvalues. • Indiaasamega- diversitynation. • WesternGhatasa biodiversityregion.Hot-spotsofbiodiversity. • Threatstobiodiversity:habitatloss,poachingofwildlife,man-wildlifeconflicts,	04 Hrs.
	• Conservationofbiodiversity:In-situandEx-situconservationofbiodiversity.	
	EnvironmentalProtection-Policiesandpractices • EnvironmentProtectionAct. • Air(PreventionandControlofPollution)Act. • Water(Preventionand controlofPollution)Act • WildlifeProtectionAct • ForestConservationAct • NationalandInternationalConventionsandagreementsonenvironment.	04 Hrs.

Field work:(Fieldwork is equal to 4 lectures)**10 marks****Note-The ISE/CA is carried out through the Fieldwork and Report writing.**

- Visit to a local area to document environmental assets river/ forest/grassland/hill/mountain
- Visit to a local polluted site-Urban/Rural/Industrial/Agricultural
- Study of common plants, insects, birds.
- Study of simple ecosystems-pond, river, hillslopes, etc.

References:

Reference Books	
1	Raut P.D., "Environmental Studies", Shivaji University Press, 2021
2	Gleick, H., 1993, Water in Crisis, Pacific Institute for studies in Dev., "Environment & Security". Stockholm Env. Institute. Oxford Univ. Press 473p
3	Hawkins R.e., "Encyclopedia of Indian Natural History", Bombay Natural History Society, Bombay (R)
4	Heywood, V.H. & Watson, R. T. 1995, "Global Biodiversity Assessment", Cambridge Univ. Press 1140p.
5	Jadhav, H. & Bhosale, V.M. 1995, "Environmental Protection and Laws", Himalaya Pub. House, Delhi 284p
6	McKinney, M.L. & School. R.M. 1996, "Environmental Science Systems & Solutions", Webenhanced edition, 639p
7	Mhaskar A.K., Master Hazardous, "Techno-Science Publications (TB")

Second Year(Sem.IV)B.Tech.inElectricalEngineering	
VSECEE03412ComputationalMethods	
Practical: 2Hrs/Week	ExaminationScheme
	ISE/CA: 50Marks
Credit: 1	Total: 50 Marks
Objectives: Lab exercises focus on applying computational techniques to solve real-world electrical engineering problems using programming tools like MATLAB, Python etc.	

Course Outcome(CO): Student able to	
CO1	Analyze linear and nonlinear algebraic equations and systems of nonlinear equations using numerical techniques
CO2	Apply numerical schemes for differentiating and integrating complicated functions.
CO3	Understand computational schemes for solving systems of ordinary differential equations.

Sr.No.	Title of Experiments	CO's	Hrs.
1	To write a simple program to calculate and display the factorial of a number.	CO2	2hrs
2	To create a script to plot a sine and cosine function.	CO1	2hrs
3	To implement a program to compare the results of a numerical approximation with the actual value.	CO2	2hrs
4	To analyze the error in numerical differentiation using finite differences.	CO2	2hrs
5	To implement and compare the Bisection method and Newton-Raphson's method to find roots of a nonlinear equation. Graph the convergence of each method.	CO1	2hrs
6	To study Trapezoidal rule and Simpson's rule to estimate the integral of a function. Compare results with the analytical solution.	CO1	2hrs

7	To write a program to compute derivatives using forward, backward, and central difference methods. Analyze the accuracy of each method.	CO3	2hrs
8	To implement Gaussian elimination to solve linear equations. Use LU decomposition to solve a given system and analyze the efficiency.	CO2	2hrs
9	To implement Lagrange interpolation for a set of data points. Compare it with spline interpolation and visualize the results.	CO3	2hrs
10	To implement gradient descent to minimize a simple function. Apply constrained optimization techniques to an engineering problem.	CO3	2hrs
11	To use Euler's method and the Runge-Kutta method to solve a first-order ODE. Compare the results with analytical solutions.	CO2	2hrs
12	To implement the finite difference method for a simple heat equation. Visualize the temperature distribution over time.	CO1	2hrs
13	Choose a case study from power systems, control systems, or communication systems. Analyze data using computational methods and present findings.	CO3	2hrs
Textbook 1. Numerical Methods for Engineers, Steven Chapra and Raymond Canale, Seventh Edition, McGraw Hill, 2015. 2. Applied Numerical Analysis, Laurene Fausett, Second Edition, Pearson, 2008. 3. Advanced Engineering Mathematics, Erwin Kreyszig, Tenth Edition, Wiley, 2011.			

Reference Books

1. M.K.Jain,S.R.K.IyengarandR.K.Jain,NumericalmethodsforScientificandEngineeringComputation,NewAgeInternational Publishers, Fifth edition, 2007.
2. C.FGeraldandP.OWheatleyAppliedNumericalAnalysis,SeventhEdition,AddisonWesley,2009.RizwanButt,Introductionto NumericalAnalysisUsingMATLAB, JonesandBartlettPublisher,2010.AbdelwahabKharab, RonaldB, AnIntroductiontoNumerical Methods: A MATLAB Approach, Third Edition, CRC Press, 2012.

MappingofCOsandPOs

PO→ CO↓	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	2	1	-	-	-	-	-	-	2
CO2	2	2	3	3	3	1	-	-	1		2	2
CO3	2	2	3	3	3	1	-	-	1		2	3

1:Slight(Low)2:Moderate(Medium)3:Substantial(High)

**Equivalence of Subjects between CBCS and NEP for
S.Y.B.Tech (Sem.-III & IV)**

Name of Programme: Electrical Engineering

Class: S.Y. B.Tech

Semester-III

Sr. No.	Name of Subjects in existing CBCS 2018 onwards pattern (Add all subjects)	Name of Subjects in NEP Pattern	Reason	Remark
01	Engineering Mathematics-III	-	-	Added new subjects (Sr.No.07 to 11)
02	Electrical Engineering Materials And Energy Conversion	-	-	
03	Analog Electronics Engineering	-	-	
04	Basic Circuit Theory	Electrical Circuit Analysis		All content is in accordance with the Basic Circuit Theory as per the CBCS 2018 pattern.
05	Electrical Measurement	Electrical Measurement and Instrumentation		95 percent content is in accordance with the Electrical Measurement as per the CBCS 2018 pattern
06	C Programming	-		-
07		Signals and Systems		Added new subject
08		Universal Human Values		Added new subject
09		Soft Skill Development		Added new subject
10		Open Elective-01		Added new subject
11		Multi-disciplinary Minor-01		Added new subject

Class:S.Y.B.Tech

Semester-IV

Sr. No.	Name of Subjects in existing CBCS 2018 onwards pattern (Add all subjects)	Name of Subjects in NEP Pattern	Reason	Remark
01	DCMT	DC Machine and Transformer		All content is in accordance with the subject DCMT as per the CBCS 2018 pattern.
02	Power Electronics	-		-
03	Power System-I	-		-
04	Electromagnetic	Electromagnetic Engineering		All content is in accordance with the subject Electromagnetic as per the CBCS 2018 pattern.
05	Control System-I			-
06	Environmental Studies	Environmental Science		Change in the subject title i.e. Environmental Science
07		Analog and Digital Electronics		Added new subject
08		Strategic Management		Added new subject
09		Professional Ethics		Added new subject
10		Software Programming for Electrical Engineering		Added new subject
11		Computational Methods		Added new subject
12		Open Elective-02		Added new subject
13		Multi-disciplinary Minor-02		Added new subject

Department of Electrical Engineering

Exit Course for Electrical Engineering after 2nd Year

Exit option: Award of UG Diploma in Major with 88 credits and an additional 8 credits from Following Exit Courses				
Sr. No	Course Code	Course Title	Mode	Credits
1		Repairing and Maintenance of Electrical Appliances	Analogous Online/offline certification Course or industrial training of total 8 credits	8
		OR		
2		Installation and Maintenance of Industrial Electrical Systems		8

- Students may select multiple courses from the list provided to fulfill the required credits.
- To enroll in an NPTEL course, visit <https://swayam.gov.in>, register, and create an account. After logging in, join the desired course and follow the provided instructions to complete it.
- Please note that the availability of NPTEL courses is subject to change due to regular updates. If a listed course is unavailable, students may opt for an equivalent course of similar duration and subject matter, with prior approval from the concerned institute.
- If a student is unable to complete the NPTEL/MOOC online course, they are required to appear for a Computer-Based Examination (MCQ and MSQ format) conducted by Shivaji University, based on the content of the NPTEL/MOOC courses selected by the student.

Examination scheme for first year exit:

- The marks obtained from the MOOCs will be scaled to a total of 100 marks.

List of NPTEL/MOOCs Course

Certificate Course in Repairing and Maintenance of Electrical Appliances and Certificate Course on Installation and Maintenance of Industrial Electrical Systems

Sr.No.	NPTEL Course Title	Duration	Credits
01	Domestic Equipment Maintenance	12 weeks	03
02	Electricity and Electrical Wiring (EEW)	12 weeks	03
03	Maintenance and Testing of Electrical Machines	12 weeks	04

