Estd. 1962
"A++" Accredited by NAAC (2021)
With CGPA 3.52

SHIVAJI UNIVERSITY, KOLHAPUR
416 004, MAHARASHTRA
PHONE : EPABX – 2609000, BOS Section – 0231-2609094, 2609487
Web : www.unishivaji.ac.in Email: bos@unishivaji.ac.in
शिवाजी विद्यापीठ, कोल्हापूर ४१६ ००४, महाराष्ट्र
दूरध्वनी - इपीबीएक्स - २०६०९०००, अभ्यासमंडळे विभाग : ०२३१- २६०९०९४, २६०९४८७
वेबसाईट : www.unishivaji.ac.in ईमेल : bos@unishivaji.ac.in

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,

Dr. S. M. Kubal
Dy. Registrar

Copy to: for Information and necessary action

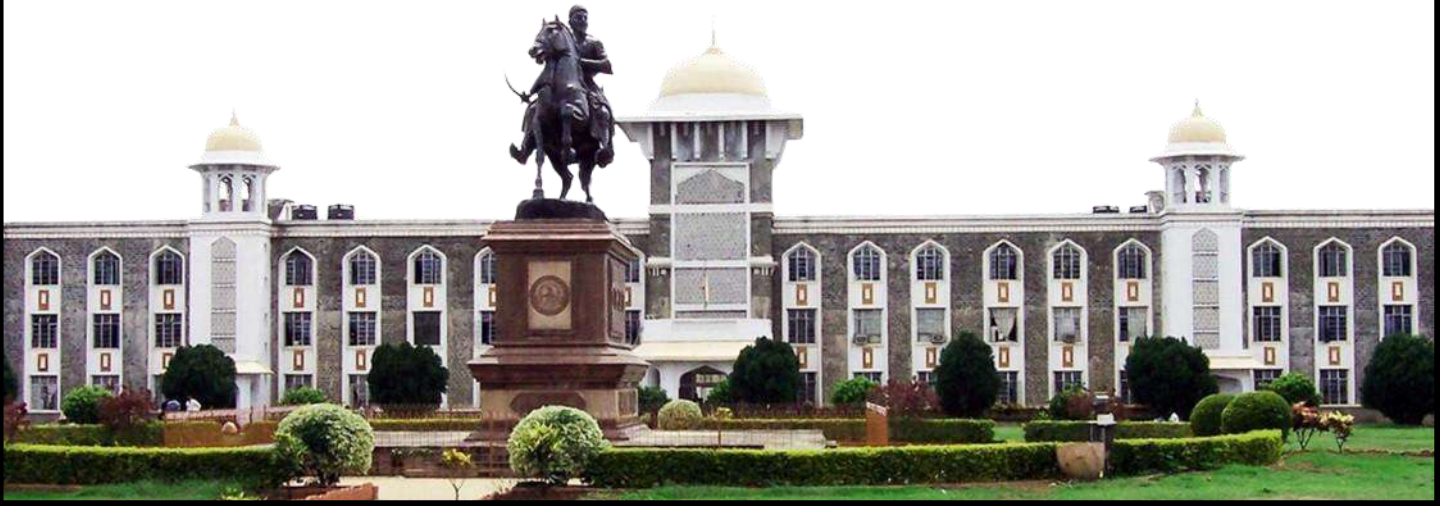
1	The I/c Dean, Faculty of Science & Technology	6	Appointment Section A & B
2	Director, Board of Examinations & Evaluation	7	Affiliation Section (T.1) (T.2)
3	The Chairpersan, Respective Board of Studies	8	P.G.Admission Section, /P.G Seminar Section
4	OE 4 Exam Section,	9	Computer Centre,/IT Cell
5	Eligibility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

Shivaji University
Kolhapur

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

S. Y. B. Tech.
Electrical and Computer 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 updatation 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. Similarly, for Virual 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 compete 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 updatation 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 compete 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 updatation 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. Similarly, for Virual 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 compete 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 updatation 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.

Exit course for Electrical and Computer Engineering after First-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	NPTEL	Introduction to Electrical Engineering	Online/offline certification Course or project of total 6 credits	3
2	NPTEL	Electricity & Safety measurers		3
Virtual Lab				
1	Virtual Lab	Computer Programming Lab	Offline Course	1
2	Virtual Lab	Electrical Measurement Lab	Offline Course	1

Earning of additional 2 mandatory credits for Direct Second Year admitted students to Electrical and Computer Engineering Branch

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

Shivaji University, Kolhapur				
Second Year B. Tech. Electrical and Computer Engineering **Semester – III (Direct Second Year Entry Course)**				
General Electrical Engineering				
TeachingScheme			**ExaminationScheme**	
Lectures	2 Hrs./week		MSE	30 Marks
Tutorials	00 Hrs./week		ISE	10 Marks
Total Credits	02		ESE	60 Marks
			Duration of ESE	02 Hrs. 30 Min

Course Outcomes (CO): At the end of successful completion of the course, the student will be

CO1	Explain the basic electric and magnetic circuits.
CO2	Interpret the fundamentals of single-phase alternating quantities.
CO3	Examine relation between line and phase quantities for three phase connection.
CO4	Explain the working principle of transformer and calculate the efficiency.

	Course Contents	**CO**	**Hours**
Unit 1	**D.C. circuits & Magnetic Circuit:** Concept of E.M.F, Potential Difference, Current, Resistance, Ohm's Law,Kirchhoff's laws, Concept of mmf, reluctance, magnetic flux, Magnetic Flux density, Magnetic field strength, BH curve, magnetic leakage, Comparison of Electric and Magnetic circuit.	**CO1**	**08**
Unit 2	**Single phase AC Circuits** Fundamentals of Alternating quantities, Faraday's Law, 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**
Unit 3	**Three phase A.C. Circuits** Advantages of 3 phase system, Generation of 3 phase AC supply, balanced 3 phase load, relation between line and phase quantities for star connected circuit and delta connected circuit.	**CO3**	**07**

Unit 4	**Transformer:** Single phase Transformer: Construction, Operating Principle, Types and Applications, EMF Equation, Ratios of Voltage and Current, Losses, Efficiency and Voltage Regulation	**CO4**	**08**
Unit 5	**Motors:** Introduction to AC and DC motors, types of AC motors, Construction and operation of servo motor, Types and applications.	**CO5**	**04**
Unit 6	**Basic Electrical Measurement:** Types of Instruments, Types of Error in, Measurement, Absolute and secondary instruments, Types of Secondary Instruments: Indicating, Integrating Instruments, deflecting torque, controlling torque and damping torque. Introduction to CRO and DSO.	**CO6**	**06**

Text Books	
1.	Basic Electrical Engineering, Nagrath I. J. and D. P. Kothari, Tata McGraw Hill, 2009.
2.	Basic Electrical Engineering, V.K Mehta, Rohit Mehta, S. Chand, 2008.
Reference Books	
1.	B.L Theraja, "Electrical Technology" Vol II, S. Chand & Co. Ltd, India.
2.	BharatiDwivedi and Anurag Tripathi, "Fundamentals of Electrical Engineering" Wiley PRECISE Text Book.
3.	V.K. Mehta, "Principles of Electrical Engineering" S.Chand& Co. Ltd, India.
4.	P.V. Prasad and S. Shivanaraju, "Electrical Engineering Concepts and Applications" CENGAGE Learning.
5.	Vincent Del Toro, "Electrical Engineering" Prentice Hall, Inc. Englewood Cliffs, New Jersey.
6.	Ashfaq Husain, "Fundamentals of Electrical Engineering" Dhanpat Rai & Co.
7.	Nagrath I.J. and D. P. Kothari, "Basic Electrical Engineering" Tata McGraw Hill.
Useful Links	
1.	https://onlinecourses.nptel.ac.in/noc22_ee113/previewBy Prof. Debapriya Das, IIT Kharagpur
2.	https://archive.nptel.ac.in/courses/108/102/108102185 by Prof.Bhim Singh,IIT Delhi
3.	https://nptel.ac.in/courses/108108076 byProf.L. Umanand, Bangalore.

SCHEME OF INSTRUCTION & SYLLABI

Programme Electrical and Computer Engineering

Scheme of Instructions: Second Year B. Tech. Electrical and Computer 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	ECE0231	Electrical Circuit Analysis	3	1	-	4	4	30	10	60	100
2	PCC	ECE0232	Electrical Machine I	3	--	-	3	3	30	10	60	100
3	PCC	ECE0233	Data Structure	3	--	--	3	3	30	10	60	100
4	PCC	ECE0234	Electrical Machine I Lab	--	--	2	2	1	-	50	25	75
5	PCC	ECE0235	Computer Hardware and Networking Lab	--	--	2	2	1	--	50	25	75
6	MDM	ECE0236	Multi-disciplinary Minor – 01	2	--	--	2	2	30	10	60	100
7	OE	ECE0237	Open Elective -01	3	--	--	3	3	30	10	60	100
8	OE	ECE0238	Open Elective -01 Lab	--	--	2	2	1	-	25	25	50
9	HSSM	ECE0239	Universal Human Values	2	--	--	2	2	-	50	-	50
10	HSSM	ECE02310	Soft Skill development	2	--	--	2	2	-	50	-	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 (OE/MDM)	Vocational andSkill Enhancement Course (VSEC)	Humanities Social Science and Management (HSSM)	Experiential Learning (EL)	Co-curricular And Extracurricular Activities (CCA)
Last Sem. Cumulative Sum	**16**	**18**	**--**	**-**	**-**	**04**	**04**	**--**	**02**
Semester Credits	**--**	**-**	**12**	**-**	**06**	**-**	**04**	**-**	**-**
Cumulative Sum	**16**	**18**	**12**	**-**	**06**	**04**	**08**	**-**	**02**

PROGRESSIVE TOTAL CREDITS: 44+22 =66

SCHEME OF INSTRUCTION & SYLLABI

Programme Electrical and Computer Engineering

Scheme of Instructions: Second Year B. Tech. Electrical and Computer 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	ECE0241	Electrical Machine II	3	--		3	3	30	10	60	100
2	PCC	ECE0242	Analog and Digital Electronics	3	--	--	3	3	30	10	60	100
3	PCC	ECE0243	Database Management Systems	3	1	--	4	4	30	10	60	100
4	PCC	ECE0244	Electrical Machine II Lab	--	--	2	2	1	-	25	25	50
5	PCC	ECE0245	Analog and Digital Electronics Lab	--	--	2	2	1	-	50	25	75
6	PCC	ECE0246	Python Programming Lab	--	--	2	2	1	--	25	25	50
7	MDM	ECE0247	Multi-disciplinary Minor – 02	2	--	--	2	2	30	10	60	100
8	OE	ECE0248	Open Elective -02	2	--	--	2	2	30	10	60	100
9	HSSM	ECE0249	Strategic Management	2	--	--	2	2	-	50	-	50
10	HSSM	ECE02410	Professional Ethics	2	--	--	2	2	-	25	-	25
11	BSC	ECE02411	Environmental Science	2	--	--	2	Audit	30	10	60	100
12	VSEC	ECE02412	Mini Project	--	--	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 program (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**	**18**	**12**	**-**	**06**	**04**	**08**	**-**	**02**
Semester Credits	**-**	**-**	**13**	**-**	**04**	**01**	**04**	**--**	**-**
Cumulative Sum	**16**	**18**	**25**	**-**	**10**	**05**	**12**	**--**	**02**

PROGRESSIVE TOTAL CREDITS: 66+22 =88

Shivaji University, Kolhapur

Second Year B. Tech. Electrical and Computer Engineering

Semester – III

Course Title	**Electric Circuit Analysis**	**Course Category**	**PCC**
ContactHrs/Week	**4**	**CourseCode**	**ECE0231**

Teaching Scheme				**Exam Scheme**			
L	**T**	**P**	**Course Credits**	**MSE**	**ISE/CA**	**ESE**	**TOTAL**
3	**1**	**-**	**4**	**30**	**10**	**60**	**100**

Course Objectives:

- To understand the basic laws, source transformations, theorems and the methods of analyzing electrical circuits.
- To understand the use of network theorems and the concept of resonance.
- To familiarize the analysis of three-phase circuits, two port networks and networks with non-sinusoidal inputs.
- To explain the importance of initial conditions, their evaluation and transient analysis of R-L and R-C circuits.
- To impart basic knowledge on network analysis using Laplace transforms.

Unit No	**Contents**	**Hrs**
Unit-1	**Basic Concepts:** Active and passive elements, Concept of ideal and practical sources. star – delta transformation. Analysis of networks by (i) Network reduction method including, (ii) Mesh and Node voltage methods for ac and DC circuits with independent and dependent sources. Concept of Super-Mesh and Super node analysis, Duality.	**8 Hrs**
Unit-2	**Network Theorems:** Super Position theorem, Thevenin's theorem, Norton's theorem, and Maximum power transfer theorem. (Problems with independent AC and DC sources only)	**8 Hrs**
Unit-3	**Resonant Circuits:** Analysis of simple series RLC and parallel RLC circuits under resonances. Problems on Resonant frequency, Bandwidth and Quality factor at resonance.	**5 Hrs**

Unit-4	**Transient Analysis:** Transient analysis of RL and RC circuits under DC excitations: Behaviour of circuit elements under switching action, Evaluation of initial conditions.	**5 Hrs**
Unit-5	**Laplace Transformation & Applications:** Basic signals and waveform synthesis, Laplace transformations, Determination of time response of networks with step, ramp and impulse inputs, sinusoidal and synthesized inputs.	**6 Hrs**
Unit-6	**Two port network parameters:** Definitions of z, y, h and transmission parameters, modeling of two port networks with these parameters, inter relationship between parameters sets.	**6 Hrs**

Course Outcomes:

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

1. Understand the basic concepts, basic laws and methods of analysis of DC and AC networks and reduce the complexity of network using source shifting, source transformation and network reduction using transformations.
2. Solve complex electric circuits using network theorems.
3. Discuss resonance in series and parallel circuits and also the importance of initial conditions and their evaluation.
4. Synthesize typical waveforms using Laplace transformation.
5. Solve unbalanced three phase systems and also evaluate the performance of two port networks.

Text Books:

1.Roy Choudhury, “Networks and systems”, New Age International Publications, 2nd edition,

2. Hayt, Kemmerly and Durbin, “Engineering Circuit Analysis”, TMH 7th Edition, 2010.

Reference Books:

1. M. E. Van Valkenburg, “Network Analysis”, PHI / Pearson Education, 3rdEdition.

2. A.Chakrabarti, Circuit Theory(Analysis and Synthesis), Dhanpat Rai & Co.,2010.

E-resources (NPTEL/SWAYAM.. Any Other)- mention links

1. https://archive.nptel.ac.in/courses/108/105/108105159

Shivaji University, Kolhapur
Second Year B. Tech. Electrical and Computer Engineering
Semester – III

Course Title	Electrical Machines-I	Course Category	PCC
ContactHrs/Week	3	Course Code	ECE0232

Teaching Scheme				Exam Scheme			
L	T	P	Course Credits	MSE	ISE/CA	ESE	TOTAL
3	-	-	3	30	10	60	100

Course Objectives:

1. To understand the construction, working and various tests of single-phase Transformer.
2. To understand the construction, working of three-phase Transformer.
3. To understand the parallel operation of three-phase Transformer
4. To understand the construction, working of Synchronous Generator.
5. To understand the performance analysis of Synchronous Generator
6. To understand the construction, working of solar and wind power generators.

Unit No	Contents	Hrs
Unit-1	**Single phase Transformers:** Necessity of transformer, principle of operation, Types and construction, EMF equation, equivalent circuit, Operation of practical transformer under no-load and on-load with phasor diagrams. Losses and methods of reducing losses, efficiency and condition for maximum efficiency. Polarity test, Sumpner's test. Open circuit and short circuit tests, calculation of equivalent circuit parameters. Predetermination of efficiency, voltage regulation and its significance. Numerical.	7 Hrs
Unit-2	**Three-phase Transformers:** Introduction, Constructional features of three-phase transformers. Transformer connection for three phase operation– star/star, delta/delta and star/delta, comparative features. Labelling of three-phase transformer terminals.	5 Hrs
Unit-3	**Parallel Operation of Transformers:** Necessity of Parallel operation, conditions for parallel operation– Single phase and three phase. Load sharing in case of similar and dissimilar transformers. Numerical. **Auto transformers and tap changing transformers**: Introduction to auto transformer-copper economy, equivalent circuit, no load and on load tap changing transformers. Numerical.	6 Hrs
Unit-4	**Synchronous Generators:** Construction, working, Armature windings, winding factors, EMF equation. Harmonics–causes, reduction and elimination. Armature reaction, Synchronous reactance, Equivalent circuit. **Synchronous Generators (Salient Pole):** Effects of saliency, two-reaction theory, Parallel operation of generators and load sharing. Methods of Synchronization, Synchronizing power.	7 Hrs
Unit-5	**Synchronous Generators Analysis:** Open circuit and short circuit characteristics, Assessment of reactance-short circuit ratio, Alternator on load.	6 Hrs

	Voltage regulation. Voltage regulation by EMF and MMF methods. Excitation control for constant terminal voltage.	
Unit-6	**Wind & Solar power Generator :** **Wind power generator**-Basic components of wind energy conversion system, types of wind generators- Horizontal and vertical axis. Advantages and disadvantages of WECS. **Solar power generator** - principle of solar cell, Basic Solar Photo voltaic, system for power generation, Advantages and disadvantages.	**5 Hrs**

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

1. Explain the construction, working and various tests of single-phase Transformer.
2. Explain the construction, working of three phase Transformer.
3. Explain the parallel operation of three phase Transformer
4. Explain the construction, working of Synchronous Generator.
5. Explain the performance analysis of Synchronous Generator
6. Explain the construction, working of solar and wind power generators.

Textbooks

1. Electric Machines, D. P. Kothari, et al, 4th Edition, 2011.
2. Electric Machines, Ashfaq Hussain, Dhanpat Rai & Co, 2nd Edition, 2013.

Reference Books:

1. Performance and Design of A.C. Machines M. G. Say CBS Publishers 3 rd Edition, 2002
2. Electrical Machines M.V. Deshpande PHI Learning 1 st Edition, 2013
3. Electrical Machines Abhijit Chakrabarti et al McGraw Hill 1 st Edition, 2015

Shivaji University, Kolhapur

Second Year B. Tech. Electrical and Computer Engineering

Semester – III

Course Title	**Data Structures**	**Course Category**	**PCC**
ContactHrs/Week	**3**	**CourseCode**	**ECE0233**

Teaching Scheme				**Exam Scheme**			
L	**T**	**P**	**Course Credits**	**MSE**	**ISE/CA**	**ESE**	**TOTAL**
3	**-**	**-**	**3**	**30**	**10**	**60**	**100**

Course Objectives:

1.To make the students familiar with basic data structures.

2. To provide students with foundation in computer programming/problem.

3.To teach the students to select appropriate data structures in computer applications.

4.To provide the students with the details of implementation of various data structures.

Unit No	**Contents**	**Hrs**
Unit-1	**Basic of Data Structures**: Data structure- Definition, Types of data structures, Data Structure Operations, 03 Algorithms: Complexity, Time and Space complexity.	**3 Hrs**
Unit-2	**Searching and Sorting Techniques:** Linear search, Binary search, Hashing – Definition, hash functions, Collision, Bubble sort, Selection sort, Insertion sort, Merge sort, Quick sort, Radix sort, Complexity and analysis.	**7 Hrs**
Unit-3	**Stacks and Queues:** Stack: Definition, operations, Array representation of stack, applications Queue: Definition, operations, Array representation of queue, applications, circular queue, Priority queue, Deque.	**3 Hrs**
Unit-4	**Linked Lists:** Definition, representation, operations, implementation and applications of singly, doubly 06 and circular linked lists. Linked representation of stack and Queue.	**6 Hrs**
Unit-5	**Tree**s: Terminology, representation, binary tree, traversal methods, binary search tree, AVL search tree, B tree, B+ tree, Heaps- Operations and their applications, Heap sort.	**6Hrs**
Unit-6	**Graphs:** Basic concept of graph theory, storage representation, graph traversal techniques- BFS and DFS, Graph representation using sparse matrix.	**6Hrs**

Course Outcomes:

Upon successful completion of this course, the student will be able to –

1. Identify the appropriate data structure for specific application.

2. Design and analyse programming problem statements.

3. Chose appropriate sorting and searching algorithms.

4. Outline the solution to the given software problem with appropriate datastructure.

Text Books:

1. Schaum's Outlines Data Structures – Seymour Lipschutz (MGH)

Reference Books:

2. Data Structure using C- A. M. Tanenbaum, Y. Langsam, M. J. Augenstein(PHI)

3. Data Structures- A Pseudo code Approach with C – Richard F. Gilberg and Behrouz A. Forouzon 2ndEdition.

3. Debasis Samanta: Classic Data Structures, 2nd Edition, PHI, 2009.

4.Richard F. Gilberg and Behrouz A. Forouzan: Data Structures A Pseudocode Approach with C, Cengage Learning, 2005.

Shivaji University, Kolhapur

Second Year B. Tech. Electrical and Computer Engineering

Semester – III

Course Title		**Electrical Machines-I Lab**		**Course Category**		**PCC**	
ContactHrs/Week		**2**		**Course Code**		**ECE0234**	
Teaching Scheme				**Exam Scheme**			
L	**T**	**P**	**Course Credits**	**MSE**	**ISE/CA**	**ESE**	**TOTAL**
-	**-**	**2**	**1**	**--**	**50**	**25**	**75**

Course Objectives:

1. To conduct various tests on transformers and synchronous machines and evaluate their performance.
2. To perform the parallel operation on two single-phase transformers.
3. To study and verify the performance of synchronous generator.
4. To calculate the voltage regulation of an alternator using different methods for comparison.

S. No.	**Experiments**
1	To conduct open circuit and short circuit tests on single phase transformer. (a) Predetermine efficiency, regulation for different loads and power factor. (b) To draw the equivalent circuit and represent all the parameter
2	To conduct Sumpner's test or back to back test on two identical single phase transformers. (a)To determine efficiency for different loads & power factor.
3	To operate two dissimilar single phase transformer in parallel to observe the load sharing by each transformer.
4	To conduct polarity test on single phase transformer.
5	Scott connection with balanced and unbalanced resistive loads.
6	Determination of Voltage regulation of a three-phase alternator by EMF and MMF method
7	Determination of Xd and Xq by slip test and regulation of three phase alternator.
8	To study the performance of Synchronous Generator connected to infinite bus
9	To determine PV and IV characteristics of solar cell using simulation.

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

1. Conduct various tests on transformers and synchronous machines and evaluate their performance.
2. Perform the parallel operation on two single phase transformers.
3. Verify the performance of synchronous generator.
4. Calculate the voltage regulation of an alternator using different methods for comparison.

Shivaji University, Kolhapur
Second Year B. Tech. Electrical and Computer Engineering
Semester – III

Course Title		Computer Hardware and Networking Lab		Course Category		PCC	
ContactHrs/Week		2		Course Code		ECE0235	
Teaching Scheme				Exam Scheme			
L	T	P	Course Credits	MSE	ISE/CA	ESE	TOTAL
-	-	2	1	--	50	25	75

Course Objectives:

1. To provide students with the knowledge of computer hardware and networking with all the related technologies.
2. To understand knowledge of installation, identification, repairing and upgrading all hardware equipment's.
3. To understand detailed knowledge on the setup and maintain of LAN with internet connection

S.No.	Experiments
1	To study about the purpose, features and functions of hardware components used in networking.
2	To crimp Ethernet cable for networking computers.
3	Install and configure Network Interface Card
4	To assign a unique name to computer and also the workgroup to which it belongs .
5	To connect computers to hub and switch to form a network.
6	To connect two computers using crossover cable and transfer files.
7	A. Connect the computers in Local Area Network. B. To Configure IP Address in a system in LAN (TCP/IP Configuration) and Configure DNS to establish interconnection between systems. C. To share printer among workgroup and can print to any shared printer.
8	A. To establish peer to peer network connection in a LAN and share folders among work group. B. To establish connection to a remote desktop.

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

1. To understand the basics of computer systems along with peripherals and troubleshooting of different computer related issues.
2. Learn to determine and installing appropriate security measures.
3. Able to troubleshoot software and hardware problems related to internet applications

Shivaji University, Kolhapur
Second Year B. Tech. Electrical and Computer Engineering
Semester – III

Course Title	Renewable Energy Sources	Course Category	MDM
ContactHrs/Week	2	Course Code	ECE0236

Teaching Scheme				Exam Scheme			
L	T	P	Course Credits	MSE	ISE/CA	ESE	TOTAL
2	--	-	2	30	10	60	100

Course Objectives:

1. To discuss causes of energy scarcity and its solution, energy resources and availability of renewable energy.
2. To discuss types of solar collectors, their configurations and their applications
3. To discuss wind turbines, wind resources, site selection for wind turbine
4. To discuss biogas, its composition, production, benefits.
5. To discuss tidal energy resources, energy availability, power generation
6. To discuss principles of ocean thermal energy conversion and production of electricity

Unit No	Contents	Hrs
Unit-1	**Introduction:** Causes of Energy Scarcity, Solution to Energy Scarcity, Factors Affecting Energy Resource Development, Energy Resources and Classification, Renewable Energy – Worldwide Renewable Energy Availability, Renewable Energy in India.	5 Hrs
Unit-2	**Solar Thermal Energy Collectors** Types of Solar Collectors, Configurations of Certain Practical Solar Thermal Collectors, Material Aspects of Solar Collectors, Concentrating Collectors, Parabolic Dish – Stirling Engine System, Working of Stirling or Brayton Heat Engine, Solar Collector Systems into Building Services, Solar Water Heating Systems, Passive Solar Water Heating Systems, Applications of Solar Water Heating Systems, Active Solar Space Cooling, Solar Air Heating, Solar Dryers, Crop Drying, Space Cooing, Solar Cookers, Solar pond. **Solar Cells**: Components of Solar Cell System, Elements of Silicon Solar Cell, Solar Cell materials, Practical Solar Cells, I – V Characteristics of Solar Cells,	6 Hrs
Unit-3	**Wind Energy** Windmills, Wind Turbines, Wind Resources, Wind Turbine Site Selection. **Geothermal Energy**: Geothermal Systems, Classifications, Geothermal Resource Utilization, Resource Exploration, Geothermal Based Electric Power Generation, Associated Problems, environmental Effects.	5 Hrs
Unit-4	**Biogas Energy** Introduction, Biogas and its Composition, Anaerobic Digestion, Biogas Production, Benefits of Biogas, Factors Affecting the Selection of a Particular Model of a Biogas Plant, Biogas Plant Feeds and their Characteristics.	5 Hrs

Unit-5	**Tidal Energy**: Introduction, Tidal Energy Resource, Tidal Energy Availability, Tidal Power Generation in India, Leading Country in Tidal Power Plant Installation, Energy Availability in Tides, Tidal Power Basin, Turbines for Tidal Power, Advantages and Disadvantages of Tidal Power, Problems Faced in Exploiting Tidal Energy.	**5 Hrs**
Unit-6	**Ocean Thermal Energy:** Introduction, Principles of Ocean Thermal Energy Conversion (OTEC), Ocean Thermal Energy Conversion plants, Basic Rankine Cycle and its Working, Closed Cycle, Open Cycle and Hybrid Cycle, Carnot Cycle, Application of OTEC	**5 Hrs**

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

1. Discuss causes of energy scarcity and its solution, energy resources and availability of renewable energy.
2. Discuss types of solar collectors, their configurations, solar cell system, its characteristics and their applications.
3. Discuss wind turbines, wind resources, site selection for wind turbine.
4. Discuss production of energy from biomass, biogas.
5. Discuss tidal energy resources, energy availability and power generation.
6. Discuss principles of ocean thermal energy conversion and production of electricity

Books:

Textbooks

1. Nonconventional Energy Resources, B.H. Khan, McGraw Hill, 3rd Edition.

Reference Books

1. Nonconventional Energy Resources, Shobh Nath Singh, Pearson,1st Edition, 2015
2. Renewable Energy; Power for a sustainable Future, Godfrey Boyle, Oxford,3rd Edition, 2012
3. Renewable Energy Sources: Their Impact on global Warming and Pollution, Tasneem Abbasi, S.A. Abbasi, PHI, 1st Edition, 2011

Shivaji University, Kolhapur
Second Year B. Tech. Electrical and Computer Engineering
Semester –III

Course Title	Electrical Machine	Course Category	OE -1
Contact Hrs/Week	3	CourseCode	ECE0237

Teaching Scheme				Exam Scheme			
L	T	P	Course Credits	MSE	ISE/CA	ESE	TOTAL
3	--	--	3	30	10	60	100

Course Objectives:

1) To explain the construction and operation of DC Machines.
2) To explain the construction and operation of transformers.
3) To explain the construction and operation of Three-phase induction Motors.
4) To explain the construction and operation of Three-phase synchronous generators.
5) To explain the construction and operation of Single-phase induction motors.
6) To explain the construction and operation of Special types of Motors.

Unit No	Contents	Hrs
Unit-1	**DC Machines:** (a) Principle of operation, constructional details, induced emf expression, types of generators, and the relation between induced emf and terminal voltage. (b) Principle of operation, back emf and torque equations, types of motors, characteristics (shunt and series only), and applications.	6 Hrs
Unit-2	**Transformers:** Necessity of transformer, the principle of operation, Types, and construction of single-phase transformers, emf equation, losses, variation of losses with respect to load, efficiency, and condition for maximum efficiency.	7 Hrs
Unit-3	**Three-phase induction Motors:** Concept of rotating magnetic field, Principle of operation, constructional features of motor, types – squirrel cage and wound rotor, slip and problems on the slip, significance of slip, applications.	6 Hrs
Unit-4	**Three-phase synchronous generators:** Principle of operation, constructional details of salient and non-salient pole generators, synchronous speed, frequency of generated voltage, emf equation, with the concept of winding factor (excluding the derivation and calculation of winding factors).	6 Hrs
Unit-5	**Single phase induction motors:** Construction characteristics and applications, Nature of field produced in single phase induction motor, Split phase induction motor, Capacitors start and run motor, Shaded pole motor, Reluctance start motor, universal motors and its applications.	6 Hrs
Unit-6	**Special types of Motors:** Introduction of stepper motor, types of stepper motor, application of stepper motor and problems on step angle calculations. Permanent magnet DC motor, type of permanent magnet DC motor and its applications.	6 Hrs

Course Outcomes:

1.Realize the requirement of transformers in transmission and distribution of electric power and other applications.

2.To understand the basic concept of DC Machines.

3.To understand the basic concept of Three-phase induction Motors.

4.To understand the basic concept of Three-phase synchronous generators.

5.To understand the basic concept of Single-phase induction motors.

6. To understand the basic concept of Special types of Motors.

Books:

Textbooks

1. Electric Machines, D. P. Kothari, et al, 4th Edition, 2011.
2. Electric Machines, Ashfaq Hussain, Dhanpat Rai & Co, 2nd Edition, 2013.

Reference Books:

1. Performance and Design of A.C. Machines M. G. Say CBS Publishers 3 rd Edition, 2002
2. Electrical Machines M.V. Deshpande PHI Learning 1 st Edition, 2013
3. Electrical Machines Abhijit Chakrabarti et al McGraw Hill 1 st Edition, 2015

Shivaji University, Kolhapur

Second Year B. Tech. Electrical and Computer Engineering

Semester – III

Course Title		**Electrical Machines-I Lab**		**Course Category**		**OE-1 Lab**	
ContactHrs/Week		**2**		**Course Code**		**ECE0238**	
Teaching Scheme				**Exam Scheme**			
L	**T**	**P**	**Course Credits**	**MSE**	**ISE/CA**	**ESE**	**TOTAL**
--	**-**	**2**	**1**	**--**	**25**	**25**	**50**

Course Objectives:

1. To perform tests on DC Machines to determine their characteristics.
2. To conduct Test for pre-determination of the performance characteristics of DC Machines.
3. To conduct various tests on Transformer and evaluate their performance.
4. To study and verify the performance of synchronous generator.

S.No.	**Experiments**
1	Load test on DC shunt motor to draw speed–torque and horse power–efficiency characteristics.
2	Swin burne's Test on DC motor.
3	To conduct open circuit and short circuit tests on single phase transformer. (a) Predetermine efficiency, regulation for different loads and power factor. (b) To draw the equivalent circuit and represent all the parameter
4	To conduct polarity test on single phase transformer.
5	To conduct Sumpner's test or back to back test on two identical single phase transformers. (a)To determine efficiency for different loads & power factor.
6	Determination of Voltage regulation of a three-phase alternator by EMF and MMF method
7	Determination of Xd and Xq by slip test and regulation of three phase alternator.
8	To study the performance of Synchronous Generator connected to infinite bus

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

1. Perform tests on DC Machines to determine their characteristics.
2. Perform the OC and SC on single phase transformers.
3. Verify the performance of synchronous generator.
4. Calculate the voltage regulation of an alternator using different methods for comparison.

Shivaji University, Kolhapur

Second Year B. Tech. Electrical and Computer Engineering

Semester – III

Course Title			Universal Human Values	Course Category			HSSM
Contact Hrs/Week			2	Course Code			ECE0239
Teaching Scheme				Exam Scheme			
L	T	P	Course Credits	MSE	ISE/CA	ESE	TOTAL
2	--	-	2	---	50	---	50

Course Objectives:

1. To help students understand the meaning, importance, and application of human values in daily life.
2. To develop an understanding of self and body, inner happiness, and mindfulness.
3. To help students understand trust, respect, and responsibility in relationships and social coexistence.
4. To create awareness about the interconnection between humans and nature for sustainable living.
5. To develop ethical decision-making skills and moral responsibility in professional life.
6. To enable students to apply human values in personal and social life for conflict resolution and ethical decision-making.

Unit No	Contents	Hrs
Unit-1	**Introduction to Universal Human Values:** Meaning and Importance of Human Value, Right Understanding Relationship & Physical facility, Understanding Value Education, Continuous Happiness & prosperity- The basic human aspirations, method to fulfil the human values.	5 Hrs
Unit-2	**Harmony in Human being:** Understanding Human being as the Co-existence of the self & Body., Needs of Self vs. Body – Physical needs vs. inner happiness. Understanding harmony in the self. Developing Inner Peace and Self-Awareness. Achieving Inner Peace – Self-awareness and mindfulne.	5 Hrs
Unit-3	**Harmony in Family & Society:** Harmony in Family – Trust, respect, and responsibility in relationships, Family as a Support System – Role of love and care, Justice in Human-to-Human Relationship. Understanding Harmony in the society Living in Coexistence- Respect for Diversity – Accepting different cultures, beliefs, and perspectives without discrimination.	5 Hrs
Unit-4	**Nature and Coexistence**: Understanding Nature and Its Role in Human Life, Interconnection between Humans and the Environment, Sustainable Living Practices Responsibility towards Nature and Future Generations.	5 Hrs
Unit-5	**Professional Ethics & Holistic Development:** Ethical Decision-Making in Professional Life, Workplace Ethics and Moral Responsibility, Leadership	5 Hrs

	with Integrity and Values, Developing a Holistic Perspective in Life.	
Unit-6	**Universal Human Values in Daily Life:** Application of Human Values in Personal and Social Life, Conflict Resolution through Values, Overcoming Challenges with Ethical Approaches, Case Studies on Value-Based Decision-Making.	**5 Hrs**

Course Outcomes:

1.Students will be able to explain the significance of human values and identify ways to achieve happiness and prosperity.
2.Students will be able to identify key values in family and social relationships and apply them for peaceful coexistence.
3.Students will be able to recognize the role of nature in human life and apply eco-friendly practices.
4.Students will be able to explain workplace ethics and apply ethical values in professional decision-making.
5.Students will be able to identify ethical approaches to challenges and apply value-based decision-making.

Text Books:

1.Universal Human Values: A Global Perspective on Shared Principles and Ethics" by Dr. Narayan R. Chandak and Adv. Jyotsna N. Chandak, Notion Press, Chennai.
2. Human Values and Professional Ethics (AP Univ)" by Dr. Madhukar Behara, Dr. N. Sambasiva Rao, and Prof. Abdul Noorbasha, Himalaya Publishing House, Mumbai.
3. The Invention of Good and Evil: A World History of Morality", Hanno Sauer, Published in The New Yorker
4. Human Values", A. Tripathi, New Age International Publishers, New Delhi.
5. Values and Ethics in Profession", Prof. Mazumdar, Everest Publishing House, Pune
6. Human Values and Professional Ethics", Jayshree Suresh and B.S. Raghavan, S Chand Publishing, New Delhi

Reference Books:

1.Universal Human Values by Dr. C.S.G. Krishnamacharyulu and Dr. Lalitha Ramakrishnan, Himalaya Publishing House, Mumbai.
2.Universal Human Values: Navigating Ethics and the Environment with Case Studies Approach by Debidutta Acharya and Amitabh Nanda, S Chand Publishing, New Delhi.
3.A Foundation Course in Human Values and Professional Ethics by R.R. Gaur, R. Asthana, and G.P. Bagaria, UHV Publications, Delhi.
4.Human Values and Beliefs: A Cross-Cultural Sourcebook, Ronald F. Inglehart, Miguel Basanez, and Alejandro Moreno, University of Michigan Press, Ann Arbor
5.Universal Human Values for GTU 24 Course, Technical Publications, Nashik
6.Universal Human Values and Professional Ethics, Dr. Ritu Soryan, Neelkamal Publications, New Delhi.
7.Human Rights and Global Diversity, Robert Paul Churchill, Prentice Hall, Upper Saddle River, NJ.

Shivaji University, Kolhapur
Second Year B. Tech. Electrical and Computer Engineering
Semester – III

Course Title	Soft Skill Development	Course Category	HSSM
ContactHrs/Week	2	CourseCode	ECE02310

Teaching Scheme				Exam Scheme			
L	T	P	Course Credits	MSE	ISE/CA	ESE	TOTAL
2	--	-	2	---	50	---	50

Course Objectives:

1. To help learners develop their soft skills and develop their personality together with their technical skills.
2. Developing professional, social and academic skills to harness hidden strengths, capabilities and knowledge equip them to excel in real work environment and corporate life.
3. Understand various issues in personal and profession communication and learn to overcome them

Unit No	Contents	Hrs
Unit-1	**Introduction to Soft Skills and Hard Skills:** **Personality Development**: knowing yourself Positive Thinking johari's Communication Skills, Non-verbal Communication, Physical Fitness Window. **Emotional Intelligence**: Meaning and Definition, Need for Emotional Intelligence, Intelligence Quotient versus Emotional Intelligence Quotient, Components of Emotional Intelligence, Competencies of Emotional Intelligence, Skills to Develop Emotional Intelligence.	5 Hrs
Unit-2	**Etiquette and Mannerism**: Introduction, Professional Etiquette, Technology Etiquette. **Communication Today**: Significance of Communication, GSC's 3M Model of Communication, Vitality of the Communication Process, Virtues of Listening, Fundamentals of Good Listening, Nature of Non-Verbal Communication, Need for Intercultural Communication, Communicating Digital world.	5 Hrs
Unit-3	**Academic Skills:** Employment Communication: Introduction, Resume, Curriculum Vitae, Scannable Resume, Developing an Impressive Resume, Formats of Resume, Job Application or Cover Letter. **Professional Presentation:** Nature of Oral Presentation, planning a Presentation, Preparing the Presentation, Delivering the Presentation.	5 Hrs
Unit-4	**Job Interviews:** Introduction, Importance of Resume, Definition of Interview, Background Information, Types of Interviews, Preparatory Steps for Job Interviews, Interview Skill Tips, Changes in the Interview Process, FAQ During Interviews. **Group Discussion:** Introduction, Ambience/Seating Arrangement for Group Discussion, Importance of Group Discussions, Difference between Group Discussion,	5 Hrs

	Panel Discussion and Debate, Traits, Types of Group Discussions, topic based and Case based Group Discussion, Individual Traits.	
Unit-5	**Professional Skills:** **Creativity at Workplace**: Introduction, Current Workplaces, Creativity, Motivation, Nurturing Hobbies at Work, The Six Thinking Hat Method Ethical Values: Ethics and Society, Theories of Ethics, Correlation between Values and Behavior, Nurturing Ethics, Importance of Work Ethics, Problems in the Absence of Work Ethics **Capacity Building**: Learn, Unlearn and Relearn: Capacity Building, Elements of Capacity Building, Zones of Learning, Ideas for Learning, Strategies for Capacity Building	**5 Hrs**
Unit-6	**Leadership and Team Building:** Leader and Leadership, Leadership Traits, Culture and Leadership, Leadership tyles and Trends, Team Building, Types of Teams, **Decision Making and Negotiation:** Introduction to Decision Making, Steps for Decision-Making, Decision-Making Techniques, Negotiation Fundamentals, Negotiation Styles, Major Negotiation Concepts. **Stress and Time Management:** Stress, Sources of Stress, Ways to Cope with Stress.	**5 Hrs**

Course Outcomes:

1. Demonstrate enhanced self-awareness, personality development, and positive thinking skills through techniques like Johari Window and emotional intelligence frameworks.
2. Communicate effectively using verbal, non-verbal, and digital channels, while applying appropriate etiquette in professional and technological contexts.
3. Develop and apply academic and employment-related communication tools, including resumes, cover letters, oral presentations, and job interview strategies.
4. Participate confidently in group discussions and debates, demonstrating active listening, critical thinking, and collaboration skills.
5. Exhibit workplace professionalism through creative thinking, ethical decision-making, and the ability to work effectively in teams and diverse cultural settings.
6. Apply leadership traits, decision-making and negotiation techniques, and manage time and stress effectively to enhance personal and professional productivity.

Text Books:

1. Soft Skills: an Integrated Approach to Maximise Personality, Gajendra S. Chauhan, Sangeeta Sharma, Wiley India.

References:

1. Personality Development and Soft Skills, Barun K. Mitra, Oxford Press
2. Business Communication, Shalini Kalia, Shailja Agrawal, Wiley India
3. Soft Skills - Enhancing Employability, M. S. Rao, I. K. International
4. Cornerstone: Developing Soft Skills, Sherfield, Pearson India

Shivaji University, Kolhapur
Second Year B. Tech. Electrical and Computer Engineering
Semester – IV

Course Title	Electrical Machines-II	Course Category	PCC
Contact Hrs/Week	3	Course Code	ECE0241

Teaching Scheme				Exam Scheme			
L	T	P	Course Credits	MSE	ISE/CA	ESE	TOTAL
3	-	-	3	30	10	60	100

Course Objectives:

1. To study the constructional features of Motors and select a suitable drive for specific Application.
2. To study the constructional features of Three Phase and Single-phase induction Motors.
3. To study different test to be conducted for the assessment of the performance characteristics of motors.
4. To study the speed control of motor by different methods.
5. Explain the construction and operation of Synchronous motor and special motors
6. Explain the construction and operation of special purpose motors

Unit No	Contents	Hrs
Unit-1	**DC Motors:** Construction and working principle. Back E.M.F and its significance, Torque equation, Classification, Characteristics of shunt, series & compound motors, Speed control of shunt motor, Application of motors. **Losses and Efficiency**- Losses in DC motors, power flow diagram, efficiency, condition for maximum efficiency. **Testing of DC Motors**: Direct & indirect methods of testing of DC motors- Swinburne's test, Field's test, merits and demerits of tests. (numerical as applicable)	7 Hrs
Unit-2	**Three Phase Induction Motors:** Concept and generation of rotating magnetic field, Principle of operation, construction, classification and types; squirrel-cage, slip-ring. Slip and its significance, Torque equation, torque-slip characteristic covering motoring, generating and braking regions of operation, Maximum torque, (numerical as applicable)	6 Hrs
Unit-3	**Performance of Three Phase Induction Motor:** Phasor diagram of induction motor on no-load and onload, equivalent circuit, losses, efficiency, No-load and blocked rotor tests. Performance of the motor from the equivalent circuit. Cogging and crawling. High torque rotors-double cage and deep rotor bars. Induction motor working as induction generator, construction and working of doubly fed induction generator. (numerical as applicable)	7 Hrs
Unit-4	**Starting and Speed Control of Three-Phase Induction Motors:** Necessity of starter. Direct on line, Star-Delta, and autotransformer starting. Rotor resistance starting. Speed control by frequency. **Single-Phase Induction Motor:** Double revolving field theory and principle of operation. Construction and operation of split-phase, capacitor start and capacitor run and shaded pole motors. Comparison of single-phase motors and applications. (numerical as applicable)	7 Hrs

Unit-5	**Synchronous Motor:** Principle of operation, phasor diagrams, torque and torque angle, effect of change in load, effect of change in excitation. V and inverted V curves. Synchronous condenser,	**6 Hrs**
Unit-6	**Special Purpose Motors:** Construction and operation, advantages & disadvantages of Universal motor, AC servomotor, Linear induction motor, PMSM, SRM and BLDC.	**6 Hrs**

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

1. Understand the construction and operation, characteristics, Testing of DC Motors and determine losses and efficiency.
2. Understand the construction and operation, classification and types of Three phase Induction motors.
3. Describe the performance characteristics and applications of three phase Induction motors.
4. Demonstrate and explain Speed Control methods of three phase induction motor and types of single-phase induction motors.
5. Understand the construction and operation, V and inverted V curves of synchronous motors.
6. Understand the construction and operation of Universal motor, AC servomotor, Linear induction motor, PMSM, SRM and BLDC motors.

Books: Text Books

1. Electric Machines, D. P. Kothari, I. J. Nagrath, McGraw Hill, 4th edition, 2011.
2. Theory of Alternating Current Machines, Alexander Langsdorf, McGraw Hill, 2nd Edition, 2001.
3. Electric Machines, Ashfaq Hussain, Dhanpat Rai & Co, 2nd Edition, 2013.

Reference Books

1. Electrical Machines, Drives and Power systems, Theodore Wildi, Pearson, 6th Edition, 2014
2. Electrical Machines, M.V. Deshpande, PHI Learning, 2013
3. Electric Machinery and Transformers, Bhag S. Guru at el, Oxford University Press, 3rd Edition, 2012
4. Electric Machinery and Transformers, Irving Kosow, Pearson, 2nd Edition, 2012
5. Principles of Electric Machines and power Electronic, P.C.Sen, Wiley, 2nd Edition, 2013
6. Electrical Machines, R.K. Srivastava, Cengage Learning, 2nd Edition, 2013

Shivaji University, Kolhapur
Second Year B. Tech. Electrical and Computer Engineering
Semester – IV

Course Title	**Analog and Digital Electronics**	**Course Category**	**PCC**
ContactHrs/Week	**3**	**CourseCode**	**ECE0242**

Teaching Scheme				**Exam Scheme**			
L	**T**	**P**	**Course Credits**	**MSE**	**ISE/CA**	**ESE**	**TOTAL**
3	**-**	**-**	**3**	**30**	**10**	**60**	**100**

Course Objectives:

1. To understand construction and characteristics of BJT.
2. To learn construction and characteristics of FET.
3. To understand the operation of OP-AMP and Timers.
4. To understand Number Systems, Logic gates and Boolean Algebra.
5. To understand the concepts of combinational logic circuits and sequential circuits.

Unit No	**Contents**	**Hrs**
Unit-1	**Bipolar Junction Transistors (BJT):** Structure, Types, symbols, Construction, operation of (NPN/PNP) transistors. BJT Configurations (CB, CE, CC), Transistor currents, alpha, beta and relationship between alpha and beta. CE input and output characteristics- cut off, saturation, and active regions. Transistor biasing- definition, importance, list types, Explain Voltage divider bias. Transistor as a switch in CE mode. Stabilisation, thermal runaway, heat sink.	**7 Hrs**
Unit-2	**Field Effect Transistor:** JFET-Construction, principle of Operation, V-I characteristics, Pinch- off voltage. Small signal model of JFET. FET as Voltage Variable Resistor, Comparison of BJT and FET. MOSFET- Construction, Principle of Operation and symbol, MOSFET characteristics in Enhancement and Depletion modes.	**7 Hrs**
Unit-3	**Op-amp & Timers:** OPAMP– block diagram, applications, µA 741 pin diagram. concept of virtual ground, concept of virtual short. OPAMP applications- Inverting amplifier, Non- Inverting amplifier, Adder, Subtractor, Integrator, Differentiator, V-I converter, I-V Converter. **Timer–** block diagram, pin diagram of IC 555, duty cycle, time-delay, Applications, A stable and Monostable multi-vibrators using IC 555.	**6 Hrs**
Unit-4	**Number system and Boolean Algebra:** Decimal, binary, octal, hexadecimal number system and conversion , binary weighted codes, signed numbers, 1s and 2s complement codes, Binary logic functions , Boolean laws, truth tables, associative and distributive properties, DeMorgans theorems, realization of switching functions using logic gates	**7 Hrs**
Unit-5	**Combinational Circuits:** Half adder, Full Adder, Half subtractor, Full subtractor, Multiplexer/Demultiplexer, decoder, encoder, Magnitude Comparator. sum of product & product of sums, Karnaugh maps, two, three and four variable Karnaugh maps, simplification of expressions	**7 Hrs**

Unit-6	**Sequential circuits:** Flip-flops, clocked and edge triggered flipflops, asynchronous and synchronous counters, Shift-Registers, serial in serial out shift registers	**6 Hrs**

Course Outcomes:

1. Able to Explain construction and characteristics of BJT
2. Able to Explain construction and characteristics of FET.
3. Able to illustrate operation of OP-AMP and Timers.
4. Understand digital circuits, Boolean algebra, logic gates and their simplification.
5. Able to Explain the operation of Combinational Circuits and know its applications.
6. Able to Explain the operation of Sequential circuits and know its applications

Text Books:

1. Electronic Devices and Circuit Theory, Robert L. Boylestad and Louis Nashelsky, PHI/Pearson Education. 9th Edition
2. Op-amps & Linear Integrated Circuits, Ramakant A. Gayakwad, PHI Publication New Delhi, 2013, 4th Edition
3. Logic Design, A.P.Godse &D.A.Godse, Technical Publications, Pune
4. Modern digital electronics, R.P. Jain, TMH Publications
5. Fundamentals of digital circuits, Anand Kumar, PHI

Reference Books:

1. Operational amplifiers and linear ICs", David A Bell, Oxford University Press, 2010
2. Electronic Devices and circuits" Jacob Millman, Christos C. Halkiasc Tata McGraw Hill, 3rd edition,2013
3. Principle of Electronics", V. K. Mehata, Rohit Mehata, S. Chand
4. Electronic Principles", Albert Malvino and David J Bates, Tata McGraw Hill, 7th edition,2014.
5. Electronic Devices and circuits", Allen Mottershead, PHI publication,
6. Digital Electronics: Principles & Integrated Circuits, A. K. Maini, Wiley Publications
7. Digital Systems- Principles and Design, Rajkamal, Pearson Education

Shivaji University, Kolhapur

Second Year B. Tech. Electrical and Computer Engineering

Semester – IV

Course Title	**Database Management Systems**	**Course Category**	**PCC**
Contact Hrs/Week	**4**	**CourseCode**	**ECE0243**

Teaching Scheme				**Exam Scheme**			
L	**T**	**P**	**Course Credits**	**MSE**	**ISE/CA**	**ESE**	**TOTAL**
3	**1**	**-**	**4**	**30**	**10**	**60**	**100**

Course Objectives:

1. Develop entity relationship data model and its mapping to relational model
2. Learn relational algebra and formulate SQL queries
3. Apply normalization techniques to normalize the database
4. Understand concepts of transaction, concurrency control and recovery techniques.

Unit No	**Contents**	**Hrs**
Unit-1	**Introduction to Database Concepts** Introduction, Characteristics of databases, File systems v/s Database systems, Data abstraction and Data Independence, DBMS system architecture, Database Administrator.	**7 Hrs**
Unit-2	**Entity–Relationship Data Model** The Entity-Relationship (ER) Model, Entity types: Weak and strong entity sets, Entity sets, Types of Attributes, Keys Extended Entity-Relationship (EER) Model: Generalization, Specialization and Aggregation	**7 Hrs**
Unit-3	**Relational Model and Relational Algebra** Introduction to the Relational Model, Relational schema and concept of keys, Mapping the ER and EER Model to the Relational Model, Relational Algebra – operators, Relational Algebra Queries.	**7 Hrs**
Unit-4	**Structured Query Language (SQL)** Overview of SQL, Data Definition Commands, Integrity constraints: Key constraints, Domain Constraints, Referential integrity, Check constraints Data Manipulation commands, Data Control commands, Set and string operations, aggregate function - group by, having, Views in SQL, joins, Nested and complex queries, Triggers.	**7 Hrs**
Unit-5	**Relational–Database Design** Pitfalls in Relational-Database designs, Concept of normalization Function Dependencies, First Normal Form, 2NF, 3NF, BCNF.	**6 Hrs**
Unit-6	**Transactions Management and Concurrency and Recovery** Transaction Concept, Transaction states, ACID properties, Transaction Control Commands, Concurrent Executions, Serializability: Conflict and View, Concurrency Control: Lock-based, Timestamp-based protocols, Recovery System: Log based recovery Deadlock handling	**7 Hrs**

Course Outcomes:

After successful completion of the course students will be able to:

1. Recognize the need of database management system
2. Design ER and EER diagram for real life applications
3. Construct relational model and write relational algebra queries.
4. Formulate SQL queries
5. Apply the concept of normalization to relational database design.
6. Describe the concepts of transaction, concurrency and recovery

Text Books:

1. Korth, Slberchatz, Sudarshan, Database System Concepts, 6th Edition, McGraw Hill

2. Elmasri and Navathe, Fundamentals of Database Systems, 5th Edition, Pearson education

3. Raghu Ramkrishnan and Johannes Gehrke, Database Management Systems, TMH

Reference Books:

1. Peter Rob and Carlos Coronel, Database Systems Design, Implementation and Management‖, Thomson Learning, 5th Edition

2. Dr.P.S. Deshpande, SQL and PL/SQL for Oracle 10g, Black Book, Dreamtech Press

3. G. K. Gupta, Database Management Systems, McGraw Hill., 2012

Shivaji University, Kolhapur

Second Year B. Tech. Electrical and Computer Engineering

Semester – IV

Course Title	**Electrical Machines-II Lab**	**Course Category**	**PCC**
ContactHrs/Week	**2**	**Course Code**	**ECE0244**

Teaching Scheme				**Exam Scheme**			
L	**T**	**P**	**Course Credits**	**MSE**	**ISE/CA**	**ESE**	**TOTAL**
--	**-**	**2**	**1**	**--**	**25**	**25**	**50**

Course Objectives:

1. To perform tests on DC Machines to determine their characteristics.
2. To study the different control methods for DC Motors.
3. To conduct test for pre-determination of the performance characteristics of DC Machines.
4. To conduct load test on single-phase and three-phase Induction Motor.
5. To conduct test on Induction Motor to determine performance characteristics.
6. To conduct test on synchronous motor to draw performance curves.

S.No.	**Experiments**
1	Load test on DC shunt motor to draw speed–torque and horse power–efficiency characteristics.
2	Speed control of DC shunt motor by armature and field control.
3	Swin burne's Test on DC motor.
4	Load test on three phase induction motor.
5	No-load and Blocked rotor test on three phase induction motor to draw (i) equivalent circuit and (ii) circle diagram. Determination of performance parameters at different load conditions.
6	Load test on single phase induction motor to draw output versus torque, current, power and efficiency characteristics.
7	Conduct suitable tests to draw the equivalent circuit of single-phase induction motor and determine performance parameters.
8	Conduct an experiment to draw V and Inverted V curves of synchronous motor at no load and load conditions.
9	Analyze current and load torque of DC Shunt Motor using Simscape
10	Model 3-phase induction motor using MATLAB and Simulink

Course Outcomes:

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

1. Perform tests on DC Machines to determine their characteristics.
2. Control the DC Motors using different methods.
3. Pre-determination the performance characteristics of DC Machines.
4. Conduct load test on single-phase and three-phase Induction Motor and draw performance characteristics.
5. Conduct test on Induction Motor to determine performance characteristics.
6. Conduct test on synchronous motor to draw performance curves.

Shivaji University, Kolhapur

Second Year B. Tech. Electrical and Computer Engineering

Semester – IV

Course Title		**Analog and Digital Electronics Lab**		**Course Category**		**PCC**	
ContactHrs/Week		**2**		**Course Code**		**ECE0245**	
Teaching Scheme				**Exam Scheme**			
L	**T**	**P**	**Course Credits**	**MSE**	**ISE/CA**	**ESE**	**TOTAL**
-	**-**	**2**	**1**	**--**	**50**	**25**	**75**

Course Objectives:

1. To understand the characteristics of BJT, FET and OP-AMP
2. To learn basic techniques for the design of digital circuits and fundamental concepts used in the design of digital systems.
3. To understand the concepts of combinational logic circuits and sequential circuits

S.No.	**Experiments**
1	V-I Characteristics of Transistor.
2	V-I Characteristics of JFET.
3	To conduct Inverting and Non-inverting amplifier
4	Study of IC 555 as Astable multi-vibrator
5	Realization of logic functions with the help of Universal Gates (NAND, NOR)
6	Verify Half and Full adder.
7	Verify the truth table of RS & JK flip-flops using NAND and NOR gates
8	Verify the truth table of Comparator.

Course Outcomes:

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

1. Know the characteristics of various components.
2. Known about the logic families
3. Analyse combinational and sequential circuits.

Shivaji University, Kolhapur

Second Year B. Tech. Electrical and Computer Engineering

Semester – IV

Course Title		**Python Programming Lab**		**Course Category**		**PCC**	
ContactHrs/Week		**2**		**Course Code**		**ECE0246**	
Teaching Scheme				**Exam Scheme**			
L	**T**	**P**	**Course Credits**	**MSE**	**ISE/CA**	**ESE**	**TOTAL**
-	**-**	**2**	**1**	**--**	**25**	**25**	**50**

Course Objectives:

1. To be able to introduce core programming basics and various Operators of Python programming language.
2. To demonstrate about Python data structures.
3. To Understand Electrical/ Electronic network parameters using Python.

List of experiments:

1. Calculation of Force, Electric field and Potential at a given point using Python commands.
2. Calculation of ripple factor for a given rectifier: Half-wave/Full-wave/Bridge circuit using Python program.
3. Obtain the characteristics for the given circuit using Maximum power transfer theorem.
4. Modelling of an electrical circuit using Python program.
5. Apply Nodal analysis and Mesh analysis for a given electrical circuit.
6. Conversion between Star-Delta configurations and generate three phase voltage waveforms for Star and Delta configurations using Python commands.
7. Generate Continuous and Discrete time signals for elementary functions.
8. Obtain the response of a Second-order system (Time-response, Root locus, Bode plot).
9. Calculation of the equivalent circuit parameters and efficiency of a Transformer at different loads using Python commands

Course outcomes

At the end of the Course, the student shall be able to

1. Illustrate Decision Making statements and Functions.
2. Develop programs with different data types such as lists, tuples and strings.
3. Assess the Object properties and use for GUI applications.
4. Evaluate the electrostatic field parameters using Python
5. Determine the Electrical/ Electronic network parameters using Python

Text books:

1. Y. Daniel Liang, Introduction to programming using Python, 1st Edition,Pearson Publications, 2017.
2. Sheetal Taneja, Python Programming A Modular Approach ,1st Edition Pearson Publications, 2017.

References:

1. Brett Slatkin (C), Effective Python: 59 Specific Ways to Write Better Python, I/C, 1st Edition Pearson Publications, 2015.
2. Ashok Namdev Kamathane and Amit Ashok Kamathane, Programming and Problem Solving

with Python , 1st Edition, McGraw Hill Education (India) Private Limited, 2017.

Web references:

1. https://pyspice.fabrice-salvaire.fr/releases/v1.6
2. https://tbc-python.fossee.in/convert notebook/Electrical_Circuit_Theory_And_Technology
3. https://wiki.python.org/moin/PythonBooks

Shivaji University, Kolhapur
Second Year B. Tech. Electrical and Computer Engineering
Semester – IV

Course Title	Python Programming	Course Category	MDM
ContactHrs/Week	2	Course Code	ECE0247

Teaching Scheme				Exam Scheme			
L	T	P	Course Credits	MSE	ISE/CA	ESE	TOTAL
2	-	-	2	30	10	60	100

Course Objectives:

1. Gain knowledge about basic Python language syntax and semantics to write Python programs using the procedure-oriented programming paradigm.
2. Appreciate the usage of high-level data constructs provided by Python and work with file and exception handling mechanisms.
3. Write Python applications using the object-oriented programming paradigm.
4. Become acquainted with the development of database and GUI applications and usage of various packages.

Unit No	Contents	Hrs
Unit-1	**Python Fundamentals:** **An Introduction to Python programming**: Introduction to Python, IDLE to develop programs. **How to write your first programs**: Basic coding skills, data types and variables, numeric data, string data, five of the Python functions. **Control statements**: Boolean expressions, selection structure, iteration structure.	5 Hrs
Unit-2	**Define and use Functions and Modules:** define and use functions, more skills for defining and using functions and modules, create and use modules, standard modules **Higher Data Constructs:** **Lists and tuples**: Basic skills for working with lists, list of lists, more skills for working with lists, tuples **Dictionaries**: get started with dictionaries, more skills for working with dictionaries	5 Hrs
Unit-3	**Files, Exception Handling, Database Programming** **File I/O**: An introduction to file I/O, text files, CSV files, binary files **Exception Handling:** handle a single exception, handle multiple exceptions **Work with a database**: An introduction to relational databases, SQL statements for data manipulation, SQLite Manager to work with a database, use Python to work with a database	5 Hrs
Unit-4	**Object Oriented Programming** **Define and use your own classes:** An introduction to classes and objects, define a class, object composition, encapsulation **Inheritance:** Inheritance, override object methods	5 Hrs
Unit-5	**Packages:** **How to build a GUI Program**: Create a GUI that handles an event	5 Hrs

	Numpy Basics: Arrays and Vectorized Computation: Creating ndarrays, Data Types for ndarrays, Operations between Arrays and Scalars, Basic Indexing and Slicing, Indexing with slices, Boolean Indexing, Transposing Arrays and Swapping Axes	
Unit-6	**Getting started with Pandas:** Introduction to Pandas Data Structures, Summarizing and Computing Descriptive Statistics, Handling missing data	**5 Hrs**

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

1. Illustrate basic principles of Python programming and Develop programs using the procedure-oriented programming paradigm.
2. Develop Python programs for file operations, exception handling, GUI, database operations and Make use of different packages for computing and manipulation.
3. Explain the concepts of object-oriented programming paradigm and apply the same to develop programs.
4. Apply the learnings inculcated throughout the course by developing a course project.

Textbooks

1. Michael Urban and Joel Murach, Python Programming, Shroff/Murach, 2016Hadi Saadat, Power System Analysis, Tata McGraw-Hill.
2. Wes McKinney, Python for Data Analysis, OReilly, 1st Edition, 2012
3. SciPy and NumPy, O`Reilly, 1st Edition, 2012, Mark Lutz, Programming Python, O`Reilly, 4th Edition, 2010.

Reference Books

1. SciPy and NumPy, O`Reilly, 1st Edition, 2012
2. Mark Lutz, Programming Python, O`Reilly, 4th Edition, 2010

Shivaji University, Kolhapur
Second Year B. Tech. Electrical and Computer Engineering
Semester – IV

Course Title		Electrical Design Estimation and Costing		Course Category		OE-2	
Contact Hrs/Week		2		Course Code		ECE0248	
Teaching Scheme				Exam Scheme			
L	T	P	Course Credits	MSE	ISE/CA	ESE	TOTAL
2	0	0	2	30	10	60	100

Course Objectives:

1. To discuss the purpose of estimation and costing.
2. To discuss different types of wiring systems.
3. To discuss different types of service mains.
4. To Design and Estimation of Power Circuits
5. To discuss Overhead Transmission and Distribution Line systems
6. To discuss the protective equipment used in substation.

Unit No	Contents	Hrs
Unit-1	**Principles of Estimation:** Introduction to Estimation and Costing, Electrical Schedule, Catalogues, Market Survey and Source Selection, Recording of Estimates, Determination of Required Quantity of Material, Labour Conditions, Determination of Cost Material and Labour, Contingencies, Overhead Charges, Profit, Purchase System, Purchase Enquiry and Selection of Appropriate Purchase Mode, Comparative Statement, Purchase Orders, Payment Of Bills, Tender Form.	6 Hrs
Unit-2	**Wiring:** Introduction, Distribution of energy in a Building, PVC Casing and Capping, Conduit Wiring, Types of cables used in Internal Wiring, Multi Strand Cables, Voltage Grading and Specification of Cables Wiring, **Internal Wiring:** General rules for wiring, Design of Lighting Points, Number of Points, Determination of Total Load, Number of Sub –Circuits, Ratings Main Switch and Distribution Board and Size of Conductor. Current Density, Layout.	5 Hrs
Unit-3	**Service Mains:** Introduction, Types, Estimation of Underground and Overhead Service Connections. Design and Estimation of service mains.	4 Hrs
Unit-4	**Design and Estimation of Power Circuits:** Introduction, Important Considerations Regarding Motor Installation Wiring, Input Power, Input Current to Motors, Rating of Cables, Rating of Fuse, Size of Condit, Distribution Board Main Switch and Starter.	4 Hrs

Unit-5	**Overhead Transmission and Distribution Line:** Main Components of overhead line, Line Supports, Conductor Materials, Size of Conductor for Overhead Transmission Line, Types of Insulators, Cross Arms, Pole Brackets and Clamps, Guys and Stays, Conductors Configuration Spacing and Clearances, Span Lengths.	**5 Hrs**
Unit-6	**Protecting equipment used in substations:** Lightning Arrestors, Phase Plates, Danger Plates, Anti Climbing Devices, Bird Guards, Beads of Jumpers, Muffs, Points to be Considered at the Time of Erection of Overhead Lines, Erection of Supports, Setting of Stays, Fixing of Cross Arms, Fixing of Insulators, Conductor Erection.	**6 Hrs**

Course Outcomes:

1. Explain the purpose of estimation and costing.
2. Analyse the different types of wiring systems.
3. Analyse the different types of service mains.
4. Understand power circuits and its wiring system.
5. Understand Overhead Transmission and Distribution line system.
6. Understand the Protecting equipment used in substations.

Text Books:

1. A Course in Electrical Installation Estimating and Costing, J. B. Gupta, Katson Books,, 9 th Edition, 2012

Reference Book

1. Electrical Design Estimating and Costing, K.B. Raina, S.K. Bhattacharya, New Age International Publisher.
2. Electrical InstallationandEstimating, SurjitSingh, Dhanpatrai AndSons**.**

Shivaji University, Kolhapur
Second Year B. Tech. Electrical and Computer Engineering
Semester – IV

Course Title		**Strategic Management**		**Course Category**		**HSSM**	
ContactHrs/Week		**2**		**CourseCode**		**ECE0249**	
Teaching Scheme				**Exam Scheme**			
L	**T**	**P**	**Course Credits**	**MSE**	**ISE/CA**	**ESE**	**TOTAL**
2	**-**	**-**	**2**	**---**	**50**	**---**	**50**

Course Objectives:

1. To understand the fundamental concepts of strategic management, its scope, and the role of top management in decision-making.
2. To explore the process of strategy formulation and its impact on business growth.
3. To analyze business environments using environmental scanning techniques and SWOT analysis.
4. To study various competitive strategies and business models adopted by organizations.
5. To understand the implementation and evaluation of strategies using various performance measurement tools.
6. To explore the impact of emerging trends like AI, digital transformation, and globalization on business strategies.

Unit No	**Contents**	**Hrs**
Unit-1	**Introduction to Strategic Management:** Meaning and importance of strategy formulation, Types of strategies: Corporate, Business, and Functional strategies, Vision, Mission, and Objectives of an organization, Strategy formulation process, Case study on real-world strategy formulation	**2 Hrs**
Unit-2	**Strategy Formulation**: Meaning and importance of strategy formulation, Types of strategies: Corporate, Business, and Functional strategies, Vision, Mission, and Objectives of an organization, Strategy formulation process, Case study on real-world strategy formulation	**2 Hrs**
Unit-3	**Environmental Analysis and SWOT Analysis:** Understanding business environment: Internal and External, Environmental scanning techniques, PESTLE analysis (Political, Economic, Social, Technological,Legal, Environmental), SWOT analysis: Strengths, Weaknesses, Opportunities, Threats Industry analysis: Porter's Five Forces Model	**2 Hrs**

Unit-4	**Competitive Strategies and Business Models** : Competitive strategies: Cost Leadership, Differentiation, and Focus strategies, Generic strategies by Michael Porter, Business models: Traditional vs. Digital models, Case studies on competitive strategies adopted by leading companies, Role of innovation in business strategy, Evaluation of initial conditions.	**2 Hrs**
Unit-5	**Strategy Implementation and Evaluation:** Concept and process of strategy implementation, Challenges in strategy execution, Resource allocation and budgeting, Balanced Scorecard approach, Strategy evaluation techniques: Key Performance Indicators (KPIs) and Performance metrics	**2 Hrs**
Unit-6	**Emerging Trends in Strategic Management:** Digital transformation and its impact on strategic management, Sustainability and Green Business Strategies, Globalization and its effect on strategy formulation, Impact of Artificial Intelligence (AI) and Big Data on strategic decision- making, Future trends in strategic management	**2 Hrs**

Course Outcomes:

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

1.Learners will be able to explain strategic management concepts and differentiate between strategic planning and strategic management.

2.Learners will be able to describe corporate, business, and functional strategies and their significance.

3.Learners will be able to conduct SWOT and PESTLE analysis for a given business scenario.

4.Learners will be able to compare and apply different competitive strategies in real-world cases.

5.Learners will be able to use the Balanced Scorecard and KPIs to evaluate business performance

6.Learners will be able to explain how digital transformation and sustainability influence strategic decision-making

Text Books:

1.Strategic Management: Concepts and Cases, Fred R. David & Forest R. David, Pearson Education.

2.Strategic Management: A Competitive Advantage Approach, Thomas L. Wheelen & J. David Hunger, Pearson.

3.Crafting and Executing Strategy: The Quest for Competitive Advantage, Arthur A. Thompson, A.J. Strickland & John E. Gamble, McGraw-Hill.

4.Strategic Management and Business Policy, Azhar Kazmi, McGraw-Hill.

5.Exploring Corporate Strategy, Gerry Johnson, Kevan Scholes & Richard Whittington, Pearson

Education.

6.Strategic Management: Theory and Practice, John A. Parnell, Sage Publications

7.Strategic Management: Planning for Domestic & Global Competition, John A. Pearce & Richard B. Robinson, McGraw-Hill.

Reference Books:

1. Strategic Management: Concepts and Cases – Fred R. David & Forest R. David, Pearson Education.
2. Strategic Management: A Competitive Advantage Approach – Thomas L. Wheelen & J. David Hunger, Pearson.
3. Strategic Management and Business Policy – Azhar Kazmi, McGraw-Hill.
4. Exploring Corporate Strategy– Gerry Johnson, Kevan Scholes & Richard Whittington, Pearson Education.
5. Strategic Management: Theory and Practice– John A. Parnell, Sage Publications

Shivaji University, Kolhapur

Second Year B. Tech. Electrical and Computer Engineering

Semester – IV

Course Title	**Professional Ethics**	**Course Category**	**HSSM**
ContactHrs/Week	**2**	**CourseCode**	**ECE02410**

Teaching Scheme				**Exam Scheme**			
L	**T**	**P**	**Course Credits**	**MSE**	**ISE/CA**	**ESE**	**TOTAL**
2	**--**	**-**	**2**	**---**	**25**	**---**	**25**

Course Objectives:

1. To understand the fundamental concepts of ethics and professionalism in a workplace.
2. To study ethical theories and their application in professional decision-making.
3. To explore the principles of corporate governance and ethical leadership in organizations.
4. To understand workplace ethics and responsibilities of professionals.
5. To examine the ethical challenges posed by technology and digital transformation.
6. To study the ethical aspects of environmental sustainability and global corporate ethics.

Unit No	**Contents**	**Hrs**
Unit-1	**Introduction to Ethics and Professionalism:** Meaning, scope, and importance of ethics, Difference between ethics, morals, and values, Professional ethics vs. personal ethics, Role of ethics in decision-making, Ethical dilemmas in the workplace	**2 Hrs**
Unit-2	**Ethical Theories and Decision-Making Models:** Utilitarianism, Deontology, and Virtue Ethics, Ethical decision-making frameworks, Corporate social responsibility (CSR) and its importance, Application of ethical theories in business	**2 Hrs**
Unit-3	**Corporate Governance and Ethical Leadership:** Principles of corporate governance, Ethical leadership and corporate culture, Role of board of directors in governance, Case studies on corporate frauds (e.g., Enron, Satyam).	**2 Hrs**
Unit-4	**Workplace Ethics and Professional Responsibilities**: Ethical behavior in the workplace, Rights and responsibilities of employees and employers, Workplace discrimination and harassment, Code of conduct and professional responsibility.	**2 Hrs**
Unit-5	**Technology and Ethics:** Ethical issues in AI, automation, and data privacy, Cyber security ethics, Intellectual property rights and plagiarism, Ethical considerations in social media usage	**2 Hrs**

Unit-6	**Environmental and Global Ethics:** Business ethics in environmental sustainability, Ethical trade and globalization issues, Ethical consumerism and fair trade, Sustainable development goals (SDGs)	**2 Hrs**

Course Outcomes:

1. Learners will be able to explain the significance of ethics and ethical dilemmas in professional life.
2. Learners will be able to describe different ethical theories and their relevance in business ethics.
3. Learners will be able to apply corporate governance principles to analyze Ethical leadership.
4. Learners will be able to apply ethical principles to workplace scenarios and Professional responsibilities.
5. Learners will be able to describe the ethical issues related to technology and privacy
6. Learners will be able to apply ethical frameworks in sustainability and global business ethics.

Text Books:

1. Professional Ethics and Human Values", R. S. Naagarazan, New Age International Publishers.
2. Ethics in Engineering", Mike W. Martin & Roland Schinzinger, McGraw-Hill Education.
3. Professional Ethics and Corporate Governance", A. C. Fernando, Pearson Education.
4. Business Ethics: Concepts and Cases", Manuel G. Velasquez, Pearson Education.
5. Engineering Ethics", Charles B. Fleddermann, Pearson Education

Reference Books:

1. Professional Ethics and Human Values" – R. S. Naagarazan, New Age International Publishers.
2. Ethics in Engineering" – Mike W. Martin & Roland Schinzinger, McGraw-Hill Education.
3. Professional Ethics and Corporate Governance" – A. C. Fernando, Pearson Education.
4. Business Ethics: Concepts and Cases" – Manuel G. Velasquez, Pearson Education.
5. Engineering Ethics" – Charles B. Fleddermann, Pearson Education.
6. Ethics and the Conduct of Business" – John R. Boatright, Pearson Education.
7. Corporate Ethics, Governance, and Social Responsibility" – S. K. Bhatia, Deep & Deep Publications.

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

Unit No	Content	Hours
Unit 1	**Nature of Environmental Studies and Importance of ecosystems.**	
	• Definition, scope and importance. • Multidisciplinary nature of environmental studies • Need for public awareness. **Ecosystem** • Concept of an ecosystem. • Structure and function of an ecosystem. • Producers, consumers and decomposers. • Food chains, food webs and ecological pyramids • Introduction, types, characteristics features, structure and function of the following ecosystem a) Forest ecosystem, b) Grassland ecosystem, c) Desert ecosystem, d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) • Degradation of the ecosystems and it's impacts.	**06 Hrs**
Unit 2	**Natural Resources and Associated Problems.**	
	• Forest resources: Use and over-exploitation, deforestation, dams and their effects on forests and tribal people. • Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. • Mineral resources: Usage and exploitation. Environmental effects of extracting and using mineral resources. • Food resources: World food problem, changes caused by agriculture, effect of modern agriculture, fertilizer-pesticide problems. • Energy resources: Growing energy needs, renewable and non- renewable energy resources, use of alternate energy sources. Solar energy, Biomass energy. • Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. • Role of individuals in conservation of natural resources. Equitable use of resources for sustainable lifestyles.	**06 Hrs**

Unit 3	**Social Issues and the Environment**	
	• Human population growth and impact on environment. • Environmental ethics: Role of Indian religious traditions and culture in conservation of the environment. • Environmental movements- Chipko Movement, Appiko Movement, Silent Valley Movement. • Resettlement and rehabilitation of people; its problems and concerns. • Water conservation, rain water harvesting. • Disaster management: floods, earthquake, cyclone, tsunami and landslides, Case studies.	**04 Hrs**
Unit 4	**Environmental Pollution**	
	• Definition: Causes, effects and control measures of: Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Global warming, acid rain, ozone layer depletion. • Solid waste Management: Causes, effects and control measures of urban and industrial wastes. Solid waste management, control & rules, • Role of an individual in prevention of pollution	**04 Hrs**
Unit 5	**Biodiversity and its conservation:**	
	• Introduction- Definition: genetic, species and ecosystem diversity. • Bio-geographical classification of India. • Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. • India as a mega- diversity nation. • Western Ghat as a biodiversity region. Hot-spots of biodiversity. • Threats to biodiversity: habitat loss, poaching of wildlife, man- wildlife conflicts, • Conservation of biodiversity: In-situ and Ex- situ conservation of biodiversity.	**04 Hrs**
	Environmental Protection-Policies and practices	
Unit 6	• Environment Protection Act. • Air (Prevention and Control of Pollution) Act. • Water (Prevention and control of Pollution) Act • Wildlife Protection Act • Forest Conservation Act • National and International Conventions and agreements on environment.	**04 Hrs**

Field work: (Field work is equal to 4 lectures) **10 marks**

Note - The ISE/CA is carried out through the Field work 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, hill slopes, 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.1196, Environmental Science Systems & Solutions, Web enhanced edition, 639p
7	Mhaskar A.K., Master Hazardous, Techno-Science Publications (TB)

Shivaji University, Kolhapur
Second Year B. Tech. Electrical and Computer Engineering
Semester – IV

Course Title	**Mini Project**	**Course Category**	**VSEC**
ContactHrs/Week	**2**	**CourseCode**	**ECE02412**

Teaching Scheme				**Exam Scheme**			
L	**T**	**P**	**Course Credits**	**MSE**	**ISE/CA**	**ESE**	**TOTAL**
--	**-**	**2**	**1**	**---**	**50**	**---**	**50**

Course Objectives:

1. Encourage application of theoretical knowledge gained in core electrical engineering subjects to practical, real-world problems.
2. Enhance proficiency in engineering design through the development of small-scale projects involving hardware/software tools and circuit simulation platforms.
3. Develop problem-solving and analytical skills by identifying, formulating, and implementing solutions in the field of electrical engineering.
4. Introduce students to project planning and management techniques, including time management, resource allocation, and progress tracking.
5. Promote innovation and creativity by encouraging students to develop novel ideas, prototypes, or process improvements.

Mini project work should consist of following steps

1. Students should propose project ideas & finalize the project idea in consultation with guide.
2. Students should submit implementation plan in the form of CPM (Critical Path Method chart) chart, which will cover weekly activity of project report.
3. Problem definition and specification development in the form of synopsis.
4. Design of circuit with calculation & should include materials used with their specification.
5. Design & assembly of hardware part of the mini project/Simulation of design using simulation softwares etc.
6. Testing & Validation of the result.

Course Outcomes:

1. Apply theoretical knowledge from core electrical engineering subjects to solve practical, real-world problems.
2. Demonstrate proficiency in engineering design by developing small-scale projects using hardware/software tools and circuit simulation platforms.
3. Develop problem-solving and analytical skills by identifying, formulating, and implementing effective solutions in electrical engineering.
4. Apply project planning and management techniques, including time management, resource allocation, and progress tracking, in engineering tasks.
5. Foster innovation and creativity by encouraging the development of novel ideas, prototypes, or process improvements.

Note: -

1. Project report should include report of all above steps and conclusion.
2. Project group should demonstrate and deliver seminar on project.
3. A mini project should not exceed three students per group.

SY B.Tech Exit Course

Exit option : Award of UG Diploma in Major with 88 credits and an additional 8 credits from following Exit Courses				
Sr. No	**Course Code**	**NPTEL Course Title**	**Mode**	**Credits**
1	NPTEL	Electricity and Electrical Wiring	Online/offline certification Courseor project of total 8 credits	3
2	NPTEL	Artificial Intelligence		3
Virtual Lab				
1	Virtual Lab	Electrical Machines Lab		1
2	Virtual Lab	Computer Organization Lab		1