Pimpri Chinchwad Education Trust's

Pimpri Chinchwad College of Engineering and Research

Plot B, Survey No. 110 (P), Laxminagar, Ravet, Pune – 412101

(An Autonomous Institute Approved by AICTE and Affiliated to SPPU, Pune)

PCET's PCCOER
पिंपरी चिंचवड कॉलेज ऑफ इंजिनीअरिंग अँड रिसर्च

Academic and Examination Rules and Regulations, Curriculum Structure, and Syllabus

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For

Second Year – Electronics & Telecommunication Engineering (B. Tech.)

With effect from (AY 2026-27)

National Education Policy (NEP) 2020 Compliant Approved by the Board of Studies (BoS-Electronics & Telecommunication Engineering) and Academic Council

(Applicable to Regulations 2023, 2021 and 2020)

(www.pccoer.com)

PCET's Pimpri Chinchwad College of Engineering and Research, Pune - 412 101 — An Autonomous Institute

Chairman, Academic Council
PCET's Pimpri Chinchwad College of Engineering and Research, Ravet, Pune - 412 101

PREFACE

Pimpri Chinchwad Education Trust's Pimpri Chinchwad College of Engineering and Research (PCCOE&R) is one of the promising institutes in Quality & Professional Education. Since 2014, PCCOE&R has been imparting value-added quality education to satisfy the needs and expectations of the stakeholders like Students, Parents, Industry etc. Focused efforts are made to achieve this, by providing state-of-the-art Engineering and Management education to Students. PCCOE&R has a student centric academic system to ensure holistic development. Every possible opportunity is provided to the student to progress academically and excel.

PCCOE&R indigenously adheres the philosophy of National Education Policy (NEP)-2020, in curriculum design, as to create an academic system that is flexible, inclusive, and focused on the holistic development of students. NEP-2020 fosters a mindset of continuous growth and lifelong learning. The continuous assessment, which involves regular evaluations throughout the academic year is promoted. This method provides ongoing feedback to students, allowing them to understand their progress and improve over time.

The weightage of stringent Academic Monitoring and Control has led towards Qualitative Results and Placements, thereby becoming the most opted Institute for admissions by engineering aspirants in and around Pune and all over the state of Maharashtra.

This booklet gives comprehensive information on the existing Rules and Regulations for B. Tech. Programmes of all branches. All Undergraduate Programmes will be governed by these Rules and Regulations. The various departments are given a direction to excel in academics through these Rules and Regulations approved by the Academic Council from time to time, keeping in view the ever-growing challenges and new developments. The stakeholders particularly the students, and parents/guardians, are advised to be fully familiar with the Academic System of the Institute. Students should be aware of the Rules and Regulations governing Academic requirements, Evaluation and Assessment policy, and Grading System. These rules may be revised to ensure the optimized learning experience of students to meet the global needs of the industry. These revisions are recommended as per the directives of UGC, AICTE, DTE and BoS. The Academic Council is the final authority to approve the Rules and Regulations, and these are binding on all the interested parties.

It is expected that this booklet would bring transparency in the functioning of the Institute related to Academics, Examinations and Evaluation amongst Students, Faculty members, Administrators, Parents and other Stakeholders.

Vision:

To be a globally recognized Institute of technological education and research for the holistic development of aspirants, through excellence in education, innovation and collaborations to fulfil the expectations of all stakeholders.

Mission:

1. To design and deliver state-of-art knowhow through experiential learning based on changing needs of industry and society worldwide, to ensure the employability and employment of each aspirant.
2. To enhance the collaborative partnership between Industry and Institute at national and international levels for commercializing and transferring the latest technological know-how towards societal, ethical and economic development.
3. To achieve and sustain institute position as one of the topmost recognized and ranked institutes in technical and technological education.

EOMS Policy:

We, at PCCOE&R, are committed to:

- Develop as a premier institute of technical education & research as per the needs and expectations of all stake holders.
- Comply with all applicable requirements.
- Continual improvement in educational, technical and scientific development, infrastructure and management system.
- Social responsibility
- Managing intellectual property
- We shall strive to maintain an environment conducive to learning and student's overall development with high moral and ethical values.

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1. DEFINITIONS

1. “Institute” means Pimpri Chinchwad College of Engineering and Research (PCCOE&R)
2. “University” means Savitribai Phule Pune University (SPPU), Pune
3. “Bachelor of Technology” B. Tech means, Undergraduate Degree awarded by SPPU
4. “Semester" means the period in which Academic activities are carried out.
5. “Course" means theory/laboratory/seminar/project/mini project/ tutorial etc.
6. “Course Credit" means weightage assigned to a Course.
7. “Course Teacher" means Faculty member assigned to teach a Course.
8. “Grade" means ***Single*** Letter assigned to indicate the Performance of Student in a Course.
9. “GB” means Governing Body.
10. “Academic Council” means apex Academic Body governing the academic programmes & policies in PCCOE&R.
11. “Board of Studies” (BOS) means departmental Academic Body common for UG and PG Programmes.
12. “Board of Examinations” (BOE) means apex Examination Body responsible for Examination conduction, framing and implementing Rules and Regulations approved by Academic Council.
13. “Grievance Redressal and Discipline Committee” (GRDC) means committee appointed by the Director to deal with cases of Grievances and Indiscipline.
14. “Complaint Redressal Committee” (CRC) means Committee appointed by the Director to deal with cases of Unfair means/Malpractice/s in Examination.
15. “Department Advisory Board” (DAB) means Departmental Advisory Body common for UG.
16. “Programme Assessment Committee” (PAC) means departmental committee for Assessment of Program.
17. “Academic Standing Committee (ASC)” means apex body next to Academic Council to take decisions under emergent situations subjected to ratification by Academic Council.

18. “Semester Grade Performance Average (SGPA)" means the weighted average of Grade Point of a Student in a Semester.
19. “Cumulative Grade Performance Average (CGPA)" means the weighted average of Grade Points for all the Semesters completed by a student.
20. “Allowed to Keep Term (ATKT)" means allowed for admission to higher class after satisfying minimum credits criterion.
21. “Academic Examination and Assessment R&R” means Academics, Examination & Evaluation Rules and Regulations governing system of the Institute.
22. “COE” means Controller of Examinations.
23. “FA” means Formative Assessment
24. “SA” means Summative Assessment
25. “DTE” means Directorate of Technical Education, Mumbai
26. “AICTE” means All India Council for Technical Education, New Delhi
27. “UGC” means University Grant Commission
28. “NEP” means National Education Policy
29. “NBA” means National Board of Accreditation
30. “NAAC” means National Assessment and Accreditation Council, Bangalore

2. INTRODUCTION

The provisions made in this document shall govern the Academic Policies and Procedures, Curriculum, Course Delivery, Evaluation System, Continuous Assessment, conduct of the Examinations and declaration of Results.

i. The medium of instruction throughout the programme shall be English except where it is explicitly mentioned as Regional.
ii. Semester system shall be adopted for Academic activities in the Institute. Normally, all Odd Semesters shall commence from the first week of July and Even Semesters shall commence from the first week of January.
iii. The commencement of first semester for B. Tech shall be governed by the admission schedule declared by DTE, Government of Maharashtra.
iv. There are eight semesters having total **168 Credits** for every Undergraduate Programme. Around 14 credits out of 168 credits would be for Multi- Disciplinary Minor (MDM).
v. All seven Undergraduate Engineering Programmes (Civil Engineering, Computer Engineering, Electronics and Telecommunication Engineering, Information Technology and Mechanical Engineering, Bachelor of Business Administration, Bachelor of Computer Applications) shall be governed by Rules and Regulations provided in this version of 'Rules and Regulations for Academic, Examinations and Evaluation'.
vi. Academic Calendar shall be prepared and published before the commencement of every Academic year.
vii. Evaluation norms shall be strictly followed to maintain quality of engineering education. Examination system shall be transparent and governed by Rules and Regulations.
viii. Rules and Regulations hereafter shall be subjected to amendments made by the Academic Council from time to time, based on recommendations of the BOS and BOE. All such amendments shall be applicable from the date of amendment.
ix. The Rules and Regulations formulated in this document shall be subjected to revisions/refinement/updates/modifications through the approval by the Academic Council from time to time, and shall be binding on all concerned Stakeholders, including the Students, Faculty, Staff, Departments, and Administrators.

3. ORGANIZATION STRUCTURE & ACADEMIC DEPARTMENTS

The organization structure and academic departments are well-established to ensure the proper execution of B. Tech Engineering, BBA & BCA programmes in a qualitative way. Following are details about the various committees and undergraduate programmes:

i. The academic administration of the Institute consists of committees and functionaries as below:
   - The Academic Council (AC) is a statutory and supreme body that governs all academic matters of the Institute. The AC is chaired by the AC Chairman (Director of the Institute) and the decisions made by the Chairman of AC in regard to all academic issues shall be final and binding to all the stakeholders. The AC may also form various sub- committees from time to time for specific purposes.
   - The Academic Standing Committee (ASC) shall continuously assess the academic activities and make appropriate revisions / modifications / improvements as and when required. All academic activities shall be scheduled through an approved 'Academic Calendar' notified in the beginning of each Academic Year.
   - Board of Examination (BOE) is constituted as per statutes of Savitribai Phule Pune University to ensure proper organization and conduction of examinations and related processes including moderation, tabulation and declaration of the results.
   - At the department level, the Board of Studies (BOS) is responsible for framing the syllabi for various courses, reviewing and updating syllabi from time to time, introducing new courses of study, determining details of continuous assessment, recommending panels of examiners etc.
   - The Department Advisory Board (DAB) and Programme Assessment Committee (PAC) are responsible to evaluate, assess and monitor the academic practices of the Department.

ii. The functionaries of the Institutes related to Academics and Examination shall be Director, Deputy Director, Dean Academics, Controller of Examinations and Heads of the Departments.

iii. Academic Departments and Programmes offered:

The Institute offers undergraduate programmes in Engineering, management and computer applications as mentioned in Table 3.1.

Table 3.1: Academic Departments and Programmes Offered

Sr. No	Academic Department	Programme Offered	Sanctioned Intake
1	Civil Engineering	Bachelor of Technology in Civil Engineering	60
2	Computer Engineering	Bachelor of Technology in Computer Engineering	360
3	Electronics & Telecommunication Engineering	Bachelor of Technology in Electronics & Telecommunication Engineering	60
4	Information Technology	Bachelor of Technology in Information Technology	60
5	Mechanical Engineering	Bachelor of Technology in Mechanical Engineering	60
6	BBA	Bachelor of Business Administration	120
7	BCA	Bachelor of Computer Applications	120

4. ADMISSIONS AND CHANGE OF BRANCH

The admission to B. Tech. programme at PCCOE&R will take place in regular and lateral entry mode.

i. Regular entry refers to admission of students for first, second (excluding lateral entry), third, and final year of the programme in odd semesters. Lateral entry refers to admission of students for second year B. Tech. Programme directly through Diploma qualification.

ii. The admission process and eligibility to various undergraduate programmes for regular entry (First Year) and lateral entry (Second Year) are governed by the norms and procedures of DTE. The candidate shall be provisionally admitted subject to fulfillment of eligibility criteria prescribed by government/University from time to time. Details of admissions are available on weblink, www.dtemaharashtra.gov.in.

iii. Students seeking admission (regular entry) to Second, Third and Final Year should have earned all the necessary credits of the pre-previous year and at least 60% credits of the previous year. For example, for admission to 5^{th} semester (i.e. 3^{rd} year of programme), a student should have earned all credits of the First Year and 60% credits of the Second Year. Similarly, for admission to the 7^{th} semester (i.e. 4^{th} year of programme), a student should have earned all the credits of the second year and 60% credits of the third year. However, if calculation of 60% credits results in a mixed number (integer + proper fraction) then the integer part of that number shall be considered for taking decisions related with this clause.

iv. Each student shall be allotted Permanent Registration Number (PRN) at the time of registration / or admission to the Institute and that will be a permanent identification number. Students are required to use this PRN for all purposes and communication.

v. Change of Programme / Branch:

Students shall be eligible to apply for change of branch after completing the first two semesters. The following rules/guidelines shall be used for considering their application for change:

a) The process of change of branch shall be carried out purely on merit basis subject to the rules of admissions prevailing at the time of such change.

b) The candidate seeking for a change in course or shift after completing the first year of studies or both first and second semester examinations in full or failed in one of the heads of passing will be allowed to do so in the same institute subject to the availability of seats and changes will be carried out based on the marks of First year or First and Second semester together.

c) The request for change of branch by a student from branch A to branch B shall be considered if the number of students of branch B does not exceed the sanctioned capacity of branch B.

d) All such transfers shall be granted only once at the beginning of third semester. No application for change of branch during subsequent semesters shall be entertained.

e) Students allotted with a branch of their choice should accept it and complete the bridging courses offered by the branch allotted. No further request for change shall be entertained.

5. ACADEMIC CALENDAR

The academic activities of the Institute are regulated by Academic Calendar approved by the AC / ASC, and are released at the beginning of each Academic Year. It is mandatory for Students and Faculty to strictly adhere to the academic calendar for completion of academic and related activities.

i. The Academic Calendar shall be prepared by Dean Academics and approved by the AC / ASC.

ii. The AC sets a definite time schedule for various academic activities, through an Academic Calendar issued and notified to all stakeholders at the beginning of each Academic Year.

iii. The Academic Calendar shall be disseminated on the notice boards and website of the Institute.

iv. The academic activities of the institute shall be monitored as per the Academic Calendar

v. Academic Calendar shall incorporate schedule of admissions, course registration, course delivery, examination/evaluation, course feedback, course/graduate exit survey, meeting schedules, student internship, summer examinations.

vi. The curriculum shall be typically delivered in two semesters in an Academic Year.

Each semester shall be of 20 weeks duration, including evaluation, grade moderation and result declaration. The Academic semester shall provide at least 90 instructional days.

vii. All co-curricular and extra-curricular activities shall be scheduled so as not to interfere with the academic activities as stipulated in the academic calendar.

viii. The non-conduct of academics on any particular teaching day for whatever reason shall be made up on a suitable day.

6. SEMESTER REGISTRATION, ATTENDANCE, COURSE DROPPING, COURSE WITHDRAWAL, TEMPORARY BREAK, DETENTION AND TERMINATION

6.1 Semester Registration:

i. Students have to register for courses at the beginning of every semester as per the notification issued by the institute and prescribed dates in the Academic Calendar. The Institute shall notify the process of registration well in advance to the stakeholders.

ii. The students admitted through regular entry shall be automatically registered for the Core Courses of the First Semester. Such students have to register separately for Elective/Choice based Courses only.

iii. On joining the Institute, each student is assigned to a Proctor. Students are advised to discuss with the proctor about the nature of courses for which he / she can register during the semester, as given in the curriculum, within the framework of guidelines approved by the AC.

iv. In case of any delay in registration of courses, due to unforeseen reasons, the student and parent shall take prior approval from the Director well in advance indicating the reason for delay in registration. However, for such students the attendance shall be calculated from the date of commencement of the semester and not from the date of joining.

v. Only those students shall be permitted to register for a course who have:
   a. Cleared all dues of the Institute, Hostel and Library including fine if any of the previous semester.
   b. Earned all the credits prior to previous academic year and minimum 60% credits during the previous Academic Year.
   c. Not been debarred from registration of courses on any other specific ground.

vi. If a student does not register in a prescribed schedule, notified by the Institute, his / her admission shall stand canceled in the respective semester. Parents are advised to take a note.

vii. Students need to re-register for courses in which they failed in earlier year/s by paying applicable fees, if they wish to go for betterment of Formative Assessment. Students are not permitted to re-register for course/(s), which they have already passed.

6.2 MDM:

In accordance with the National Education Policy (NEP) of 2020, it is mandatory for every student (from Regulations 2023) to fulfill MDM requirements as part of their B.Tech. degree program. The MDM requirements as part of their B.Tech. degree program. The MDM curriculum consists of around 14 credits distributed across six semesters (Semester III to Semester VIII) and is integrated within the 168-credit course structure. Students are required to select and register for a single MDM from the available options provided to them. MDM registration will commence prior to the beginning of the Second Year of the B.Tech. program. Completion of all courses within the chosen MDM is mandatory for students across the six semesters (Semester III to Semester VIII) in order to fulfill the minimum credit requirement. Due to inter-dependencies among courses, students are not permitted to change their selected MDM in subsequent semesters. The students will be awarded B. Tech. in relevant discipline with respective MDM

6.3 ATTENDANCE REQUIREMENT:

The Institute expects all B. Tech. students to attend 100% lectures. However, a shortfall of not more than 25% lectures may be condoned if the shortfall is caused by valid reasons and supported by appropriate evidence, such as personal illness or death in the family. Students shall note that academics should not be missed without valid reasons, and the number of sessions missed due to valid reasons cannot exceed 25%.

i. Each semester is considered as a unit and the candidate has to put in a minimum attendance of 75% in each course with a provision for consideration of 15% of the attendance by the Director, for reasons such as serious medical condition or representing the Institute /University / State / Nation in sports, cultural, technical or academic activity with the permission of the Institute authorities.
ii. For the students representing the institution at University, National and International level, the attendance can be considered as ‘Present’ for such cases at the end of semester. However, prior permission must be obtained from the HOD and relevant documents must be submitted upon completion of the activity.
iii. The student who has not attended minimum 75% of all conducted classes like Lectures, Tutorials, Laboratories, Workshops etc. shall be declared as Detained and shall not be permitted to attend the SA.
iv. The basis for the calculation of the attendance shall be the period prescribed by the Institution through its Academic Calendar. For late admission / transfer of students from other institutes /universities, the date of admission would be considered for the calculation of attendance (this rule does not apply to higher semesters).
v. The students will be informed about the attendance status periodically by the Institute notifying the percentage attendance on the notice board.

6.4 DROPPING OF COURSES:

A student can drop an Elective Course (Maximum 2) within 3 weeks of the commencement of the semester, under the guidance of the proctor and recommendation of Course Teacher if the Student and Parent feel that the student cannot cope up with all the courses registered at a time during that semester.

However, the total credits should not fall short of 16 credits which are the minimum number of credits to be registered per semester. The students can register for a new elective course (other than dropped courses) next year.

This dropping of course shall be intimated to the Dean Academics, through the HOD of the department before the dropping date as announced. The dropped courses are not recorded in the grade card. This facility is not applicable for First Year students.

6.5 WITHDRAWAL FROM COURSES:

A student can withdraw from the Elective Courses (maximum 2) before MidTerm submission under the guidance of the proctor and recommendation of Course Teacher if the Student and Parent feel that the student cannot cope up with the courses.

However, the total credits should not fall short of 16 credits which are the minimum number of credits to be registered per semester. The student has to re-register for the same course withdrawn in the next year by paying applicable fees. The withdrawn course(s) are recorded in the Grade Cards as **"WW"** grade. However, such withdrawals will be permitted only twice during the span of the program. This facility is not applicable for first year students. Students who want to utilize this facility must apply with recommendation of course teacher through the HOD of the department to Dean Academics, in consultation with proctor and parent. The Dropping and withdrawal facilities are available only for REGULAR Semester(s).

6.6TEMPORARY SEMESTER BREAK OF STUDY FROM THE PROGRAMME:

A candidate is normally not permitted to break the study. However, if a candidate intends to temporarily discontinue the program in the middle for valid reasons such as entrepreneurship, incubation, start-ups, internships leading to placement, foreign university opportunities, research opportunities etc. and wants to rejoin the programme later in respective semester, he / she shall apply to the Director, well in advance.

i. Such application shall be submitted within at least 6 weeks of the commencement of the semester or from the date he/she has attended the classes, whichever is later, stating fully the reason for such a withdrawal, together with supporting documents and endorsement of his/her parents/guardians through the Head of the Department.

ii. The institute shall examine such an application and if it finds the case to be genuine, it may permit the student to temporarily withdraw from the program.
Such permission is accorded only to those

a) who have the possibility to complete the prescribed program requirements within the time limits specified by the programme.

b) who do not have any outstanding dues /demand at the Institute / University level including tuition fees, any other fees library materials etc.

iii. Such students are expected to pay 100% fees of the year in which they are taking semester break. The candidate has to rejoin the semester after the break from the commencement of the respective semester as and when it is offered.

iv. The total period for completion of the programme is considered from the commencement of the semester to which the candidate was first admitted and shall not exceed the maximum period prescribed for the respective programme. The maximum period includes the break period.

a. If any candidate is detained for any reason, the period of detention shall not be considered as a "break of study".

b. It may be noted that the fees/charges once paid shall not be refunded.

c. Normally, a student will be entitled to avail of the temporary break facility only once for maximum period of two years during his/her studentship of the programme. Hence, the student shall take the advice of the Director to use the above provision only in exceptional cases.

6.7 DETENTION:

i. A student shall be declared as Detained and shall not be permitted to attend the SA and Practical/Oral Exams if;
    a. The student who has not attended minimum 75% of all conducted classes like Lectures, Tutorials, Laboratories, Workshops etc.
    b. Incomplete term work and non-submission of laboratory journal.

ii. Such students are expected to pay 100% fees of the year in which they are detained.

iii. Such students are expected to take admission in the next Academic Year by paying applicable fees as below: 100% fees if detained in odd semester and 50% fees if detained in even semester.

6.8 TERMINATION FROM THE PROGRAMME:

A student shall be terminated from the programme in the following cases:

i. Involved in ragging and in any illegal activity as per law defined by the governing authorities.

ii. Successive failures in first Year: On failure to get admitted in third semester after three successive academic years from the date of admission, he / she shall be declared as Not Fit for Technical Education (NFTE). Such students shall be permitted for only one year to continue the education in the institute provided the permission is accorded by AC. Director shall be authorized to terminate the student from the program.

iii. Not completing programme in prescribed period: Students will have to complete B. Tech. programme in maximum period of 6 years (12 semesters) for regular entry and 5 years (10 semesters) for lateral entry from the date of first admission. Genuine cases with valid justification may be referred to the Director. On behalf of the Academic Council, the Director is authorized to make decisions regarding such applications for extending the programme completion period for degree award, in accordance with the prevailing rules and guidelines set by professional statutory bodies. Students who are not able to complete the programme in the stipulated period

will be declared as Not Fit for Technical Education (NFTE).

iv. Under following circumstances student admission may be terminated from the programme if;

a. Students misbehave with faculty or staff.

b. Remain absent without any information for a period of one year.

c. In case of termination, the student has to pay all applicable dues.

7. CURRICULUM

There shall be a prescribed course structure for each of the academic programmes and in general terms it shall be known as the Curriculum. The Curriculum prescribes all the Courses of study semester-wise with credits assigned, teaching/contact hours, evaluation scheme and minimum requirements for the award of degree. The curriculum revisions/reforms/revamping shall be a continuous process governed by outcome-based education, choice-based credit system and AICTE model curriculum.

7.1 Credit System:

i. The primary purpose of the credit system is continuous evaluation of a student's performance which is measured by the number of credits the student has earned. Typically, credit measures the quantum of work involved in a course.

ii. Credit structures for various courses with various combinations of theory/tutorial and Laboratory/Project/Seminar/Mini Project hours are given in Table 7.1.

iii. A student can earn credits for a particular course by fulfilling the minimum academic requirements of attendance, assessment and evaluation. No credits shall be awarded if a student satisfies the minimum attendance requirements but fails to meet minimum assessment & evaluation requirements.

Table 7.1: Assigned credits for various types of courses

Hours per week per student for engagement for			**Credits Assigned**
Theory	**Tutorial/Seminar**	**Laboratory/Project**	
1	0	0	1
0	1	0	1
0	0	2	1
0	0	4	2
1	1	0	2
1	0	2	2
3	0	0	3
2	0	2	3
2	1	0	3
3	1	0	4
3	0	2	4
4	0	0	4
2	0	4	4
Credit = Theory hours + Tutorial hours + 0.5 (Laboratory hours)			

iv. The CGPA & SGPA is calculated based on the course credits and grades obtained by students. A minimum number of earned credits and minimum CGPA should be acquired in order to qualify for the degree.

7.2 Components of Curriculum:

i. The structure of curriculum for a programme and course syllabi shall be approved by AC on recommendation of respective BOS.

ii. The entire curriculum is spanned over eight semesters and has thoughtfully designed contents and evaluation methods. Total credits are 168. The exact number of credits required is mentioned in the curriculum structure for the respective programme.

iii. Curriculum shall have credit and audit (Non-Credit) courses.

iv. Curriculum will have balanced offerings of various courses such as Basic Science, Engineering Science, Professional Core, Professional Electives, Multidisciplinary courses, Skill courses, Humanities Social Science and Management courses, Experiential courses, and Liberal Learning courses. The curriculum offerings include various course types as mentioned in Table 7.2.

Table 7.2: Curriculum Components.

Sr. No	Course Code	*Component of Curriculum
1	BSC	Basic Science Course
2	ESC	Engineering Science Course
3	PCC	Programme Core Course
4	PEC	Programme Elective Course
5	MDM	Multidisciplinary Minor
6	OEC	Open Elective Course
7	VSEC	Vocational and Skill Enhancement Course
8	AEC	Ability Enhancement Course
9	EEM	Engineering/Economics/Management Course
10	IKS	Indian Knowledge System Course
11	VEC	Value Education Course
12	ELC	Experiential Learning Course
13	LLC	Liberal Learning Course

v. Normally the number of courses in a semester shall not be more than six for theory and four for laboratory courses.

vi. Audit courses in the curriculum shall offer students to understand the way their expertise/ domain knowledge can be utilized for developing core engineering knowledge.

vii. The MDM curriculum consists of around 14 credits distributed across six semesters

(Semester III to Semester VIII) and is integrated within the 168-credit course structure.

viii. A typical description of the programme curriculum shall consist of course title, course code, teaching hours per week for lecture/ tutorial/practical's, credit allotment, pre-requisites, text books, reference books, Course Objectives and Course Outcomes (COs) with relevant Bloom's taxonomy levels, Programme Outcomes (POs), Programme Specific Outcomes (PSOs), mapping of the COs with POs and PSOs and assessment scheme etc.

ix. The details of the programme structure and course details shall be published on institute website https://www.pccoer.com

8. EXAMINATION AND EVALUATION

There shall be continuous evaluation of students. This system will have following objectives:

i. To get insights regarding student performance/abilities which helps to identify learning needs and take necessary actions for possible improvement.

ii. To give feedback to the student about his level of understanding and abilities as per required Graduate Attributes (GAs).

iii. To allow students to demonstrate their competence which they will practice in their professional career.

iv. To award students grades based on their performance and abilities.

   a. Evaluation processes shall ensure outcome-based education adopted by the institute. All assessment methods will ensure constructive alignment of curriculum with intended outcomes.

   b. There shall be internal and external evaluation of students as a part of evaluation to award grades. All assessment of Theory, Practical, Project, Seminar and internship shall be conducted to evaluate GAs essential to meet the needs of engineering graduates at national as well as international level. Appropriate weightages given to these evaluation methods will ensure quality of assessment and evaluation.

   c. Evaluation scheme based on type of course with weightage is mentioned in table 8.1.

Table 8.1: Scheme of evaluation for courses prescribed in curriculum with weightages

Sr. No.	Type of course	Method of Formative/ Internal Assessment	Formative / Internal Assessment Weightage (%)	Method of Summative / External Assessment	Summative / External Assessment Weightage (%)	Total
1	BSC/ESC/ PCC/PEC/ OEC/ MDM (Theory)	Assignment/ case study/ Quiz/Poster presentation/ Seminar presentation/ Open book test etc.	50 (20 + 20 + 10)	SA of 50 Marks based on 100% syllabus shall be conducted.	50	100
2	Term work	Experiment/Assignment/ case study report for each Experiment/Assignment	25 or 50	NA		25 or 50
3	Laboratory	Oral/practical examination	NA	Oral/practical examination	25 or 50	25 or 50
4	Major Project *TW	Project Reviews (Minimum 2) Rubric based Evaluation	-	Oral and Term Work	50+100	150
	OR	-	-	Viva voce	50+100	
5	Internship*	Rubrics based evaluations along with report.	-	-	200+200	400
6	Seminar*	Two rubric based reviews along with report	50	Report evaluation by external	30	100
				Viva	20	
7	MOOCs courses*	Based on submission of assignment and performance	MOOCs Weekly assgs 30%	MOOCs Weekly assgs	30%	25/ 50/ 100
			Certification 70%	Certification	70%	
8	Skill courses	Hands on/Practical test, Live projects, Assignment/case study/Quiz/Poster presentation/Seminar presentation/Open book test/ Class test etc.	50/100	If needed as per the demand of course	-	50/100
9	*Experiential Learning/ Liberal Learning courses	Rubric based Evaluations/ Live task / assignment / Practice/ case study / Quiz / Poster presentation for PP or NP grade	50/100	-	-	50/100

* As specified in the programme curriculum.

8.1 Internal Evaluation:

Internal Evaluation shall be done continuously by faculty over a span of semester. Structured Evaluation will be done for all programmes with appropriate schedule in Academic Calendar as follows:

8.1.1 Formative Assessment (FA) Theory Courses:

i. The FA for Professional Core, Professional Elective, Open Elective, Basic Science Course, Engineering Science Course, HSMC courses and MDM courses, Experiential Learning Courses etc. shall be conducted at department level. FA shall consist of three evaluation instances as follows:
   a. Formative Assessment 1 (FA 1) [Unit test]
   b. Formative Assessment 2 (FA2) [Assignment/ case study/ Quiz/Poster/ Presentation / Seminar presentation/ Open book test etc.] The FA for other type of courses shall be based on feasibility & need of Evaluation.
   c. Formative Assessment 1 (FA3) [Quiz]

ii. Sum of the scores obtained in FA1, FA2 and FA3 shall be considered for computing the final FA of a student in each course.

8.1.2 Internal Evaluation of Practical Term work

i. Continuous evaluation of each experiment/assignment shall be done throughout the semester, collating as Termwork at the end of each semester. The Evaluation in a laboratory course will be based on the following criteria
   - Attendance and participation in laboratory work.
   - Performance in Evaluation of understanding through viva voce, group discussions, quizzes, etc.
   - The quality of work as prescribed by the course instructor.
   - Timely Submission
   - Report through laboratory journals

ii. It is mandatory for the student to complete all the experiments/assignments as specified in course curriculum for the grant of Termwork. It is obligatory to maintain and submit laboratory journals as prescribed by the course instructor before the Term End.

iii. Students shall be detained for incomplete Termwork and non-submission of laboratory journals and will require registering the course again.

iv. Termwork marks assigned for special courses such as Mini Project etc. shall be evaluated based on parameters proposed by respective Department and duly approved by Dean Academics.

8.1.3 Internal Evaluation of Project/Seminar/Internship:

i. Project/Seminar Term work will be evaluated based on Reviews scheduled in the semester/s as mentioned in the Guidelines.

ii. For Internship rubrics-based evaluations along with a report shall be conducted. The marks of this evaluation will be collated as term work with 100% weightage in total Evaluation.

8.2 External Evaluation:

8.2.1 Theory Evaluation:

Summative Assessment (SA): Summative assessment at the end of semester shall be conducted for external evaluation. This SA of 50 Marks and it will be conducted at Institute level.

Re-examination: Re-examination shall be conducted after declaration of result of main SA examination for students with failed/acquired transitional grade as per rules and regulations. Students need to pay additional examination fees for such Re-SA examinations.

Re-SA examination shall be provided for those students who are having satisfactory attendance (Minimum 75%), course-wise, but remained absent for the regular SA due to a valid/unavoidable circumstance, like:

a. Students, who have sought due prior permission from concerned HOD and Director through proper channel, and there after permitted by the institute for taking part in important curricular/ co-curricular/ extra-curricular activities like Technical events/NSS/Sports/Cultural/Project Competitions/Paper presentation etc. at University/ State/ National/ International levels (the students/ authorities should exercise enough care that a student shall not remain absent for the makeup examination) After such an event, at the time of reporting to the Institute, the student must submit the proof of participation/ certificate from the competent authority for approval of the prior leave request. The prior leave request shall be converted to official leave and an endorsement will be issued by the Institute, based on which the student shall be eligible for the makeup examination.

b. Students seeking prior leave on account of
    1. Accident or severe illness leading to hospitalization, which disables the student from writing the examination.
    2. A calamity in the family (first relation Only-Parents, Grandparents and Siblings) barring the student from writing the examination.

c. Students seeking prior leave for attending any competitive examinations (NDA/SSB/UPSC/MPSC etc.) /Placement drives.

In the event of b and c, it is mandatory on the part of the student/parent to inform the respective departmental authorities (Class Teacher/HOD) immediately through email or mobile message and submit a prior leave request. If the information reaches the Class Teacher first, it is the responsibility of the Class Teacher to immediately intimate the HOD and record the same in the examination report without fail. After such an event at the time of reporting to the Institute, the student must submit all the relevant reports/certificates from the competent authority for approval of the prior leave request. The prior leave request will then be converted to official leave and an endorsement will be issued by the Institute, based on which the student becomes eligible for the Re-SA examination. Any intimation after the completion of regular examination and/or non-submission of report/certificate will be construed as absent for the examination and the student will be awarded ZERO marks in the respective examination. No further request will be entertained in this regard.

The Re-SA examination shall not to be treated as an improvement examination.

Summer Examination: The Summer examination shall be conducted at the end of even semester. The summer exam includes courses offered in both the semesters. Only Summative examination will be conducted. Students need to register for such examinations by paying specified fees.

If a student fails in the Summer Examination, then he/she may Reregister with FA again or he/she may Reappear with his/her existing FA performance (Latest FA will be considered).

8.2.2 Practical Evaluation

Practical/Oral examinations by the internal and external examiners will be conducted for Practical's at the end of each semester as per the schedule in Academic Calendar.

i. Final examination for laboratory courses will normally be held in the last week of conclusion of teaching as per Academic Calendar.
ii. These oral/practical examinations will be conducted in the presence of an External Examiner appointed by competent authority.
iii. Weightage of 50% each for evaluation by internal and external examiner shall be considered. In case of absence from oral/practical examination, the same rules as those for theory courses are applicable.
iv. Re-examination for practical/oral examinations shall be conducted before re-examination of theory courses.

8.2.3 Major Project/Seminar Evaluation

The Project is a group activity. Minimum two Internal Reviews per semester shall be conducted. Students shall be evaluated as per the rubric designed by the relevant Programmes. A Viva voce will be conducted at the end of the semester in the presence of an External Examiner. The student team has to submit a hard bound copy of the report summarizing the Problem, Relevant Literature, Design, Analysis, Experimentation, Results, Outcomes and Conclusions as per the guidelines provided by the relevant Programmes.

9. EXAMINATION RULES AND REGULATION

9.1 Credit Courses:

Based on the Evaluation student will be awarded letter grades after combining performance of all (FA+SA) evaluations for the respective course. These letter grades will be derived from quantitative and qualitative evaluation converted into a 10-point scale called as grade point for credit courses.

9.2 Noncredit Courses:

Apart from credit courses, Noncredit courses will be awarded letter grades as PP (Pass) and NP (Not Pass) based on quantitative and qualitative Evaluation. In addition to above letter grades students will be awarded dual letter grades in specific circumstances mentioned in rules and regulations for passing, A.T.K.T, award of class.

9.3 Passing, A.T.K.T. and award of class

9.3.1 Rules of Passing

i. Term work/Practical/Oral

To pass the Termwork/Practical/Oral the student has to earn a minimum of 40% marks in each head.

ii. Theory Course head

a. To pass the Theory Subject head the student must earn a minimum of 40 percent marks in SA and 40 percent average marks (FA+ SA).

b. The failing student can repeat the SA to pass the head in the same semester and the FA marks will be retained as it is. However, grades earned in re- examination (Re-SA) shall be marked with *(asterisk) for more than 2 attempts except for transitional grades II and XX.

Students failed in re-examination (Re-SA) can:

i) continue their FA just by appearing for SA (Reappear)

ii) apply for FA betterment (Re-Registration).

This is irrevocable once opted.

If students have applied for FA betterment (Re-Registration), they need to attend classes and perform their FA and appear for the SA.

c. To earn credits of a course (Theory/term work/practical/oral/presentation) students must pass the course with minimum passing marks/grade.

Summary:

Students must earn a minimum of 40 percent marks in SA and 40 percent average marks (FA + SA) for passing.

Students failed in Re-examination need to reappear for the course/s by paying applicable fees in the Summer Examination, if offered by the Department or reappear/re-register by paying applicable fees in respective semester (Odd and Even) of next academic year.

iii. A student shall be awarded the bachelor's degree if he/she earns 168 credits as per the structure defined by the programme and clears all the audit and noncredit courses specified in the curriculum. In case of lateral entry, students shall be awarded the bachelor's degree if he/she earns 124 credits as per the structure defined by the programme.

9.3.2 Rules of A.T.K.T.:

i. A student can register for the third semester if he/she earns minimum 60% credits of the total of first and second semesters.
ii. A student can register for the fifth semester if he/she earns a minimum 60% credits of the total of third and fourth semesters and all the credits of first and second semester.
iii. A student can register for the seventh semester if he/she earns a minimum 60% credits of the total of fifth and sixth semesters and all the credits of third and fourth semester.

10. PERFORMANCE INDICES SGPA & CGPA

10.1 Grading and Evaluation:

Grade points and equivalent letter grades for absolute grading will be as mentioned in Table 10.1.

Table 10.1. Performance with grade points and equivalent letter grades

Grade Point	Letter Grade
10	O (Outstanding)
9	A+ (Excellent)
8	A (Very Good)
7	B+ (Good)
6	B (Above Average)
5	C (Average)
4	P (Pass)
0	F (Fail)
0	Ab (Absent)

i. Apart from credit courses, Noncredit courses will be awarded with letter grades based on quantitative and qualitative evaluations as PP (Pass) and NP (Not Passed).
ii. Grades in special circumstances: In addition to above letter grades students will be awarded dual letter grades in specific circumstances as mentioned in table 10.2.

Table 10.2 Grades in special circumstances

Reason	Letter Grade
Detained due to insufficient attendance or incomplete Termwork (Detained and Repeat)	DR
Withdrawal of course with satisfactory attendance (Willful Withdrawal)	WW
Satisfactory performance in FA but absent in SA due to valid reason (Incomplete due to Illness)	II
Very good performance in FA (more than or equal to 80%) but poor performance in SA leading to fail (F) overall grade	XX
Credit Transfer grades, if student is completing grades for any courses at other Institute/ University etc.	CT
Special Grades to be given to students appearing for special examination, who could not attend earlier examination due to Co-curricular activities/ NSS/ NCC/ Competitions.	SG
Result Reserved due to backlog	RRB

iii. Note: 'II' and 'XX' are transitional grades awarded which will be converted to actual grades earned in re-examination else will automatically get converted into 'F' grade. Candidates can avail facility of XX grade only once over the span of program for theory courses.

10.2 Calculation of SGPA and CGPA:

Based on the grade points earned by the students, performance of student in each semester will be calculated as semester grade point average (SGPA) as follows

$$SGPA = \frac{\sum_{i=1}^{n} \boldsymbol{Grade\ points\ earned\ X\ credits\ of\ each\ course}}{\boldsymbol{Total\ credits\ in\ a\ semester}}$$

For Example: suppose in a given semester a student has registered for five courses having credits C1, C2, C3, C4, C5 and his / her grade points in those courses are G1, G2, G3, G4, G5 respectively. Then student's SGPA will be

$$SGPA = \frac{\sum_{i=1}^{5} \boldsymbol{C1G1 + C2G2 + C3G3 + C4G4 + C5G5}}{\boldsymbol{C1 + C2 + C3 + C4 + C5}}$$

At the end of each academic year cumulative grade point average will be calculated based on the grade points obtained in all the courses (Theory/term work/practical/oral) of first semester to eighth semester for the students admitted in the First year and third to eighth semesters for the students directly admitted in Second year. It is calculated in the same manner as the SGPA. The class shall be awarded to a student on the CGPA calculated as mentioned in Table 10.3:

Table 10.3 Class of Degree

Sr. No.	CGPA	Class of the degree awarded
1	7.75 or More than 7.75	First class with distinction
2	6.75 or more but less than 7.75	First class
3	6.25 or more but less than 6.75	Higher second class
4	5.50 or more but less than 6.25	Second class
5	4.00 or more but less than 5.50	Pass Class

10.3 Percentage of Marks: Based on the CGPA earned by the students, percentage of marks of student will be calculated as follows:

Percentage of Marks = CGPA X 9.5

11. SEMESTER GRADE REPORT

i. A Grade Report in the form of a Grade Card shall be issued to students at the end of each Semester.

ii. The Grade Card shall include the following;
   a. The list of courses registered for an academic year along with credits.
   b. The letter grade obtained in each course.
   c. The total number of credits earned by a student.
   d. SGPA, CGPA Details.
   e. Examination details.
   f. Grading System, calculation of performance indices and conversion of CGPA to equivalent percentage shall be provided on the back page of the grade card.

iii. Grade Cards shall be used to prepare Transcripts of the student.

12. AWARD OF THE DEGREE

A student shall be eligible for the award of B.Tech. Degree from the institute and Savitribai Phule Pune University if the student has:

i. Obtained eligibility certificate from the University.
ii. Registered & passed all the prescribed courses & earned minimum credit requirement for the said degree.
iii. Obtained CGPA ≥ 4.00
iv. Paid all the Institute dues and satisfied all the requirements prescribed.
v. No case of indiscipline pending against him/her.

The Academic Council (AC) shall recommend the list of all eligible students to SPPU for award of B.Tech. Degree with additional Honors/Minor certification wherever applicable.

13. EXIT OPTION

PCCOE&R recommends a 4 years multidisciplinary Bachelor's programme as the preferred option since it allows the opportunity to experience the full range of holistic and multidisciplinary education in addition to a focus on major and minor subjects as per the student's preference. However, in case of unavoidable circumstances if students need to give up their education they can opt to exit at the end of 2nd or 4th or 6th semester after completing additional 8 credits as prescribed in this document.

The student has to submit a request for exiting the programme to the Director through the Head of the Department within 2 weeks of declaration of results.

Students will be allowed to take the exit option after counseling by class teacher, proctor, academic coordinator and Head of the Department.

Multiple Exits: Students will have the flexibility to enter a programme in odd semesters and exit a programme after the successful completion of even semesters as per their future career needs. The student has to earn the minimum credits as mentioned in the below table and should not have any backlogs. The additional 8 credits need to be earned during the Summer Vacation (within 2 months of approval of Exit Request). The table 13.1 gives the summary of the Exit option after even semesters. The reentry option is available as per NEP 2020 guidelines.

Table 13.1 Exit option after 2nd or 4th or 6th Semester

Sr. No.	After Semester	Qualification Title	Regular Credit Requirement	Additional Credits to be Earned
1	Second	One Year UG Certificate in the relevant discipline	Minimum 40 credits	8 Credits of VSEC/ Internship/ Apprentice as per the relevant programme
2	Fourth	Two Years UG Diploma in the relevant discipline	Minimum 80 credits	8 Credits of VSEC/ Internship/ Mini Project as per the relevant programme
3	Sixth	Three Years B. Sc. / B. Voc. in the relevant Discipline	Minimum 120	8 Credits of VSEC/ Internship/Mini Project as per the relevant programme

However, the B. Tech. degree can be obtained only within 8 years from the date of registration.

14. DISCIPLINE & CONDUCT

i. Every admitted student shall be issued a photo identification (ID) card which must be retained by the student while he/she is registered at PCCOE&R. The student must have a valid ID card with him/her while in the Institute.

ii. Discipline & Conduct: Any act of misconduct committed by a student inside or

outside the campus shall be an act of violation of discipline of the institute. Violations of the discipline shall include:

a. Disruption of teaching, examination, administrative work, curricular or extracurricular activity, and any act likely to cause such disruption.
b. Refusing to provide an identity card when demanded by any institute authority.
c. Damaging or defacing the property inside or outside the institute campus.
d. Engaging in any attempt at wrongful confinement of teachers, offices, employees and students of the institute.
e. Use of abusive and derogatory slogans or intimidatory language or incitement of hatred and violence.
f. Ragging in any form ("Ragging" means causing, inducing, compelling or forcing a student, whether by way of a practical joke or otherwise, to do any act which detracts from human dignity or violates his person or exposes him to ridicule or to forbear from doing any lawful act, by intimidating, wrongfully re-straining, wrongfully confining or injuring him or by using criminal force to him or by holding out to him any threat of such intimidation, wrongful restraint, wrongful confinement, injury or the use of criminal offense. Supreme Court of India has defined ragging as a criminal offense.)
g. Eve teasing or disrespectful behavior to women or girl's students.
h. An assault upon, or intimidation of, or insulting behavior towards a teacher, officer, employee or student or any other person.
i. Getting enrolled in more than one programme course of study simultaneously.
j. Committing forgery, tampering with documents or records, identity cards, furnishing false certificate or false information.
k. Organizing instant agitation/meetings without prior permission in the campus.
l. Viewing/downloading obscene information/data, images and executable files, sending obscene mails/ messages via facebook / twitter/other social sites using institute servers.
m. Sharing the login and passwords & other details of IT facilities provided to other students/outsiders.
n. Consuming or possessing alcoholic drinks, dangerous drugs or other intoxicants in the institute campus.
o. Possessing or using any weapons and firearms in the institute campus.
p. Unauthorized occupation of a hostel, Accommodating guests or other persons in hostels without permission.
q. Malpractice in examination.
r. Indulging in anti-national activities contrary to the provisions of acts and laws enforced by the Government.
s. Any other act which may be considered by the Director or the Discipline Committee to be an act of violation of discipline.

iii. Any act of indiscipline of a student reported to Director/concerned authority shall be referred to Grievance Redressal and Disciplinary Committee (GRDC) of the institute. The Committee shall enquire into the charges and recommend suitable punishment if the charges are substantiated. The penalties/punishment/actions may include:

a. Written warning and information to the parents/guardian.
b. Imposition of fine ranging from Rs.500/- up to Rs.5000/-
c. Suspension from the Institute/Hostel/Mess/Library/ or availing of any other facility.
d. Suspension or cancellation of scholarships /fellowship or any financial assistance from any source.
e. Recover of loss caused to Institute property.
f. Debarring from participation in sports/NSS/student club.
g. Disqualifying from holding any representative position in the Class/institute / Hostel / Mess/Sports/ Clubs and in similar other bodies.
h. Disqualifying from appearing in placement and receiving any awards.
i. Expulsion from the Hostel/Mess/Library/Club/institute for a specified period by forfeiting fees.
j. Debarring from an examination.
k. Action as per Maharashtra anti-ragging act1999.

iv. If a student is found guilty of malpractice in examinations, then he/she shall be punished as per the recommendations of the Complaint Redressal Committee (CRC) constituted by BOE. The CRC committee shall inquire and decide the punishment by following the guidelines for imposing punishment on examinee/s/others involved in unfair means. However, depending on the situation, committee may quantify the severity of the punishment which may include:

a) Cancellation of the performance of the student in the course/s in which he/she was involved in malpractice.
b) Cancellation of the performance in that examination for all the courses.
c) Expulsion/termination from the institute if repeatedly involved.
d) Stoppage of scholarships/stipend.
e) Issuing warning.
f) Debarring from the examinations for a specified period.

Student/s involved in acts of indiscipline/malpractice in examination shall be issued notice asking him/her to be present before the respective committee (CRC) on the day at specified time and venue with his/her parents/guardian. He/she shall give written reply/oral explanation to the charges leveled against him/her for consideration. If the implicated students fail to appear before the committee, then a decision shall be taken in absentia, based on available evidence/documents, which shall be binding on the concerned student.

14.1 Conduct during Examination:

i. Timing:

a. The students are required to be present outside the examination hall exactly 20 minutes before the start of the examination.
b. Students will only be allowed to enter the examination hall 15 minutes prior to commencing the examination.
c. The students will not be allowed to appear in the examination if they reach the examination center 30 minutes after commencement of examination.
d. No student can leave for 30 minutes after the commencement of the examination.
e. Students are not permitted to leave the examination hall during the last 10 minutes.
f. Students are responsible for keeping themselves informed about exam dates, as well as the time and place of the examination.
g. Differently abled students will be given additional time of 20 minutes/ hour of examination.

ii. Identity check-up:

a. Students will not be allowed into the examination hall without presenting an appropriate photo identity card, Hall ticket issued by the Institute.
b. Invigilators are responsible to ensure full compliance with such requirements.
c. If a student forgets his/her Institute Identity Card, the driving license/ other photo identity card will be accepted in place subject to verification by the concerned teacher/ examination coordinator/ Head of the Department concerned.

iii. Breaks:

a. Breaks for visits to the bathroom may be taken only after permission from the invigilator and under the condition that the invigilator's instructions given on the occasion are followed.
b. If a student falls ill during the examination and is unable to complete the examination, the concerned student should alert the invigilator and senior supervisor in consultation with the concerned Head of the Department may make suitable arrangements for proper medical attention.
c. No student shall re-enter the examination hall after leaving it unless he/she was under approved supervision during the full period of absence.

iv. Question papers and answer sheets:

a. During an ongoing examination students are not allowed to take the examination question paper outside the examination hall. After the examination, the student should personally submit his/her examination answer sheet to the invigilator.
b. Even a blank answer sheet shall be handed over to the invigilator.
c. Each answer sheet should contain details as mentioned on the front page.
d. If there are any queries regarding the exam questions the students must ask the

invigilators who will contact the course teacher through the proper channel.

v. Other materials:

a. Students should bring their own pencils, pens, erasers, rulers, non-programmable calculators, and any other tools required for the examination.
b. Students are advised not to bring valuables for examination. Students shall keep their handbags, cases, outdoor clothes, etc. at identified locations for the same. Students are responsible for the safekeeping of all personal belongings they bring to the examination hall. The Institute takes no responsibility for the loss or damage of such belongings.
c. Pencil cases, mobile phones, smart watches, earbuds/neck bands/headphones, dictionaries, electronic dictionaries, written or electronic media, digital media, or any other materials are not permitted/ allowed into the examination hall, with the exception of devices used for assisting students with hearing visual or other physical difficulties.
d. Exchange of pens, pencils, calculators, study material, etc. is not permitted.
e. Calculators with more than one-line display or with alphanumeric display (programmable calculators) are not permitted into the examination hall unless specified in advance by the examiner. If the invigilator reasonably believes that a student is using a calculator that does not conform to the rules, he/she has the discretion to replace the calculator and a report on the matter will be made on the invigilator's declaration form.

vi. Disturbance:

a. During the examination period, there must be no communications among students or between a student and an outsider by any means, such as phones. This rule applies to students in the examination hall and those on supervised breaks for visits to bathroom/s.
b. No student shall leave his/her assigned seat without the permission of the invigilator. It is the invigilator's discretion to decide whether there is enough reason to remove a student from the examination hall owing to disorderly conduct.

vii. Miscellaneous:

a. The students must ensure before they leave the examination hall that they have signed the attendance sheet.
b. The students with medical problems will be provided Writer in the Examinations only subject to prior permission from the Dean Academics.
c. The documentary proof along with recommendations of concerned HOD will be required. All such cases will be dealt with as per academic rules.
d. If you suffer from language difficulties or any disabilities you can apply for an extension of the test time.
e. Students are not allowed to wear a smart watch during the examination.
f. Cheating, and attempts at cheating, will immediately be reported to the

Examination Office. Consequences of proven cheating or attempts at cheating will be dealt with separately by the malpractice and grievance handling committee.

15. CONCLUSIONS

i. The Academic, Examination and Evaluation Policies/Rules and Regulations regarding conduct of undergraduate programmes at PCCOE&R are published in this document. The Academic Council reserves the right to modify these policies/ regulations as and when required from the point of achieving academic excellence.

ii. The rules for grace marks, consideration of extracurricular activities, condonation, amendment of results, unfair means resorted to by the students and punishments, physically challenged students will be governed by the ordinance approved in Academic Council. These policies will be in concurrent with the rules and guidelines of professional statutory bodies such as AICTE, UGC and affiliating university SPPU etc.

iii. Interpretation: Any question as to the interpretation of these guidelines shall be decided by the institute head, whose decision shall be final and binding in the matter. The institute head shall also have the power to issue clarifications to remove any doubt, difficulty or anomaly, which may arise regarding the implementation of these Guidelines.

iv. The decision of the Director (Chairman, Academic council) shall be final and binding on all concerned i) for the cases not covered through this document; ii) in case of dispute, difference of opinion in interpretation of this regulation; and
iii) emergent cases.

Annexure I

1) Formative Assessment Paper Format

	Pimpri Chinchwad Education Trust's **Pimpri Chinchwad College of Engineering & Research Ravet, Pune** An Autonomous Institute | NBA Accredited (4 UG Programs) | NAAC A++ Accredited | ISO 21001:2018 Certified **IQAC PCCOER**	
Academic Year:2025-26 **Term**–I	**Formative Assessment**	**ACAD/R/11-FA**

Department: **Class:** **Div:**
Subject: **Maximum Marks: 30** **Duration:** 1 hr
Subject Code: **Date:**

Note: *1. Attempt all Questions*
2. Give explanation or justification wherever required.
3. Neat diagrams must be drawn wherever necessary.

Course Outcomes:

CO No.	Course Outcomes	BT Level

Question No.		Question	CO / BTL /PI	Marks
Q1		**Attempt any Three (Unit 1)**		**15 Marks**
	a			
	b			
	c			
	d			
	e			
Q2		**Attempt any Three (Unit 2)**		**15 Marks**
	a			
	b			
	c			
	d			
	e			

**********END**********

Department Seal

2) Summative Assessment Paper Format

	Pimpri Chinchwad Education Trust's **Pimpri Chinchwad College of Engineering & Research Ravet, Pune** An Autonomous Institute | NBA Accredited (4 UG Programs) | NAAC A++ Accredited | ISO 21001:2018 Certified **IQAC PCCOER**	
Academic Year:2025-26 **Term**–I	**Summative Assessment**	**ACAD/R/11-SA**

Department: **Class:** **Div:**
Subject: **Maximum Marks: 50** **Duration:** 2 Hrs
Subject Code: **Date:**

Note: *1. Attempt all Questions*
2. Give explanation or justification wherever required.
3. Neat diagrams must be drawn wherever necessary
4. Figures to the right indicate full marks

Course Outcomes:

CO No.	Course Outcomes	BT Level

Question No.		Question	CO & BT	Marks
Q1		**Attempt any Two (Unit 1)**		**10 Marks**
	a			
	b			
	c			
Q2		**Attempt any Two (Unit 2)**		**10 Marks**
	a			
	b			
	c			
Q3		**Attempt any Two (Unit 3)**		**10 Marks**
	a			
	b			
	c			
Q4		**Attempt any Two (Unit 4)**		**10 Marks**
	a			

b
c

Q5 **Attempt any Two (Unit 5)** **10 Marks**

a
b
c

****

These Academics, Examinations and Evaluation Guidelines are applicable for all years and all batches under autonomy, as per NEP 2020 guidelines commencing from the Academic Year 2025-26.

For any difficulty in understanding rules and regulations, please write to:

- deanacademics@pccoer.in
- examcell@pccoer.in
- registrar@pccoer.in
- principal@pccoer.in

Note:

The above rules and regulations are also applicable to BBA and BCA courses with obvious changes wherever required/applicable.

Dr. Harish Tiwari

Director
PCET's Pimpri Chinchwad College of Engineering and Research, Ravet,
Pune - 412 101

Pimpri Chinchwad Education Trust's

Pimpri Chinchwad College of Engineering and Research, Ravet

(An Autonomous Institute affiliated to Savitribai Phule Pune University)

Curriculum Structure and Syllabus

Second Year B. Tech.

Academic Year 2026–2027

Electronics & Telecommunication Engineering

With effect from (AY 2026-27)

National Education Policy (NEP) 2020 Compliant Approved by the Board of Studies (BoS-Electronics & Telecommunication Engineering) and Academic Council

Contents

1. Nomenclature

AEC	Ability Enhancement Course
AICTE	All India Council for Technical Education
CEP	Community Engagement Project
EEM	Entrepreneurship/Economics/Management Courses
MDM	Multidisciplinary Minor
MOOC	Massive Open Online Course
NEP	National Education Policy
NPTEL	National Programme on Technology Enhanced Learning
OEC	Open Elective Course
PCC	Program Core Course
PEO	Programme Educational Objectives
PSO	Program Specific Outcomes
SWAYAM	Study Webs of Active learning for Young Aspiring Minds
UGC	University Grants Commission
VEC	Value Education Course
VSE	Vocational and Skill Enhancement Course
WK	Knowledge and Attitude Profile

2. Preface by Board of Studies

The syllabus for S.Y. B.Tech. Electronics & Telecommunication Engineering will be effective from the Academic Year (AY) 2026–27. Subsequently, this curriculum will be extended to the Third Year (TY) and Final Year (B.Tech.) programs in the AY 2027–28 and 2028–29, respectively.

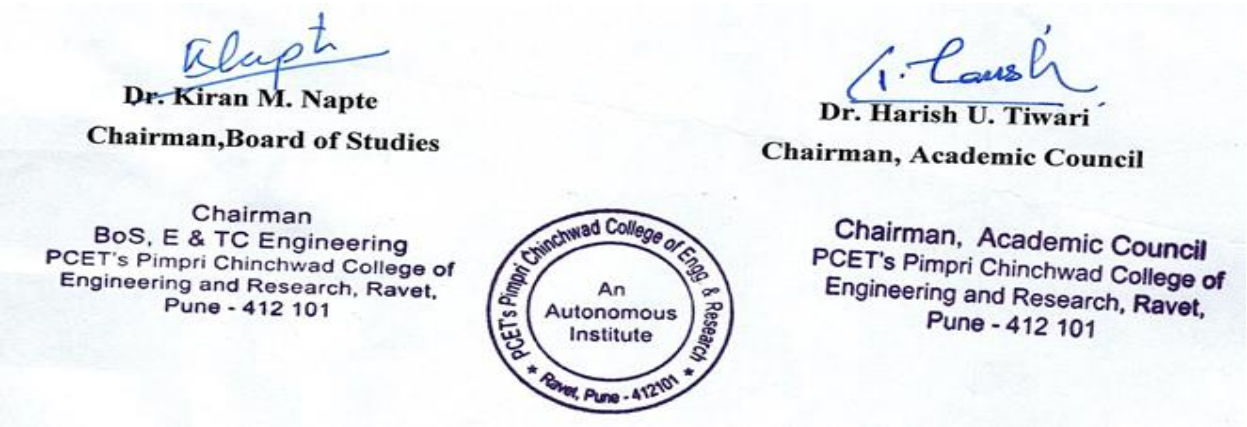
Electronics and Telecommunication Engineering is a dynamic discipline that forms the backbone of modern communication systems, electronic devices, and embedded technologies. This curriculum has been carefully structured to provide students with a strong understanding of the fundamental principles, theories, and practices of electronics and communication engineering, while equipping them with the skills required to design, develop, and implement advanced electronic and communication systems. It prepares students to address the challenges of rapidly evolving technologies thereby enabling them to contribute effectively to the advancement of the global technological landscape.

The revised syllabus is aligned with the objectives of the National Education Policy (NEP) 2020, guidelines of Savitribai Phule Pune University, AICTE, New Delhi, UGC, and other accreditation bodies. It incorporates recent technological advancements, emerging industry requirements, and innovative educational practices. Wherever appropriate, additional learning resources from platforms such as NPTEL and SWAYAM have been included at the end of each course to encourage self-directed learning.

The curriculum is designed to provide learners with adequate time and opportunities for self-learning through online courses, hands-on projects, and interdisciplinary activities, thereby enhancing their knowledge, technical competence, and skill sets according to their individual interests.

This syllabus has been formulated through extensive consultations with academic experts, industry professionals, alumni, and other stakeholders to ensure both academic rigor and industry relevance. The curriculum not only meets contemporary industry expectations but also prepares students for higher studies, research, and innovation in the field of Electronics & Telecommunication engineering.

We sincerely hope that this curriculum will inspire students to become competent professionals, responsible citizens, and contributors to technological advancement and societal development. We place on record our deep appreciation and gratitude to the faculty members, students, industry experts, and stakeholders who contributed significantly to the formulation of this syllabus.



3. Vision Mission of the Institute and Department

VISION

To be a globally recognized Institute of technological education and research for the holistic development of aspirants, through excellence in education, innovation and collaborations to fulfil the expectations of all stakeholders.

MISSIONS

1. To design and deliver state-of-art knowhow through experiential learning based on changing needs of industry and society worldwide, to ensure the employability and employment of each aspirant.
2. To enhance the collaborative partnership between Industry and Institute at national and international levels for commercializing and transferring the latest technological know-how towards societal, ethical and economic development
3. To achieve and sustain institute position as one of the topmost recognized and ranked institutes in technical and technological education

Vision Mission of the Department

Vision:

To be a globally recognized center of excellence in Electronics and Telecommunication Engineering through quality education, innovation, and research, fostering professionals who contribute ethically and effectively to society and industry.

Mission:

1. To impart cutting-edge knowledge and practical skills in Electronics and Telecommunication Engineering through innovative and experiential learning to enhance employability and lifelong learning.
2. To foster research, innovation, and collaboration with industry and academia at national and international levels for technological advancement and societal benefit.
3. To cultivate ethical values, leadership qualities, and a sense of social and environmental responsibility among students for holistic professional development.

4. Program Specific Outcomes

A graduate of the E&TC Engineering Program will demonstrate -

PSO1: Graduate will be able to identify, design, prototype and test electronics and communication systems using software and hardware tools.

PSO2: Graduate will be able to develop and support systems based on embedded, automation, microwave, signal and image processing.

5. Program Educational Objectives

PEO1: To provide learning environment and hands on training in the domains of Electronics and Telecommunication engineering to achieve skill up-gradation of the human capital.

PEO2: To inculcate research and innovation capabilities in the Electronics and Telecommunication Engineering and allied interdisciplinary domains and adapt themselves to rapidly evolving technology.

PEO3: To impart moral, professional ethics and required skill set among the students so as to transform them into capable, adaptable and responsible citizens.

6. Knowledge and Attitude Profile (WK)

A Knowledge and Attitude Profile (KAP), often represented as WK (Knowledge and Attitude Profile) in some contexts, is a framework or assessment tool used to evaluate an individual's knowledge and attitudes related to a specific area, topic, or domain.

WK1	A systematic, theory-based understanding of the natural sciences applicable to the discipline and awareness of relevant social sciences.
WK2	Conceptually-based mathematics, numerical analysis, data analysis, statistics and formal aspects of computer and information science to support detailed analysis and modelling applicable to the discipline.
WK3	A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline.
WK4	Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline.
WK5	Knowledge, including efficient resource use, environmental impacts, whole-life cost, re-use of resources, net zero carbon, and similar concepts, that supports engineering design and operations in a practice area.
WK6	Knowledge of engineering practice (technology) in the practice areas in the engineering discipline.
WK7	Knowledge of the role of engineering in society and identified issues in engineering practice in the discipline, such as the professional responsibility of an engineer to public safety and sustainable development.
WK8	Engagement with selected knowledge in the current research literature of the discipline, awareness of the power of critical thinking and creative approaches to evaluate emerging issues.
WK9	Ethics, inclusive behavior and conduct. Knowledge of professional ethics, responsibilities, and norms of engineering practice. Awareness of the need for diversity by reason of ethnicity, gender, age, physical ability etc. with mutual understanding and respect, and of inclusive attitudes.

7. Programme Outcomes (PO)

PO1	**Engineering Knowledge:** Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop to the solution of complex engineering problems.
PO2	**Problem Analysis:** Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)
PO3	**Design/Development of Solutions:** Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required. (WK5)
PO4	**Conduct Investigations of Complex Engineering Problems:** Using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions. (WK8).
PO5	**Engineering Tool Usage:** Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems. (WK2 and WK6)
PO6	**The Engineer and The World:** Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment. (WK1, WK5, and WK7).
PO7	**Ethics:** Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9)
PO8	**Individual and Collaborative Team work:** Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.
PO9	**Communication:** Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences
PO10	**Project Management and Finance:** Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.
PO11	**Life-Long Learning:** Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change. (WK8)

S. Y. B. Tech. E&TC Engineering Syllabus Structure

Level 5															
S.Y. B.Tech. E&TC Engineering															
Semester III															
Course Code	**Course**	**Type**	**Total Credits**	**Credits Scheme**			**Teaching Scheme (Hours/Week)**			**Evaluation Scheme and Marks**					**Total**
				L	**T**	**P**	**L**	**T**	**P**	**FA**	**SA**	**PR**	**OR**	**TW**	
PCC-201-ETC	Signals & Systems	PCC	4	3	1	-	3	1	-	50	50	-	25	25	150
PCC-202-ETC	Electronic Devices and Circuits	PCC	3	3	-	-	3		-	50	50	-	-	-	100
PCC-203-ETC	Electronic Devices and Circuits Lab	PCC	1	-	-	1	-	-	2	-	-	50	-	-	50
PCC-204-ETC	Mathematics for Electronics & Telecommunication Engineers	PCC	3	2	1	-	2	1		50	50	-	-	25	125
MDM-205-ETC	MDM-1(Data Structures)	MDM	2	2	-	-	2	-	-	50	50	-	-	-	100
MDM-206-ETC	MDM-1 # (Data Structures Lab)	MDM	1	-	-	1	-	-	2	-	-	25	-	-	25
	Open Elective Course-I	OEC	2	2	-	-	2	-	-	-	-	-	25	25	50
VEC-207-ETC	Universal Human Values	VEC	2	2	-	-	2	-	-	25	25	-	-	-	50
AEC-208-ETC	Modern Indian Language	AEC	2	1	1	-	1	1	-	-	-	-	-	50	50
CEP-209-ETC	Community Engagement project	CEP	2	-	-	2	-	-	4	-	-	-	25	25	50
Total			**22**	**15**	**3**	**4**	**15**	**3**	**8**	**225**	**225**	**75**	**75**	**150**	**750**

Dr. Kiran M. Napte
Chairman,Board of Studies

Chairman
BoS, E & TC Engineering
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Dr. Harish U. Tiwari
Chairman, Academic Council

Chairman, Academic Council
PCET's Pimpri Chinchwad College of Engineering and Research, Ravet, Pune - 412 101

S. Y. B. Tech. E&TC Engineering Syllabus Structure

Level 5															
S.Y. B.Tech. E&TC Engineering															
Semester IV															
Course Code	**Course**	**Type**	**Total Credits**	**Credits Scheme**			**Teaching Scheme (Hours/Week)**			**Evaluation Scheme and Marks**					**Total**
				L	**T**	**P**	**L**	**T**	**P**	**FA**	**SA**	**PR**	**OR**	**TW**	
PCC-251-ETC	Communication Engineering	PCC	3	3	-		3	-	-	50	50	-	-	-	100
PCC-252-ETC	Communication Engineering Lab	PCC	1	-	-	1	-	-	2	-	-	50	-	-	50
PCC-253-ETC	Microcontroller	PCC	3	3	-	-	3	-	-	50	50		-	-	100
PCC-254-ETC	Microcontroller Lab	PCC	1	-	-	1	-	-	2	-	-	25	-	-	25
PCC-255-ETC	Control Systems	PCC	3	2	1		2	1	-	50	50	-	-	25	125
VSE-256-ETC	Project Based Learning	VSE	2	-	-	2	-	-	4	-	-	-	25	50	75
EEM-257-ETC	Project Management and Finance Essentials	EEM	2	2	-	-	2	-	-	-	-	-	-	50	50
MDM-258-ETC	MDM-2 (Object Oriented Programming)	MDM	2	2	-	-	2	-	-	50	50	-	-	-	100
MDM-259-ETC	MDM-2 # (Object Oriented Programming Lab)	MDM	1	-	-	1	-	-	2	-	-	-	25	-	25
	Open Elective Course-II	OEC	2	2	-	-	2	-	-	-	-	-	25	25	50
VEC-260-ETC	Environmental Science	VEC	2	2	-	-	2	-	-	25	25	-	-	-	50
Total			**22**	**16**	**1**	**5**	**16**	**1**	**10**	**225**	**225**	**75**	**75**	**150**	**750**

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Dr. Harish U. Tiwari
Chairman, Academic Council

Chairman, Academic Council
PCET's Pimpri Chinchwad College of Engineering and Research, Ravet, Pune - 412 101

Syllabus for SEM-III

S. Y. B. Tech. E&TC Engineering Syllabus Structure

Level 5															
S.Y. B.Tech. E&TC Engineering															
Semester III															
Course Code	**Course**	**Type**	**Total Credits**	**Credits Scheme**			**Teaching Scheme (Hours/Week)**			**Evaluation Scheme and Marks**					**Total**
				L	**T**	**P**	**L**	**T**	**P**	**FA**	**SA**	**PR**	**OR**	**TW**	
PCC-201-ETC	Signals & Systems	PCC	4	3	1	-	3	1	-	50	50	-	25	25	150
PCC-202-ETC	Electronic Devices and Circuits	PCC	3	3	-	-	3		-	50	50	-	-	-	100
PCC-203-ETC	Electronic Devices and Circuits Lab	PCC	1	-	-	1	-	-	2	-	-	50	-	-	50
PCC-204-ETC	Mathematics for Electronics & Telecommunication Engineers	PCC	3	2	1	-	2	1		50	50	-	-	25	125
MDM-205-ETC	MDM-1(Data Structures)	MDM	2	2	-	-	2	-	-	50	50	-	-	-	100
MDM-206-ETC	MDM-1 # (Data Structures Lab)	MDM	1	-	-	1	-	-	2	-	-	25	-	-	25
	Open Elective Course-I	OEC	2	2	-	-	2	-	-	-	-	-	25	25	50
VEC-207-ETC	Universal Human Values	VEC	2	2	-	-	2	-	-	25	25	-	-	-	50
AEC-208-ETC	Modern Indian Language	AEC	2	1	1	-	1	1	-	-	-	-	-	50	50
CEP-209-ETC	Community Engagement project	CEP	2	-	-	2	-	-	4	-	-	-	25	25	50
Total			**22**	**15**	**3**	**4**	**15**	**3**	**8**	**225**	**225**	**75**	**75**	**150**	**750**

Class- Term	**Second Year- Term III (OEC-1)**
CREDITS	**2**
OEC	Vastushastra in Modern Realms
	Pragmatics of Communication and the Wisdom of Literature
	Digital Marketing
	Financial Literacy and Digital Finance

Class: Second Year Engineering (2025 Pattern)					**Sem:** III	
Course Code: PCC-201-ETC		**Name of Course:** Signals and Systems				
Teaching Scheme (Hrs./week):				**Credits:**		
Lecture	Tutorial	Practical		Lecture	Tutorial	Practical
3	1	-		3	1	-

Examination Scheme :					
FA	SA	PR	OR	TW	Total
50	50	-	25	25	150

Prerequisite:

1. Basics of Electrical and Electronics Engineering & Mathematics

Course Objectives: The objectives of this course aims to:

1. Introduce signals, its operations with examples and to classify signals into different categories.
2. Classify systems into different categories.
3. Analyze the Liner Time Invariant (LTI) systems and finding the system response in time domain.
4. Acquire knowledge about Fourier Series and Transform and its significance in signal analysis.
5. Understand the limitations of Fourier transform and need for Laplace transform and develop the ability to analyze the system in s- domain.

Course Outcomes: On completion of course, Learner will be able to

PCC-201.1	Develop the mathematical equations of continuous and discrete time signals and perform fundamental operations on signals and Categorize signals into different categories.
PCC-201.2	Analyze different systems by applying the knowledge of system classification.
PCC-201.3	Find response of a system for any arbitrary input signal using the convolution process and aware of its modern applications. Test the system stability using the impulse response.
PCC-201.4	Analyze and resolve the signals in frequency domain using Fourier Transform.

PCC-201.5	Apply Laplace transform for continuous time signals and perform system analysis.

Course Content (TH)

Unit I	Introduction to Signals	(09 Hours)

Signals: Introduction, Continuous and Discrete time signals representation: Graphical, Functional, Tabular and Sequence. Sampling And Aliasing, Basic Elementary signals and their relationships: Unit Impulse, Unit step, Unit ramp, Unit parabolic, rectangular pulse, Triangular, Signum, Sinusoidal, Real exponential, Complex exponential, Sinc, and Gaussian function.

Operations on signals (CT and DT): Amplitude scaling, signal addition, subtraction, signal multiplication, signal differentiation, signal integration, difference, accumulation, time shifting, time reversal, and time scaling.

Classification of signals (CT and DT): Deterministic and Random, Periodic and Non-periodic, Even and odd, Energy and Power, and Stationary and non-stationary.

Unit II	Introduction to Systems	(09 Hours)

Introduction to systems: Communication, control etc., Classification of systems using input output relationship: static and dynamic, causal and non-causal, Linear and Non- linear, time variant and time invariant, stable and unstable, invertible and non- invertible. Linear Time Invariant (LTI) systems, impulse response, basic concepts of Finite Impulse Response (FIR) and Infinite Impulse Response (IIR), FIR and IIR system structures, comparison and applications of FIR and IIR systems.

Unit III	Time-domain Analysis of LTI Systems and Applications	(09 Hours)

Introduction to convolution, convolution sum, methods of finding convolution sum: tabular and graphical, convolution integral, computation of convolution integral using graphical method for unit step to unit step, unit step to exponential, exponential to exponential, unit step to rectangular and rectangular to rectangular only. Properties of convolution sum and convolution integral. System interconnection, system properties in terms of impulse response, step response in terms of impulse response.

Unit IV	Fourier Analysis and Applications	(09 Hours)

Introduction to Fourier Series: Fourier Series (FS) representation of periodic Continuous-Time (CT) signals using trigonometric and exponential forms, Dirichlet conditions for the existence of Fourier Series, Gibbs phenomenon. Fourier Transform (FT): Fourier Transform representation of aperiodic CT signals; Dirichlet conditions for the existence of Fourier Transform; evaluation of magnitude and phase response; Fourier Transform of standard CT signals; properties and their significance; interplay between time and frequency domains using sinc and rectangular signals; Fourier Transform for periodic signals

Unit V	**Laplace Transform and Applications**	**(09 Hours)**

Definition of Laplace transform, Limitations of Fourier transform and need of Laplace transform, ROC, Properties of ROC, Laplace transform of standard periodic and aperiodic functions, properties of Laplace transform and their significance, Laplace transform evaluation using properties, Inverse Laplace transform based on partial fraction expansion, stability considerations in S domain, Application of Laplace Transforms: RL, RC, RLC Circuit analysis, transfer function and impulse response.

Learning Resources

Text Books:

1. Simon Haykins and Barry Van Veen, Signals and Systems, Wiley India, 2nd Edition.
2. A. V. Oppenheim, A. S. Willsky, "Signals and Systems", Pearson, 2nd Edition.
3. B. P. Lathi, "Linear Systems and Signals" Oxford University Press, 2nd Edition.

Reference Books:

1. A. Nagoor Kanni Signals and Systems, Mc Graw Hill, 2nd Edition
2. John G. Proakis and Dimitris G. Manolakis, "Digital signal Processing: Principles, Algorithms, and Applications", 4th Edition. Sept. 2007.
3. Ian Goodfellow, Yoshua Bengio, Aaron Courville, Deep Learning, MIT Press, 2016.
4. Charles Phillips, Signals, Systems and Transforms, Pearson Education, 3rd Edition

E-resources:

1. https://archive.nptel.ac.in/courses/108/106/108106163/
2. https://ocw.mit.edu/courses/res-6-007-signals-and-systems-spring-2011

Course Name : Signals and Systems

List of Tutorials

Sr. No.	**Content**

1	Generate and plot the following signals in time domain and also sketch its amplitude and phase spectrum. Verify the result: Impulse Unit Step Exponential Unit ramp Sinc Rectangular.
2	Write the codes to plot the following signals also simulate the signals: (a) sin(200πt), (b) sin(200πt+π/6), (c) sin(200πt-π/6), (d) cos(200πt), (e) sin(200πt+π/4), (f) cos(200πt- π/4)
3	Develop codes to simulate, and plot the results for an exponential signal: x(t) = k e^−at u(t) for the cases: (a) k = 1 and a = 0.35 (b) k =1.5 and a= -0.45
4	Sampling & Aliasing: Consider various human voice / speech (probably your voice both male and female) or music signals. Try different sampling rates and observe the effect of aliasing.
5	Find the convolution integral of Unit step and exponential signals and write a program to sketch the out response of the system. Also verify the commutative property of convolution integral.
6	Take any one periodic signal and find its Fourier series coefficients using exponential or trigonometric FS method. Write a program to find its Fourier series coefficients. Also using FS coefficients, reconstruct the signal. Observe the effect of Gibbs phenomenon.
7	Real time speech signal and Spectral analysis The speech signal has frequency components in the audio frequency range 300 Hz to 3400 Hz of the electromagnetic spectrum. Record the male and female voice speech Signal. Write a program to record the speech signals and sketch it in time domain, its amplitude spectrum and phase spectrum.

8	The music signal has frequency components in the audio frequency range 20 Hz to 20000 Hz of the electromagnetic spectrum. Record or use the recorded music samples of different instruments (at least four) and Write a program to record the music signal and sketch it in time domain, its amplitude spectrum and phase spectrum. Also comment on the result.

Class: Second Year Engineering (2025 Pattern)				**Sem:** III		
Course Code: PCC-202-ETC			**Name of Course:** Electronic Devices and Circuits			
Teaching Scheme (Hrs./week):				**Credits:**		
Lecture	Tutorial	Practical		Lecture	Tutorial	Practical
3	-	-		3	-	-

Examination Scheme:					
FA	SA	PR	OR	TW	Total
50	50	-	-	-	100

Pre-requisite :-

Basics of Electrical and Electronics Engineering.

Course Objectives: The objectives of this course aims to

1. Semiconductor device like MOSFET, its characteristics, parameters and applications.
2. Concepts of feedbacks in amplifiers and oscillators.
3. Operational amplifier, concept, parameters and Linear and non-linear applications of Op-Amp.
4. Types of power supply, performance parameters of power supply and design of power supply.

Course Outcomes: On completion of course, learner will be able to

PCC-202.1	Analyze the performance of MOSFET with the help of physics, characteristics and parameters towards its application as an amplifier.
PCC-202.2	Design amplifiers with and without feedback and oscillators using MOSFET for given specifications.
PCC-202.3	Design linear applications of Op-Amp considering the ideal and practical characteristics

	of op-amps
PCC-202.4	Design Non-linear applications of Op-Amp considering the ideal and practical characteristics of op-amps.
PCC-202.5	Analyze the performance of linear and switching regulators towards applications in regulated Power Supplies.

Course Content		
Unit I	**MOSFET and its Analysis**	**(09 Hours)**
EMOSFET-construction, EMOSFET V-I characteristics, Non-ideal V-I characteristics of EMOSFET: finite output resistance, body effect, Sub-threshold conduction Break down effect, Temperature effect, MOSFET biasing and DC circuit analysis, MOSFET small signal amplifier (CS configuration), Frequency response for amplifier, Comparison of CS, CG, CD Configuration.		
Unit II	**MOSFET Circuits**	**(09 Hours)**
MOSFET as switch, CMOS inverter, resistor and diode, Four types of amplifiers, Types of feedback, Four types of feedback topologies, Effects of feedback, Voltage series and current series feedback amplifiers and analysis. Barkhausen criterion, Types of Oscillator, Crystal oscillator, RC oscillators		
Unit III	**Op-amp and Linear Applications**	**(09 Hours)**
Block diagram of OP-Amp, Differential Amplifier configurations, Ideal equivalent circuit of Op-Amp, Differential amplifier analysis for dual-input balanced-output configuration, DC and AC characteristics of Op-Amp, Inverting and non-inverting amplifier, Summing amplifier, Difference Amplifier, Ideal integrator, errors in ideal integrator, Practical integrator, Ideal differentiator, errors in ideal differentiator, Practical differentiator, first Order Low pass Filter, High Pass Filter		
Unit IV	**Op-amp and Non Linear Applications**	**(09 Hours)**
Comparator, Characteristics of comparator, Applications of Comparator, Schmitt trigger, Square wave and triangular generator, **DAC and ADC**: Resistor weighted and R-2R DAC, SAR and Flash ADC, I to V converters, V to I converters , Characteristics, block diagrams, Circuits, Specifications, Merits, Demerits, Comparisons.		
Unit V	**Voltage Regulators**	**(09 Hours)**

Block diagram of power supply. Three terminal voltage regulators (IC 317 and IC337): Block diagram of linear voltage regulator Features and Specifications, Typical connection diagram, current boosting, Low Dropout Regulator (LDO). SMPS: Block diagram, features and specifications, Types of SMPS. Comparison of Linear Power supply and SMPS.
Text Books:
1. Donald Neaman, Electronic Circuits - Analysis and Design, Mc Graw Hill, 3rd Edition. 2. Ramakant Gaikwad, Op Amps & Linear Integrated Circuits, Pearson Education.
Reference Books:
1. Millman Halkias, Integrated Electronics. 2. Phillip E. Allen and Douglas R. Holberg, CMOS Analog Circuit Design, Oxford, 2nd Edition. 3. Salivahan and Kanchana Bhaskaran, Linear Integrated Circuits, Tata McGraw Hill.
E-resources:
1. https://nptel.ac.in/courses/108108111 2. https://nptel.ac.in/courses/108103378

Class: Second Year Engineering (2025 Pattern)				**Sem:** III		
Course Code: PCC-203-ETC			**Name of Course:** Electronic Devices and Circuits Lab			
Teaching Scheme (Hrs./week):				**Credits:**		
Lecture	Tutorial	Practical		Lecture	Tutorial	Practical
-	-	2		-	-	1
Examination Scheme:						
FA	SA	PR	OR	TW	Total	
-	-	50	-	-	50	

Course Objectives: The objectives of this course aims to

1. Semiconductor device like MOSFET and OPAMP, its characteristics, parameters and applications.
2. Performance parameters and design of power supply

Course Outcomes: On completion of course, learner will be able to

PCC-203.1	Design and Implement MOSFET and OPAMP Circuits, Voltage Regulator for given specifications.
PCC-203.2	Simulate and test CS amplifier, feedback amplifier, Inverter, square and triangular waveform generator.
PCC-203.3	To conduct experiments of Electronic Devices and Circuits as individuals, or team by using hardware setup or simulation tool, analyse the outputs and to make an effective report based on experiment.

List of Experiments	
Expt. No.	**Name of the Experiment**
GROUP A	
1	Design, build single stage CS configuration and verify DC operating point and comment on results.
2	To measure following Op- amp parameters and compare with specifications given in data sheet using LM741/ LF 356/OP 07 a) Input bias current b) Input offset current c) Input offset voltage d) Slew rate e) CMRR.
3	Design, build and test integrator/ differentiator using Op-amp for given frequency fa, and comment on result.
4	Design, build and test Schmitt trigger using Op-Amp and comment on result
5	Design, build and test 2 or 3-bit R-2R ladder DAC.
GROUP B	
6	Simulate single stage CS amplifier, plot frequency response. Calculate Av, Ri, Ro and bandwidth
7	Simulate Current series/ Voltage series feedback amplifier and measure Rif , Rof , Avf , bandwidth and comment on result.
8	Simulate MOSFET/ CMOS Inverter.
9	Simulate square and triangular waveform generator using Op-Amp and Compare theoretical and Practical value of frequency
GROUP C	
10	Case Study: Design and Implement a linear regulator variable power supply.

Text Books:

1. Donald Neaman, Electronic Circuits - Analysis and Design, Mc Graw Hill, 3rd Edition.
2. Ramakant Gaikwad, Op Amps & Linear Integrated Circuits, Pearson Education.

Reference Books:

1. Millman Halkias, Integrated Electronics.
2. Phillip E. Allen and Douglas R. Holberg, CMOS Analog Circuit Design, Oxford, 2nd Edition.

3. Salivahan and Kanchana Bhaskaran, Linear Integrated Circuits, Tata McGraw Hill.
E-resources:
1. https://nptel.ac.in/courses/108108111 2. https://nptel.ac.in/courses/108103378

Pimpri Chinchwad Education Trust's
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| An Autonomous Institute | NBA Accredited (4 UG Programs) |
| NAAC A++ Accredited | ISO 21001:2018 Certified |
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Department of Electronics & Telecommunication Engineering

Class: Second Year Engineering (2025 Pattern)					**Sem:** III	
Course Code: PCC-204-ETC			**Name of Course:** Mathematics for Electronics & Telecommunication Engineers			
Teaching Scheme (Hrs./week):				**Credits:**		
Lecture	Tutorial	Practical		Lecture	Tutorial	Practical
2	1	-		2	1	-
Examination Scheme :						
FA	SA	PR	OR	TW	Total	
50	50	-	-	25	125	

Pre-requisites:
Engineering Mathematics – I & II

Course Objectives: The objectives of this course aims to

1. Develop the ability to apply linear differential equations for modeling and solving problems arising in electrical and electronic circuits.
2. Introduce statistical methods and data analysis techniques for interpreting experimental and measurement data in electronics and communication systems.
3. Build a strong foundation in probability theory and probability distributions, enabling students to analyze random signals, noise, and to perform hypothesis testing in electronics engineering applications.
4. Familiarize students with complex analysis and numerical techniques and their applications in communication systems and signal analysis.
5. Equip students with numerical modeling and simulation skills for analyzing and solving real-world problems in electronic and telecommunication systems.

Course Outcomes: On completion of this course, the learner will be able to

PCC-204.1	Apply linear differential equations for solving electrical circuits.
PCC-204.2	Analyze experimental data using statistical techniques.

PCC-204.3	Apply probability laws and distributions to analyze data and test hypotheses in electronics engineering.
PCC-204.4	Apply complex analysis and numerical methods in communication systems.
PCC-204.5	Apply numerical methods to model, analyze, and simulate problems in communication and electronic systems.

Course Content

Unit I	**Linear Differential Equations with constant coefficient**	**(06 Hours)**

Linear Differential Equations with constant coefficient; general & particular solutions; Cauchy's, Legendre's simultaneous DEs; Applications to Electric Circuit.

Unit II	**Statistics**	**(06 Hours)**

Basic concepts and data representation; measures of central tendency and dispersion (RMS, SD, variance, Moments, Skewness and Kurtosis, Curve fitting, Correlation and regression

Unit III	**Probability**	**(06 Hours)**

Probability – Bayes theorem, Law of total probability, conditional, joint probability, probability distribution – binomial, poisons, exponential, geometric, normal, hypothesis testing – different techniques.

Unit IV	**Complex Analysis**	**(06 Hours)**

Functions of a complex variable, Cauchy–Riemann equations, Analytic functions, Complex integration, Cauchy's integral theorem and formula, Residue theorem, Applications in signal and network analysis

Unit V	**Numerical Methods**	**(06 Hours)**

Solution of algebraic equations (Bisection, Newton–Raphson methods, Regula Falsi,), Numerical integration (Trapezoidal and Simpson's rules), Numerical solution of differential equations, Applications in simulation of communication systems.

Learning Resources

Text Books:

1. **B. S. Grewal**, Higher Engineering Mathematics, Khanna Publishers
2. **Erwin Kreyszig**, Advanced Engineering Mathematics, Wiley

Reference Books:

1. **S. L. Ross**, "Differential Equations", 3E by Wiley India.
2. **Miller & Freund**, Probability and Statistics for Engineers, Pearson
3. **K.A. Stroud**, Engineering Mathematics, Palgrave Macmillan
4. **Sheldon M. Ross**, "Introduction to Probability and Statistics for Engineers and Scientists", 5E, by Elsevier Academic Press.

E-resources:

1. nptel.ac.in/courses/111104521
2. nptel.ac.in/courses/111102160
3. nptel.ac.in/courses/111102160
4. https://nptel.ac.in/courses/111103070
5. https://nptel.ac.in/courses/127106019

Class: Second Year Engineering (2025 Pattern)				**Sem:** III		
Course Code: MDM-205-ETC		**Name of Course:** Data Structures				
Teaching Scheme (Hrs./week):				**Credits:**		
Lecture	Tutorial	Practical		Lecture	Tutorial	Practical
2	-	-		2	-	-

Examination Scheme :					
FA	SA	PR	OR	TW	Total
50	50	-	-	-	100

Prerequisite:

Fundamentals of Programming in C, algorithm

Course Objectives: The objectives of this course aims to

1. Apply C programming concepts, pointers, and memory management techniques for implementing data structures.
2. Develop the ability to design and implement linear and non-linear data structures such as stacks, queues, linked lists, trees, and graphs.
3. Analyze algorithms and data structures using time and space complexity for efficient problem solving.
4. Enable the use of appropriate data structures and algorithms for solving problems in communication networks, IoT, and embedded systems.

Course Outcomes: On completion of course, Learner will be able to

MDM-205.1	Analyze the efficiency of searching and sorting algorithms using time and space complexity.

MDM-205.2	Apply concepts of data types, data structures and memory organization to solve computational problems.
MDM-205.3	Implement stack and queue data structures to develop efficient programs..
MDM-205.4	Analyze tree and graph based models to solve routing, communication and hierarchical data problems using appropriate traversal and representation techniques.
MDM-205.5	Evaluate and select appropriate data structures for applications in electronics, communication, and embedded systems.

Course Content (TH)		
Unit I	**Introduction to Data Structures**	**(06 Hours)**

Data Structures: Introduction and Types:-linear and non-linear data structures, static and dynamic data structures

Algorithm: Time and space complexity, Tradeoff , asymptotic notations , Storage Classes in C,

Data Handling Using Structures and Pointers:-Array of structures, Pointers and structures, Functions:-Recursive functions. Passing arrays to functions, passing structures to functions, passing pointers to functions.

Unit II	**Linked lists**	**(06 Hours)**

Dynamic Memory Allocation (malloc, calloc, realloc, free), comparison of sequential and linked organization,

Linked List: Singly, Doubly, and Circular Linked List concept and algorithm, memory management in linked structures, applications in networking and IoT device lists.

Unit III	**Linear Data Structures**	**(06 Hours)**

Stack: Concept, Basic Stack operations, Array representation of stack, Stack Applications: Reversing data, Arithmetic expression conversion (Infix to Postfix) and Expression evaluation.

Queue: Concept, Queue operations, Array representation of queue, Types and Applications of queue, Stack and Queue implementation using Linked list

Unit IV	**Non-Linear Data Structures-Trees**	**(06 Hours)**

Introduction to tree: Basic Tree Concepts. Binary Tree: Concept & Terminologies, Representation of Binary Tree in memory, Traversing a binary tree.

Binary Search Tree (BST): Basic Concepts, BST operations, AVL Tree: Basic concepts and rotations of a Tree

Unit V	**Non-Linear Data Structures –Graph**	**(06 Hours)**

Graph: Basic Concepts & terminology, Representation of graph: Adjacency matrix, Adjacency list. Operations on graph: Traversing a graph. Spanning tree: Minimum Spanning tree- Kruskal's Algorithm, Prim's Algorithm

Learning Resources

Text Books:

1. Mark Allen Weiss, Data Structures and Algorithm Analysis in C, Pearson, 2nd Edition
2. Richard F. Gilberg and Behrouz A. Forouzan, Data Structures: A Pseudocode Approach with C, Cengage Learning, 2nd Edition
3. R. Kruse, C. L. Tondo, B. Leung, and C. Reinbold, Data Structures and Program Design in C, Pearson

Reference Books:

1. Debasis Samanta, *Classic Data Structures (C Edition)*, PHI Learning
2. Reema Thareja, *Data Structures Using C*, Oxford University Press, 2nd Edition
3. Luis Joy and K. Mohanraj, *Data Structures Through C in Depth*, Bharti Publications

E-resources:

1. https://elearn.nptel.ac.in/shop/nptel/c-programming-and-assembly-language/
2. https://onlinecourses.swayam2.ac.in/nou23_cs13/preview

Course Name : Data Structures

Group Assignment

Sr. No.	Unit No.	Content
1	I	ADC Data Logger using Arrays and Structures in C Store and process real-time sensor readings; practice arrays, structures, functions
2	II	Dynamic Sensor Data Management using Linked Lists Dynamically store & update readings from multiple sensors (linked list operations)
3	III	Circular Buffer Implementation for UART/SPI Communication and Stack-Based Expression

		Evaluation for Filter Design
4	**IV**	Binary Search Tree Implementation for Efficient Storage and Retrieval of Electronic Component Calibration Data
5	**V**	Hash Table Implementation for Fast Lookup of MAC Addresses in a Communication Network

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Class: Second Year Engineering (2025 Pattern)				**Sem:** III		
Course Code: MDM-206-ETC		**Name of Course:** Data Structures Lab				
Teaching Scheme (Hrs./week):				**Credits:**		
Lecture	Tutorial	Practical		Lecture	Tutorial	Practical
-	-	2		-	-	1

Examination Scheme :					
FA	SA	PR	OR	TW	Total
-	-	25	-	-	25

Prerequisite:

Fundamentals of Programming Languages, algorithm

Course Objectives: The objectives of this course aims to

1. Provide hands-on experience in implementing fundamental data structures using C programming.
2. Develop problem-solving skills through practical implementation of linear and non-linear data structures.
3. Enable students to apply data structures in embedded systems and communication-related applications such as buffers, routing, and data handling.
4. Help students analyze time and memory efficiency of data structures for real-time system constraints.

Course Outcome: On completion of course, learner will be able to

MDM-206.1	Implement linear data structures such as arrays, linked lists, stacks, and queues using C for real-time data handling.
MDM-206.2	Design and implement non-linear data structures such as trees, graphs, and hash tables for efficient storage and retrieval.

MDM-206.3	Apply algorithms such as traversal, searching, and shortest path in communication and networking applications.
MDM-206.4	Analyze the performance of data structures and select appropriate structures for embedded system requirements.

List of Laboratory Experiments (Implement using C language)

1) Sorting Algorithms

An online store wants to sort its product prices to help customers compare them easily. Choose suitable sorting techniques for small to medium datasets. Implement bubble sort, selection sort, and insertion sort to reorder product prices.

2) Student Database Management

You are developing a student result management system. The database should support updating records, adding new entries, searching for specific students, and sorting based on performance.
Using an array of structures, implement a student database with attributes: roll no, name, program, course, subject marks, total, and average. Support operations: display, search, and sort. (Students can additionally perform modify, append.)

3) Stack or Queue using Array (Static Implementation)

Simulate a parcel handling system at a post office where packages are stacked (LIFO) or queued (FIFO). Use an array to implement a stack (push, pop, display) or a queue (add, delete, display).
Choose the appropriate model based on the scenario.

4) Singly Linked List Operations

You are building a text editor where lines of text are stored dynamically. You need to allow insertion and deletion of lines at any position, and display text both normally and in reverse.Use a singly linked list to implement: display, insert (front/end/middle), delete (front/end/middle), display in reverse, and reverse the list.

5) **Stack or Queue using Linked List (Dynamic Implementation)**

Design a service window system where customers arrive and are served in order (FIFO),or a browser history system where the last visited page is accessed first (LIFO).Use a linked list to implement a dynamic stack

6) Binary Search Tree Operations

An online directory system uses a BST to keep names in a sorted manner and support fast searching.
Create a binary search tree and implement recursive traversals (inorder, preorder, postorder) and search for a specific name in the directory.

7) Graph Creation

You are designing a navigation system for a campus with multiple buildings. The system should explore possible paths (routes) using BFS or DFS. Create a graph using an adjacency matrix and

8) Graph Traversal Implement breadth-First Search and Depth-First Search to explore building connectivity.
9) VLAB / Mini Project You are required to design and implement a small virtual lab or mini project using data structures in C to solve a real-world or embedded system problem, along with proper documentation and reporting.

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Class: Second Year B.Tech. (2025 Pattern)		**Sem: III**
Name of Course: OEC		

Course Code	Course Name	Course Type
OEC-220-CVL	Vastushastra in Modern Realms	OEC
OEC-221-COM	Essentials of Linguistics and Literature	OEC
OEC-222-ITT	Financial Literacy and Digital Finance	OEC
OEC-223-MEC	Digital Marketing	OEC

Class: Second Year Engineering (2025 Pattern)				**Sem:** III		
Course Code: VEC-207-ETC				**Name of Course:** Universal Human Values		
Teaching Scheme (Hrs./Week):				**Credits:**		
Lecture	Tutorial	Practical		Lecture	Tutorial	Practical
2	-	-		2	-	-

Examination Scheme :					
FA	SA	PR	OR	TW	Total
25	25	-	-	-	50

Prerequisite:

Induction Programme

Course Objectives: The objectives of this Course aims to

1. To elaborate on Self-exploration as the process for Value Education
2. To help the students develop a holistic, humane world-vision, and appreciate the essential complementarity between values and skills.
3. To facilitate the understanding of harmony at various levels starting from self and going towards family and society.
4. To elaborate on the salient aspects of harmony in nature and the entire existence.

Course Outcomes: On completion of course, Learner will be able to

VEC-207.1	Explore the human being as a coexistence of the self and the body in order to gain clarity about real needs and basic aspirations.

VEC-207.2	Recognize self-exploration as a process of value education and understand that individuals have the potential to explore values independently.
VEC-207.3	Explain relationship between one self and the other self as the essential part of relation- ship and harmony in the family.

Course Content (TH)

Unit I	**Introduction to Human Values**	**(06 Hours)**

Understanding Value Education, Self-exploration as the Process for Value Education, Continuous Happiness and Prosperity- the Basic Human Aspirations and their Fulfillment, Right Understanding, Relationship and Physical Facility, Happiness and Prosperity Current Scenario, Method to Fulfill the Basic Human Aspirations.

Unit II	**Harmony in the Human Being**	**(06 Hours)**

Understanding Human being as the Co-existence of the Self and the Body, Distinguishing between the Needs of the Self and the Body, The Body as an Instrument of the Self ,Understanding Harmony in the Self , Harmony of the Self with the Body , Programme to Ensure self-regulation and Health

Unit III	**Harmony in the Family and Society**	**(06 Hours)**

Harmony in the Family- the Basic Unit of Human Interaction "Trust"- the Foundational Value in Relationship, ‘Respect’- as the Right Evaluation , Values in Human-to-Human Relationship , Understanding Harmony in the Society , Vision for the Universal Human Order

Unit IV	**Harmony in the Nature**	**(06 Hours)**

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 , The Holistic Perception of Harmony in Existence , Professional Ethics in the light of Right Understanding , Strategies for Transition towards Value-based Life and Profession.

Learning Resources

Text Books:

1. A Foundation Course in Human Values and Professional Ethics, RR Gaur, R Asthana, GP Bagaria, 3rd

revised edition, UHV Publications, 2023, ISBN: 978-81-957703-7-3 (Printed Copy), 978-81-957703-6-6 (e-book)

2. Teachers Manual for A Foundation Course in Human Values and Professional Ethics, RR Gaur, R Asthana, GP Bagaria, 3rd revised edition, UHV Publications, 2023, ISBN: 978-81- 957703-5-9 (Printed Copy), 978-81-957703-0-4 (e-Book)

Reference Books:

1. P. L. Dhar, R. R. Gaur, 1990, Science and Humanism, Commonwealth Publishers.

2. A. Nagaraj, 1999, Jeevan Vidya: Ek Parichaya, Jeevan Vidya Prakashan, Amarkantak

3. B. P. Banerjee, 2005, Foundations of Ethics and Management, Excel Books.

4. A. N. Tripathy, 2003, Human Values, New Age International Publishers.

E-resources:

1. https://nptel.ac.in/
2. https://ocw.mit.edu/

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Class: Second Year Engineering (2025 Pattern)				**Sem: III**		
Course Code: AEC-208-ETC			**Name of Course:** Modern Indian Language आधुनिक भारतीय भाषा (मराठी)			
Teaching Scheme (Hrs./week):				**Credits:**		
Lecture	Tutorial	Practical		Theory	Tutorial	Practical
1	1	-		1	1	1
Examination Scheme:						
FA	SA	PR	OR	TW	Total	
-	-	-	-	50	50	

Pre-requisites:

प्रादेशिक भाषा शिकण्याची इच्छा आणि कुतूहल हवे.

Course Objective:

हा विषय शिकणाऱ्या विद्यार्थ्यांना;

१. प्रादेशिक बोली भाषेची महती कळावी व महाराष्ट्रात दैनंदिन व्यवहार करणे सुलभ व्हावे.
२. मराठी बोलण्याची तसेच वाचण्याची गोडी लागावी.

Course Outcomes:

हा विषय हाताळून होईस्तोवर विद्यार्थ्यांना;

AEC-208.1	मराठी भाषेचा इतिहास आणि जडणघडण कळेल.

AEC-208.2	आधुनिक मराठीचे सौंदर्य आणि क्षमता कळेल तसेच मराठी साहित्यास भरीव योगदान देणारे लेखक, कवी यांचा आणि त्यांच्या साहित्याचा परिचय होईल.
AEC-208.3	समाज माध्यमे वापरताना योग्य ती दक्षता घेता येईल व मराठी भाषेतून व्यक्त होता येईल.
AEC-208.4	अभिव्यक्ती: निबंध लेखन, वृत्तपत्र लेखन, स्फुटलेखन, वाचन, वक्तृत्व यासाठी मराठी भाषा सहज वापरता येईल.

Course Content

Unit I	प्राचीन आणि मध्ययुगीन साहित्य (१३ वे ते १८ वे शतक)	**(06 Hours)**

- बाराखडी, अंक, गद्य, पद्य, म्हणी, वाक्प्रचार, छंद, मुक्तछंद, यमक, अलंकार, इ. मुलभूत व्याकरण
- महानुभाव साहित्य**:** चक्रधर स्वामी आणि 'लीळाचरित्र'.
- संत साहित्य: संत ज्ञानेश्वर (ज्ञानेश्वरी), संत तुकाराम (गाथा), समर्थ रामदास.
- पंत साहित्य: वामन पंडित आणि मोरोपंत यांच्या आर्या.
- शाहिरी साहित्य**:** पोवाडे आणि लावणी (राम जोशी, होनाजी बाळा).

Unit II	आधुनिक मराठी साहित्य	**(06 Hours)**

- कविता: केशवसुत (आधुनिक कवितेचे जनक), बालकवी, कुसुमाग्रज, स्वातंत्र्यवीर सावरकर, सुरेश भट
- कादंबरी: ह. ना. आपटे, वि. स. खांडेकर, श्री. ना. पेंडसे, नारायण धारप
- नाटक: वसंत कानेटकर, विजय तेंडुलकर, पु. ल. देशपांडे, जयवंत दळवी
- कथा: चिं. वि. जोशी, जी. ए. कुलकर्णी, अरविंद गोखले, शंकर पाटील

Unit III	भाषा आणि प्रसारमाध्यमे	**(06 Hours)**

- आकाशवाणी (Radio): रेडिओवरील भाषणे, मुलाखती आणि उद्घोषणांसाठी संहिता लेखन (Script Writing).
- दूरचित्रवाणी (Television): माहितीपट (Documentary) आणि बातम्यांसाठी संहिता लेखन व सादरीकरण.
- मुलाखत तंत्र: दूरचित्रवाणी किंवा डिजिटल माध्यमांसाठी मुलाखत घेण्याची आणि देण्याची कला..
- सूत्रसंचालन (Anchoring)**:** सांस्कृतिक कार्यक्रम किंवा व्यावसायिक सोहळ्यांचे प्रभावी सूत्रसंचालन करण्याची कौशल्ये.

Unit IV	अभिव्यक्ती	**(06 Hours)**

- निबंध लेखन, अर्ज लेखन, पत्र लेखन, अहवाल लेखन
- वृत्तपत्र स्तंभलेखन, वृत्तलेखन, अग्रलेख/वैचारिक लेखन
- नवमाध्यमे, समाजमाध्यमांविषयी साक्षरता, दक्षता, वापर आणि परिणाम

Learning Resources

Text Books**:**

- वर उल्लेखिलेल्या लेखकांची साहित्य रचना
- "उपयोजित मराठी", डॉ. केतकी मोडक, डॉ. सुहासकुमार बोबडे, डॉ. संजय विठ्ठल
- "व्यावहारिक मराठी", डॉ. ल. रा. नसिराबादकर,फडके प्रकाशन
- " मराठी भाषा : संवादाचे स्वरूप आणि माध्यमे", डॉ. नागनाथ कोत्तापल्ले

Reference Books:

- "सुगम मराठी व्याकरण" मो. रा. वाळंबे
- मराठी साहित्य टीका आणि विश्लेषण
- "साहित्यवेध" वि. वा. शिरवाडकर
- "व्यावहारिक उपयोजित मराठी आणि प्रसारमाध्यमांची कार्यशैली", डॉ. संदीप सांगळे
- "प्रसारमाध्यमे आणि मराठी भाषा", डॉ. भास्कर शेळके
- "सायबर संस्कृती", डॉ. रमेश वरखेडे
- "भाषांतर मीमांसा",कल्याण काळे आणि अंजली सोमण

Assignment Writing:

वरील प्रत्येक विभागावर अभ्यासात्मक लेख, ज्यात कविता रसग्रहण, समीक्षा, वर्णनात्मक निबंध, मुलाखत प्रश्नावली, सूत्रसंचालन संहिता, अहवाल लेखन, परिच्छेद भाषांतर, औपचारिक व अनौपचारिक पत्रलेखन, अर्जलेखन इत्यादींचा समावेश असेल.

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Class: Second Year Engineering (2025 Pattern)				**Sem:** III		
Course Code: CEP-209-ETC		**Name of Course:** Community Engagement project				
Teaching Scheme (Hrs./week):				**Credits:**		
Lecture	Tutorial	Practical		Lecture	Tutorial	Practical
-	-	4		-	-	2
Examination Scheme :						
FA	SA	PR	OR	TW	Total	
-	-	-	25	25	50	

Prerequisite:

Willingness to Participate, Communication Skills, Teamwork and Collaboration, Ethical Awareness

Course Objectives: The objectives of this course aims to:

1. Foster a mutually beneficial partnership between the college and the community.
2. Avail opportunities for students to connect with the local community, enhancing empathy, teamwork, and problem-solving skills while positively impacting their surroundings.
3. An understanding of the challenges faced by the local community and the role of engineering in developing effective solutions.
4. Build a capability to use technical expertise to design and implement solutions that create meaningful benefits for the community.
5. Evaluate and critically analyze the outcomes of engagement activities, deriving actionable insights for sustainable impact.

Course Outcomes: On completion of course, learner will be able to

CEP-209.1	Identify local community needs through active engagement with stakeholders.
CEP-209.2	Analyze local challenges by evaluating real-world problems faced by the community
CEP-209.3	Design practical, creative, and context-specific solutions using engineering principles.

CEP-209.4	Implement the solutions which are effectively addressed and resolve community issues.
CEP-209.5	Assess the effectiveness of interventions and communicate key lessons learned through reports a

Course Content (PR)

Implementation

- A group of 10 students could be assigned for a particular habitation or village or municipal ward, as far as possible, in the near vicinity of their place of stay/college premise.
- Each group is allotted to a faculty member of the department as a mentor.
- The group of students will be associated with a government official / village authorities /NGOs etc. concerned, allotted by the district administration, during the duration of the project.
- An activity book has to be maintained by each of the students to record the activities undertaken/involved and will be countersigned by the concerned mentor/HoD.
- Project report shall be submitted by each student/group of students.
- An internal evaluation shall also be conducted by a committee constituted by the HoD. Evaluation to be done based on the active participation of the student and marks could be awarded by the mentor/HoD.
- Students groups can conduct an awareness Programme on Health and Hygiene or in Organic Farming or in Fisheries or in advocating prohibition of liquor or about renewable energy, e- waste management or any other activity in an area of their studies and as per his/her aptitude.

Suggestive list of topics/Areas under Community Engagement Project

It is expected that the focus should be on specific local issues in their nearby areas. The students are expected to carry out these projects with involvement, commitment, responsibility and accountability. The below lists are not exhaustive and open for HoD's or mentors to add, delete or modify. The mentors of a student/group of students shall

- Use and/or miss-use of cell phones
- **Aashadhi/ Kartiki wari**
- Career orientation of youth
- Water facilities and drinking water availability
- Health and hygiene of the school going students, home makers and old personals
- Health intervention and awareness programmes
- Food habits
- Air /Sound /Water pollution
- Plantation and Soil protection
- Organic farming
- Food adulteration
- Women education and empowerment

Project Scope

- Conduct workshops or awareness drives on topics like digital literacy, environmental sustainability, mental health, or career planning for local stakeholders.
- Develop a simple prototype or solution that addresses a real-world problem (e.g., a water-saving device, simple mobile apps, or tools for community use).
- Organize clean-up drives, tree plantations, recycling campaigns, or energy conservation initiatives.
- Promote health through awareness programs on hygiene, nutrition, and exercise.
- Teach basic computer or technical skills to students, staff, or the community

Proposal Submission

CEP Group should Submit a two-page project proposal, preferably prior to the term commencement outlining the following:-

- Title of the project
- Aim, Objective and expected outcome
- Plan of execution (timeline and activities).
- Project Scope
- Place of the CEP and involvement of any local authority, NGP
- Required resources (if any).
- Get approval from the designated faculty mentor.

Learning Resources

Text Books:

1. Waterman, A. Service-Learning: A Guide to Planning, Implementing, and Assessing Student Projects. Routledge, 1997.
2. Beckman, M., and Long, J. F. Community-Based Research: Teaching for Community Impact. Stylus Publishing, 2016.
3. Design Thinking for Social Innovation. IDEO Press, 2015.
4. Dostilio, L. D., et al. The Community Engagement Professional's Guidebook: A Companion to The Community Engagement Professional in Higher Education. Stylus Publishing, 2017.

MOOC / NPTEL/YouTube Links:

1. https://onlinecourses.nptel.ac.in/noc20_hs77/preview
2. https://www.unesco.org
3. https://engineering.purdue.edu/EPICS
4. https://www.ashoka.org
5. https://www.dfcworld.com

Syllabus for SEM-IV

S. Y. B. Tech. E&TC Engineering Syllabus Structure

Level 5														
S.Y. B.Tech. E&TC Engineering														
Semester IV														
Course Code	**Course**	**Type**	**Total Credits**	**Credits Scheme**			**Teaching Scheme (Hours/Week)**			**Evaluation Scheme and Marks**					**Total**
				L	**T**	**P**	**L**	**T**	**P**	**FA**	**SA**	**PR**	**OR**	**TW**	
PCC-251-ETC	Communication Engineering	PCC	3	3	-		3	-	-	50	50	-	-	-	100
PCC-252-ETC	Communication Engineering Lab	PCC	1	-	-	1	-	-	2	-	-	50	-	-	50
PCC-253-ETC	Microcontroller	PCC	3	3	-	-	3	-	-	50	50		-	-	100
PCC-254-ETC	Microcontroller Lab	PCC	1	-	-	1	-	-	2	-	-	25	-	-	25
PCC-255-ETC	Control Systems	PCC	3	2	1		2	1	-	50	50	-	-	25	125
VSE-256-ETC	Project Based Learning	VSE	2	-	-	2	-	-	4	-	-	-	25	50	75
EEM-257-ETC	Project Management and Finance Essentials	EEM	2	2	-	-	2	-	-	-	-	-	-	50	50
MDM-258-ETC	MDM-2 (Object Oriented Programming)	MDM	2	2	-	-	2	-	-	50	50	-	-	-	100
MDM-259-ETC	MDM-2 # (Object Oriented Programming Lab)	MDM	1	-	-	1	-	-	2	-	-	-	25	-	25
	Open Elective Course-II	OEC	2	2	-	-	2	-	-	-	-	-	25	25	50
VEC-260-ETC	Environmental Science	VEC	2	2	-	-	2	-	-	25	25	-	-	-	50
Total			**22**	**16**	**1**	**5**	**16**	**1**	**10**	**225**	**225**	**75**	**75**	**150**	**750**

Class- Term	**Second Year- Term IV (OEC-II)**
CREDITS	**2**
OEC	Biology for Engineers
	Financial Management
	Critical thinking and problem solving
	Media, Society, and Digital Culture

Class: Second Year Engineering (2025 Pattern)				**Sem:** IV		
Course Code: PCC-251-ETC		**Name of Course:** Communication Engineering				
Teaching Scheme (Hrs./week):				**Credits:**		
Lecture	Tutorial	Practical		Lecture	Tutorial	Practical
3	-	-		3	-	-
Examination Scheme:						
FA	SA	PR	OR	TW	Total	
50	50	-	-	-	100	

Course Objectives: The objectives of this course aims to

1. Familiarize students with the fundamental principles of modulation and various analog modulation techniques.
2. Introduce students to the concept of the sampling theorem and PCM, DM, and ADM modulation techniques.
3. Familiarize students with various digital modulation techniques used in digital communication systems.
4. Introduce students to real-world applications of communication systems.

Course Outcomes: On completion of course, learner will be able to

PCC-251.1	Analyze the AM generation and detection techniques like DSB-FC, DSB-SC, SSB-SC, VSB, ISB.
PCC-251.2	Analyze the analog modulation techniques like FM and pulse modulation techniques like PCM, DM, and ADM.
PCC-251.3	Evaluate the performance of digital communication systems in the presence of noise.
PCC-251.4	Compare digital modulation techniques for probability of error, bandwidth and power requirements.
PCC-251.5	Interpret real-world applications of communication systems.

Course Content

Unit I	**AM Communication Systems**	**(09 Hours)**

Introduction to Communication System, Need for Modulation, Amplitude modulation (DSB-C), Double

sideband Suppressed carrier (DSB SC) modulation, Single sideband modulation (SSB), Vestigial Sideband modulation (VSB),Spectrum and Bandwidth of AM, DSB-SC, SSB & VSB, Calculation of modulation index for AM wave, Modulation index for more than one modulating signals, Power and power efficiency, AM reception.

Unit II	**Frequency and Pulse modulation Techniques**	**(09 Hours)**

Frequency Modulation (FM), Instantaneous frequency, Modulation Index, FM modulator and demodulator-FM generation by Armstrong 's method, FM detection using PLL.

Need of analog to digital conversion, sampling theorem, Nyquist criteria, Types of sampling: Natural and Flat top. Data formats (RZ, NRZ, UNIPOLAR, BIPOLAR, AMI, Manchester and its properties) Concept of Generation & Reconstruction of PCM, Delta Modulation, Adaptive Delta Modulation

Unit III	**Random Processes and Noise**	**(09 Hours)**

Random Processes: Introduction, Stationary processes, Mean, Correlation and Covariance function, Ergodic processes, Transmission of a random process through a LTI filter, Power spectral density.

Mathematical Representation of Noise: Sources of Noise, Types: Thermal noise, shot noise, flicker noise, and burst noise, Additive White Gaussian Noise (AWGN) channel model, Noise representation in baseband and passband.

Unit IV	**Digital Modulation and Demodulation Schemes**	**(09 Hours)**

A Base-band Signal Receiver: Probability of Error, The Optimum Filter.

Digital Modulation: Generation, Reception, Signal Space Representation, and Probability of Error Calculation for Binary Phase Shift Keying (BPSK), Binary Frequency Shift Keying (BFSK), Quadrature Phase Shift Keying (QPSK).

Unit V	**Applications of Communication Engineering**	**(09 Hours)**

Case study: Applications of communication systems, with a focus on their real-world relevance, working principles, and functional blocks. Two-Way Radio Communication (Walkie-Talkies) FM Radio Broadcasting, Aviation and Marine Communication, Television Fundamentals.

Learning Resources

Text Books:

1. John G. Proakis and MasoudSalehi, "Fundamentals of Communication Systems", Pearson, 2005.
2. S. Haykin and M. Moher, "An Introduction to Analog and Digital Communications", Wiley, 2e, 2006.
3. H. Taub, D. Schilling, and G. Saha, "Principles of Communication Systems", McGraw-Hill, 2013.
4. B. P. Lathi and Z. Ding, "Modern Digital and Analog Communication Systems", Oxford Univ. Press, 4e, 2009.

Reference Books:

1. Sklar and P. K. Ray, *Digital Communication: Fundamentals and Applications*, 2nd edition. Pearson, 2009.
2. Couch: Digital and Analog Communication Systems, 6th edn. Pearson Education.
3. Marvin K. Simon, Sami M. Hinedi, William C. Lindsey: Digital Communication Techniques, PHI.

E-Resources:

1. https://nptel.ac.in/courses/108/104/108104091/
2. https://nptel.ac.in/courses/108/102/108102096/

Class: Second Year Engineering (2025 Pattern)				**Sem:** IV		
Course Code: PCC-252-ETC			**Name of Course:** Communication Engineering Lab			
Teaching Scheme (Hrs./week):				**Credits:**		
Lecture	Tutorial	Practical		Lecture	Tutorial	Practical
-	-	2		-	-	1
Examination Scheme:						
FA	SA	PR	OR	TW	Total	
-	-	50	-	-	50	

Course Objectives: The objectives of this course aims to

1. Familiarize students with the fundamental principles of modulation and various analog modulation techniques.
2. Introduce students to the concept of the sampling theorem and PCM, DM, and ADM modulation techniques.
3. Familiarize students with various digital modulation techniques used in digital communication systems.

Course Outcomes: On completion of this course, learner will be able to

PCC-252.1	Analyze the AM generation techniques using DSB-FC.
PCC-252.2	Analyze the analog modulation techniques like FM and pulse modulation techniques like PCM, DM, and ADM.
PCC-252.3	Evaluate the performance of digital communication systems in the presence of noise.

List of Experiments

Group A: Hardware Practical's to be performed

1	AM Generation (DSB-FC): Calculation of modulation index by graphical method and trapezoidal method.
2	Frequency modulator & demodulator using Varicap / Varactor Diode and NE 566 VCO, IC 565 (PLL based detection), calculation of modulation index & BW of FM.
3	Verification of Sampling Theorem in time domain (Flat top & Natural sampling).
4	Study of line codes (NRZ, RZ, POLAR RZ, BIPOLAR (AMI), MANCHESTER) & their spectral analysis.
5	Study of BPSK transmitter & receiver using suitable hardware setup/kit.
6	Study of QPSK transmitter & receiver using suitable hardware setup/kit.
7	Study of BFSK transmitter & receiver using suitable hardware setup/kit.
Group B: Simulation Practical's to be performed using suitable platform	
8	Write a program to Verify Sampling Theorem.
9	Simulation study of random processes. Find various statistical parameters of the random process.
10	Simulation Study of performance of BPSK receiver in presence of noise.

Class: Second Year Engineering (2025 Pattern)						**Sem:** IV
Course Code: PCC-253-ETC		**Name of Course:** Microcontroller				
Teaching Scheme (Hrs./week):				**Credits:**		
Lecture	Tutorial	Practical		Lecture	Tutorial	Practical
3	-	-		3	-	-

Examination Scheme :					
FA	SA	PR	OR	TW	Total
50	50	-	-	-	100

Prerequisites:

1. Basics of Electrical and Electronics Engineering
2. Digital Circuits
3. Programming in "C"

Course Objectives: The objectives of this course aims to

1. Understand architecture and features of 8051 Microcontroller.
2. Use concepts of timers and interrupts of 8051 in programming.
3. Explore different features of PIC 18F Microcontroller with Architecture.
4. Learn interfacing of real-world peripheral devices with microcontroller.
5. Demonstrate real life applications using PIC 18F.

Course Outcomes: On completion of course, learners will be able to

PCC-253.1	Understand the fundamentals of microcontroller architecture and features.
PCC-253.2	Explore concepts timer and serial communication in programming.
PCC-253.3	Analyze the features of PIC 18F XXXX.

PCC-253.4	Develop interfacing models according to applications.
PCC-253.5	Evaluate the serial communication details and interfaces.

Course Content (TH)

Unit I	**Microcontroller Overview and 8051 Architecture**	**(09 Hours)**

Numbering system, Comparison of Microcontroller and Microprocessor, Architectures of Microcontroller: Harvard, Von Neumann. RISC and CISC comparison, Concept of pipelining, Selection Criteria for Choosing Microcontroller, Block diagram of 8051 Microcontroller: CPU, input device, output device, memory and buses, 8051 Microcontroller: Architecture, Pin Configuration, Memory Organization, Power saving options

Unit II	**8051 Timers, Interrupts, Serial Communication**	**(09 Hours)**

Interrupt structure, timers and its modes, Serial communication: concept of baud rate, Data transmission and reception using Serial port. Sample programs of data transfer, Delay using Timer (0&1) and interrupt, Data transmission and reception using Serial port.

Unit III	**PIC 18F Microcontroller Architecture**	**(09 Hours)**

Comparison of PIC family, features, PIC18FXX architecture with generalized block diagram. MCU, Program and Data memory organization, Bank selection using Bank Select Register, Pin out diagram, Reset operations, Watch Dog Timers, Configuration registers and oscillator options (CONFIG), Power down modes .

Unit IV	**Real World Interfacing with PIC18F**	**(09 Hours)**

Port structure, interrupt structure & timers of PIC18F. Interfacing of switches, LED, LCD, Keypad, Motion Detectors, DAC for generation of waveform, Block diagram of in-built ADC with Control registers, Sensor interfacing using ADC PWM generation. All programs in embedded C.

Unit V	**Serial Port Programming interfacing with PIC18F**	**(09 Hours)**

Basics of Serial Communication Protocol: Study of RS232, RS 485, I2C and SPI, USART (Receiver and Transmitter), MSSP structure, SPI, I2C Interfacing serial port, RTC with I2C and EEPROM with SPI. All programs in embedded C. Case studies.

Learning Resources:

Text Books:

1. Mazidi & McKinlay," The 8051 Microcontroller and Embedded Systems using Assembly and C", PHI.
2. Mazidi & McKinlay," The PIC Microcontroller and Embedded Systems using Assembly and C", PHI.
3. Myke Predko," Programming and Customizing the 8051 Micro-controller", Tata McGraw-Hill.
4. R A Gaonkar, "Fundamentals of Microcontrollers and Applications in Embedded Systems (with PIC18 Microcontroller Family)", Penram Publishing India.

Reference Books:

1. Kenneth J. Ayala, Dhananjay V. Gadre, "The 8051 Microcontroller & Embedded Systems Using
2. Assembly and C", Cengage Learning India Publication.
3. Ajay Deshmukh, "Microcontrollers Theory and Applications", TATA McGraw Hill, 4th Edition
4. Peatman, John B, "Design with PIC Microcontroller", Pearson Education PTE, 1st Edition
5. Data Sheet of PIC 18Fxxxx series

E-resources:

1. https://nptel.ac.in/courses/108105102
2. https://nptel.ac.in/courses/106108100
3. https://nptel.ac.in/courses/117104072

	Pimpri Chinchwad Education Trust's **Pimpri Chinchwad College of Engineering & Research, Ravet, Pune** | An Autonomous Institute | NBA Accredited (4 UG Programs) | | NAAC A++ Accredited | ISO 21001:2018 Certified | **IQAC PCCOER** **Department of Electronics & Telecommunication Engineering**	

Class: Second Year Engineering (2025 Pattern)				**Sem:** IV		
Course Code: PCC-254-ETC			**Name of Course:** Microcontroller Lab			
Teaching Scheme (Hrs./week):				**Credits:**		
Lecture	Tutorial	Practical		Lecture	Tutorial	Practical
-	-	2		-	-	1

Examination Scheme:					
FA	SA	PR	OR	TW	Total
-	-	25	-	-	25

Course Objectives: The Objectives of this course aims to

1. Explore different features of PIC 18F Microcontroller with Architecture.
2. Learn interfacing of real-world peripheral devices with microcontroller.
3. Demonstrate real life applications using PIC 18.

Course Outcome: On completion of course, learner will be able to

PCC-254.1	Apply the hardware and software tools for real world peripheral interfacing using the fundamentals of PIC18F microcontroller and programming.

List of Experiments

Expt. No.	Name of the Experiment
1	Introduction to Integrated Development Environment MPLAB for PIC18F.
2	Interfacing of LED, Buzzer, Relay, Switch to PIC18F.
3	Interfacing of 16X2 LCD with PIC 18F to display message.
4	Interfacing of 4X4 keypad with PIC18Fand displaying key pressed on LCD.

5	Interface analog voltage 0-5V to internal ADC of PIC18F and display value on LCD.
6	Generate square wave using timer with interrupt.
7	Interfacing serial port with PC both side communication.
8	Generation of PWM signal for DC Motor control.
9	Interfacing OF RTC using I2C protocol
10	Case study: Design and implement home automation system.

	Pimpri Chinchwad Education Trust's **Pimpri Chinchwad College of Engineering & Research, Pune** An Autonomous Institute | NBA Accredited (4 UG Programs) | NAAC A++ Accredited | ISO 21001:2018 Certified **IQAC PCCOER** **Department of Electronics & Telecommunication Engineering**	

Class: Second Year Engineering (2025 Pattern)						**Sem:** IV
Course Code: PCC-255-ETC		**Name of Course:** Control Systems				
Teaching Scheme (Hrs./week):				**Credits:**		
Lecture	Tutorial	Practical		Lecture	Tutorial	Practical
2	1	-		2	1	-
Examination Scheme :						
FA	SA	PR	OR	TW	Total	
50	50	-	-	25	125	

Prerequisite:

Basics of Electrical and Electronics Engineering

Course Objectives: The objectives of this course aims to

1. Introduce the fundamentals of control systems and mathematical tools such as differential equations, signal flow graphs, and block diagrams for system modeling.
2. Develop the ability to analyze transient and steady-state responses of control systems under different input conditions.
3. Impart knowledge of stability analysis using time-domain and frequency-domain techniques.
4. Familiarize students with state-space modeling and conversion between transfer function and state-space representations.

Course Outcomes: On completion of course, learner will be able to

PCC-255.1	Apply principles of system modeling to develop control system representations using differential equations, transfer functions, block diagrams, and signal flow graphs.

PCC-255.2	Analyze the time-domain behavior of control systems by determining transient response, steady-state response, performance specifications, and steady-state errors.
PCC-255.3	Analyze the stability of control systems using characteristic equations, Routh–Hurwitz criterion, and root locus techniques.
PCC-255.4	Analyze control systems in the frequency domain using Bode plots, polar plots, and frequency response specifications for stability and performance evaluation.
PCC-255.5	Apply state-space methods to model control systems and determine controllability, observability and state transition matrices.

Course Content (TH)		
Unit I	**Introduction to Control Systems and System Modeling**	**(06 Hours)**
Basic concepts and classification of control systems, mathematical modeling of mechanical, electrical and electromechanical systems, transfer function representation, concept of poles and zeros and their significance, block diagram representation and reduction techniques, signal flow graph representation, and application of Mason's Gain Formula.		
Unit II	**Time Domain Analysis**	**(06 Hours)**
Time response analysis of control systems, standard test signals, transient and steady-state response, first-order and second-order systems, time-domain performance specifications, analysis of step response of underdamped systems, steady-state error, system type, and static error constants.		
Unit III	**Stability Analysis and Root Locus Technique**	**(06 Hours)**
Concept of stability, absolute and relative stability, characteristic equation, effect of pole locations in the s-plane on system response, Routh–Hurwitz stability criterion, root locus technique: definition, construction rules, magnitude and angle conditions, dominant poles, effect of addition of poles and zeros, and application of root locus for stability and performance analysis.		
Unit IV	**Frequency Domain Analysis**	**(06 Hours)**

Frequency response and frequency domain specifications-resonant peak, resonant frequency, bandwidth, correlation between time domain and frequency domain specifications. Construction of Polar plot, Nyquist Plot and Bode plot, determination of frequency domain specifications gain crossover frequency, phase crossover frequency, gain margin, phase margin and stability analysis.

Unit V	**State Space Analysis**	**(06 Hours)**

State space advantages and representation, Transfer function from State space, physical variable form, phase variable forms: Concept of Controllability and Observability, Solution of homogeneous state equations, state transition matrix and its properties, computation of state transition matrix by Laplace transform method only.

Learning Resources

Text Books:

1. N. J. Nagrath and M. Gopal, "Control System Engineering", New Age International Publishers, 5th Edition.
2. K. Ogata, "Modern Control Engineering", Prentice Hall India Learning Private Limited; 5th Edition

Reference Books:

1. Benjamin C. Kuo, "Automatic control systems", Prentice Hall of India, 7th Edition.
2. M. Gopal, "Control System – Principles and Design", Tata McGraw Hill, 4th Edition.
3. Schaum"s Outline Series, "Feedback and Control Systems" Tata McGraw-Hill.
4. John J. D"Azzo and Constantine H. Houpis, "Linear Control System Analysis and Design", Tata McGraw-Hill, Inc.
5. Richard C. Dorf and Robert H. Bishop, "Modern Control Systems", Addison – Wesley.

E-resources:

1. https://nptel.ac.in/courses/108106098.
2. https://onlinecourses.nptel.ac.in/noc25_de14/preview
3. https://onlinecourses-archive.nptel.ac.in/noc18_ph16/preview
4. https://onlinecourses-archive.nptel.ac.in/noc18_ee25/preview

Course Name : Control Systems

List of Tutorials

Sr. No.	Content
1	Simulate basic open-loop and closed-loop systems with simple transfer functions.
2	Construct block diagrams of control systems and perform block diagram reduction in Simulink.
3	Model simple electrical and mechanical systems in Simulink and derive their transfer functions.
4	Simulate time response to step inputs for first and second-order systems.
5	Simulate responses to ramp and parabolic inputs to find steady-state error.
6	Implement Routh-Hurwitz stability test using MATLAB scripts for different characteristic equations.
7	Plot root locus of a system and determine range of controller gains for stability.
8	Generate Bode plots and determine gain margin, phase margin, and bandwidth.
9	Model a mass-spring-damper system in MATLAB, analyze controllability and observability, and simulate its step response.
10	Model a series RLC circuit in Simulink, check controllability and observability, and simulate the capacitor voltage step response.

Class: Second Year Engineering (2025 Pattern)					**Sem:** IV
Course Code: VSE-256-ETC			**Name of Course:** Project Based Learning (PBL)		
Teaching Scheme (Hrs./week):			**Credits:**		
Lecture	Tutorial	Practical	Lecture	Tutorial	Practical
-	-	4	-	-	2

Examination Scheme:					
FA	SA	PR	OR	TW	Total
-	-	-	25	50	75

Course Objectives: The objectives of this course aims to

1. Emphasize project based learning activities that are long-term, interdisciplinary and student-centric.
2. Inculcate independent and group learning by solving real world problem with the help of available resources.
3. Develop application based on the fundamentals of electronics and communication engineering by possibly the integration of previously acquired knowledge.
4. Get practical experience in all steps in the life cycle of the development of electronic systems: specification, design, implementation, and testing.

5. Select and utilize appropriate hardware and software tools to design and analyze the proposed system.

6. Provide every student the opportunity to get involved either individually or as a group so as to develop team skills and learn professionalism.

Course Outcomes: On completion of course, learner will be able to	
VSE-256.1	Identify the real-world problem (possibly of interdisciplinary nature) through a rigorous literature survey and formulate / set relevant aim and objectives.
VSE-256.2	Contribute to society through proposed solution by strictly following professional ethics and safety measures.
VSE-256.3	Propose a suitable solution based on the fundamentals of electronics and communication engineering by possibly the integration of previously acquired knowledge
VSE-256.4	Analyze the results and arrive at valid conclusion.
VSE-256.5	Use of technology in proposed work and demonstrate learning in oral and written form.
VSE-256.6	Develop ability to work as an individual and as a team member.

Group Structure

Working in supervisor/mentor –monitored groups. The students plan, manage and complete a task/project/activity which addresses the stated problem.

- Create groups of 5 (five) to 6 (six) students in each class
- A supervisor/mentor teacher assigned to 3-4 groups or one batch

Project Selection

- Survey through journals, patents or field visit (A problem can be theoretical, practical, social, technical, symbolic, cultural and/or scientific), check the physibility of solution, analyze the problem, design and find the values of components.
- Projects vary greatly in the depth of the questions explored, the clarity of the learning goals, the content and

structure of the activity.

- The problem-based project oriented model for learning is recommended. The model begins with the identifying of a problem, often growing out of a question or "wondering". This formulated problem then stands as the starting point for learning. A problem can be theoretical, practical, social, technical, symbolic, cultural and/or scientific and grows out of students‟ wondering within different disciplines and professional environments.
- As stated in the preamble as electronics is an important grounding for other disciplines (computer science, signal processing, and communications), the project topic can be Interdisciplinary in nature. However the chosen problem must involve the application of electronics and communication engineering fundamentals.
- Out of the total developed system setup, the project must involve minimum 40% electronic components. Although in a genuine case 100% software based project topic may be allowed.

Ethical Practices, team work and project management

Use IEEE standards for project manufacturing, respect the time of others, attend the reviews, poster presentation and model exhibitions, strictly follow the deadline of project completion, comply with all legislation requirements that govern workplace health and safety practices.

- Plagiarism policy for synopsis and report : Less than 15%

Effective Documentation

In order to make our engineering graduates capable to prepare effective documentation, it is required for the students to learn the effective writing skills. The PBL final report is expected to consist of the-

- Literature Survey
- Problem Statement
- Aim and Objectives
- System Block Diagram
- System Implementation Details
- Discussion and Analysis of Results
- Conclusion, System Limitations and Future Scope.

Many freely available software tools (for instance Medley (Elsevier), Grammerly) are expected to be used during the preparation of PBL synopsis and final report. It is expected that the PBL guides/mentors shall teach students about utilizing valid sources of information (such as reference papers, books, magazines, etc) related to their PBL topic.

Evaluation & Continuous Assessment

The institution/head/mentor is committed to assessing and evaluating both student performance and program effectiveness. Progress of PBL is monitored regularly on weekly basis. Weekly review of the work is necessary. During process of monitoring and continuous assessment and evaluation the individual and team performance is to be measured. PBL is monitored and continuous assessment is done by supervisor /mentor and authorities. Students must maintain an institutional culture of authentic collaboration, self-motivation, peer-learning and personal responsibility. The institution/department should support students in this regard through guidance/orientation programs and the provision of

appropriate resources and services. Supervisor/mentor and Students must actively participate in assessment and evaluation processes. It is recommended that the all activities are required to be recorded and regularly. A regular assessment of PBL work is required to be maintained at the department in PBL log book by students. It is expected that the PBL log book must include following:

- Weekly monitoring by the PBL guide
- Assessment sheet for PBL work review by PBL guide and PBL Evaluation Committee (PEC).
- The PEC structure shall consist of Head of the department, 1/2 senior faculties of the department and one industry expert (optional).
- Continuous Assessment Sheet (CAS) is to be maintained by the department

Recommended parameters for assessment, evaluation and weightage

- Idea Inception (kind of survey). (10%)
- Outcome (Participation/ publication, copyright, patent, product in market). (50%)
- Documentation (Gathering requirements, design & modeling, implementation/execution, use of technology and final report, other documents). (15%)
- Attended reviews, poster presentation and model exhibition. (10%)
- Demonstration (Poster Presentation, Model Exhibition etc). (10%).
- Awareness /Consideration of - Environment/ Social /Ethics/ Safety measures/Legal aspects. (5%)

Learning Resources

Text Books:

1. John Larmer, John R. Mergendoller, and Suzie Boss, “Setting the Standard for Project Based Learning”.
2. John Larmer and Suzie Boss, “Project Based Teaching: How to Create Rigorous and Engaging Learning Experiences”.

Reference Books:

1. Erin M. Murphy and Ross Cooper, “Hacking Project Based Learning: 10 Easy Steps to PBL and Inquiry”. M. Krašna, "Project based learning (PBL) in the teachers' education,"39th International Convention on Information and Communication Technology, Electronics and Microelectronics (MIPRO), Opatija, 2016, pp. 852-856, doi: 10.1109/MIPRO.2016.7522258.
2. J. Macias- Guarasa, J.M. Montero, R. San-Segundo, A. Araujo and O. Nieto-Taladriz, "A project based learning approach to design electronic systems curricula", IEEE transactions on Education, vol.49, no. 3, pp. 389-397, Aug. 2006, doi: 10.1109/TE.2006.879784

E-resources:

1. https://onlinecourses.swayam2.ac.in/ntr20_ed12/preview

Class: Second Year Engineering (2025 Pattern)						**Sem:** IV
Course Code: EEM-257-ETC		**Name of Course:** Project Management and Finance Essentials				
Teaching Scheme (Hrs./week):				**Credits:**		
Lecture	Tutorial	Practical		Lecture	Tutorial	Practical
2	-	-		2	-	-
Examination Scheme :						
FA	SA	PR	OR	TW	Total	
-	-	-	-	50	50	

Prerequisite: NA

Course Objectives: The Objectives of this course aims to

1. Understand project management principles and apply them to engineering projects.
2. Learn financial management concepts and apply them to project decision-making.
3. Familiarize with industry-standard tools and methodologies (Agile, Scrum, PMBOK)
4. Develop skills for project planning, execution, and monitoring.
5. Analyze financial statements and make informed decisions.

Course Outcome: On completion of course, learner will be able to

EEM-257.1	Apply the fundamental knowledge of project management for effectively handling projects.
EEM-257.2	Develop project plans and schedules using industry-standard tools.
EEM-257.3	Analyze financial data and make informed decisions.
EEM-257.4	Execute and monitor projects using industry-standard methodologies

EEM-257.5	Evaluate the sources of finance, their closure and evaluation.

Course Content (TH)

Unit I	Fundamentals of Project Management	(06 Hours)

Project Definition, Project Life Cycle, Project Management Process and Key Principles, Role of the Project Manager (PM) , Phases of Project Management Life Cycle, Project management methodologies (Agile, Scrum, Waterfall), PMBOK framework and process groups, Project Management Tools: MS Project, Jira etc.

Case Study: Mumbai Metro Project

Unit II	Project Planning and Scheduling	(06 Hours)

Defining project scope, Work Breakdown Structure (WBS), and Gantt charts, Resource allocation, estimation and budgeting, Critical Path Method (CPM) and Program Evaluation Review Technique (PERT), Objectives of Activity planning, Project Schedules, Activities, Sequencing and Scheduling.

Case study: Develop the Software project plan using Microsoft Projects or any open source tool like Jira, Kanban etc.

Unit III	Financial Management for Projects	(05 Hours)

Financial statements (Balance Sheet, Income Statement, Cash Flow), Time value of money, Net Present Value(NPV),Internal Rate of Return (IRR) and payback period, Cost-benefit analysis and break-even analysis, Tools: Excel, financial calculators.

Unit IV	Project Execution and Control	(06 Hours)

Project execution: task assignment, tracking, and monitoring-, Project control: schedule control, budget control, and quality control, Risk management and mitigation, Earned value management (EVM) and project performance measurement, Project reporting and communication

Unit V	Project Financing, Closure and Evaluation	(07 Hours)

Financing of Projects: Capital structure, menu of financing, equity capital, internal accruals, term loans, debentures, working capital advance, miscellaneous sources, raising of venture capital, raising capital in international markets

Project closure: formal closure, documentation, and lessons learned- Project evaluation: success criteria, metrics, and benefits realization- Post-project review and evaluation- Best practices and future directions in project management,

Emerging trends in project management (AI, Blockchain)

Learning Resources

Text Books:

1. “Project Management: The Managerial Process" by Erik W. Larson and Clifford F. Gray.
2. "Project Management: A Systems Approach to Planning, Scheduling, and Controlling" by Harold Kerzner
3. "Project Management for Engineering, Business, and Technology" by John M. Nicholas & Her man Steyn
4. Roger Pressman, “Software Engineering: A Practitioner‘s Approach”, McGraw Hill, ISBN 0–07–337597

Reference Books:

1. A Guide to the Project Management Body of Knowledge (PMBOK Guide)" by Project Management Institute (PMI)
2. Pankaj Jalote, “An Integrated Approach to Software Engineering”, Springer, ISBN 13:9788173192715.
3. "Financial Accounting: A Managerial Perspective" - R. Narayanaswamy
4. "Agile Project Management" - Jim High-smith
5. "Scrum: The Art of Doing Twice the Work in Half the Time" - Jeff Sutherland

E-resources:

1. https://onlinecourses.swayam2.ac.in/cec20_cs07/preview
2. https://onlinecourses.nptel.ac.in/noc24_mg01/preview
3. https://www.atlassian.com/work-management/project-management
4. https://www.atlassian.com/project-management
5. https://ebookpdf.com/roger-s-pressman-software-engineering

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IQAC PCCOER
Department of Electronics & Telecommunication Engineering

Class: Second Year Engineering (2025 Pattern)				**Sem:** IV		
Course Code: MDM-258-ETC		**Name of Course:** Object Oriented Programming				
Teaching Scheme (Hrs/week):				**Credits:**		
Lecture	Tutorial	Practical		Lecture	Tutorial	Practical
2	-	-		2	-	-

Examination Scheme :					
FA	SA	PR	OR	TW	Total
50	50	-	-	-	100

Prerequisite:

Programming in C.

Course Objective: The objectives of this course aims to:

1. To introduce fundamental concepts of Object Oriented Programming (OOP) using C++.
2. To develop problem-solving skills through structured and object-oriented approaches.
3. To enable students to design and implement classes, objects, and relationships.
4. To familiarize students with advanced OOP concepts such as inheritance, polymorphism, and templates.
5. To prepare students to apply OOP concepts in real-world engineering and software development problems.

Course Outcome: On completion of course, Learner will be able to

MDM-258.1	Understand and explain basic programming constructs and OOP principles in C++.
MDM-258.2	Design and implement classes and objects using appropriate data abstraction techniques.
MDM-258.3	Apply inheritance and polymorphism to develop reusable and maintainable code.
MDM-258.4	Use advanced C++ features such as templates, exception handling, and STL.
MDM-258.5	Analyze real-world problems and develop efficient object-oriented C++ solutions.

Course Content (TH)		
Unit I	**Introduction to C++ and Object-Oriented Programming**	**(06 Hours)**
History and evolution of C++ language , Comparison of C and C++, Features of C++, Structure of a C++ program, Tokens, Data types, Variables and scope rules, Input/output operations using cin, cout, manipulators, Control structures, Introduction to Object-Oriented Programming concepts, Principles of OOP, Benefits and applications of OOP in real-world systems.		
Unit II	**Classes and Objects**	**(06 Hours)**
Concept of class and object, Data members and member functions, Access specifiers, Constructors: default, parameterized, copy constructor, Destructor: purpose and usage, Inline member functions, Static data members and static member functions, Friend functions and friend classes, Arrays of objects, Pointers to objects and this pointer, Memory management basics (new and delete)		
Unit III	**Inheritance and Polymorphism**	**(06 Hours)**
Concept and need for inheritance, Base class and derived class, Types of inheritance, Access control and inheritance modes, Virtual base classes and diamond problem, Function overloading and operator overloading, Compile-time polymorphism, Virtual functions, Runtime polymorphism, Abstract classes and pure virtual functions, Use of interfaces (conceptual understanding)		
Unit IV	**Advanced C++ Concepts**	**(06 Hours)**
Templates: need and advantages, Function templates, Class templates, Exception handling: try, catch, throw, File handling in C++, File streams,Text and binary file operations, Namespaces and scope resolution, Type casting: implicit and explicit casting, Introduction to Standard Template Library (STL): Containers: vector, list, map Iterators and algorithms		
Unit V	**Object-Oriented Design and Case Studies**	**(06 Hours)**
Object-oriented analysis and design concepts, Software development life cycle with OOP approach, Introduction to UML, Class diagrams: attributes, methods, relationships, Association, aggregation, and composition, Overview of design patterns , Application of OOP concepts in real-world problems		
Learning Resources		
Text Books:		
1. E. Balagurusamy, *Object Oriented Programming with C++*, McGraw-Hill. 2. Robert Lafore, *Object-Oriented Programming in C++*, Pearson Education.		

Reference Books:

1. Bjarne Stroustrup, *The C++ Programming Language*, Addison-Wesley.
2. Herbert Schildt, *C++: The Complete Reference*, McGraw-Hill.
3. Deitel & Deitel, *C++ How to Program*, Pearson.

E-Resources :

1. https://nptel.ac.in/courses/106/105/106105151/

2. https://nptel.ac.in/courses/106/105/106105191/

Pimpri Chinchwad Education Trust's
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IQAC PCCOER
Department of Electronics & Telecommunication Engineering

Class: Second Year Engineering (2025 Pattern) | **Sem: IV**

Course Code: MDM-259-ETC | **Name of Course:** Object Oriented Programming Lab

Teaching Scheme (Hrs./week):				**Credits:**		
Lecture	Tutorial	Practical		Lecture	Tutorial	Practical
-	-	2		-	-	1

Examination Scheme :

FA	SA	PR	OR	TW	Total
-	-	-	25	-	25

Prerequisite:

1. Programming in C Laboratory.

Course Objectives: The objectives of this course aims to:

1. Implement modular programs using functions, function overloading, and templates to improve code reusability and clarity.
2. Design and develop object-oriented programs using classes and objects for real-world problem solving.
3. Apply object-oriented features including constructors, destructors, inheritance, polymorphism, operator overloading, and containment.

Course Outcomes: On completion of course, Learner will be able to

MDM-259.1	Understand and explain basic programming constructs and OOP principles in C++.
MDM-259.2	Design and implement classes and objects using appropriate OOP concepts and advanced C++ concepts.
MDM-259.3	Analyze real-world problems and develop efficient object-oriented C++ solutions.

Course Content (PR)

General Guidelines: Any seven Experiments from group A and Any 2 Experiments from group B are to be performed.

List of Laboratory Experiments	
Group A: [Any Six to be performed]	
1.	Write a program in C++ to sort the numbers in an array using separate functions for read, display, sort and swap. The objective of this assignment is to learn the concepts of input, output, functions, call by reference in C++.
2.	Write a C++ program that illustrates the concept of Function over loading.
3.	Write a program in C++ to perform following operations on complex numbers Add, Subtract, Multiply, Divide, Complex conjugate. Design the class for complex number representation and the operations to be performed. The objective of this assignment is to learn the concepts classes and objects.
4.	Write a program in C++ to implement Stack. Design the class for stack and the operations to be performed on stack. Use Constructors and destructors. The objective of this assignment is to learn the concepts classes and objects, constructors and destructors.
5.	Write a program in C++ to perform following operations on complex numbers Add, Subtract, Multiply, Divide. Use operator overloading for these operations. The objective of this assignment is to learn the concepts operator overloading.
6.	Write a program in C++ to Read and Display the information of Employee Using Multiple Inheritance. Use Basic Info and Department Info as a base classes of Employee class.
7.	Write a C++ program that illustrates run time polymorphism by using virtual functions.
8.	Write a C++ program which use try and catch for exception handling.
Group B : [Any 02 to be performed]	
9.	Write a C++ program which to implement class and function template.
10.	Write a program in C++ to implement string class. Write constructors, destructor, Accepts function

	and Display function. To overload = operator so as call copy constructor.
11.	Write a program in C++ to implement containment concept using Employee, B Date, & String Classes.
12.	Write a C++ program which copies the contents of one file to another.
Group C : Mandatory	
13	Object-Oriented Analysis and Design using UML and C++ with Mini-Project Implementation

Virtual LAB Links:

1. Object Oriented Programming with C++: http://vlabs.iitb.ac.in/vlabs-dev/labs/oops/index.php

2. Problem Solving Lab: http://ps-iiith.vlabs.ac.in/

	Pimpri Chinchwad Education Trust's **Pimpri Chinchwad College of Engineering & Research, Pune** An Autonomous Institute | NBA Accredited (4 UG Programs) | NAAC A++ Accredited | ISO 21001:2018 Certified **IQAC PCCOER** **Department of Electronics & Telecommunication Engineering**	
Department: Second Year B.Tech. (2025 Pattern)		**Sem:** IV
Name of Course: OEC		

Course Code	Course Name	Course Type
OEC-270-CVL	Biology for Engineers	OEC
OEC-271-COM	Critical Thinking and Problem Solving	OEC
OEC-272-ETC	Financial management	OEC
OEC-273-ITT	Media, Society, and Digital Culture	OEC

Class: Second Year Engineering (2025 Pattern)				**Sem:** IV		
Course Code: VEC-260-ETC				**Name of Course:** Environmental Science		
Teaching Scheme (Hrs./Week):				**Credits:**		
Lecture	Tutorial	Practical		Lecture	Tutorial	Practical
2	-	-		2	-	-

Examination Scheme :

FA	SA	PR	OR	TW	Total
25	25	-	-	-	50

Prerequisite:

Basic Knowledge of Science

Course Objectives: The objectives of this course aims to

1. To introduce the fundamentals of environment, ecosystems, and sustainability.
2. To develop awareness and analytical ability regarding natural resources, biodiversity, and their conservation.
3. To understand environmental pollution, policies, and community practices for sustainable development.
4. To evaluate human–environment interactions and propose practical, ethical, and sustainable solutions.

Course Outcomes: On completion of course, learner will be able to

VEC-260.1	Demonstrate an integrative understanding of environmental concepts, ecosystems, and

	sustainable development.
VEC-260.2	Analyze the use and conservation of natural resources, biodiversity, and ecosystem services with real-world case studies.
VEC-260.3	Evaluate environmental pollution, policies, and community practices to propose sustainable solutions for societal and ecological well-being.

Course Content (TH)

Unit I	Foundations of Environmental Studies & Ecosystems	(06 Hours)

Definition, scope, importance, need for public awareness of environmental studies.

Concept of sustainability, sustainable development goals, Environmental ethics

Renewable and non-renewable sources; issues of land degradation and soil erosion.

Structure, components and functions of ecosystems, Energy flow in an ecosystem: food chains, food webs, ecological pyramids.

Major ecosystems and Case studies on Forest, Grassland, Desert, Aquatic ecosystems.

Unit II	Natural Resources, Biodiversity & Conservation	(06 Hours)

Natural resources: Land, water, air, energy resources – renewable and non-renewable.

Over-exploitation, land degradation, soil erosion, conflicts over water.
Definition, types, importance of biodiversity.
Biodiversity: levels (genetic, species, ecosystem), hotspots in India.
Threats to biodiversity: habitat loss, poaching, invasive species.
Conservation: in-situ and ex-situ strategies, role of communities.
Ecosystem services: ecological, social, cultural, economic values.

Unit III	Pollution, Policies, Communities & Practices	(06 Hours)

Air, water, soil, noise, e-waste, nuclear hazards: causes, effects, control measures.

Solid waste management and disaster management (floods, earthquakes, cyclones, landslides).

Environmental legislation: Environmental Protection Act, Air Act, Water Act, Wildlife Protection Act, Forest Conservation Act.

Unit IV	e-Waste Control and Measures	(06 Hours)

E-waste, composition and generation, Need for stringent health safeguards and environmental protection laws in India, Extended Producers Responsibility (EPR), Import of e-waste permissions, Producer-Public-Government cooperation, Administrative Controls & Engineering controls, monitoring of compliance of Rules, Effective regulatory mechanisms strengthened by manpower and technical expertise, Reduction of waste at source in India.

Learning Resources

Text Books:

1. Erach Bharucha *(2005), Textbook of Environmental Studies for Undergraduate Courses,* Universities Press.
2. Benny Joseph (2005), *Environmental Studies,* Tata McGraw Hill.

Reference Books:

1. Odum, E.P. (2011), *Fundamentals of Ecology*.
2. P.D. Sharma (2011), *Ecology and Environment.*

E-resources:

1. https://nptel.ac.in/
2. Open Courseware - https://ocw.mit.edu/

List of Assignments

Sr.No.	Topic to be covered
1	Introduction : Group discussion and poster making on "Why Environmental Studies Matter for Technologists"
2	Eco Mapping: Identify and document elements of an ecosystem within the college campus
3	Model the Food Web: Create food chains and food webs using flowcharts (digital tools like Canva / Lucid chart)
4	Case Study Review: Present real-world examples of forest, grassland, and aquatic ecosystems
5	Soil and Water Testing Activity: Test soil pH, water quality (use school-level kits), and

	interpret results
6	Field Visit / Virtual Tour: Document deforestation or mining impact in a chosen region; students prepare a comparative report
7	Water Audit Exercise: Estimate water usage at home/hostel and identify areas of overuse; propose conservation measures
8	Renewable Energy Models: Create a simple model or PPT on any renewable energy source (e.g., solar cooker, wind energy demo)
9	E-Waste Management: Challenges and Sustainable Solutions
10	Environmental and Health Impacts of Electronic Waste