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

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

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.

Electronics and Tele-Communication 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.

ELECTRONICS AND TELECOMMUNICATION ENGINEERING

First Year Exit Course

Bucket List of NPTEL course and Virtual Lab course

Choose any Two as F. Y. Exit Course after completion of Semester II from given below list. Corresponding lab need to be chosen based on NPTEL course selected as MOOC course. Exit course covers total 08 credits which include NPTEL Courses cover 06 credits (03 credit of each) and virtual lab cover 02 credits (01 credit of each).

Bucket list cum correlative course and lab Table		
Sr. No.	**NPTEL Course Title**	**Virtual Lab Title**
1	Communication Networks	Analog Electronics Circuits Virtual Lab
2	Principles of Communication Systems - I	Analog and Digital Lab-1
3	Analog Circuits	Analog Electronics Lab
4	Digital Electronic Circuits	Digital Electronics 1 Lab
5	Principles of Digital Communication	Basic Electronics Virtual Laboratory

Note:

1. There is an uncertainty of the availability of the NPTEL courses mentioned above as there is constant updation of the courses. The students can choose equivalent subjective course of the required duration with permission from the concerned institute.

2. To fulfill the required credit score of 03 credits and taking the courses available in consideration students can go for 1 course of 12 week or 2 course of 8 week or 3 courses of 4 weeks.

3. For NPTEL course visit to website https://swayam.gov.in and register and create your account. Log in the account and join the required course and follow the instructions to compete the course. Similarly, for Virtual Lab visit to website https://www.vlab.co.in and (sometimes need register and create your account, also log in the account and) join the required lab and follow the instructions to compete the course (need to do all listed experiment under that Lab).

Details of NPTEL Course (https://swayam.gov.in)			
Sr. No.	**NPTEL Course Title**	**Duration**	**Credit**
1	Communication Networks	12 Week	03
2	Principles of Communication Systems - I	12 Week	03
3	Analog Circuits	08 Week	02
4	Digital Electronic Circuits	12 Week	03
5	Principles of Digital Communication	12 Week	03

Details of Virtual Lab Course (https://www.vlab.co.in)			
Sr. No.	**Vitual Lab Course Title**	**Supporting Institution**	**Credit**
1	Analog Electronics Circuits Virtual Lab	IIT Kharagpur	
2	Analog and Digital Electronics Lab-1	IIIT Roorkee	
3	Analog Electronics Lab	IIIT Roorkee	
4	Digital Electronics 1 Lab	IIIT Roorkee	
5	Basic Electronics Virtual Laboratory	IIT Kharagpur	

Distribution of the credits:

1. Two MOOCs Certification Courses (NPTEL):

Each course is worth 3 credits. These courses are likely to be available online and can be completed at the student's own pace within a set timeframe. The content will be specific to the student's field of study or program.

2. Virtual Lab:

The student must complete two virtual lab work that adds 2 credits to simulate practical or experimental learning experiences in a controlled virtual environment.

Examination scheme for first year exit:

The marks gained from the two MOOCs are converted to a total of 100 marks. The report for the performed two Virtual Lab practices 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.

Direct Second Year Entry Course

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

Sr. No.	Semester	Subject	Credit
1	III	Basics of Electronics Engineering	2

Distribution of the credits:

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

Examination scheme for direct second year entry students:

Students admitted directly into the second year of a program from another program 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 program 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 Examination Section, Engineering and Technology, Shivaji University, Kolhapur.

SHIVAJI UNIVERSITY, KOLHAPUR
ELECTRONICS AND TELECOMMUNICATION ENGINEERING
ENTRY LEVEL COURSE FOR DSY E&TC ENGINEERING
ETC-EC- Basics of Electronics Engineering

Course Details:

Class	F. Y. B-Tech
Course Code & Course Title	ETC-EC- Basics of Electronics Engineering
Prerequisites:	Basics of Electronics
Teaching scheme: Lecture / Practical	----
Credits	02
Evaluation Scheme (ISE /CA) / MSE / ESE	---

Teaching Scheme	Examination Scheme
Lectures : 03 Hrs. /week	---
Practical: 0 Hrs. /Week	--

Course Objectives: The course aims to:	
1	To introduce the fundamental concepts and key electronic components
2	To develop skills in analyzing and designing basic electronic circuits.
3	To familiarize students with essential electronic tools, instruments, and measurement techniques.

Course Outcomes: Upon successful completion of this course, the student will be able to:	
ETC-EC-0201.01	Identify and describe key electronic concepts and components (resistors, capacitors, diodes, transistors).
ETC-EC-0201.02	Identify series, parallel, electronics circuits.
ETC-EC-0201.03	Explain the use of testing, measuring equipments.

Course Contents		
Unit 01	**Introduction to Electronics Engineering:** Definition and scope of electronics engineering, Overview of electronics and its applications. Basic concepts: Voltage, current, resistance, and power.	---
Unit 02	**Electronic Components and Their Working:** Passive Components: Resistors, capacitors, inductors, Working principles, symbols, and color codes. Active Components: Diodes, transistors (BJT, FET), Basic working and applications of PN junction diode, Transistor types and their applications.	---
Unit 03	**Basic Electronic Circuits:** Series and parallel circuits, Analyzing simple resistive circuits, Voltage and current dividers.	---
Unit 04	**Semiconductor Devices and Applications:** Semiconductors: Intrinsic and extrinsic properties, PN junction, forward and reverse biasing, Bipolar Junction Transistor (BJT): Working and characteristics for common emitter configurations.	---
Unit 05	**Introduction to Digital Electronics:** Digital vs. analog signals, Binary number system and logic gates (AND, OR, NOT)	---
Unit 06	**Electrical and Electronics Instrument:** Introduction to measurement instruments: Multimeters, oscilloscopes, power supplies, Signal generation: Function generators and waveform analysis, Power supplies and their use in electronics experiments	---

Text Books:

Sr. No.	Name of Author and Publication Details
1	Ramakanth N. Basic Electronics Engineering. Pearson.
2	Malvino A. P., & Leach, D. P. Digital Principles and Applications. McGraw-Hill Education.
3	Hambley A. R. Electronics for Engineers: An Introduction to Electrical and Electronics Engineering. Pearson.

Reference Books:

Sr.No.	Name of Author and Publication Details
1	Boylestad R. L., & Nashelsky, L. Electronic Devices and Circuit Theory. Pearson.
2	Grob B., & Schultz, M. Basic Electronics: A Text-Lab Manual. McGraw-Hill Education.

SCHEME OF INSTRUCTION & SYLLABI

Name of Programme: Electronics and Telecommunication Engineering

Scheme of Instructions: Second Year B.Tech.in Electronics and Telecommunication 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	ETC0231	Network Analysis	3	--	--	3	3	30	10	60	100
2	PCC	ETC0232	Analog Circuit Design	3	--	--	3	3	30	10	60	100
3	PCC	ETC0233	Analog and Digital Communication	3	--	--	3	3	30	10	60	100
4	PCC	ETC0210	Mathematics for Electronics Engineering	2	--	--	2	2	30	10	60	100
5	EL	ETC0234	Analog and Digital Communication Lab	--	--	2	2	1	--	10	50	60
6	MDM	ETC0235	Multi-disciplinary Minor–01	2	--	--	2	2	30	10	60	100
7	OE	ETC0236	Open Elective -01	3	--	--	3	3	30	10	60	100
8	HSSM	ETC0237	Universal Human Values	1	--	--	1	1	--	10	--	10
9	CEP/FP	ETC0238	Analog Circuit Design Lab	--	--	2	2	1	--	10	50	60
10	HSSM	ETC0239	Soft Skill Development	2	--	--	2	2	--	20	--	20
11	OE	ETC0240	Open Elective -01 Lab	--	--	2	2	1	--	25	25	50
			Total	**19**	--	**6**	**25**	**22**	**180**	**135**	**485**	**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 and Skill Enhancement Course (VSEC)	Humanities Social Science and Management (HSSM)	Experiential Learning (EL)	Co-curricular And Extracurricular Activities (CCA)
Last Sem. Cumulative Sum	**16**	**16**	**--**	**--**	**--**	**06**	**04**	**--**	**02**
Semester Credits	**--**	**--**	**11**	**--**	**05**	**--**	**04**	**02**	**--**
Cumulative Sum	**16**	**16**	**11**	**--**	**05**	**06**	**08**	**02**	**02**

PROGRESSIVE TOTAL CREDITS: 44 + 22 = 66

SCHEME OF INSTRUCTION & SYLLABI

Name of Programme: Electronics and Telecommunication Engineering

Scheme of Instructions: Second Year B.Tech.in Electronics and Telecommunication 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	ETC0241	Linear Integrated Circuits	3	--	--	3	3	30	10	60	100
2	PCC	ETC0242	Computer Network	3	--	--	3	3	30	10	60	100
3	PCC	ETC0243	Electromagnetic Engineering	3	--	--	3	3	30	10	60	100
4	MDM	ETC0244	Multi-disciplinary Minor–02	2	--	--	2	2	30	10	60	100
5	OE	ETC0245	Open Elective -02	2	--	--	2	2	30	10	60	100
6	HSSM	ETC0246	Employability Enhancement Skill	2	--	--	2	2	--	50	--	50
7	HSSM	ETC0247	Professional Ethics	2	--	--	2	2	--	20	--	20
8	PCC	ETC0248	Linear Integrated Circuits Lab	--	--	2	2	1	--	10	50	60
9	VEC	ETC0249	Electronics Workshop-I	--	--	2	2	1	--	10	50	60
10	VEC	ETC02410	Simulation Lab	--	--	2	2	1	--	10	50	60
11	BSC	ETC02411	Environmental Science	2	--	--	2	**Audit**	30	10	60	100
12	VSEC	ETC02412	Data Structure using C/C++	1	--	2	3	2	--	50	--	50
			Total	**20**	**--**	**8**	**28**	**22**	**180**	**210**	**510**	**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**	**16**	**11**	**--**	**05**	**06**	**08**	**02**	**02**
Semester Credits	**--**	**--**	**10**	**--**	**04**	**02**	**06**	**--**	**--**
Cumulative Sum	**16**	**16**	**21**	**--**	**09**	**08**	**14**	**02**	**02**

PROGRESSIVE TOTAL CREDITS : 66 + 22 = 88

Following Degrees will begin with effect from Academic Year 2026-27.

A) Bachelor's Engg./Tech. Honors Degree in chosen Major Engg./Tech. Discipline with Multidisciplinary Minor(194 credits)

B) Bachelor's Engg./Tech. Honors with Research Degree in chosen Major Engg./Tech. Discipline with Multidisciplinary Minor(194 credits)

C) Bachelor's Engg./Tech. Degree in chosen Major Engg./Tech. Discipline with Double Minor(Multidisciplinary and specialization Minor(194 credits)

List of Electives: Verticals

Specialization	Industrial Automation	IoT/Embedded System	AIML/CSE/IT	Communication
Elective-I	PLC Programming	Embedded Linux	Data Science using Python	Massive MIMO
Elective-II	Wiring Harness an Panel Design	IoT Architecture with Raspberry Pi	Artificial Intelligence	Multi-media Communication
Elective-III	Sensors and Actuators	IoT Communication Protocol	Machine Learning	Advanced Network Security
Elective-IV	SCADA & DCS	System on Chip	Deep Learning	Satellite Communication
Elective-V	Mechatronics	CAD for VLSI	Cloud Computing	Wireless Sensor Networks
Elective-VI	Robotics	Advance Processors and Design	Cyber security	Audio and Video Communication

List of Open Electives

Open Elective-01	Introduction to IoT
Open Elective-02	Control System Engineering

List of MDM

Multi-disciplinary Minor-01	Electronics System
Multi-disciplinary Minor-02	Electronics Measurements

Instructions regarding Examinations:

1. Compulsory passing with 40% marks is mandatory in ESE examinations and combined passing marks (MSE+ISE/CA+ESE) for theory course is 40%
2. Mid sem. examination will be based on 50% syllabus from beginning (First Three Units).
3. No compulsory passing for **MSE.**
4. ESE paper setting weightage will be, **25% on syllabus covered for MSE (First Three Units) and 75% on remaining syllabus (Last Three Units).**
5. Passing percentage for ESE practical examination 40%.

SHIVAJI UNIVERSITY, KOLHAPUR
ELECTRONICS AND TELECOMMUNICATION ENGINEERING
PCC-ETC0231 Network Analysis

Course Details:

Class	S. Y. B.Tech. Sem-III
Course Code & Course Title	PCC-ETC0231: Network Analysis
Prerequisites:	Fundamentals of Network Elements
Teaching scheme: Lecture / Practical	03/0
Credits	03+0
Evaluation Scheme (ISE /CA) / MSE / ESE	10/30/60

Teaching Scheme	Examination Scheme
Lectures : 03 Hrs. /week	Theory : 60 (ESE) + 30 (MSE) +10 (ISE/CA)
Practical: 0 Hrs. /Week	--

Course Objectives: The course aims to:	
1	To understand basics fundamental laws, theorems and elements of electrical circuits.
2	To understand two port networks and its parameters.
3	To understand series and parallel resonance and its effects.
4	To understand and implement filter approximations.
5	To understand transient and steady-state response of RLC circuits.

Course Outcomes: Upon successful completion of this course, the student will be able to:	
PCC-ETC0231.01	Explain the graph theory and solve problems related to graph theory and different basic laws and network theorems.
PCC-ETC0231.02	Demonstrate two port networks and significance of its parameters.
PCC-ETC0231.03	Analyze and design prototype LC filters.
PCC-ETC0231.04	Explain series and parallel resonance and address problems related to resonance.
PCC-ETC0231.05	Identify and study types of transient responses.

Course Contents		
Unit 01	**Network Fundamentals:** KVL & KCL, Mesh & Super mesh analysis, Node & Super node Analysis, Graph Theory: graph of network & its parts, tree & co-tree, incidence matrix, Tie Set matrix, cut sets.	**07 Hrs.**
Unit 02	**Network Theorems:** Superposition Theorem, Thevenin's Theorem, Norton's Theorem, Maximum Power Transfer Theorem, Reciprocity Theorem, Compensation theorem, Duality theorem, Millman's Theorem.	**07 Hrs.**
Unit 03	**Two Port Network & Network Functions:** **a)Two port network**: Z, Y, ABCD, h and Interrelation of different parameters, Interconnections of port network (Series, Parallel, Cascaded, Series-Parallel) **b) Network Functions**: Network functions for one port & two port networks, Driving point impedance & admittance function, Transfer function, Concept of complex Frequency.	**07 Hrs.**
Unit 04	**Filters:** Definitions, classification & characteristics of different filters, filter fundamental such as attenuation constant (O), phase shift (N) propagation constant (S) characteristic impedance (Zo). Design & analysis of constant K, M derived filters (low pass, high pass, band pass & band stop filters): T & Pi sections.	**06 Hrs.**

Unit 05	**Resonance :** Introduction to AC circuit, steady state analysis of RL, RC and RLC circuits, **a) Series resonance:** Properties, Bandwidth, Q factor. **b) Parallel resonance:** Properties, Bandwidth, Q factor	**06 Hrs.**
Unit 06	**Transient Response:** Network Solution using Laplace transforms, Initial Conditions of elements. Steady state & transient response (Voltage & Current) DC response of RL circuit DC response of RC circuit DC response of RLC circuit	**06 Hrs.**

Text Books:

Sr. No.	Name of Author and Publication Details
1	A. Sudhakar, Shyammohan S.Palli 'Circuits & Networks, 5th Edition –McGraw Hill Publication.
2	Ravish Singh, "Networks Analysis & Synthesis", McGraw Hill Publication.
3	A. Chakrabarti 'Circuit Theory (Analysis & Synthesis)',3rd Edition, Dhanpat Rai & Co.
4	William H. Hayt, Jack E Kimmerly and Steven M. Durbin, Engineering Circuit Analysis, McGraw Hill

Reference Books:

Sr.No.	Name of Author and Publication Details
1	D. Roy Choudhury 'Networks & Systems' - New Age International Publisher
2	Soni Gupta 'Electrical Circuit Analysis' Dhanpat Rai & Co.
3	Boylestad 'Introductory Circuit Analysis, Universal book stall, New Delhi.
4	M.E. Van Valkenburg ' Network Analysis', 3rd Edition , Pearson Education / PHI
5	Josheph Edministrar 'Theory & Problems of Electronic Circuit (Schaum's series), McGraw Hill, Publication
6	R.G .Kaduskar, S.O.Rajankar, T.S. Khatavkar, Network Fundamentals and Analysis, Wiley

List of Assignments/Tutorials for ISE/CA:

- Minimum 06 Assignments/Tutorials based on the curriculum.

Examination Scheme and Guidelines:

<table>
<tr><td>ISE/CA
10 Marks</td><td>ISE/CA-In Semester Evaluation/Continuous Assessment.</td></tr>
<tr><td>MSE
30 Marks</td><td>Examination of 30 marks based on Units 1, 2, and 3 should be conducted, and marks should be communicated to the university.
One question of 06 Marks based on MCQ’s compulsory.</td></tr>
<tr><td rowspan="7">ESE
60 Marks</td><td>ESE-End Semester Examination
25% marks based on questions of Unit 1, 2, and 3, and 75% marks based on questions of Unit 4, 5, and 6.</td></tr>
<tr><td>Instructions for Paper Setter</td></tr>
<tr><td>Que.1: MCQ’s based on All Units (Carries 12 Marks).</td></tr>
<tr><td>Que.2: based on Unit 1, 2, 3 (Carries 12 Marks).</td></tr>
<tr><td>Que.3: based on Unit 4, 5, 6 (Carries 12 Marks).</td></tr>
<tr><td>Que.4: based on Unit 4, 5, 6 (Carries 12 Marks).</td></tr>
<tr><td>Que.5: based on Unit 4, 5, 6 (Carries 12 Marks).</td></tr>
</table>

SHIVAJI UNIVERSITY, KOLHAPUR
ELECTRONICS AND TELECOMMUNICATION ENGINEERING

PCC-ETC0232 ANALOG CIRCUIT DESIGN

Course Details:

Class	S. Y. B.Tech. Sem-III
Course Code & Course Title	PCC-ETC0232: Analog Circuit Design
Prerequisites:	Fundamentals of Basic Electronics
Teaching scheme: Lecture / Practical	03/02
Credits	03+01
Evaluation Scheme (ISE /CA) / MSE / ESE	10/30/60/10/50

Teaching Scheme	Examination Scheme
Lectures : 03 Hrs. /week	Theory : 60 (ESE) + 30 (MSE) +10 (ISE/CA)
Practical: 02 Hrs. /Week	10 (ISE/CA) + 50 (ESA)

Course Objectives: The course aims to:	
1	Study significance & designing of FWR with different types of filters Also study different types of voltage regulators along with its designing.
2	Study Significance of different types of Linear & Non-Linear wave shaping circuits
3	Study Significance of H parameters & Hybrid equivalent model
4	Study and design of single stage & multistage RC coupled amplifier concept & importance of feedback, also study of different types of feedback topologies.
5	Study different types of Oscillators
6	Study Different types of Multivibrators

Course Outcomes: Upon successful completion of this course, the student will be able to:	
PCC-ETC0232.01	Analyze & Design Different types of filters & Voltage Regulators
PCC-ETC0232.02	Analyze & Design Different types of linear & nonlinear wave shaping circuits
PCC-ETC0232.03	Analyze a small signal voltage amplifier.
PCC-ETC0232.04	Analyze & Design Single & Multistage RC coupled amplifier Know different types of feedback topologies
PCC-ETC0232.05	Analyze & Design Different types of Oscillators
PCC-ETC0232.06	Analyze & Design Different types of Multivibrators

Course Contents		
Unit 01	**Filters & Voltage Regulators** Analysis of center tap full wave Rectifier for parameters: Vdc, Idc, Vrms, Irms, PIV, TUF, efficiency, ripple factor, form factor, Peak Factor etc. Types of filters: capacitor, inductor, LC, CLC, Design of unregulated power supply with filter using full wave rectifier (C, L filters), Need of voltage regulator, Types of Voltage Regulators, IC voltage regulators: IC's :78XX, 79XX	**06 Hrs.**
Unit 02	**Wave Shaping Circuits** Need & significance of wave shaping circuits, LPF & HPF circuits response (square input), HPF as a differentiator, LPF as a integrator. Clipping circuits: Classifications, Clipping operation of Simple & Biased Clippers, Clamping circuit: Clamping theorem, Classification, clamping operations, different types of clampers.	**06 Hrs.**
Unit 03	**Voltage Amplifiers:** Significance of H-Parameters, Hybrid model for transistor (CE, CB& CC Configuration), CE Amplifier equations for Voltage Gain, Current gain, Input resistance & Output resistance	**06 Hrs.**
Unit 04	**Feedback Amplifiers:** General theory of feedback, need of negative feedback, Feedback Topology, Analysis of Voltage series, Current series, Voltage shunt, Current shunt feedback amplifiers (Using block schematic & Circuit), Design of single stage amplifier, Multistage amplifier: Need, Significance, types of multistage amplifiers, Two stage RC coupled amplifier.	**06 Hrs.**

Unit 05	**Oscillators:** Barkhausen's criteria, Frequency and amplitude stability, Classification, RC oscillators: analysis & design of RC phase shift Oscillator & Wein bridge oscillator. LC oscillators: analysis & design of Colpitt's & Hartley's oscillators, Crystal oscillator.	**06 Hrs.**
Unit 06	**Multivibrators:** Transistor as a switch, Different transistor switching parameters, overdrive factor, classification of multivibrators, Analysis and design of collector coupled: Astable, Bistable, Monostable, fixed bias and self-bias binary Multivibrator,	**06 Hrs.**

Text Books:

Sr. No.	Name of Author and Publication Details
1	NC. Goyal & R.K. Khetan, "A Monograph on Electronics Design Principles", Khanna Publishers
2	Allen Mottershed, "Electronic Devices & Circuits", Prentice- Hall India
3	G. K. Mittal, "Electronic Devices & Circuits"
4	J. B. Gupta, "Electronic Devices & Circuits", Kataria Publications.

Reference Books:

Sr. No.	Name of Author and Publication Details
1	David A. Bell, "Electronic Devices & Circuits", Oxford University
2	Robert L. Boylsted, Louis Nashelsky, "Electronic Devices & Circuit Theory", Pearson Education
3	R. S. Sedha, "A Textbook Of Applied Electronics", S. Chand
4	J. Millman & C.Halkias, "Electronic Devices & Circuits", Tata McGraw Hill Publication
5	Salivahanan, N Sureshkumar, "Electronic Devices & Circuits", Tata McGraw Hill Publication

List of Experiment for ISE/CA/MSE:

- Minimum 10 Experiments based on the curriculum.

Sr. No.	Title of Experiment
1.	Design and Study of full wave rectifier with capacitive filter.
2.	Design and Study of IC78XX
3.	Design and study the performance of Low pass filter: a. Integrator for Square wave input

4.	Design and study of High pass filter: a. Differentiator for Square wave input
5.	Study of different types of clipper circuits
6.	Study of different types of clamping circuits
7.	Design and study of frequency response of Single stage RC coupled amplifier
8.	Design and study of RC phase shift oscillator using BJT
9.	Design and study of Colpitts oscillator using BJT
10.	Design and study of Hartley oscillator using BJT
11.	Design and study of Astable multivibrator
12.	Design and study of Monostable multivibrator using BJT
13.	Design and study of Bistable multivibrator using BJT
14.	Simulation based experiments on above syllabus (Any 2)
15.	Mini-project based on above syllabus. (Maximum two students in each group)

Examination Scheme and Guidelines:

ISE/CA **10 Marks**	ISE/CA-In Semester Evaluation/Continuous Assessment.
MSE **30 Marks**	Examination of 30 marks based on Units 1, 2, and 3 should be conducted, and marks should be communicated to the university. • One question of 06 Marks based on MCQ's compulsory.
ESE **60 Marks**	ESE-End Semester Examination **25% marks** based on questions of Unit 1, 2, and 3, and **75% marks** based on questions of Unit 4, 5, and 6.
	• **Instructions for Paper Setter**
	Que.1: MCQ's based on All Units (based on Unit 1, 2, 3 Carries 4 Marks and Unit 4, 5, 6 Carries 6 Marks).
	Que.2: based on Unit 1, 2, 3 (Carries 12 Marks).
	Que.3: based on Unit 4, 5, 6 (Carries 14 Marks).
	Que.4: based on Unit 4, 5, 6 (Carries 14 Marks).
	Que.5: Write short note based on Unit 4, 5, 6 (Carries 10 Marks).
ESE **50 Marks**	**Practical Oral Examination (POE)**

SHIVAJI UNIVERSITY, KOLHAPUR
ELECTRONICS AND TELECOMMUNICATION ENGINEERING
PCC-ETC0233-Analog and Digital Communication

Course Details:

Class	S. Y. B-Tech. Sem-III
Course Code & Course Title	PCC-ETC0233: Analog and Digital Communication
Prerequisites:	Electrical Communication Concepts
Teaching scheme: Lecture / Practical	03/02
Credits	03+01
Evaluation Scheme (ISE /CA) / MSE / ESE/(ISE /CA)(PR)/ ESE(PR)	10/30/60/10/50

Teaching Scheme	Examination Scheme
Lectures : 03 Hrs. /week	Theory : 60 (ESE) + 30 (MSE) +10 (ISE/CA)
Practical: 02 Hrs. /Week	10 (ISE/CA) +50 (ESE)

Course Objectives: The course aims to:	
1	Explain basic information of Analog Communication & AM, modulation and demodulation techniques along with AM Transmitters & Receivers.
2	Explain basic information of Analog Communication & FM modulation demodulation techniques along with FM Transmitter & Receivers.
3	Understand Sampling theorem and types of pulse modulation techniques.
4	Study the concept of information theory.
5	Elaborate the different source coding techniques with the help of their block diagrams and differentiate line coding techniques.
6	Explain the different digital modulation techniques and describe the baseband transmission and reception system.

Course Outcomes: Upon successful completion of this course, the student will be able to:	
PCC-ETC0233.01	Understand the fundamental concepts of AM Transmitters and receiver in analog communication systems.
PCC-ETC0233.02	Understand the fundamental concepts of FM Transmitters and Receivers in analog communication systems.
PCC-ETC0233.03	Differentiate between various pulse modulation techniques.
PCC-ETC0233.04	Solve the problem based on information theory in communication System.
PCC-ETC0233.05	Classify different source coding & line coding techniques.
PCC-ETC0233.06	Compare different digital modulation technique and distortion in baseband transmission of digital signal.

Course Contents		
Unit 01	**AM Modulation & Demodulation** Introduction to Communication Systems Electromagnetic spectrum, Elements of electronic communication systems, Modulation -Types, need for Modulation., Amplitude Modulation principles, AM envelope, frequency spectrum & BW, Modulation index, % modulation, AM transmitters: Block diagram of low level DSBFC, High level DSBFC. Block diagram of SSB, Vestigial sideband (VSB). Receiver parameters: Sensitivity, Selectivity, dynamic range, fidelity, Types of AM receiver: TRF and Super heterodyne (block diagram), AM detection using diode detector, distortion in diode detector. Negative peak clipping & diagonal clipping,	**07 Hrs.**
Unit 02	**Angle Modulation & Demodulation** Concept of angle modulation: FM and PM, Modulation Index, Bandwidth. Narrowband & Wide Band FM, Generation of FM (Direct and Indirect Method), Pre-emphasis and De-emphasis. FM receivers Block Diagram, FM demodulators: slope detectors, fosters seeley discriminator, ratio detectors, PLL.	**07 Hrs.**
Unit 03	**Pulse Modulation** Sampling, Occurrence of aliasing error, Natural Sampling, Flat-top Sampling, Generation of PAM, Generation of PWM, Generation of PPM.	**06 Hrs.**

Unit 04	**Information Theory** Measure of Information, Entropy, Shannon -Hartley theorem, Entropy Coding: Huffman's coding & Shannon-Fanno Coding techniques.	**06 Hrs.**
Unit 05	**Digital transmission of analog signals:** Quantization–Uniform, Non-Uniform. Study of PCM, DPCM, DM, ADM, Comparison of all these. Line Coding Line codes: Unipolar, Bipolar, NRZ, RZ, RZ-AMI, Manchester	**06 Hrs.**
Unit 06	**Band Pass Modulation Techniques** ASK, FSK, PSK, DPSK, QPSK, QAM Coherent, Non- Coherent detection. Constellation diagram, Baseband Transmission of Digital Signals: eye diagram, ISI, Scrambler, Unscramble.	**06 Hrs.**

Text Books:

Sr. No.	Name of Author and Publication Details
1	George Kennedy, "Electronic Communications", McGraw Hill Kennedy.
2	Wayne Tomasi, "Electronics Communication System Fundamentals through Advanced", Vth Edition, Pearson Education.
3	V. Chandra Shekhar, "Analog Communication", Oxford University press.
4	K. Sam Shanmugam, "Digital & Analog Communication", John Wiley India..
5	Singh & Sapre, "Communication Systems-Analog & Digital", IInd Edition TMH
6	Simon Haykin, "Digital Communication", Wiley India.

Reference Books:

Sr. No.	Name of Author and Publication Details
1	B.P. Lathi, "Analog and Digital Communication", Oxford University press.
2	Simon Haykin, "An Introduction To Analog & Digital Communications", John Wiley India. & Sons
3	R P Singh, S D Sapre, "Communication System- Analog & Digital", IInd Edition,TMH
4	Blake, "Electronic Communication Systems", IInd Edition, CENGAGE learning
5	Louis E. Frenzel, "Principals Of Electronic Communication System", IIIrd Edition., TMH

6	Wayne Tomasi, "Electronic Communications Systems", Vth edition, Pearsonpublication
7	John Proakis, " Digital Communication", IVth Edition, TMH

List of Assignments/Tutorials for ISE/CA:

- Minimum 06 Assignments/Tutorials based on the curriculum.

List of Experiment for ISE/CA/MSE:

- Minimum 10 Experiments.

Sr. No.	Title of Experiment
Section-I (Minimum 5)	
01	Practical implementation of Amplitude modulation and demodulation.
02	DSB modulation and SSB modulation and its detection.
03	Practical implementation of frequency modulation and demodulation.
04	Practical implementation of PAM system
05	Practical implementation of PWM system
06	Practical implementation of PPM system
07	Study of Pulse Code Modulation
08	Sampling and Reconstruction
09	Study of Any Modulation Technique using MATLAB/SCILAB
Section-II (Minimum 5)	
10	Study of Delta Modulation
11	Study of Adaptive Delta Modulation
12	Study of Data Formats
13	Study of Amplitude Shift Keying
14	Study of Frequency Shift Keying
15	Study of Phase Shift Keying
16	Study of Quadrature Phase Shift Keying
17	Study of Any Modulation Technique using MATLAB/SCILAB
18	Visit to AIR.

Examination Scheme and Guidelines:

ISE/CA **10 Marks**	ISE/CA-In Semester Evaluation/Continuous Assessment.
MSE **30 Marks**	Examination of 30 marks based on Units 1, 2, and 3 should be conducted, and marks should be communicated to the university. • One question of 06 Marks based on MCQ's compulsory.
ESE **60 Marks**	ESE-End Semester Examination **25% marks** based on questions of Unit 1, 2, and 3, and **75% marks** based on questions of Unit 4, 5, and 6.

	• **Instructions for Paper Setter**
	Que.1: MCQ's based on All Units (Carries 12 Marks).
	Que.2: based on Unit 1, 2, 3 (Carries 12 Marks).
	Que.3: based on Unit 4, 5, 6 (Carries 12 Marks).
	Que.4: based on Unit 4, 5, 6 (Carries 12 Marks).
	Que.5: based on Unit 4, 5, 6 (Carries 12 Marks).
MSE **50 Marks**	**Practical Oral Examination (POE)**

SHIVAJIUNIVERSITY, KOLHAPUR
ELECTRONICSANDTELECOMMUNICATIONENGINEERING
PCC-ETC0210- Mathematics for Electronics Engineering

Course Details:

Class	S.Y.B-Tech. Sem-III
Course Code& Course Title	PCC-ETC0210: Mathematics for Electronics Engineering
Prerequisites:	Basics of matrices, complex algebra, derivative and its properties. Integration and it's Basic properties
Teaching scheme: Lecture/Practical	02/--
Credits	02
Evaluation Scheme (ISE/CA)/MSE / ESE	10/30/60

Teaching Scheme	Examination Scheme
Lectures:02Hrs./week	Theory: 60 (ESE) + 30 (MSE)+10 (ISE/CA)

Course Objectives: The course aims to:	
1	To develop mathematical skills and enhance thinking power of students.
2	To give the knowledge to the students of Linear Differential Equations, Fourier series, Vector Differentiation, Laplace transforms, Probability, with an emphasis on the application of solving engineering problems.
3	To prepare students to formulate a mathematical model using engineering skills& interpret the solution in real world.

Course Outcomes: Upon successful completion of this course, the student will be able to:	
PCC-ETC0210.01	Make use of Linear Differential Equations to solve the electronics engineering problems.
PCC-ETC0210.02	Develop Fourier series expansion of a function over the given interval.
PCC-ETC0210.03	Apply knowledge of vector differentiation to find directional derivatives, curl and divergence of vector fields.

PCC-ETC0210.04	Solve problems involving the Normal, Poisson, and Binomial Distributions in probability theory.
PCC-ETC0210.05	Find Laplace Transform of given functions.

Course Contents		
Unit 01	**Linear Differential Equations:** Linear Differential Equations with constant coefficient; Rules to find complementary functions; Methods to find particular integral $(e^{ax}, sinax\ or\ cosax, x^m, e^{ax}x^m, e^{ax}sinax\ or\ e^{ax}cosax)$.	**04 Hrs.**
Unit 02	**Applications of Linear Differential Equations :** Applications of Linear Differential Equations with constant coefficients to Electronics system.	**03 Hrs.**
Unit 03	**Fourier Series:** Introduction, Definition, Euler's formulae, Dirichlet's conditions, Change of interval, Expansions of odd and even functions.	**04 Hrs.**
Unit 04	**Vector Differential Calculus:** Differentiation of vectors, Gradient of scalar point function, Directional Derivatives, Divergence of vector point function, Curl of vector point function, Irrotational, and Solenoidal vector field.	**04 Hrs.**
Unit 05	**Probability Distribution :** Random variables, Discrete probability distribution, Continuous probability distribution, Binomial Distribution, Poisson Distribution, Normal Distribution.	**04 Hrs.**
Unit 06	**Laplace Transform:** Laplace transform of elementary functions. Properties of Laplace Transforms (First- Shifting, Multiplication & Division by t). Laplace transforms of derivatives and integral.	**04 Hrs.**

Reference Books:

Sr. No.	Name of Author and Publication Details
1	B. S. Grewal 'Higher Engineering Mathematics', Khanna Publication, Delhi.
2	H. K. Das 'Advanced Engineering Mathematics', S. Chand Publication.
3	Jack Goldberg 'Advanced Engineering Mathematics', Oxford University Press.

4	Navneet D. Sangale 'Applied Mathematics', Cengage Publication.
5	Erwin Kreyszig 'Advanced Engineering Mathematics', Wiley India.
6	B.V.Ramana 'Higher Engineering Mathematics', McGraw-Hill.

List of Assignments/Tutorials for ISE/CA:

- Minimum 06 Assignments/Tutorials based on the curriculum.

Examination Scheme and Guidelines:

ISE/CA **10 Marks**	ISE/CA-In Semester Evaluation/Continuous Assessment.
MSE **15Marks**	Examination of 15 marks based on Units 1, 2, and 3 should be conducted, and marks should be communicated to the university. • One question of 03 Marks based on MCQ's compulsory.
ESE **60Marks**	ESE-End Semester Examination **25% marks** based on questions of Unit 1, 2, and 3, and **75% marks** based on questions of Unit 4, 5, and 6.
	• **Instructions for Paper Setter**
	Que.1: MCQ's based on All Units (Carries 10 Marks).
	Que.2: based on Unit 1, 2, 3 (Carries 10 Marks).
	Que.3: based on Unit 4, 5, 6 (Carries 10 Marks).
	Que.4: based on Unit 4, 5, 6 (Carries 10 Marks).
	Que.5: based on Unit 4, 5, 6 (Carries 10 Marks).

SHIVAJI UNIVERSITY, KOLHAPUR
ELECTRONICS AND TELECOMMUNICATION ENGINEERING
ETC-MNR0211- MDM-1 (Electronics System)

Course Details:

Class	S. Y. B-Tech. Sem-III
Course Code & Course Title	ETC-MNR0211: Electronics Systems
Prerequisites:	Fundamentals of Network Elements
Teaching scheme: Lecture / Practical	02/--
Credits	02
Evaluation Scheme (ISE /CA) / MSE / ESE	10/30/60

Teaching Scheme	Examination Scheme
Lectures : 02 Hrs. /week	Theory : 60 (ESE) + 30 (MSE) +10 (ISE/CA)

Course Objectives: The course aims to:	
1	To impart foundational knowledge of electronic components and their applications.
2	To develop the ability to analyze and design analog and digital electronic circuits.
3	To introduce students to signal processing and communication systems.
4	To familiarize students with power electronics and control mechanisms.
5	To provide insights into embedded systems and contemporary technological trends.

Course Outcomes: Upon successful completion of this course, the student will be able to:	
ETC-MNR0211.01	Explain the fundamental principles of electronic components and semiconductor physics.
ETC-MNR0211.02	Describe the working of transistors and operational amplifiers in analog electronic circuits.
ETC-MNR0211.03	Interpret digital logic circuits and their applications in various systems.
ETC-MNR0211.04	Summarize the characteristics of signals and their role in communication systems.

ETC-MNR0211.05	Classify different power electronic converters and illustrate their applications in control systems.
ETC-MNR0211.06	Discuss the basics of embedded systems and recognize advancements in emerging electronic technologies.

Course Contents		
Unit 01	**Electronic Components and Semiconductors** Introduction to passive components: Resistors, Capacitors, Inductors, Semiconductor materials and intrinsic/extrinsic semiconductors, PN junction diodes: Characteristics and applications.	**04 Hrs.**
Unit 02	**Analog Electronic Circuits** Bipolar Junction Transistors (BJTs): Operation, configurations. Field-Effect Transistors (FETs). Operational Amplifiers: Characteristics and Inverting, Non-Inverting configuration.	**04 Hrs.**
Unit 03	**Digital Electronics and Logic Design** Number systems and binary arithmetic, Boolean algebra and logic simplification, Combinational logic circuits: Adder, Subtractor, Multiplexers, De-multiplexers.	**04 Hrs.**
Unit 04	**Signals and Communication Systems** Classification of signals: Continuous and discrete, Time and frequency domain analysis. Modulation techniques: Amplitude and Frequency modulation Basics of analog and digital communication systems.	**04 Hrs.**
Unit 05	**Power Electronics** Introduction to power semiconductor devices: SCR, TRIAC, IGBT Basics of control systems: Open-loop and closed-loop control.	**05 Hrs.**
Unit 06	**Embedded Systems and Emerging Technologies** Introduction to microcontrollers and microprocessors Basics of Internet of Things (IoT) Overview of recent advancements in electronics: VLSI, MEMS, and Nanoelectronics.	**05 Hrs.**

Text Books:

Sr. No.	**Name of Author and Publication Details**
1	Electronic Devices and Circuit Theory – Robert L. Boylestad & Louis Nashelsky.
2	Microelectronic Circuits – Adel S. Sedra & Kenneth C. Smith.
3	Digital Design – M. Morris Mano & Michael D. Ciletti.

4	Signals and Systems – Alan V. Oppenheim & Alan S. Willsky.
5	Power Electronics: Converters, Applications, and Design – Ned Mohan, Tore M. Undeland, & William P. Robbins.
6	Embedded Systems: A Contemporary Design Tool – James K. Peckol.

Reference Books:

Sr. No.	Name of Author and Publication Details
1	Electronic Principles – Albert Malvino & David J. Bates
2	Op-Amps and Linear Integrated Circuits – Ramakant A. Gayakwad
3	Modern Digital Electronics – R.P. Jain
4	Communication Systems – Simon Haykin
5	Control Systems Engineering – Norman S. Nise
6	The 8051 Microcontroller and Embedded Systems – Muhammad Ali Mazidi, Janice Gillispie Mazidi, & Rolin D. McKinlay

List of Assignments/Tutorials for ISE/CA:

- Minimum 06 Assignments based on the curriculum.

Examination Scheme and Guidelines:

ISE/CA **10 Marks**	ISE/CA-In Semester Evaluation/Continuous Assessment.
MSE **30 Marks**	Examination of 30 marks based on Units 1, 2, and 3 should be conducted, and marks should be communicated to the university. • One question of 06 Marks based on MCQ's compulsory.
ESE **60 Marks**	ESE-End Semester Examination **25% marks** based on questions of Unit 1, 2, and 3, and **75% marks** based on questions of Unit 4, 5, and 6.
	• **Instructions for Paper Setter**
	Que.1: MCQ's based on All Units (Carries 12 Marks).
	Que.2: based on Unit 1, 2, 3 (Carries 12 Marks).
	Que.3: based on Unit 4, 5, 6 (Carries 12 Marks).
	Que.4: based on Unit 4, 5, 6 (Carries 12 Marks).
	Que.5: based on Unit 4, 5, 6 (Carries 12 Marks).

SHIVAJI UNIVERSITY, KOLHAPUR
ELECTRONICS AND TELECOMMUNICATION ENGINEERING

OPEN ELECTIVE-1

OE-ETC0236- INTRODUCTION TO IoT

Course Details:

Class	S. Y. B-Tech. Sem-III
Course Code & Course Title	OE-ETC0236: Introduction To IoT
Prerequisites:	Fundamentals of Computer Network and Internet, basics of C / C++ programming language.
Teaching scheme: Lecture / Practical	03/02
Credits	03+01
Evaluation Scheme (ISE /CA) / MSE / ESE	10/30/60/25/25

Teaching Scheme	Examination Scheme
Lectures : 03 Hrs. /week	Theory : 60 (ESE) + 30 (MSE) +10 (ISE/CA)
Practical: 02 Hrs. /Week	02

Course Objectives: The course aims to:	
1	To learn Internet of Things Technology
2	To know the basics of RFID, Sensor technologies.
3	To know the basics of IoT systems like Raspberry Pi, Arduino, and Banana Pi.
4	To aware students about wireless communication technologies and IoT applications.
5	To know the Communication Technology
6	To understand applications of IoT

Course Outcomes: Upon successful completion of this course, the student will be able to:	
OE-ETC0236.01	To understand basic concepts of IoT
OE-ETC0236.02	To learn and implement RFID technology in various applications.
OE-ETC0236.03	To write programs for basic applications
OE-ETC0236.04	To understand and implement different communication technologies in IoT systems.
OE-ETC0236.05	To understand communication technology
OE-ETC0236.06	To understand applications of IoT

Course Contents		
Unit 01	**Introduction:** IoT, Objects/Things, IoT definitions, IoT framework, Identification technologies, Internet in IoTs.	**4 Hrs.**
Unit 02	**Fundamentals of IoT mechanisms:** Identification of IoT objects and services, Traffic characteristics, scalability and inter-operability, security and privacy, Communication capabilities, Mobility support and device power, Sensor technology, RFID technology and satellite technology.	**5 Hrs.**
Unit 03	**Radio Frequency Identification Technology:** RFID, IoT objects and services, principles of RFID, Components of an RFID system, RFID reader, Tags, middleware, Sensor nodes, connecting nodes, networking nodes.	**4 Hrs.**
Unit 04	**IoT systems:** Hardware and Software: Introduction to Raspberry Pi, Familiar with Raspberry Pi hardware, study of I/O ports, Programming with Raspberry Pi: Study of operating system, simple programs in C / C++, Introduction with Python programming.	**5 Hrs.**
Unit 05	**Communication Technologies:** WPAN Technologies: Introduction to IEEE 802.15.4 standard, Bluetooth, Zigbee, IEEE 802.15.6; WBANS, NFC, IEEE 802.11 WLAN, Cellular and mobile technologies.	**4 Hrs.**

Unit 06	**IoT Application Examples:** Smart Metering, advanced metering infrastructure, e-health / Body Area Network, City Automation (Smart City), Automotive Application, Environmental Applications, Home Automation, Control Applications.	**4 Hrs,**

Text Books:

Sr. No.	Name of Author and Publication Details
1	Hakima Chaouchi , "The Internet of Things -Connecting objects to the web", Wiley Publications
2	Daniel Minoli "Building the Internet of Things" Wiley Publications
3	Gareth Halfacree, "Raspberi Pi Beginner's Guide" Raspberry Press
4	Gary J. Mulett , "Introduction to Wireless Telecommunications systems and Networks" Cengage Learning (India Edition).

Reference Books:

Sr.No.	Name of Author and Publication Details
1	Sean McManus, Mike Cook, "Raspberry Pi for Dummies" A Wiley Brand
2	Bernd Scholz, Reiter, "Architecting the Internet of Things" Springer

List of Experiment for ISE/CA/MSE:

- Minimum 08 Experiments from the following list of based on curriculum.

Sr. No.	Title of Experiment
1.	To study different boards used in IoT
2.	Familiarization with Arduino/Raspberry Pi and perform necessary software installation
3.	To interface LED/Buzzer with Arduino/Raspberry Pi and write a program to turn ON LED for 1 sec after every 2 sec.
4.	To interface DHT11 sensor with Arduino/Raspberry Pi.
5.	To interface motor using relay with Arduino/Raspberry Pi.
6.	To interface bluetooth sensor with Arduino/Raspberry Pi.
7.	Automated light control system using Arduino uno
8.	Weather monitoring system using Raspberry Pi module
9.	IoT Application Examples
10.	IoT Application Examples

Examination Scheme and Guidelines:

<table>
<tr><td>ISE/CA
10 Marks</td><td>ISE/CA-In Semester Evaluation/Continuous Assessment.</td></tr>
<tr><td>MSE
30 Marks</td><td>Examination of 30 marks based on Units 1, 2, and 3 should be conducted, and marks should be communicated to the university.
One question of 06 Marks based on MCQ’s compulsory.</td></tr>
<tr><td rowspan="7">ESE
60 Marks</td><td>ESE-End Semester Examination
25% marks based on questions of Unit 1, 2, and 3, and 75% marks based on questions of Unit 4, 5, and 6.</td></tr>
<tr><td>Instructions for Paper Setter</td></tr>
<tr><td>Que.1: MCQ’s based on All Units (Carries 12 Marks).</td></tr>
<tr><td>Que.2: based on Unit 1, 2, 3 (Carries 12 Marks).</td></tr>
<tr><td>Que.3: based on Unit 4, 5, 6 (Carries 12 Marks).</td></tr>
<tr><td>Que.4: based on Unit 4, 5, 6 (Carries 12 Marks).</td></tr>
<tr><td>Que.5: based on Unit 4, 5, 6 (Carries 12 Marks).</td></tr>
<tr><td>ESE
25 Marks</td><td>Oral Examination (OE)</td></tr>
</table>

SHIVAJI UNIVERSITY, KOLHAPUR
ELECTRONICS AND TELECOMMUNICATION ENGINEERING
HSSM-ETC0237 Universal Human Values

Course Details:

Class	S. Y. B.Tech. Sem-III
Course Code & Course Title	HSSM-ETC0237: Universal Human Values
Prerequisites:	Meaning of Values, Ethics, Happiness, etc.
Teaching scheme: Lecture / Practical	01/--
Credits	01
Evaluation Scheme (ISE /CA) / MSE / ESE	10/--/--

Teaching Scheme	Examination Scheme
Lectures : 02 Hrs. /week	Theory : -- (ESE) + -- (MSE) +10 (ISE/CA)
Practical: -- Hrs. /Week	--

Course Objectives: The course aims to:	
1	To help the students appreciate the essential complementarity between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings
2	To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence.
3	To understand holistic perspective on the basis of Universal Human Values and movement towards value-based living in a natural way.
4	To highlight acceptable implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behavior and mutually enriching interaction with Nature.
5	To provide a much-needed orientation input in value education to the young inspiring minds.

Course Outcomes: Upon successful completion of this course, the student will be able to:	
HSSM-ETC0237.01	Become more aware of themselves, and their surroundings (family, society and nature); they would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.
HSSM-ETC0237.02	Become sensitive to their commitment towards what they have understood (human values, human relationship and human society).
HSSM-ETC0237.03	Apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction.
HSSM-ETC0237.04	Positively impact common graduate attributes like: 1. Holistic vision of life 2. Socially responsible behavior 3. Environmentally responsible work 4. Ethical human conduct 5. Having Competence and Capabilities for Maintaining Health and Hygiene 6. Appreciation and aspiration for excellence (merit) and gratitude for all

Course Contents		
Unit 01	**Introduction to Value Education :** Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education) Understanding Value Education, Self-exploration as the Process for Value Education, Continuous Happiness and Prosperity – the Basic Human Aspirations, Happiness and Prosperity – Current Scenario, Method to Fulfil the Basic Human Aspirations	**03 Hrs.**
Unit 02	**Harmony in the Human Being :** Understanding Human being as the Co-existence of the Self and the Body, Distinguishing between the Needs of the Self and the Body, Understanding Harmony in the Self.	**02 Hrs.**

Unit 03	**Harmony in the Family and Society :** Harmony in the Family – the Basic Unit of Human Interaction, 'Trust' – the Foundational Value in Relationship, 'Respect' – as the Right Evaluation, Other Feelings, Justice in Human-to-Human Relationship, Understanding Harmony in the Society.	**02 Hrs.**
Unit 04	**Harmony in the Nature/Existence:** Understanding Harmony in the Nature, Interconnectedness, self-regulation and Mutual Fulfillment among the Four Orders of Nature, Realizing Existence as Co-existence at All Levels.	**02 Hrs.**
Unit 05	**Implications of the Holistic Understanding** : A Look at Professional Ethics: Natural Acceptance of Human Values, Definitiveness of (Ethical) Human Conduct, A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order, Competence in Professional Ethics Holistic Technologies.	**03 Hrs.**

Reference Books:

Sr.No.	Name of Author and Publication Details
1	A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034- 47-1
2	The Teacher‟s Manual for A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana.
3	Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
4	B P Banerjee, 2005, Foundations of Ethics and Management, Excel Books.
5	Web links and Video Lectures (e-Resources): Value Education websites: • https://www.uhv.org.in/uhv-ii, • http://uhv.ac.in, • http://www.uptu.ac.in • Story of Stuff, • http://www.storyofstuff.com • Al Gore, An Inconvenient Truth, Paramount Classics, USA • Charlie Chaplin, Modern Times, United Artists, USA • IIT Delhi, Modern Technology – the Untold Story • Gandhi A., Right Here Right Now, Cyclewala Productions • https://www.youtube.com/channel/UCQxWr5QB_eZUnwxSwxXEkQw • https://fdp-si.aicte-india.org/8dayUHV_download.php • https://www.youtube.com/watch?v=8ovkLRYXIjE • https://www.youtube.com/watch?v=OgdNx0X923I • https://www.youtube.com/watch?v=nGRcbRpvGoU • https://www.youtube.com/watch?v=sDxGXOgYEKM

Examination Scheme and Guidelines:

ISE/CA **10 Marks**	ISE/CA-In Semester Evaluation/Continuous Assessment. Assessment Details (both ISE and CA) The weightage of ISE and CA is 50% each. The minimum passing mark for the ISE/CA is 40% of the maximum marks (04 marks out of 10) As a part of ISE, the first test will be conducted after 40-50% of the syllabus has been covered, and the second test will be conducted after 85-90% of the syllabus has been covered. 3 to 4 Assignments are evaluated as a part of CA.

SHIVAJIUNIVERSITY, KOLHAPUR

ELECTRONICS AND TELECOMMUNICATION ENGINEERING

HSSM- ETC0239 Soft Skill Development

Course Details:

Class	S.Y.B.Tech. Sem-III
Course Code& Course Title	HSSM- ETC0239: Soft Skill Development
Prerequisites:	Professional Communication-I & II
Teaching scheme: Lecture/Practical	02/--
Credits	02
Evaluation Scheme (ISE/CA)/MSE / ESE	20/--

Teaching Scheme	Examination Scheme
Lectures:02Hrs./week	Theory: -- (ESE) + -- (MSE) + 20 (ISE/CA)
Practical: 0 Hrs. /Week	--

Course Objectives: The course aims to:	
1	To make the engineering students aware of the importance, the role and the content of soft skills through instruction, knowledge acquisition, demonstration and practice.
2	To develop and nurture the soft skills of the students through individual and group activities.
3	To expose students to right attitudinal and behavioral aspects and to build the same through activities
4	To encourage the all-round development of students by focusing on soft skills.

Course Outcomes: Upon successful completion of this course, the student will be able to:	
HSSM- ETC0239.1	Demonstrate effective communication through verbal/written communication and improved listening skill.
HSSM- ETC0239.2	Exhibit effective communication in group discussion/meetings/interviews, prepare & presentations.
HSSM- ETC0239.3	Demonstrate effective communication in multi-disciplinary and heterogeneous teams through the knowledge of team work, inter-personal relationships, conflict management and leadership quality.
HSSM- ETC0239.4	Write precise briefs or reports and technical documents.

Course Contents		
Unit 01	**Understanding Soft and Communication Skills:** Importance of Soft Skills, Attributes regarded as Soft Skills, Verbal Communication-Effective Communication-Active listening Articulation Paraphrasing- Feedback Non-Verbal Communication- Body Language of self and others- LSRW Skills	**03 Hrs.**
Unit 02	**Behavioral Skills /Self Development:** Process of Knowing Self, SWOT Analysis, Confidence improvement, values, positive attitude, Developing Positive attitude, positive thinking and self-esteem.	**04 Hrs.**
Unit 03	**Leadership and Team Building:** Culture and Leadership- Salient Features of Corporate Culture, Leadership Styles, Leadership Trends, Team Building- Team Development Stages, Types of Teams, Attributes of a successful team – Barriers involved, Managerial Skills	**03 Hrs.**
Unit 04	**Developing Writing skills:** E-mail writing, report writing, resumes writing, practice.	**03 Hrs.**
Unit 05	**Stress and Time Management:** Stress in Today‘s Time- Identify the Stress Source, Signs of Stress, Ways to Cope with Stress. Healthier Ways to Combat Stress, Steps to be taken in the Organizations: Open communication, Time Management, Working towards Your Goals, Smart Work, Prioritize your Tasks	**03Hrs.**
Unit 06	**Professional Skill:** Ethics, Etiquette and Mannerism-All types of Etiquette (at Meetings, Etiquette at Dining. Involuntary Awkward Actions, Public Relations Office(PRO)‘s Etiquettes) Technology Etiquette: Phone Etiquette, Email Etiquette, Social Media Etiquette, Video Conferencing Etiquette, Interview Etiquette. Dressing	**03 Hrs.**

	Etiquettes: for Interview, offices and social functions. Ethical Values: Importance of Work Ethics, Problems in the Absence of Work Ethics.	

Text Books:

Sr. No.	Name of Author and Publication Details
1	Dr. K. Alex , 'Soft Skills-Know Yourself and Know the world'- S. Chand & Company Pvt. Ltd. New Delhi.
2	Gajendra Singh Chauhan, Sangeeta Sharma 'Soft Skills – An Integrated Approach to Maximize Personality,' Dhanpat Rai & Co.
3	Krishna Mohan and Meera Banerji 'Developing Communication Skills', MacMillan India Ltd., Delhi.
4	Ludlow and Panthon, 'Essentials of Effective Communication', Prentice Hall of India.
5.	Gopalaswamy Ramesh, Mahadevan Ramesh, 'The ACE of Soft Skills: Attitude, Communication and Etiquette for Success', Pearson India Education Services Pvt. Ltd.

Reference Books:

Sr. No.	Name of Author and Publication Details
1	Indrajit Bhattacharya, 'An Approach to Communication Skills', Dhanpat Rai, Delhi.
2	Dr. M. Sambaiah, 'Technical English' Network Fundamentals and Analysis, Wiley India Pvt. Ltd. New Delhi.
3	Prof. M. S. Rao 'Soft Skills for Young Manager' Ar Emm International, New Delhi.
4	Prin. A. R. D'Souza, Prin. G. V. Kulkarni, 'Enriching Oral Communication' Phadke Prakashan, Kolhapur.

List of Assignments/Tutorials for ISE/CA:

- Minimum 08 Assignments based on the curriculum.

Sr. No.	Title of Assignments
01	Communication Skills
02	SWOT Analysis
03	Positive attitude
04	Leadership and team building
05	Developing writing skills: Email, report & resume
06	Stress management
07	Time management
08	Ethics and etiquettes
09	Ethical values
10	Group Discussion
11	Power point Presentation on technical or non-technical topics
12	Seminar in any one technical or non-technical topic

Examination Scheme and Guidelines:

ISE/CA **20 Marks**	**ISE/CA-In Semester Evaluation/Continuous Assessment:** • Parameters for In Semester Evaluation could be: Attendance, Assignments, Group Discussion, Seminar, Power point Presentation on technical or non-technical topics, and LSRW Activities etc. • Assignments should be given and should be assessed continuously during academic.

SHIVAJI UNIVERSITY, KOLHAPUR
ELECTRONICS AND TELECOMMUNICATION ENGINEERING
PCC-ETC0241 Linear Integrated Circuits

Course Details:

Class	S. Y. B.Tech. Sem-IV
Course Code & Course Title	PCC-ETC0241: Linear Integrated Circuits
Prerequisites:	Basic knowledge of electronics Components
Teaching scheme: Lecture / Practical	03/02
Credits	03+01
Evaluation Scheme (ISE /CA) / MSE / ESE/(ISE /CA)(PR)/ ESE(PR)	10/30/60/10/50

Teaching Scheme	Examination Scheme
Lectures : 03 Hrs. /week	Theory : 60 (ESE) + 30 (MSE) +10 (ISE/CA)
Practical: 02 Hrs. /Week	10 (ISE/CA) +50 (ESE)

Course Objectives: The course aims to:	
1	Understand the internal circuit of operational amplifier
2	Understand various Op-amp configurations & frequency response
3	Study the application of Op-amps.
4	Understand various Active filters.
5	Study various waveform generators.
6	Understand use of Op-amp in various industrial applications.

Course Outcomes: Upon successful completion of this course, the student will be able to:	
PCC-ETC0241.01	Explain the internal circuit of operational amplifier and Analyze the differential amplifier.
PCC-ETC0241.02	Illustrate various Op-amp configurations.
PCC-ETC0241.03	Build and explain applications of Op-amp.
PCC-ETC0241.04	Design various Active filters.
PCC-ETC0241.05	Analyze and design various waveform generators.
PCC-ETC0241.06	Make use of Op-amp ICs in various industrial applications.

Course Contents		
Unit 01	**Introduction to Op-amp Analysis of Op-amp** Differential Amplifier Configurations, Differential Amplifier analysis using h-parameter (AC and DC) for Dual-Input Balanced-Output and Dual-Input Unbalanced-Output configuration, Level Shifter, CMRR improvement methods, Output Stage of Op-Amp.	**07 Hrs.**
Unit 02	**Op-Amp Configurations & Frequency Response** Open loop configuration, Virtual Ground Concept, Closed-Loop Configuration, Unity Gain Amplifier, Frequency Response of both configurations, Slew rate: causes, equation, significance	**06 Hrs.**
Unit 03	**Applications of Op-amp** Summing, Scaling & Averaging Amplifiers (Inverting & Non-Inverting configuration), Differential amplifier, Subtractor Circuit, Instrumentation amplifier using three Op-amp, V to I & I to V Converter, Precision Rectifiers, Comparator, Schmitt Trigger, Window Detector, Sample & Hold Circuits.	**06 Hrs.**
Unit 04	**Active Filters** Introduction, Design of Butterworth filters: High Pass filter & Low Pass filter (First & Second order), Band Pass filter, Band Reject filter, All Pass Filter	**06 Hrs.**

Unit 05	**Waveform Generators** Design of: Square wave generator, Triangular wave generator, Sawtooth wave generator, RC phase shift oscillator, Wein bridge oscillator, Hartley Oscillator, Colpitts Oscillator, Crystal Oscillator	**06 Hrs.**
Unit 06	**Monolithic IC Applications** IC 555 (Timer): Block Diagram, Multivibrators and Applications. IC 565 PLL- Introduction, Block Diagram and Applications. IC 8038 as Audio Function Generator, Digital DC Motor Speed Control using IC 1408 & IC 9500	**06 Hrs.**

Text Books:

Sr. No.	Name of Author and Publication Details
1	Ramakant A. Gaikwad, "Op Amps and Linear Integrated Circuits", IInd and the latest edition, Pearson Education
2	David Bell, "Operational Amplifiers and Linear IC's", Third edition, Oxford UniversityPress

Reference Books:

Sr. No.	Name of Author and Publication Details
1	Robert Coughlin, Fredric Driscoll, "Operational Amplifiers and Linear Integrated Circuits", VIth edition, PE, 2006.
2	B. Somanathan Nair, "Linear Integrated Circuits- Analysis, Design & Applications", Wiley India. India.
3	S. Salivahanan & Bhaskaran, "Linear Integrated Circuits", Ist Edition, TMH

List of Assignments/Tutorials for ISE/CA:

- Minimum 06 Assignments/Tutorials based on the curriculum.

List of Experiment for ISE/CA/MSE:

- Minimum 10 Experiments based on the curriculum.

Sr. No.	Title of Experiment
01	Study of Data sheets of following IC's μA 741, OP 07, LM324, LM 308, LM380, CA 3140, LM 311. (Compulsory)
02	Design and implementation of Inverting & non-inverting amplifier for DC & AC inputs using IC 741
03	Frequency Response of Inverting & Non-Inverting Amplifier using IC 741
04	Design and implementation of op-amp as Summing, Scaling, & Averaging amplifier in Inverting & Non-Inverting Configuration using IC LM 308/ IC 741/ IC 351
05	Implementation of Instrumentation Amplifier using LM 324 /IC 741/ IC 351
06	Study of V-I & I-V Converter using IC 741
07	Design and implementation of Schmitt Trigger using IC 741 & Window detector using LM 311
08	Implementation of Precision Rectifier using IC 741/IC 351
09	Study of Comparator & ZCD using LM324/OP 07
10	Design and implementation of Butterworth Filter using IC 741
11	Design and implementation of Triangular & square wave generators using IC 741
12	Implementation of IC 555 Timer as Astable & Monostable Multivibrator (NE/SE 555)
13	Design and implementation of RC/Wein Bridge Oscillator using IC 741

Examination Scheme and Guidelines:

ISE/CA **10 Marks**	ISE/CA-In Semester Evaluation/Continuous Assessment.
MSE **30 Marks**	Examination of 30 marks based on Units 1, 2, and 3 should be conducted, and marks should be communicated to the university. • One question of 06 Marks based on MCQ's compulsory.
ESE **60 Marks**	ESE-End Semester Examination **25% marks** based on questions of Unit 1, 2, and 3, and **75% marks** based on questions of Unit 4, 5, and 6.
	• **Instructions for Paper Setter**

	Que.1: MCQ's based on All Units (Carries 12 Marks).
	Que.2: based on Unit 1, 2, 3 (Carries 12 Marks).
	Que.3: based on Unit 4, 5, 6 (Carries 12 Marks).
	Que.4: based on Unit 4, 5, 6 (Carries 12 Marks).
	Que.5: based on Unit 4, 5, 6 (Carries 12 Marks).
ESE 50 Marks	**Practical Oral Examination (POE)**

SHIVAJI UNIVERSITY, KOLHAPUR
ELECTRONICS AND TELECOMMUNICATION ENGINEERING
PCC-ETC0242 Computer Network

Course Details:

Class	S.Y.B.Tech. Sem-IV
Course Code& Course Title	PCC-ETC0242:Computer Network
Prerequisites:	Digital Communication
Teaching scheme: Lecture/Practical	03/--
Credits	03
Evaluation Scheme (ISE/CA)/MSE / ESE	10/30/60

Teaching Scheme	Examination Scheme
Lectures:03Hrs./week	Theory: 60 (ESE) + 30 (MSE)+10 (ISE/CA)
Practical:-- Hrs. /Week	--

Course Objectives: The course aims to:	
1	Build an understanding of the fundamental concepts of computer networking.
2	Introduce Various Transmission Media & Network Devices.
3	Elaborate Concepts of Data link Layer.
4	Describe various routing algorithms and congestion control mechanism.
5	Understand the concept of TCP & UDP protocols in transport layer.
6	Outline the basic services of Application layer Protocols.

Course Outcomes: Upon successful completion of this course, the student will be able to:	
PCC-ETC0242.01	Classify different types of ComputerNetworks, distinguish between OSI and TCP/IP reference model.
PCC-ETC0242.02	Summarizes guided & unguided transmission media and different networking devices.
PCC-ETC0242.03	Identify, formulate, and manage data link communication.
PCC-ETC0242.04	Illustrate Protocols, addressing, routing algorithms and congestion control algorithms used at network layer.
PCC-ETC0242.05	Describe TCP, UDP Services and identify fields of TCP/IP header format.
PCC-ETC0242.06	Have a basic knowledge of the use of Application layer services.

Course Contents		
Unit01	**INTRODUCTION TO COMPUTER NETWORK** Computer Network definition & requirements, Network topologies, Types of networks, network software and hardware components , reference models- OSI & TCP/IP .	**06 Hrs.**
Unit02	**PHYSICAL LAYER** Guided media: twisted pair, coaxial cable, optical fiber, Unguided media:: RF allocation, terrestrial microwave, satellite communication, network connectors & devices:Repeater, Hub, Switch, Bridge, Router.	**06 Hrs.**
Unit03	**DATA LINK LAYER** Flow control protocols: Stop & Wait ARQ, Sliding window-Go-back-N ARQ, Selective repeat ARQ, HDLC-types of stations, operating modes & frame formats, Random access Protocols, IEEE 802.3 frame format.	**06 Hrs.**
Unit04	**NETWORK LAYER** Routing algorithms: shortest path, distance vector routing, link state routing, IP Protocol: IP Addressing, IPv4 header format, IPv6 header format, Subnetting, DHCP, Congestion control, traffic shaping algorithms.	**06 Hrs.**
Unit05	**TRANSPORT LAYER** Process to process delivery, port numbers, Header format: UDP & TCP, Three-way handshake in TCP, TCP Timers, TCP Congestion Control.	**06 Hrs.**

Unit06	**APPLICATION LAYER** Introduction to Application Layer Protocols: DNS, HTTP, SMTP, Telnet, FTP.	**06 Hrs.**

Text Books:

Sr. No.	Name of Author and Publication Details
1	Forouzan, , "Data Communication and Networking" Fifth Edition, Tata Mc-Graw Hill, Publication
2	Tanenbaum, "Computer Neworks", IVth Edition, pearson Education

Reference Books:

Sr. No.	Name of Author and Publication Details
1	Wayne Tomasi, "Introduction to Data communications and Networking" Pearson Education.
2	Forouzan, "TCP/IP Protocol Suite", IIIrd Edition Tata Mc-Graw Hill publication.
3	Computer Networking A top down approach, James F. Kurose, Person, Fifth Edition

ISE/CA **10 Marks**	ISE/CA-In Semester Evaluation/Continuous Assessment.
MSE **30 Marks**	Examination of 30 marks based on Units 1, 2, and 3 should be conducted, and marks should be communicated to the university. • One question of 06 Marks based on MCQ's compulsory.
ESE **60 Marks**	ESE-End Semester Examination **25% marks** based on questions of Unit 1, 2, and 3, and **75% marks** based on questions of Unit 4, 5, and 6.
	• **Instructions for Paper Setter**
	Que.1: MCQ's based on All Units (Carries 12 Marks).
	Que.2: based on Unit 1, 2, 3 (Carries 12 Marks).
	Que.3: based on Unit 4, 5, 6 (Carries 12 Marks).
	Que.4: based on Unit 4, 5, 6 (Carries 12 Marks).
	Que.5: based on Unit 4, 5, 6 (Carries 12 Marks).

List of Assignments/Tutorials for ISE/CA:

- Minimum 06 Assignments/Tutorials based on the curriculum.

SHIVAJI UNIVERSITY, KOLHAPUR
ELECTRONICS AND TELECOMMUNICATION ENGINEERING

PCC-ETC0243 Electromagnetic Engineering

Course Details:

Class	S. Y. B.Tech. Sem-IV
Course Code & Course Title	PCC-ETC0243: Electromagnetic Engineering
Prerequisites:	Engg. Mathematics, Physics
Teaching scheme: Lecture / Practical	03/--
Credits	03
Evaluation Scheme (ISE /CA) / MSE / ESE	10/30/60

Teaching Scheme	Examination Scheme
Lectures : 03 Hrs. /week	Theory : 60 (ESE) + 30 (MSE) +10 (ISE/CA)
Practical: 0 Hrs. /Week	--

Course Objectives: The course aims to:	
1	Explain the basics of Vector calculus & coordinate systems.
2	Define & derive different laws in steady electric fields.
3	Define & derive different laws in magnetic fields.
4	Apply Maxwell's equations in different forms.
5	To propagation of electromagnetic waves in different media.
6	Explain the concepts of transmission lines

Course Outcomes: Upon successful completion of this course, the student will be able to:	
PCC-ETC0243.01	Understand the fundamentals of mathematical skills related to differential, integral, and vector calculus.
PCC-ETC0243.02	Apply and analyze the concepts of steady electric fields.
PCC-ETC0243.03	Apply and analyze the concepts of magnetic fields.
PCC-ETC0243.04	Develop field equations from understanding Maxwell's Equations & The relation between the fields under time-varying situations.
PCC-ETC0243.05	Understand the principles of propagation of uniform plane waves
PCC-ETC0243.06	Be aware of electromagnetic interference and compatibility

Course Contents		
Unit No: 1	**Vector Algebra:** Review of vector Analysis and coordinate systems, Basic vector algebra, Dot product, Cross product, curl, divergence, Gradient	**6 Hrs.**
Unit No: 2	**Electrostatics:** Coulomb‟s law & electric field (Numerical Expected), field due to distributed charges (Numerical Expected), Flux density (Numerical Expected), Gauss‟s law, divergence theorem, Boundary conditions for the electrostatic field.	**6 Hrs.**
Unit No: 3	**Steady Magnetic Field:** Biot Savarts law (Numerical Expected), Ampere‟s circuital law (Numerical Expected), Stoke‟s Theorem, Magnetic flux density & Vector magnetic potential, Current carrying conductors in magnetic fields, Torque on loop, Energy stored in magnetic field, Boundary conditions for magnetostatic field.	**6 Hrs.**
Unit No: 4	**Maxwell's Equations:** Inconsistency of Ampere‟s law, Faraday‟s law, Maxwell‟s equations for static field, time varying field & harmonically varying fields, Comparison of field & circuit theory.	**6 Hrs.**

Unit No: 5	**Electromagnetic Waves:** Wave equation for free space and conducting medium, uniform plane wave equation, general solution of uniform plane wave equation, intrinsic impedance, wave equation in phasor form,	**7 Hrs.**
Unit No: 6	**Transmission Lines:** Transmission line equations, Transmission line parameters, Infinite line, terminated uniform transmission line, Reflection coefficient, VSWR, group velocity, phase velocity, Smith chart (Numerical expected on Reflection coefficient, VSWR and impedance matching using Smith chart)	**7 Hrs.**

Text Books:

Sr. No.	Name of Author and Publication Details
1	John D. Kraus, "Electromagnetics", Tata Mc Graw Hill
2	William Hayt, Buck, "Engineering Electromagnetics", Tata Mc Graw Hill.
3	G.S.N. Raju, "Antenna and Wave Propagation", Pearson Education.
4	Sadiku, "Elements of Electromagnetics", 4th edition, Oxford University Press

Reference Books:

Sr. No.	Name of Author and Publication Details
1	Jordan & Balmain, "Electromagnetic Fields & Radiation Systems", 2nd edition, PHI
2	G.S.N. Raju, "Electromagnetic field theory & Transmission lines", 1st edition, Pearson Education.

List of Assignments/Tutorials for ISE/CA:

- Minimum 06 Assignments/Tutorials based on the curriculum.

Examination Scheme and Guidelines:

ISE/CA **10 Marks**	ISE/CA-In Semester Evaluation/Continuous Assessment.
MSE **30 Marks**	Examination of 30 marks based on Units 1, 2, and 3 should be conducted, and marks should be communicated to the university. • One question of 06 Marks based on MCQ's compulsory.

ESE **60 Marks**	ESE-End Semester Examination **25% marks** based on questions of Unit 1, 2, and 3, and **75% marks** based on questions of Unit 4, 5, and 6.
	• **Instructions for Paper Setter**
	Que.1: MCQ's based on All Units (Carries 12 Marks).
	Que.2: based on Unit 1, 2, 3 (Carries 12 Marks).
	Que.3: based on Unit 4, 5, 6 (Carries 12 Marks).
	Que.4: based on Unit 4, 5, 6 (Carries 12 Marks).
	Que.5: based on Unit 4, 5, 6 (Carries 12 Marks).

SHIVAJIUNIVERSITY, KOLHAPUR
ELECTRONICS AND TELECOMMUNICATION ENGINEERING
ETC-MNR-0244-MDM-2 Electronics Measurements

Course Details:

Class	S. Y. B-Tech. Sem-IV
Course Code & Course Title	ETC-MNR-0244: Electronics Measurements
Prerequisites:	Basic Electronics Engineering
Teaching scheme: Lecture/Practical	02/--
Credits	02
Evaluation Scheme (ISE/CA)/MSE / ESE	10/30/60

Teaching Scheme	Examination Scheme
Lectures: 02Hrs/Week	Theory: 60 (ESE) + 30 (MSE) +10 (ISE/CA)
Practical: --	--

Course Objectives: The course aims to:	
1	Understand the concepts of various electrical and electronic measuring instruments.
2	Familiarize with different meters and displays
3	Handle various monitoring instruments.
4	Elucidate transducers and sensors.
5	Understand signal conditioning circuits.
6	Be able to measure different physical parameters with the help of bridges.

Course Outcomes: Upon successful completion of this course, the student will be able to:	
ETC-MNR-0244.01	Explain the working of different electromechanical indicating instruments.
ETC-MNR-0244.02	Describe the construction and working of various electronic instruments.
ETC-MNR-0244.03	Select an appropriate instrument for the required measurement.
ETC-MNR-0244.04	Analyze, formulate and select suitable transducer / sensor for the given industrial application.
ETC-MNR-0244.05	Describe signal conditioning circuits.
ETC-MNR-0244.06	Elucidate the concept of several AC bridges for inductance and capacitance

Course Contents		
Unit 01	**FUNDAMENTALS OF ELECTRONIC MEASUREMENT** Electronic Measurement: Definition, need and significance, elements of generalized measurement system, Performance Characteristics, Static Characteristics, Error in Measurement, Types of Static Error, Sources of Error, Dynamic Characteristics, Need & meaning of calibration.	**04Hrs.**
Unit 02	**ELECTRONIC METER & DISPLAY** Digital voltmeters: Introduction, Types of DVM-Successive Approximation DVM, Integrating Type DVM, Digital multimeter, Introduction to Display Devices: LED, LCD.	**04 Hrs.**
Unit 03	**TESTING & MEASURING INSTRUMENTS** CRO: Introduction, Block Diagram of- Dual Beam, Dual Trace, Measurement of phase and frequency using Lissajous pattern, DSO: Introduction, Block Diagram, Function generator: Introduction, Block Diagram, Spectrum Analyzer: Introduction, Block Diagram.	**04Hrs.**
Unit 04	**TRANSDUCERS & SENSORS** Transducer: Definition, Classification of Transducers, Selection Factors of Transducers, Detailed Study of: Displacement Transducer- LVDT, Flow Transducer- Magnetic Flow meter, Pressure Transducer- Deflected Plate pressure transducer, Bourdan Tube pressure transducer, Temperature- Thermocouple, RTD, Sound Transducer -Dynamic Moving Coil Microphone,	**06 Hrs.**

	Digital Transducers-Optical Encoder. Sensors: Definition, Proximity sensor- Inductive Proximity Sensor, Capacitive Proximity Sensor, Ultrasonic Sensor, Optical Sensor- LDR, IR Sensor.	
Unit 05	**SIGNAL CONDITIONING SYSTEM** Introduction, Need, AC & DC Signal Conditioning, Chopper Stabilized Amplifier, Instrumentation Amplifier, ADC-Single slope, Dual slope and DAC-Binary Weighted Resistor.	**04 Hrs.**
Unit 06	**BRIDGES** Introduction, DC Bridge: Wheatstone's Bridge, AC Bridges: Maxwell Bridge, Maxwell's-Wein Bridge, Hay's Bridge, Wein Bridge.	**04 Hrs.**

Textbooks:

Sr. No.	Name of Author and Publication Details
1	A.K. Sawhney, "A Course In Electrical, Electronics Measurement And Instrumentation" Dhanpat Rai & Co.
2	H. S. Kalsi, "Electronic Instrumentation", 3rd Edition, MGH

Reference Books:

Sr. No.	Name of Author and Publication Details
1	Welfrick Cooper, "Electronic Instrumentation and Measurement Techniques" Dhanpat Rai & Sons.
2	John Turner, "Instrumentation for Engineers And Scientists" , IInd Edition, Wiley India.
3	David A Bell, "Electronic Instrumentation and Measurements", IIIrd Edition, Oxford
4	James W Dally, "Instrumentation for Engineering Measurements", IInd Edition, Wiley India.
5	Krzyst of Iniewski, "Smart Sensors For Industrial Applications", CRC press, Tailor & Francis

List of Assignments/ Tutorials for ISE/CA:

- Minimum 06 Assignment/ tutorials based on the curriculum.

ISE/CA **10 Marks**	ISE/CA-In Semester Evaluation/Continuous Assessment.
MSE **30Marks**	Examination of 30 marks based on Units 1, 2, and 3 should be conducted, and marks should be communicated to the university. • One question of 06 Marks based on MCQ's compulsory.
ESE **60Marks**	ESE-End Semester Examination **25% marks** based on questions of Unit 1, 2, and 3, and **75% marks** based on questions of Unit 4, 5, and 6.
	• **Instructions for Paper Setter**
	Que.1: MCQ's based on All Units (Carries 12 Marks).
	Que.2: based on Unit 1, 2, 3 (Carries 12 Marks).
	Que.3: based on Unit 4, 5, 6 (Carries 12 Marks).
	Que.4: based on Unit 4, 5, 6 (Carries 12 Marks).
	Que.5: based on Unit 4, 5, 6 (Carries 12 Marks).

SHIVAJI UNIVERSITY, KOLHAPUR
ELECTRONICS AND TELECOMMUNICATION ENGINEERING

OPEN ELECTIVE-2

OE-ETC0245 - CONTROL SYSTEM ENGINEERING

Course Details:

Class	S. Y. B-Tech. Sem-IV
Course Code & Course Title	OE-ETC0245: Control System Engineering
Prerequisites:	Basic Electronics, Network Analysis, Knowledge of Laplace transform & differential equation
Teaching scheme: Lecture / Practical	02/--
Credits	02
Evaluation Scheme (ISE /CA) / MSE / ESE	10/30/60

Teaching Scheme	Examination Scheme
Lectures: 02 Hrs. /week	Theory : 60 (ESE) + 30 (MSE) +10 (ISE/CA)
Practical: 2 Hrs. /Week	--

Course Objectives: The course aims to:	
1	To provide an introduction and basic understanding of Control System
2	Develop time & frequency domain analysis
3	Analyze & compare different control systems
4	Understand the concept of stability & state space variables
5	To know the Compensators & Controllers
6	To understand State Space Analysis

Course Outcomes: Upon successful completion of this course, the student will be able to:	
OE-ETC0245.01	Apply knowledge of mathematics, science, and engineering to design, analyze and control the different systems
OE-ETC0245.02	Explain time & frequency domain analysis for different control system
OE-ETC0245.03	Demonstrate & compare different control systems
OE-ETC0245.04	Describe state variables
OE-ETC0245.05	To understand Compensators & Controllers
OE-ETC0245.06	To understand State Space Analysis

Course Contents		
Unit 01	**Introduction:** Need & classification of control system, Effects of feedback, Mathematical model (Mechanical & Electrical systems) Differential equations, Transfer function, Block diagram algebra, Block diagram reduction, Representation by Signal flow graph, Reduction using Mason's gain Formula.	**4 Hrs**
Unit 02	**Time Domain Analysis:** Standard test signals, Time response of first& second order systems for Step input, Characteristic Equation of Feedback control systems, Transient response of second order systems, Time domain specifications, Steady state response, Steady state errors and error constants.	**5 Hrs**
Unit 03	**Stability Analysis:** The concept of stability, Routh's stability criterion, qualitative stability and conditional stability, limitations of Routh's stability. Root Locus Technique: The root locus concept, construction of root loci, effects of adding poles and zeros on the root locus.	**4 Hrs**
Unit 04	**Frequency Domain Analysis:** Introduction, Frequency domain specifications-Bode plots, Determination of Frequency domain specifications and transfer function from the Bode Plot, Phase margin and Gain margin-Stability Analysis from Bode Plots, Polar Plots, Nyquist Stability Criterion, Nyquist plot & stability analysis.	**5 Hrs**

Unit 05	**Compensators & Controllers:** Compensation techniques, Lag, Lead, Lead-Lag Controllers design in frequency Domain, Design of PID control system.	**4 Hrs**
Unit 06	**State Space Analysis:** Concept of state, state variable & state model, state model for linear continuous time systems, Decomposition of Transfer Function, Transfer function from state model, Computation of state transition matrix, Controllability & Observability	**4 Hrs**

Text Books:

Sr. No.	Name of Author and Publication Details
1	I .J. Nagrath and M. Gopal, "Control Systems Engineering", Vth Edition, Anshan Publishers.
2	A. Anandkumar, "Control System Engineering", IInd edition, PHI Publication
3	R. Aanand Natarajan, P. Rameshbabu, "Control System Engineering", Scitech Publications.

Reference Books:

Sr. No.	Name of Author and Publication Details
1	Norman S Nise, "Control System Engineering", VIIIth edition, Wiley India.
2	Sanarjjet Ghosh, "Control System Theory & Application", Ist edition, Pearson Education/

List of Experiment for ISE/CA/MSE:

- Minimum 08 Experiments based on the curriculum.

Examination Scheme and Guidelines:

ISE/CA **10 Marks**	ISE/CA-In Semester Evaluation/Continuous Assessment.
MSE **30 Marks**	Examination of 30 marks based on Units 1, 2, and 3 should be conducted, and marks should be communicated to the university. • One question of 06 Marks based on MCQ's compulsory.
ESE **60 Marks**	ESE-End Semester Examination **25% marks** based on questions of Unit 1, 2, and 3, and **75% marks** based on questions of Unit 4, 5, and 6.

	• **Instructions for Paper Setter**
	Que.1: MCQ's based on All Units (Carries 12 Marks).
	Que.2: based on Unit 1, 2, 3 (Carries 12 Marks).
	Que.3: based on Unit 4, 5, 6 (Carries 12 Marks).
	Que.4: based on Unit 4, 5, 6 (Carries 12 Marks).
	Que.5: based on Unit 4, 5, 6 (Carries 12 Marks).

SHIVAJI UNIVERSITY, KOLHAPUR
ELECTRONICS AND TELECOMMUNICATION ENGINEERING
HSSM-ETC0246 Employability Enhancement Skill

Course Details:

Class	S. Y. B.Tech. Sem-IV
Course Code & Course Title	HSSM-ETC0246: Employability Enhancement Skill
Prerequisites:	Basic Communication Skills
Teaching scheme: Lecture / Practical	02/--
Credits	02
Evaluation Scheme (ISE /CA) / MSE / ESE/(ISE /CA)(PR)/ ESE(PR)	50 (ISE/CA)

Teaching Scheme	Examination Scheme
Lectures : 02 Hrs. /week	Theory : ---
Practical: -- Hrs. /Week	50 (ISE/CA)

Course Objectives: The course aims to:	
1	**Develop Self-Awareness through SWOC Analysis:** Students will learn to conduct self- reflection and SWOC (Strengths, Weaknesses, Opportunities, Challenges) analysis to identify areas for personal and professional growth.
2	**Enhance Communication Skills Across Platforms:** Students will develop effective verbal, written, and non-verbal communication skills, and learn to overcome communication barriers in various contexts.
3	**Master Professional Writing Techniques:** Students will learn to write professional documents, including resumes, emails, and reports, with clarity and precision to enhance their career prospects.
4	**Cultivate Leadership and Teamwork Abilities:** Students will understand key leadership qualities and team dynamics, and develop skills to manage projects and collaborate effectively in a team
5	**Apply Professional Etiquette and Ethical Standards:** Students will learn the importance of professional ethics, telephone and travel etiquette, and how to succeed in interviews and group discussions.
6	**Improve Problem-Solving and Analytical Abilities:** Students will develop strong quantitative and logical reasoning skills, and apply problem-solving strategies for success in aptitude tests and real-world scenarios.

Course Outcomes: Upon successful completion of this course, the student will be able to:	
HSSM-ETC0246.01	Self-Reflection and SWOC Analysis: Students will be able to conduct self-reflection and perform a SWOC analysis to assess their strengths, weaknesses, opportunities, and challenges for personal and professional growth.
HSSM-ETC0246.02	Effective Communication: Students will develop the ability to communicate clearly and effectively in verbal, written, and non-verbal forms across various platforms and overcome communication barriers.
HSSM-ETC0246.03	Professional Writing Proficiency: Students will be able to write professional documents, including resumes, emails, and reports, with clarity and effectiveness, following industry standards.
HSSM-ETC0246.04	Leadership and Teamwork: Students will demonstrate an understanding of leadership qualities and team dynamics and will be able to collaborate effectively in group settings and manage team-based projects.
HSSM-ETC0246.05	Professional Ethics and Interview Skills: Students will apply professional ethics and etiquette in interviews, group discussions, and workplace interactions, ensuring proper conduct and communication.
HSSM-ETC0246.06	Problem-Solving and Analytical Skills: Students will be able to solve quantitative and logical problems effectively and apply critical thinking strategies to tackle real-world challenges

Course Contents		
Unit 01	**Foundations of Self-Discovery and Personal Growth** Self-Reflection and SWOC (Strengths, Weaknesses, Opportunities, Challenges) Analysis. Importance of Soft Skills in Personal and Career Development. Cross-Disciplinary and Global Relevance of Soft Skills. Setting Personal and Career Goals. Aligning Career Aspirations with Skill Sets. Self-Esteem Evaluation and Self-Assessment Techniques.	**02 Hrs.**
Unit 02	**Mastering Communication Essentials** Basics of Communication and Its Importance, Types of Communication (Verbal, Written, Visual), Identifying and Addressing Barriers to Communication, Non-Verbal Communication and Its Role in Effective Interaction, Techniques for Group Discussions, Digital Communication: Email Etiquette and Online Presentation Skills	**02 Hrs.**
Unit 03	**Professional Language and Effective Writing** Enhancing Spoken English and Business Vocabulary, Developing Professional Emails and Letters, Resume Writing: Chronological, Functional, and Hybrid Formats, Structuring Career Objectives in Resumes, Key Traits of an Effective Resume and Common Mistakes, Basic Technical Writing and Structuring Formal Documents	**02 Hrs.**

Unit 04	**Leadership, Teamwork, and Presentation Skills** Corporate Culture and Essential Leadership Qualities, Differences Between Leaders and Managers, Decision-Making Skills: 4-Ds (Do, Delay, Delegate, Drop), Effective Team Dynamics: Positivity, Respect, Trust, Goal Focus, Support, Planning and Preparing Professional Presentation, Delivering Presentations and Handling Q&A	**02 Hrs.**
Unit 05	**Professional Ethics and Interview Preparation** Importance of Professional Ethics, Telephone and Travel Etiquette, Netiquette and Social Media Guidelines, Types of Interviews and Preparation Steps, Group Discussions, Panel Discussions, and Debates Non-Verbal Communication in Interviews and Group Discussions	**02 Hrs.**
Unit 06	**Quantitative Skills and Strategic Problem Solving** Introduction to Aptitude Tests and Preparation Strategies, Quantitative Aptitude: Number Sequences, Squares, Roots, LCM, HCF, Logical Reasoning: Matching, Selection, and Arrangement Problems, Problem-Solving Techniques: Define, Gather, Evaluate, Act, Cognitive and Analytical Skills: Brainstorming, Learning from Mistakes, Test-Taking Strategies and Time Management for Aptitude Exams	**02 Hrs.**

Text Books:

Sr. No.	Name of Author and Publication Details
1	Soft Skills: An Integrated Approach to Maximize Personality by Ghosh B. K.
2	Essentials of Business Communication by Mary Ellen Guffey and Dana Loewy
3	Technical Communication: Principles and Practice by Meenakshi Raman and Sangeeta Sharma
4	The 7 Habits of Highly Effective People by Stephen R. Covey
5	Developing Soft Skills by Robert M. Sherfield, Patricia J. Moody, and Rhonda J. Montgomery
6	Quantitative Aptitude for Competitive Examinations by R.S. Aggarwal

Reference Books:

Sr. No.	Name of Author and Publication Details
1	Developing Soft Skills by Robert M. Sherfield, Patricia J. Moody, and Rhonda J. Montgomery
2	How to Win Friends and Influence People by Dale Carnegie
3	The Art of Communicating by Thich Nhat Hanh
4	Business Etiquette: A Guide for the Indian Professional by Shital Kakkar Mehra

5	A Modern Approach to Verbal & Non-Verbal Reasoning by R.S. Aggarwal
6	Thinking, Fast and Slow by Daniel Kahneman

List of Assignment/Tutorials for ISE/CA:

- Minimum 06 Assignment /Tutorials based of curriculum.

Examination Scheme and Guidelines:

ISE/CA **50 Marks**	ISE/CA-In Semester Evaluation/Continuous Assessment.

SHIVAJI UNIVERSITY, KOLHAPUR
ELECTRONICS AND TELECOMMUNICATION ENGINEERING
HSSM-ETC0247 Professional Ethics

Course Details:

Class	S. Y. B-Tech. Sem-IV
Course Code & Course Title	HSSM-ETC0247: Professional Ethics
Prerequisites:	Basic Communication Skills
Teaching scheme: Lecture / Practical	02/--
Credits	02
Evaluation Scheme (ISE /CA) / MSE / ESE/(ISE /CA)(PR)/ ESE(PR)	20 (ISE/CA)

Teaching Scheme	Examination Scheme
Lectures : 02 Hrs. /week	Theory : ---
Practical: -- Hrs. /Week	20 (ISE/CA)

Course Objectives: The course aims to:	
1	To enable the students to create an awareness on Engineering Ethics and Human Values to instill Moral and Social Values and Loyalty and to appreciate the rights of others.
2	To enable the students to understand engineering Ethics
3	To enable the students to create an awareness of seeing Engineering as Social Experimentation
4	To enable the students to understand Safety, Responsibilities and Rights
5	To enable the students to create an awareness of Global Issues

Course Outcomes: Upon successful completion of this course, the student will be able to:	
HSSM-ETC0247.01	Create an awareness on Engineering Ethics and Human Values to instill Moral and Social Values and Loyalty and to appreciate the rights of others.
HSSM-ETC0247.02	Understand Engineering Ethics
HSSM-ETC0247.03	Create an awareness of seeing Engineering as Social Experimentation
HSSM-ETC0247.04	Understand Safety, Responsibilities and Rights
HSSM-ETC0247.05	Creating an awareness on Global Issues

Course Contents		
Unit 01	**Human Values** Morals, values and Ethics, Integrity, Work ethic, Service learning, Civic virtue, Respect for others, living peacefully, Caring, Sharing, Honesty, Courage, Valuing time, Cooperation, Commitment, Empathy, Self-confidence, Character, Spirituality, Introduction to Yoga and meditation for professional excellence and stress management.	**02 Hrs.**
Unit 02	**Engineering Ethics** Senses of 'Engineering Ethics', Variety of moral issues, Types of inquiry, Moral dilemmas, Moral Autonomy, Kohlberg's theory, Gilligan's theory, Consensus and Controversy, Models of professional roles, Theories about right action, Self-interest, Customs and Religion, Uses of Ethical Theories.	**02 Hrs.**
Unit 03	**Engineering As Social Experimentation** Engineering as Experimentation, Engineers as responsible Experimenters, Codes of Ethics, A Balanced Outlook on Law.	**02 Hrs.**
Unit 04	**Safety, Responsibilities and Rights** Safety and Risk, Assessment of Safety and Risk, Risk Benefit Analysis and Reducing Risk, Respect for Authority, Collective Bargaining, Confidentiality, Conflicts of Interest, Occupational Crime, Professional Rights, Employee Rights, Intellectual Property Rights (IPR), Discrimination.	**02 Hrs.**
Unit 05	**Global Issues** Multinational Corporations, Environmental Ethics, Computer Ethics, Weapons Development, Engineers as Managers, Consulting Engineers, Engineers as Expert Witnesses and Advisors, Moral Leadership, Code of Conduct, Corporate Social Responsibility.	**02 Hrs.**

Text Books:

Sr. No.	Name of Author and Publication Details
1	Govindarajan M, Natarajan S, Senthil Kumar V. S, "Engineering Ethics", Prentice Hall of India, New Delhi, 2004.
2	Mike W. Martin and Roland Schinzinger, "Ethics in Engineering", Tata McGraw Hill, New Delhi, 2003.

Reference Books:

Sr. No.	Name of Author and Publication Details
1	Charles B. Fleddermann, "Engineering Ethics", Pearson Prentice Hall, New Jersey, 2004
2	Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, "Engineering Ethics – Concepts and Cases", Cengage Learning, 2009.
3	Edmund G Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientists and Engineers", Oxford University Press, Oxford, 2001.
4	John R Boatright, "Ethics and the Conduct of Business", Pearson Education, New Delhi, 2003.
5	Laura P. Hartman and Joe Desjardins, "Business Ethics: Decision Making for Personal Integrity and Social Responsibility" Mc Graw Hill education, India Pvt. Ltd.,New Delhi, 2013.
6	World Community Service Centre, ' Value Education', Vethathiri publications, Erode, 2011

List of Assignment/Tutorials for ISE/CA:

- Minimum 06 Assignment /Tutorials based of curriculum.

Examination Scheme and Guidelines:

ISE/CA 20 Marks	ISE/CA-In Semester Evaluation/Continuous Assessment.

SHIVAJI UNIVERSITY, KOLHAPUR
ELECTRONICS AND TELECOMMUNICATION ENGINEERING
VEC - ETC0249- Electronics Workshop - I

Course Details:

Class	S. Y. B-Tech. Sem-IV
Course Code & Course Title	VEC - ETC0249: Electronics Workshop - I
Prerequisites:	Basic of Electronics
Teaching scheme: Lecture / Practical	-- /02
Credits	01
Evaluation Scheme (ISE /CA) / MSE / ESE/(ISE /CA)(PR)/ ESE(PR)	10 (ISE/CA) + 50 (ESE)

Teaching Scheme	Examination Scheme
Lectures : -- Hrs. /week	Theory : ---
Practical: 02 Hrs. /Week	10 (ISE/CA) + 50 (ESE)

Course Objectives: The course aims to:	
1	**Identify and Analyze Electronic Components:** Enable students to recognize and evaluate various electronic components (active, passive, electro-mechanical), interpret specifications, and analyze datasheets for selecting the right components for circuit designs.
2	**Test and Troubleshoot Electronic Components:** Provide students with practical skills to test and measure the functionality of components like resistors, capacitors, and transistors, as well as troubleshoot faulty components using appropriate testing instruments.
3	**Master PCB Design Tools and Techniques:** Introduce students to PCB design software, such as KiCad, and guide them through the process of designing, laying out, and routing PCBs based on circuit diagrams.
4	**Develop PCB Fabrication and Assembly Skills:** Teach students the hands-on process of fabricating PCBs, including etching, drilling, and preparing boards for component placement, followed by soldering and testing to ensure proper functionality.
5	**Program and Interface with Arduino Uno:** Provide foundational knowledge of Arduino programming, focusing on writing basic programs, interfacing components like LEDs and sensors, and debugging common issues.

6	**Explore ESP32 Features and Applications:** Introduce the ESP32 microcontroller, including its capabilities (Wi-Fi, Bluetooth), and guide students through setup, programming, and component interfacing for practical applications.

Course Outcomes: Upon successful completion of this course, the student will be able to:	
HSSM-ETC0249.01	Identify and Analyze Electronic Components: Students will be able to classify and evaluate different electronic components (active, passive, electro-mechanical), understand their specifications, and select appropriate components for circuit design based on functionality, size, cost, and datasheet analysis.
HSSM-ETC0249.02	Test and Troubleshoot Electronic Components: Students will acquire the skills to effectively test and measure the performance of various components (e.g., resistors, capacitors, diodes, transistors), interpret test results, and troubleshoot faulty components using appropriate tools like multimeters and oscilloscopes.
HSSM-ETC0249.03	Master PCB Design Tools and Techniques: Students will gain proficiency in using PCB design software (e.g., KiCad), enabling them to design, layout, and route PCB circuits from schematics, as well as make design decisions based on industry-standard practices.
HSSM-ETC0249.04	Develop PCB Fabrication and Assembly Skills: Students will be capable of fabricating a functional PCB, including the steps of etching, drilling, and component placement, followed by soldering and testing to ensure correct circuit functionality and assembly integrity.
HSSM-ETC0249.05	Program and Interface with Arduino Uno: Students will develop a foundational understanding of Arduino programming, writing basic programs, interfacing with components (e.g., LEDs, sensors), and debugging to ensure proper communication and functionality within the Arduino platform.
HSSM-ETC0249.06	Explore ESP32 Features and Applications: Students will be able to set up and program the ESP32 microcontroller, utilizing its Wi-Fi and Bluetooth capabilities, and successfully interface it with various components for real-world applications, demonstrating an understanding of its unique features.

Course Contents		
Experiment No. 1	**Identification and Specification Analysis of Electronic Components** • Overview of various electronic components: active, passive, electro-mechanical, etc. • Analysis of component specifications (functionality, type, size, colour coding, package, cost). • Understanding the purpose and selection criteria for each component. • Practice with reading and analysing datasheets for discrete components and ICs. • Basics of estimating costs and compiling a bill of materials (BOM).	**02 Hrs.**
Experiment No. 2	**Testing of Basic Electronic Components Using a different instruments & techniques** • Testing procedures for various electronic components like resistors, capacitors, diodes, transistors, relay, etc. • Understanding and measuring component values and functionality. • Interpreting readings for checking continuity, resistance, and polarity. • Troubleshooting and identifying faulty components.	**02 Hrs.**
Experiment No. 3	**Familiarization and Application of Testing Instruments** • Introduction to commonly used testing instruments: Multimeter, Function Generator, Power Supply, DSO. • Usage and handling of testing instruments for component and circuit testing. • Application of tools like soldering iron, desoldering pump, pliers, cutters, wire strippers, and crimping tools. • Hands-on practice with hot air soldering and de-soldering stations.	**02 Hrs.**
Experiment No. 4	**Introduction to PCB Design Software** • Understanding the role and importance of PCB design in electronics • Overview of popular PCB design software, focusing on open-source options like KiCad • Detailed exploration of the software interface, including essential tools and panels • Navigating the workspace: libraries, component placement tools, and routing functions	**02 Hours**

Experiment No. 5	**Designing and Creating a PCB Layout from a Circuit Diagram** • Reviewing the circuit schematic for PCB design • Importing and converting the circuit diagram into a PCB layout • Step-by-step component placement and arrangement on the PCB • Routing connections and managing single-layer and multi-layer designs • Verifying the PCB layout and preparing it for error checking	**02 Hrs.**
Experiment No. 6	**Techniques for PCB Printing, Etching, and Drilling** • Preparing the PCB design for printing and transferring it to a copper-clad board • Step-by-step guide to etching the PCB and safety precautions for handling chemicals • Drilling precise component holes for proper alignment • Cleaning and preparing the etched PCB for the next steps	**02 Hrs.**
Experiment No. 7	**Component Placement, Soldering Techniques, and Circuit Testing** • Placing components accurately on the prepared PCB • Effective soldering practices for reliable connections • Inspecting soldered joints for quality and ensuring circuit integrity • Powering the circuit and conducting functionality tests • Troubleshooting and resolving potential issues during testing	**02 Hrs.**
Experiment No. 8	**Overview and Setup of Arduino Uno** • Introduction to Arduino and comparison of various models, focusing on Arduino Uno • Step-by-step guide for downloading and installing the Arduino IDE • Instructions for connecting and interfacing Arduino Uno with a computer or laptop • Detailed description of Arduino Uno pins and their functions	**02 Hrs.**
Experiment No. 9	**Arduino Uno Programming Essentials** • Basic syntax and structure of Arduino programs • Creating a simple program to blink the on-board LED • Reading and displaying analog input from a potentiometer on the serial monitor • Interfacing an LED with Arduino • Debugging common programming issues	**02 Hrs.**
Experiment No. 10	**Component Interfacing Techniques with Arduino** • Connecting and programming an LED and push button with Arduino • Interfacing and coding to operate a relay with Arduino • Troubleshooting and resolving common component interfacing issues	**02 Hrs.**

Experiment No. 11	**ESP32 Introduction and Initial Setup** • Overview of the ESP32, its features, and capabilities (e.g., Wi-Fi and Bluetooth) • Installation and configuration of the Arduino IDE for ESP32 development • Steps for connecting the ESP32 to a computer and setting up the environment • Explanation of ESP32 pins and their functions in various Applications	**02 Hrs.**
Experiment No. 12	**Programming Basics and Applications with ESP32** • Understanding the program structure and syntax for ESP32 coding • Writing and running a basic program to control the on-board LED • Connecting and programming a 7-segment display with ESP32 • Tips for debugging and addressing common issues in ESP32 projects	**02 Hrs.**

Text Books:

Sr. No.	Name of Author and Publication Details
1	Electronic Devices and Circuit Theory by Robert L. Boylestad & Louis Nashelsky
2	Practical Electronics for Inventors by Paul Scherz & Simon Monk
3	The Art of Electronics by Paul Horowitz & Winfield Hill
4	Introduction to Electric Circuits by Richard C. Dorf & James A. Svoboda
5	KiCad Like a Pro: PCB Design by Michael S. Cohn
6	Arduino: A Technical Reference by Jody Culkin & Mike McRoberts

Reference Books:

Sr. No.	Name of Author and Publication Details
1	Electronic Principles by Albert Malvino & David Bates
2	The Complete Idiot's Guide to Arduino by Brian Huang & Michael McRoberts
3	PCB Design for Real-World Design by Chris Schroeder
4	Practical Electronics for Inventors by Paul Scherz

5	ESP32 Programming for Beginners by Mike McRoberts
6	Multisim: Electronic Simulation Software by James E. S. Faint

List of Assignment/Tutorials/experiments for ISE/CA:

- Minimum 08 Experiments based on the curriculum.

Examination Scheme and Guidelines:

ISE/CA **10 Marks**	ISE/CA-In Semester Evaluation/Continuous Assessment.
ESE **50 Marks**	Oral Examination (OE)

SHIVAJI UNIVERSITY, KOLHAPUR
ELECTRONICS AND TELECOMMUNICATION ENGINEERING
VEC ETC02410 Simulation Lab

Course Details:

Class	S. Y. B.Tech. Sem-IV
Course Code & Course Title	VEC ETC02410 Simulation Lab
Prerequisites:	Computer Networks
Teaching scheme: Practical	-- / 02
Credits	01
Evaluation Scheme (ISE/CA) /ESE	10/50

Teaching Scheme	Examination Scheme
Practical: 2 Hrs. /Week	ISE/CA (10) + ESE (50)

Course Objectives: The course aims to:	
1	To understand the working principle of various communication protocols.
2	To understand the network simulator environment and visualize a network topology and observe its performance.
3	To learn the Network Models and datalink layer functions.

Course Outcomes: Upon successful completion of this course, the student will be able to:	
VEC ETC02410.01	Use the network simulator for learning and practice of networking algorithms.
VEC ETC02410.02	Illustrate the operations of network protocols and algorithms
VEC ETC02410.03	Implement data link layer farming methods.

List of Experiments for CA/ESE:

- Minimum 08 Experiments based on the CISCO PACKET TRACER, Windows based (STUDENT VERSION),
- NS2, Linux/Ubuntu/Simulation based etc.

EXPT. NO.	TITLE OF THE EXPERIMENT
1.	Introduction to Cisco packet tracer & study of OSI Reference Model
2.	Simulation & Configuration of Local Area Network (LAN) using cisco packet tracer
3.	Simulation & Configuration of DHCP server using cisco packet tracer
4.	Simulation & Configuration of DNS using cisco packet tracer
5.	Simulation & Configuration of Static Routing using cisco packet tracer
6.	Simulation & Configuration of Distance Vector Routing-RIP using cisco packet tracer
7.	Simulation & Configuration of Simple Mail Transfer Protocol (SMTP) using cisco packet tracer
8.	Simulation & Configuration of File Transfer Protocol (FTP) using cisco packet tracer
9.	Introduction to Network Simulator (NS2)
10.	Simulation and implementation of star topology using NS2
11.	Simulation and implementation of ring topology using NS2
12.	Simulation and implementation of Simple wired network using NS2
13.	Simulation and implementation of Simple wireless network using NS2
14.	Simulation and implementation of Link State Routing protocol (LSR) using NS2

Text Books:

Sr. No.	Name of Author and Publication Details
1	Forouzan, , "Data Communication and Networking" Fifth Edition,TataMc-GrawHill, Publication
2	Tanenbaum, "Computer Neworks", IVth Edition, pearson Education
3	https://www.isi.edu/websites/nsnam/ns/tutorial

Reference Books:

Sr. No.	Name of Author and Publication Details
1	Forouzan, "TCP/IP Protocol Suite", IIIrd Edition Tata Mc-Graw Hill publication.
2	Computer Networking A top down approach, James F. Kurose, Person, Fifth Edition

Examination Scheme and Guidelines:

ISE/CA 10 Marks	ISE/CA-In Semester Evaluation/Continuous Assessment.
ESE 50 Marks	ESE-End Semester Examination **Oral Examination (OE)**

SHIVAJI UNIVERSITY, KOLHAPUR
ELECTRONICS AND TELECOMMUNICATION ENGINEERING
VSEC ETC02412 Data Structure using C/C++

Course Details:

Class	S. Y. B-Tech. Sem- IV
Course Code & Course Title	**VSEC ETC02412** Data Structure using C/C++
Prerequisites:	Knowledge of Mathematics, Computer Resources
Teaching scheme: Lecture / Practical	01/02
Credits	02
Evaluation Scheme : CA	50

Teaching Scheme	Examination Scheme
Lectures : 01 Hrs. /week	--
Practical: 02Hrs. /Week	CA (50)

Course Objectives: The course aims to:	
1	Provide basic concept of data structure & it's types.
2	Provide knowledge of arrays & records as well as relevant operations on it.
3	Provide the knowledge of linked list & relevant operations on it.
4	Provide the concept of stacks, queues & it's applications.
5	Provide the knowledge of various types of trees & relevant operations.
6	Provides the Knowledge of Graphs & Hashing techniques.

Course Outcomes: Upon successful completion of this course, the student will be able to:	
VSEC ETC02412.01	Elaborate the basic concept of data structure & it's types.
VSEC ETC02412.02	Design and Implement the various algorithms on arrays & records.
VSEC ETC02412.03	Implement algorithms on linked list.
VSEC ETC02412.04	Understand the concept of stacks, queues & its applications.
VSEC ETC02412.05	Construct various types of trees & their applications.
VSEC ETC02412.06	Understand the concept of Graph & Hashing.

Course Contents		
Unit 01	**Introduction & Overview:** Introduction to theory of data structures, data types, Difference between procedure oriented programming and object oriented programming, basic concepts and features of object oriented programming, structures and classes	**(02 Hrs)**
Unit 02	**Arrays, Records & Pointers:** Introduction, linear arrays, inserting & deleting, Sorting: bubble sort searching: linear search, binary search, Multi-dimensional arrays, Pointers: pointer arrays, Records: Record structures, sparse matrices.	**(02 Hrs)**
Unit 03	**Linked Lists:** Introduction, linked lists & its representation, Traversing & searching a Linked list, insertion & deletion of nodes of linked list, header linked list, two-way lists.	**(02 Hrs)**
Unit 04	**Stacks & Queues:** Introduction to stacks, stack as an Abstract Data type, representation through Arrays & linked lists, arithmetic expressions, Applications of stacks, stacks & recursion, Queue, representation of queue as an array and as a linked list, circular, double ended, priority, application of queues.	**(02 Hrs)**

Unit 05	**Trees :** Binary Tree: introduction, types, definition, properties, representations, operations, applications. Advanced trees: AVL trees or height balanced trees, representation operation, Threaded binary trees, Expression trees. Multi way trees: trees, multi way search trees, B+ trees, Heaps, construction of a Heap.	**(02 Hrs)**
Unit 06	**Graphs &Hashing**: Introduction, Graph theory terminology, sequential representation of Graphs: and its applications linked representation. Operations, Traversing, Posets, Topological sorting. Hashing, Hash functions, collision, chaining	**(02 Hrs)**

Text Books:

1	Data structure using C By ISRD group, published by Tata McGraw Hill
2	Data structures by Seymour Lipschutz, published by Tata McGraw Hill
3	Programming with C++ D Ravichandran, II edition, Tata Mc Grow Hill
4	Object oriented Programming with C++, E Balagurusamy, Mc Grow Hill

Reference Books:

Sr. No.	Name of Author and Publication Details
1	Data structure & algorithm analysis in C by Mark Allen Weiss published by Pearson Education (LPE)
2	Introduction to Data structure in C by A.N. Kathie published by Pearson Education (LPE)
3	The C++ Programming Language, Brian W. Kernighan, Dennis M. Ritchi , IInd edition, Prentice Hall of India.

List of Experiment for ISE/CA:

- Minimum 08 Experiments based on the curriculum.

Examination Scheme and Guidelines:

ISE/ CA **50 Marks**	ISE/CA-In Semester Evaluation/Continuous Assessment.

SHIVAJI UNIVERSITY, KOLHAPUR
ELECTRONICS AND TELECOMMUNICATION ENGINEERING
ENVIRONMENTAL SCIENCE (DECIDED BY UNIVERSITY)

Course Details:

Class	S. Y. B-Tech. Sem-IV
Course Code & Course Title	PCC-ETC02411: Environmental Science
Prerequisites:	
Teaching scheme: Lecture / Practical	03/00
Credits	Audit
Evaluation Scheme (ISE /CA) / MSE / ESE	10/30/60

Teaching Scheme	Examination Scheme
Lectures : 03 Hrs. /week	Theory : 60 (ESE) + 30 (MSE) +10 (ISE/CA)
Practical: 0 Hrs. /Week	00

Course Objectives: The course aims 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: Upon successful completion of this course, the student will be able to:	
PCC-ETC02411.01	Understand the importance of Environmental Studies and recognize significance of ecosystem.
PCC-ETC02411.02	Classify the values of natural resources with associated problems for sustainable lifestyles.
PCC-ETC02411.03	Describe the social and global environmental issues
PCC-ETC02411.04	Make aware of Pollution issues with its mitigation measures.

PCC-ETC0241105	Familiarize the basics of Biodiversity and concerned issues in the context of Western Ghats.
PCC-ETC02411.06	Acquaint with the role of environmental laws and regulations in conservation efforts.

Course Contents		
Unit 01	**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- Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) Degradation of the ecosystems and it's impacts.	**06 Hrs.**
Unit 02	**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 03	**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 04	**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 05	**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.**
Unit 06	**Environmental Protection-Policies and practices** 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.**

Reference Books:

Sr. No.	Name of Author and Publication Details
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

Equivalence of Subjects between CBCS and NEP for

S.Y. B. Tech (Sem-III & IV)

Name of Programme: Electronics & Telecommunication Engineering

Class: S. Y. B. Tech Semester- III

Sr. No	Name of Subjects in existing CBCS 2018 onwards pattern (Add all subjects)	Name of Subjects in NEP pattern	Reason	Remark
01	Engineering Mathematics-III	Mathematics for Electronics Engineering	Content Relevant to EM-III	Equivalence
02	Electronic Circuit Design-I	Analog Circuit Design	Content Relevant with ECD-I & ECD-II	Equivalence
03	Network Analysis	Network Analysis	Content relevant to NA	Equivalence
04	Transducers and Measurement	----Nil---	No subject relevant to this subject	No Equivalence
05	Analog Communication	Analog and Digital Communication	Content relevant to Analog comm	Equivalence
06	Programming Lab-I	----Nil---	No subject relevant to this subject	No Equivalence
07	Environmental Studies	Environmental Studies	Same content	Equivalence

Class: S. Y. B. Tech Semester- IV

Sr. No	Name of Subjects in existing CBCS 2018 onwards pattern (Add all subjects)	Name of Subjects in NEP pattern	Reason	Remark
01	Electronic Circuit Design-II	----Nil---	No subject relevant to this subject. content of EDC-II included in ACD in SEM-I	No Equivalence
02	Linear Integrated Circuits	Linear Integrated Circuits	Max content same	Equivalence
03	Control System Engineering	----Nil---	No subject relevant to this subject	No Equivalence
04	Digital Communication	----Nil---	No subject relevant to this subject. content of DC included in Analog & Digital Comm. in SEM-I	No Equivalence
05	Data Structures	Data Structure using C/C++	Content same & relevant	Equivalence
06	Programming Lab-II	----Nil---	No subject relevant to this subject	No Equivalence

Electronics & Telecommunication Engineering

S.Y. Exit Course

Bucket List of NPTEL course and Virtual Lab course

Choose any Two as S. Y. Exit Course after completion of Semester IV from given below list. Corresponding lab need to be chosen based on NPTEL course selected as MOOC course. Exit course covers total 08 credits which include NPTEL Courses cover 06 credits (03 credit of each) and virtual lab cover 02 credits (01 credit of each).

Bucket list cum correlative course and lab Table		
Sr. No.	**NPTEL Course Title**	**Vitrual Lab Title**
1	Network Analysis	Analog and Digital Electronics Lab I (New)
2	Electromagnetic Waves in Guided and Wireless Media	Analog and Digital Electronics Lab II (New)
3	Digital Electronic Circuits	Digital Logic Design Lab (Logic Gates & Mux-Demux)
4	Circuit Analysis for Analog Designers	Hybrid Electronics Lab
5	Fundamentals of MIMO Wireless Communication	Digital Electronic Circuits Lab

Note:

1. There is an uncertainty of the availability of the NPTEL courses mentioned above as there is constant updating of the courses. The students can choose equivalent subjective course of the required duration with permission from the concerned institute.

2. To fulfill the required credit score of 03 credits and taking the courses available in consideration students can go for 1 course of 12 week or 2 course of 8 week or 3 courses of 4 weeks.

3. For NPTEL course visit to website https://swayam.gov.in and register and create your account. Log in the account and join the required course and follow the instructions to compete the course. Similarly, for virtual Lab visit to website https://www.vlab.co.in and (sometimes need register and create your account, also log in the account and) join the required lab and follow the instructions to compete the course (need to do all listed experiment under that Lab).

Details of NPTEL Course (https://swayam.gov.in)			
Sr. No.	**NPTEL Course Title**	**Duration**	**Credit**
1	Network Analysis	12 Week	03
2	Electromagnetic Waves in Guided and Wireless Media	08 Week	02
3	Digital Electronic Circuits	12 Week	03
4	Circuit Analysis for Analog Designers	12 Week	03
5	Fundamentals of MIMO Wireless Communication	08 Week	02

Details of Virtual Lab Course (https://www.vlab.co.in)			
Sr. No.	**Vitual Lab Course Title**	**Supporting Institution**	**Credit**
1	Analog and Digital Electronics Lab I (New)	IIT Roorkee	
2	Analog and Digital Electronics Lab II (New)	IIT Roorkee	
3	Digital Logic Design Lab (Logic Gates & Mux-Demux)	IIIT Bombay	
4	Hybrid Electronics Lab	COEP Technological University Pune	
5	Digital Electronic Circuits Lab	IIT, Kharagpur	

Distribution of the credits:

1. Two MOOCs Certification Courses (NPTEL):

Each course is worth 3 credits. These courses are likely to be available online and can be completed at the student's own pace within a set timeframe. The content will be specific to the student's field of study or program.

2. Virtual Lab:

The student must complete two virtual lab work that adds 2 credits to simulate practical or experimental learning experiences in a controlled virtual environment.

Examination scheme for second year exit:

The marks gained from the two MOOCs are converted to a total of 100 marks. The report for the performed two Virtual Lab practices 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.