

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)



Academic and Examination Rules and Regulations,
Curriculum Structure, and Syllabus
For
Second Year - Civil Engineering (B. Tech.)

With effect from (AY 2026-27)

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

(Applicable to Regulations 2023, 2021 and 2020)

(www.pccoer.com)

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 a 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 5th semester (i.e. 3rd 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 7th semester (i.e. 4th 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).

6.6 TEMPORARY 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

$$\text{Credit} = \text{Theory hours} + \text{Tutorial hours} + 0.5 (\text{Laboratory hours})$$

- 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
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* 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 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

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

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

$$SGPA = \frac{C1G1 + C2G2 + C3G3 + C4G4 + C5G5}{C1 + C2 + C3 + C4 + C5}$$

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:

$$\text{Percentage of Marks} = \text{CGPA} \times 9.5$$

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 $\text{CGPA} \geq 4.00$
- 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/outsideers.
 - 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

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

Department:

Subject:

Subject Code:

Class:

Maximum Marks: 30

Div:

Duration: 1 hr

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.

Q1

- a
- b
- c
- d
- e

Question

Attempt any Three (Unit 1)

CO / BTL / PI

Marks

15 Marks

Q2

- a
- b
- c
- d
- e



Attempt any Three (Unit 2)

15 Marks

*****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:
Subject:
Subject Code:

Class:
Maximum Marks: 50

Div:
Duration: 2 Hrs
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, Pune - 412101

(An Autonomous Institute affiliated to Savitribai Phule Pune University, Pune)

Department of Civil Engineering

Curriculum Structure and Syllabus

Second Year B. Tech.

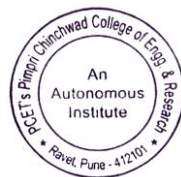
Academic Year 2026–2027



Effective from AY 2026-27

National Education Policy (NEP) 2020 Compliant

Approved by the Board of Studies (BoS – Civil Engineering) and Academic Council



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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 the Board of Studies

The syllabus for S.Y. B.Tech. Civil 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 (BTech) programs in the AY 2027–28 and 2028–29, respectively.

Civil Engineering is the basic discipline directly affecting the progress of civilization, which has off late become dynamic due to the advancement in technology and automation. Thus, the curriculum has been carefully structured to provide students with a strong understanding of the fundamental principles, theories, and practices of Civil Engineering, while equipping them to address the challenges of an ever-evolving 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 Indian Knowledge System, 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 to encourage self learning.

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

This curriculum has been formulated through extensive consultations with academic experts, industry professionals, alumni, and other stakeholders to ensure both academic rigor and industry relevance. While planning the Programme Core Courses and Programme Elective Courses, equal weightage has been given to various modules of Civil Engineering viz. Structures, Construction Management, Environmental Engineering, Hydrology & Water Resource Engineering, etc. The curriculum aims at making the aspirants employable immediately upon their graduation, as well as preparing them for higher studies, research and innovation in the field of Civil 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 express our deep appreciation and gratitude to the faculty members, students, industry experts and stakeholders who contributed significantly to the formulation of this syllabus.

Dr. Sameer Sawarkar
Chairman, Board of Studies

Dr. Harish U. Tiwari
Chairman, Academic Council

3. Vision Mission of the Institute and Department

Vision of the Institute

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 of the Institute

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 of the Department

To be an academically strong, technologically advanced, research focused and culturally vibrant Department for proficiency, employability and holistic development of the students.

Mission of the Department

1. To upgrade continuously in curricula and infrastructure so as to provide state-of-art knowhow to the aspirants.
2. To provide rigorous training for competitive examinations and to create self-learning facilities so as to be the hub of Competitive Examinations training.
3. To collaborate with outstanding research institutions for giving students and staff excellent research opportunities.
4. To enhance industry interaction through curricula design, industry visits, apprenticeships, internships, on-job training and sponsored projects so as develop employable and industry ready professionals.
5. To cultivate ethics, social awareness, cultural appreciation and soft-skills in the aspirants to make them truly global professionals and better human beings.

Programme Specific Outcomes

On completion of this B.Tech. Programme in Civil Engineering, a student should...

- PSO1 Have become well-versed with all the facets of Civil Engineering and should have acquired skills for succeeding in the competitive examinations.
- PSO2 Know the *abhiyāntriki* heritage of *Bhārat* and have learned the latest technology; so as to acquire contemporary knowhow as well as ancient wisdom.

Programme Educational Objectives

A student pursuing this B.Tech. Programme in Civil Engineering should ...

- PEO1 Be able to pursue a very rewarding occupation, as an entrepreneur or professional in Government or private sectors.
- PEO2 Be able to provide constructive and sustainable solutions to civilian issues.
- PEO3 Develop passion for research and life-long learning.

4. Knowledge and Attitude Profile (WK)

A Knowledge and Attitude Profile (KAP), represented as WK 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.


5. 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. Semester III Level 5 Curriculum Structure


Course Code	Course	Course Type	Credits	Credit Scheme			Teaching Scheme			Examination Scheme					Total Marks
				L	T	P	L	T	P	FA	SA	PR	OR	TW	
PCC-231-CVL	Mechanics of Materials	Programme Core Course	2	2	-	-	3	-	-	50	50	-	-	-	100
PCC-232-CVL	Mechanics of Materials Lab	Programme Core Course Lab	1	-	-	1	-	-	2	-	-	-	25	-	25
PCC-233-CVL	Surveying	Programme Core Course	2	2	-	-	3	-	-	50	50	-	-	-	100
PCC-234-CVL	Surveying Lab	Programme Core Course Lab	1	-	-	1	-	-	2	-	-	25	-	-	25
PCC-235-CVL	Fluid Mechanics	Programme Core Course	2	2	-	-	3	-	-	50	50	-	-	-	100
PCC-236-CVL	Fluid Mechanics Lab	Programme Core Course Lab	1	-	-	1	-	-	2	-	-	-	25	-	25
PCC-237-CVL	Construction Materials & Technology	Programme Core Course	2	2	-	-	3	-	-	50	50	-	-	-	100
PCC-238-CVL	Construction Materials & Technology Lab	Programme Core Course Lab	1	-	-	1	-	-	2	-	-	-	-	25	25
MDM-239-CVL	Engineering Geology (Hybrid)	Multi-disciplinary Minor Course	3	2	-	1	2	-	2	-	-	50	-	50	100
	OEC-I	Open Elective Course	2	2	-	-	2	-	-	-	-	-	25	25	50
VEC-231-CVL	Professional Ethics & Human Values	Value Education Course	2	2	-	-	2	-	-	25	25	-	-	-	50
EEM-232-CVL	Engineering Economics	Entrepreneurship, Economics & Management Course	2	2	-	-	2	-	-	-	-	-	-	25	25
AEC-233-CVL	Indian Language (Marathi)	Ability Enhancement Course	1	-	-	1	-	-	2	-	-	-	-	25	25
			22	16	0	6	20	0	12	225	225	75	75	150	750



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Chairman, Academic Council
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S.Y.B.Tech. Semester IV Level 5 Curriculum Structure

Course Code	Course	Course Type	Credits	Credit Scheme			Teaching Scheme			Examination Scheme					Total Marks
				L	T	P	L	T	P	FA	SA	PR	OR	TW	
PCC-241-CVL	Mechanics of Structures	Programme Core Course	3	2	1	-	3	1	-	50	50	-	-	-	100
PCC-242-CVL	Architectural Design & Drawing	Programme Core Course	2	2	-	-	3	-	-	50	50	-	-	-	100
PCC-243-CVL	Architectural Design & Drawing Lab	Programme Core Course Lab	1	-	-	1	-	-	2	-	-	25	-	-	25
PCC-244-CVL	Concrete Technology	Programme Core Course	2	2	-	-	3	-	-	50	50	-	-	-	100
PCC-245-CVL	Concrete Technology Lab	Programme Core Course Lab	1	-	-	1	-	-	2	-	-	-	25	-	25
PCC-246-CVL	Hydrology & Water Resource Engineering	Programme Core Course	2	2	-	-	3	-	-	50	50	-	-	-	100
PCC-247-CVL	Hydrology & Water Resource Engineering	Programme Core Course Lab	1	-	-	1	-	-	2	-	-	-	-	25	25
FP-248-CVL	Structural Audit & NDT	Comm. Engg. Project (CEP)/Field Project (FP)	2	-	-	2	-	-	4	-	-	-	25	25	50
MDM-249-CVL	Applied Numerical Methods in Engineering	Multi-disciplinary Minor Course (MOOC)	2	2	-	-	-	-	-	-	-	25	-	50	75
	OEC-II	Open Elective Course	2	2	-	-	2	-	-	-	-	-	25	25	50
VSE-241-CVL	GIS and Remote Sensing	Vocational & Skill Enhancement Course	2	-	-	2	-	-	4	-	-	25	-	25	50
VEC-242-CVL	Emotional Intelligence & Human Relations	Value Education Course	2	2	-	-	2	-	-	25	25	-	-	-	50
			22	14	1	7	16	1	14	225	225	75	75	150	750


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Semester III



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Department of Civil Engineering



Class: Second Year Engineering (2025 Pattern)	Sem: III
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Course Code: PCC-231-CVL	Name of Course: Mechanics of Materials
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Teaching Scheme (Hrs/week):			Credits:		
Lecture	Practical	Tutorial	Theory	Practical	Tutorial
3	-	-	2	-	-

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

Pre-requisites:
Engineering Mechanics, Linear Algebra, Differential and Integral Calculus

Course Objectives:
By the end of the course, students should be able to;

- Understand the basic types of external actions and consequent deformations and strains in the structural members.
- Understand different types of material response in the form of stresses generated in the material.
- Understand the importance and use of elastic properties of any material in structural and mechanical design.

Course Outcomes:
On completion of this Course, the Learners will be able to;

PCC-231-CVL.1	Determine simple type of strains and stresses in determinate, indeterminate, homogeneous and composite members.
PCC-231-CVL.2	Analyze determinate beams and plot Shear Force Diagram (SFD) and Bending Moment Diagram (BMD).
PCC-231-CVL.3	Determine the bending stresses and shear stresses in beams as well as shear stresses in shafts subjected to twisting moment.
PCC-231-CVL.4	Explain the concept of principal stresses and stresses due to combined loading
PCC-231-CVL.5	Analyze axially loaded and eccentrically loaded short columns and struts.

Course Content

Unit I	Simple Stresses & Strains	(08 Hours)
Concept of strain, stress, Hook's law, stress-strain curves for linear, non-linear elastic and brittle materials, Elastic constants and their relations. Stresses and strains due to change in temperature. Computation of stresses and strains in determinate and indeterminate structures for homogeneous and composite structures under concentrated loads and temperature changes.		

Unit II	Shear Force & Bending Moment in Beams	(08 Hours)
Concept of shear force and bending moment. Relation between shear force, bending moment and intensity of loading. Shear force and bending moment diagrams for cantilevers, simple and compound		

beams due to concentrated, uniformly distributed, uniformly varying loads and couples.

Unit III

Bending Stresses & Shear Stresses in Beams

(08 Hours)

Theory of pure bending, Assumptions, flexure formula, bending stress distribution diagrams, moment of Resistance of cross-section.

Shear stresses in beams, shear stress formula, shear stress distribution for various cross sections, maximum and average shear stress for circular and rectangular sections.

Theory of torsion, assumptions, torsion formula, stresses and strains in shafts of hollow and solid homogeneous cross-sections subjected to twisting moments

Unit IV

Principal Stresses & Stresses due to Combined Action

(08 Hours)

Concept of principal planes and principal stresses, transformation equations, normal and shear stresses on an oblique plane, magnitude and orientation of principal stresses and maximum shear stress.

Combined effect of axial stress, bending moment, shear and torsion. Theories of failure: maximum normal stress, maximum shear stress and maximum strain theory.

Unit V

Axially Loaded & Eccentrically Loaded Columns

(08 Hours)

Axially loaded columns, concept of critical load and buckling, Euler's formula for buckling load with hinged ends, concept of equivalent length for various end conditions, Rankine's formula, safe load on column and limitations of Euler's formula.

Direct and bending stresses for eccentrically loaded short column and other structural components such as retaining walls, dams, chimneys, etc. Resultant stress diagrams due to axial loads, uni-axial, and bi-axial bending. Concept of core of section for solid and hollow rectangular and circular sections.

Self Learning Exercise

Research on the historical development of Mechanics of Materials in *Bharatiya* context and the latest advancements in the field is to be done by students and to be submitted as Assignment for Term-work.

Learning Resources

Text Books

1. Mechanics of Structures Vol. I by S. B. Junnarkar and Dr. H. J. Shah, Twenty second edition, Charotar Publishing House Pvt Ltd.
2. Strength of Materials by D. Ghosh A. K. Datta, New Age International Publishers
3. Strength of Materials by R. Subramanian, Oxford University Press.
4. Strength of Materials by S. S. Ratan, Tata McGraw Hill.
5. Mechanics of solids by R Vaidynathan, P Perumal and S Lingedwari, Scitech Publication (India) Pvt Ltd

Reference Books:

1. Elements of Strength of Materials by Timoshenko and Young, East-West Press Ltd.
2. Strength of Materials by F.L. Singer and Andrew Pytel , Harper and Row Publication.
3. Mechanics of Materials by Beer and Johnston, McGraw Hill Publication.
4. Introduction to Mechanics of Solids by E.P. Popov, Prantice Hall Publication.
5. Mechanics of Materials by Gere & Timoshenko, CBC publisher

e-resources:

1. <https://youtu.be/Hrp2azKjGUI>
2. <https://youtu.be/QAVqcVp8m4c>
3. <https://youtu.be/8R4AzYpBNoM>
4. <https://youtu.be/7eKUhHjnOVc>
5. <https://youtu.be/f3UqRbIRXEY>



Class: Second Year Engineering (2025 Pattern)					Sem: III	
Course Code: PCC-232-CVL			Name of Course: Mechanics of Materials Lab			
Teaching Scheme (Hrs/week):				Credits:		
Lecture	Practical	Tutorial		Theory	Practical	Tutorial
-	2	-		-	1	-
Examination Scheme:						
FA	SA	PR	OR	TW		
-	-	-	25	-		
Pre-requisites:						
Basic concepts from Physics and Mathematics.						
Course Objectives:						
By the end of the course, students should be able to;						
<ul style="list-style-type: none"> • Know various testing equipment and instruments in the Lab, rules and regulations, understand the safety and precautionary measures. • Understand the materials frequently used in construction. • Understand different types of material properties and tests to be conducted. • Understand IS codes and desired standards for various material properties. 						
Course Outcomes:						
On completion of this Course, the Learners will be able to;						
PCC-232-CVL.1	Understand various tests to be conducted on metal, their desired standards and know the relevant IS codes.					
PCC-232-CVL.2	Understand various tests to be conducted on flooring tiles, their desired standards and know the relevant IS codes.					
PCC-232-CVL.3	Understand various tests to be conducted on timber, their desired standards and know the relevant IS codes.					
PCC-232-CVL.4	Understand various tests to be conducted on bricks, their desired standards and know the relevant IS codes.					
Course Content						
List of Practical Experiments						
<ol style="list-style-type: none"> 1. Tension test on Mild and TMT steel. 2. Shear (Single and Double) test on mild steel. 3. Torsion test on mild steel. 4. Impact (Izod and Charpy) test on mild steel, aluminum, brass. 5. Compression test on timber (parallel and perpendicular to grains). 6. Bending test on timber and MS Plate. 7. Abrasion test of flooring tiles. 8. Flexural strength of flooring tiles. 9. Field tests on brick, water absorption and efflorescence test 						

10. Compressive strength test on bricks.
Assignments
<ol style="list-style-type: none"> 1. Assignment containing 5 questions on each unit from the theory course PCC-231-CVL. 2. Self Learning Research Assignment 3. Market survey of structural materials with costing.
Computational Work
Write a program in any suitable app to solve one numerical example from each unit of the theory course PCC-231-CVL.
Oral Examination
<ol style="list-style-type: none"> 1. Students shall have laboratory manual, assignment book and printout of numerical example solved on code developed by them. 2. Questions shall be asked on theory course (50%) and practical experiments performed (50%).



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Class: Second Year Engineering (2025 Pattern)					Sem: III	
Course Code:PCC-233-CVL			Name of Course: Surveying			
Teaching Scheme (Hrs/Week):			Credits:			
Lecture	Practical	Tutorial		Theory	Practical	Tutorial
3	-	-		2	-	-
Examination Scheme :						
FA	SA	PR		OR	TW	
50	50	-		-	-	
Prerequisite: Basic Introduction to Civil Engineering.						
Course Objective: The objectives of this Course aims to						
<ol style="list-style-type: none"> To learn the fundamental concepts and instruments used for compass, plane table surveying and leveling. To study concepts of leveling, methods of leveling and contouring. To learn the essentials of theodolite and theodolite traversing. To study tachometry and tachometric contouring. To study various types of curves and methods of setting out of curves. To study modern instruments like EDM and total station. 						
Course Outcome: On completion of course, Learner will be able to						
PCC-233-CVL.1	Understand the concept of linear & angular measurements.					
PCC-233-CVL.2	Demonstrate the knowledge of leveling for determination of reduced levels of various points on the earth surface.					
PCC-233-CVL.3	Demonstrate the use of theodolite for the measurement of horizontal and vertical angles.					
PCC-233-CVL.4	Apply the knowledge of tacheometric method of surveying for the preparation of contour map of a given area by conducting tacheometric survey.					
PCC-233-CVL.5	Apply various methods of curve setting for setting out the horizontal & vertical curves for highway or railway alignment.					
Course Content (TH)						
Unit I	Distance Measurements and Angle Measurement				(08 Hours)	
Introduction & object of survey, classification of surveys, principles of surveying, units of measurement (linear and angular measure), scale and R.F. Introduction to instruments required for measuring distance and marking of stations. Direct ranging. Survey stations, selection of stations, base line, check line, tie line and offsets. Booking field notes. Prismatic compass traversing: introduction, open traverse, closed traverse, bearing of lines, meridians, Designation of bearings: whole circle bearing (WCB) and quadrantal or reduced bearing (RB) system, concept of fore and back bearings, local attraction, dip of the needle, magnetic declination. Plane table surveying: introduction, list of accessories, orientation, setting up of plane table, methods of plane tabling: radiation, intersection, traversing and resection. Advantages and Disadvantages of plane tabling.						

Unit II	Levelling	(08 Hours)
<p>Object and use of levelling, definitions of terms used in levelling, different types of levels: dumpy level, auto level, and digital level, laser level. Levelling staff. Temporary adjustment of level, types of levelling operations; simple levelling, differential levelling, fly levelling, longitudinal profile levelling, cross-sectional levelling, checks in levelling. Curvature and refraction correction. Reciprocal levelling. Methods of calculation of reduced level: the collimation system and rise and fall system. Permanent adjustment of level: two peg test only.</p>		
Unit III	Theodolite Traversing	(08 Hours)
<p>Study of 20" vernier transit theodolite, definitions of terms, fundamental lines (axes) of theodolite, conditions of adjustments, temporary adjustments of theodolite, measurement of horizontal angle by repetition and reiteration method. Measurement of vertical angle. Concept of direct angles, deflection angles. Setting out an angle, prolonging a line. Computation of latitude and departure. Balancing of traverse: omitted measurements.</p>		
Unit IV	Tacheometry Survey and Curves	(08 Hours)
<p>Tachometry: introduction, instruments used in tacheometry, principle of tachometry, theory of stadia tacheometry, determination of tacheometric constants. Methods of tacheometry: fixed hair method- when line of sight is horizontal or inclined and staff is held vertically. Numerical. Contouring: definition of contours, uses of contour maps, characteristics of contours, methods of contouring, and interpolation of contours.</p> <p>Curves: Introduction, different forms of curves. Definitions and explanation of different terms: degree of curve, relation between radius and degree of curve, super elevation, centrifugal ratio. Types of horizontal curves. Notations used with circular curves. Properties of a simple circular curve. Horizontal curve setting by- a) offsets from chord produced and b) Rankine's method of deflection angles. Transition curves: objectives of providing transition curve. Notations used with combined curves. Vertical curves: definition, gradient & types of vertical curves.</p>		
Unit V	Total Station Survey and Modern methods of Surveying	(08 Hours)
<p>Total Station Survey: Total station survey: introduction, parts of a total station, methods of observation: radiation method, resection method, Remote Distance Measurement (RDM), Remote Elevation Measurement (REM) Advancement in Total Station: Robotic Total station (RTS), Prism less or Laserbased Total Station, Smart Stations, Applications of Total Station.</p> <p>Modern methods of Surveying: Introduction of modern instruments and techniques used in surveying such as drone surveying and its applications. Laser scanners, space based position survey (SBPS) and systems, Global Positioning System (GPS) etc., EDM equipment- Geodimeter, tellurometer, mekenometer, distomat. Introduction to DGPS equipment and its application.</p>		
Learning Resources		
Text Books:		
<ol style="list-style-type: none"> 1. Surveying and Levelling, R. Subramanian, Oxford Publication. 2. Surveying Vol. I, Dr. B. C. Punmia, Ashok K. Jain, Arun K. Jain, Laxmi Publication. 3. Surveying, Vol. I, S. K. Duggal, Tata Mc-Graw Hill. 4. Surveying and Levelling, Vol. I and Vol. II, T. P. Kanetkar and S. V. Kulkarni, Pune Vidyarthi Griha Prakashan. 5. Plane Surveying & Higher Surveying, Dr. A. M. Chandra, New Age International Publishers New Delhi. 		
Reference Books:		
<ol style="list-style-type: none"> 1. Plane surveying, A. M. Chandra, New Age International Publishers New Delhi. 2. Surveying and Levelling, N. N. Basak, Tata Mc-Graw Hill. 3. Surveying Vol. I, Dr. K. R. Arora, Standard Book House. 		

E-resources:

1. Survey-Prismatic Compass -<https://youtu.be/MGv9DmFJTNU>
2. Surveying virtual Lab-<https://sl-iitr.vlabs.ac.in/>
3. Levelling-[https://youtu.be/ SiSn tcXZA](https://youtu.be/SiSn_tcXZA)
4. Theodolite Surveying -<https://youtu.be/1c39I7fEVqY>



Pimpri Chinchwad Education Trust's
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Class: Second Year Engineering (2025 Pattern)					Sem: III	
Course Code:PCC-234-CVL			Name of Course: Surveying Lab			
Teaching Scheme (Hrs/Week):				Credits:		
Lecture	Practical	Tutorial		Theory	Practical	Tutorial
-	2			-	1	-
Examination Scheme :						
FA	SA	PR	OR	TW		
-	-	25	-	-		
Prerequisite:						
Basic Introduction to Civil Engineering.						
Course Objective: The objectives of this Course aims to						
1. To develop practical skills in field surveying using conventional and modern surveying instruments.						
2. To measure distances, angles, and elevations and prepare basic survey drawings and data.						
Course Outcome: On completion of course, Learner will be able to						
PCC-234-CVL.1	Demonstrate proficiency in utilizing traditional and modern surveying equipment and perform analysis of the acquired survey data through teamwork.					
PCC-234-CVL.2	Determine relative positions of points on the surface of earth.					
Course Content (PR)						
List of Practicals						
1. a) Measurement of magnetic bearings of sides of a polygon, using prismatic compass and calculations of correction for local attraction and true bearings. b) Determination of elevation difference between any two points in an area using Auto level by taking at least three change points. c) Determination of distance between two points by Radiation & Intersection method of plane table survey.						
2. Measurement of horizontal and vertical angle, horizontal, vertical and Sloping distance, percentage Gradient using Total Station.						
3. Finding horizontal distance and elevation using a Tachometric method and determination of height of the building using Total Station.(Use Remote Elevation Measurement (REM) function).						
4. Determination of horizontal distance and difference in elevation between two consecutive points using Total Station (Use Remote Distance Measurement (RDM) function) and Line out of building using Total Station						
5. Conduct a topographic survey using DGPS Equipment to determine the coordinates, elevation and features of a given site.						
6. Road project using Auto level for minimum length of 100 mts including fixing of alignment, profile leveling, cross-sectioning, plotting of longitudinal section and Cross Section. (One full imperial sheet including plan, longitudinal section and any three typical Cross-sections).						
7. Total Station Traversing						



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Class: Second Year Engineering (2025 Pattern) **Sem: III**

Course Code: PCC-235-CVL **Name of Course: Fluid Mechanics**

Teaching Scheme (Hrs/Week):			Credits: 03		
Lecture	Practical	Tutorial	Theory	Practical	Tutorial
3	-	-	2	-	-

Examination Scheme :

FA	SA	PR	OR	TW
50	50	-	-	-

Prerequisite:
Engineering Mathematics and Engineering Mechanics.

Course Objective:
By the end of the course, students should;

1. Know fluid properties, fluid statics.
2. Know about fluid kinematics.
3. Be able to study & apply fluid dynamics equations.
4. Be able to calculate different types of losses in pipes.
5. Know open channel flow with reference to energy-depth relationship and uniform flow.

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

PCC-235-CVL.01	Understand fluid properties and concepts of fluid statics and solve problems based on practical applications.
PCC-235-CVL.02	Understand fundamentals of fluid kinematics and apply it to solve fluid flow problems.
PCC-235-CVL.03	Solve fluid flow problems using Bernoulli's equation.
PCC-235-CVL.04	Calculate major and minor losses in the pipe network.
PCC-235-CVL.05	Apply the knowledge of uniform flow and depth-energy to solve problems on open channel flow.

Course Content (TH)

Unit I	Properties of Fluids and Fluid Statics	(08 Hours)
Properties of fluids: basic definitions - fluid, fluid mechanics, ideal fluids, real fluids, mass density, specific weight, specific volume, specific gravity; viscosity- dynamic and kinematic, classification of fluids based on newton's law of viscosity (rheological diagram), surface tension, capillarity, vapour pressure, compressibility and elasticity. Fluid statics: pressure and its measurement, fluid pressure at a point, pascal's law, hydrostatic law; concept of atmospheric, absolute, gauge and negative pressure; pressure measuring devices. Total pressure, intensity of pressure, center of pressure. Pressure on horizontal, vertical, inclined and curved surfaces, Buoyancy and stability of floating bodies.		

Unit II	Fluid Kinematics	(08 Hours)
Eulerian and Lagrangian approach, velocity and acceleration, and their components in Cartesian co-ordinates, Classification of flows, streamline, stream tube, path line, streak line, control volume. Equation of continuity for 3-D flow in Cartesian coordinates, components of rotation, velocity potential, stream		

function, flow net and it's use.		
Unit III	Fluid Dynamics	(08 Hours)
Forces acting on fluid mass in motion, Euler's equation of motion along a streamline and its integration to get Bernoulli's equation and its limitations, Modified Bernoulli's equation, concept of HGL and TEL, Application of Bernoulli's equation: Venturimeter, Orifice meter, Rota-meter and Pitot tube, Momentum equation and applications.		
Unit IV	Flow Through Pipes	(08 Hours)
Characteristics of laminar flow, laminar flow through a circular pipe: Hagen Poiseuille equation, Hazen-Williams formula. Characteristics of turbulent flow, Darcy-Weisbach Equation, Moody's diagram, Major and minor losses of energy in pipes, flow through pipes in simple and compound pipe, pipes in series, parallel, Dupit's equation, Introduction to pipe network and design: Hardy cross method.		
Unit V	Open Channel Flow	(08 Hours)
Introduction to Open channel flow: Classification of channels, channel flows and geometric elements of channel, Velocity distribution in open channel flow and hydraulic jump. Uniform flow in open channels, Uniform flow formulae, Most efficient channel sections, Depth-Energy Relationships in Open Channel Flow: Specific energy and Specific force diagram, Depth discharge Diagram, Critical depth, Conditions for occurrence of critical flow; Froude's number and flow classification, Introduction to channel transition, GVF and Water surface profiles, Hydraulic jump, RVF, Dimensional analysis and hydraulic similitude.		
Learning Resources		
Text Books:		
1. A Text Book on Fluid Mechanics and Hydraulic Machines by Dr. R. K. Bansal Pub: Laxmi Publications (P), Ltd. New Delhi.		
2. A Text Book of Fluid Mechanics and Hydraulic Machines- by Dr. R K Rajput Pub: S Chand and Co Ltd. New Delhi.		
3. A Text Book on Fluid Mechanics and Hydraulic Machines by Sukumar Pati Pub: McGraw Hill, New Delhi		
Reference Books:		
1. Hydraulics and Fluid Mechanics including Hydraulic Machine by Dr P. N. Modi & S. M. Seth Pub: Standard book house, Delhi		
2. Flow in Open Channels by K Subramanya, Tata McGraw Hill, New Delhi		
3. Engineering Fluid Mechanics by R. J. Garde and A. J. Mirajgaonkar, SCITECH Publications(India)Pvt. Ltd, Chennai		
4. Fluid Mechanics and its Applications, Vijay Gupta, Santosh K Gupta, New Age international pvt. Ltd, New Delhi,		
5. Fluid Mechanics, Fundamentals and applications by Yunus. A Cengel and John. M Cimbala, Mc Graw Hill International, New Delhi.		
6. Fluid Mechanics by Streeter, Wylie and Bedford , McGraw Hill International, New Delhi.		
7. Open Channel Hydraulics by Ven Tee Chow, McGraw- Hill Book Company- Koga.		
E-resources:		
1. https://www.youtube.com/watch?v=awiXdmK7IKQ		
2. https://www.youtube.com/watch?v=whCu4Xl3m98		
3. https://www.slideshare.net/slideshow/unit-iii-fluid-dynamics-notes/238911165		
4. https://www.youtube.com/watch?v=S-oHA7sDyJU		
5. https://www.youtube.com/watch?v=aDdYUMfeVN8		



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Class: Second Year Engineering (2025 Pattern) **Sem: III**

Course Code: PCC-236-CVL **Name of Course: Fluid Mechanics Lab**

Teaching Scheme (Hrs/Week):			Credits:		
Lecture	Practical	Tutorial	Theory	Practical	Tutorial
-	2	-	-	1	-

Examination Scheme :

FA	SA	PR	OR	TW
-	-	-	25	-

Prerequisite:
Engineering Mathematics and Engineering Mechanics.

Course Objective:
At the end of the course students should;

1. Have hands on experience in measuring fundamental fluid properties and validating theoretical principles (viscosity, Bernoulli's theorem, friction factor, velocity distribution, etc.) through laboratory experiments.
2. Be able to develop analytical and computational skills for solving hydraulic problems, including calibration of flow devices and pipe network analysis using both manual methods (Hardy Cross) and modern software tools.
3. Be exposed to practical applications of fluid mechanics by studying hydraulic structures, instrumentation, and flow measurement systems during site visits, and to enhance their ability to prepare technical reports.

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

PCC-236-CVL.01	Apply fundamental fluid mechanics principles to experimentally determine fluid properties and validate theoretical concepts such as Bernoulli's theorem and uniform flow formulae.
PCC-236-CVL.02	Analyze hydraulic systems and flow devices through calibration, friction factor determination, and Hardy Cross method, both manually and using computational tools.
PCC-236-CVL.03	Evaluate performance of hydraulic structures and instrumentation by conducting experiments, interpreting data, and preparing technical reports from laboratory work and site visits.

Course Content (PR)

The Term work shall consist of Experiments (08), Assignments (01) and Visit Report (01)

A) Experiments:

1. Measurement of viscosity of fluid by Redwood viscometer.
2. Experimental verification of Bernoulli's theorem with reference to loss of energy.
3. Calibration of Venturimeter / Orifice meter.
4. Determination of Darcy-Weisbach friction factor (f) for a given pipe and study of variation of 'f' with Reynolds Number (Re).
5. Flow around a Circular Cylinder/Aerofoil.
6. Study of Uniform Flow Formulae for Open channel.
7. Velocity Distribution in Open Channel Flow.
8. Measurement of Pressure using different Pressure Measuring Devices (including Transducers /state of

arts Digital Instruments also).

B) Assignment: Analysis of pipe network using Hardy Cross Method (minimum two loops) – both by hand calculations and using computer any language/software solution.

C) Site visit: Report on Site visit to any one of the Research Institute or any Hydraulic Structure or Flow measuring devices.



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Class: Second Year Engineering (2025 Pattern) Sem: III

Course Code: PCC-237-CVL Name of Course: Construction Materials and Technology

Teaching Scheme (Hrs/Week):			Credits:		
Lecture	Practical	Tutorial	Theory	Practical	Tutorial
03	-	-	02	-	-

Examination Scheme :

FA	SA	PR	OR	TW
50	50	-	-	-

Prerequisite:
1. Elements of Civil Engineering

Course Objective:
By the end of the course, students should be able to;

1. Provide fundamental knowledge of building construction components, masonry, finishes, and building services used in civil engineering practice.
2. Familiarize students with modern construction technologies, materials, and safety practices adopted in contemporary construction projects.
3. Develop the ability to identify, explain, and apply construction methods and safety measures in real-life construction scenarios.

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

PCC-237-CVL.1	Explain the fundamentals of building construction, masonry, foundations, and basic building components as per relevant codes and standards.
PCC-237-CVL.2	Describe types, components, and functional requirements of doors, windows, and vertical circulation systems used in buildings.
PCC-237-CVL.3	Identify and explain suitable flooring, plastering, and finishing materials and techniques for different building applications.
PCC-237-CVL.4	Explain advanced construction technologies and sustainable practices used in high-rise and infrastructure projects.
PCC-237-CVL.5	Recognize construction site hazards and explain safety measures, regulations, and management practices to ensure safe construction operations.

Course Content (TH)

Unit I	Fundamentals of Building Construction and Masonry	(08 Hours)
Introduction to building construction and classification of buildings as per National Building Code. Building components and their basic requirements with emphasis on substructure and superstructure. Concept, advantages, and types of framed structures including timber, light framed, and RCC structures. Shallow and deep foundations, their suitability. Damp proof course, plinth filling, and soling methods. Stone and brick masonry including types, properties of bricks, IS specifications, tests, and common brick bonds. Overview of polymer-based materials, smart materials, nano-materials, and recycled construction materials		

Unit II	Doors, Windows, and Vertical Circulation	(08 Hours)
Types, components, and BIS-recommended sizes of doors including paneled, glazed, flush, collapsible, rolling shutter, and revolving doors. Components, types, and BIS-recommended sizes of windows, ventilators, and sliding systems using wood, steel, and aluminum. Fixtures and fastenings used for doors and windows. Concept and importance of vertical circulation in buildings. Staircases: terminology, types, and basic design parameters including rise, tread, and number of flights. Introduction to ramps, lifts, elevators, and escalators.		
Unit III	Flooring, Plastering, and Finishing Works	(08 Hours)
Types of floor finishes, laying procedures, and suitability of stone, tile, concrete, wooden flooring, pavement blocks, skirting, and dado. Necessity and procedure of plastering including single coat, double coat, rough finish, neeru finish, and POP. Special plasters such as stucco, sponge finish, pebble finish, plaster boards, and wall claddings. Painting: necessity, surface preparation, methods of application, and selection of suitable painting materials.		
Unit IV	Advanced Construction Technologies	(08 Hours)
Advanced construction practices such as slip form, jump form, tunnel form and aluminum formwork systems. Precast, prefab and pre-stressed constructions, 3-D Printing technology, Construction techniques for high-rise buildings, bridges and infrastructure projects. Use of automation and Building Information Modeling (BIM) in construction planning and execution. Sustainable construction technologies including green buildings.		
Unit V	Construction Safety	(08 Hours)
Introduction to construction safety, importance, and legal provisions related to safety at construction sites. Identification of common site hazards and preventive measures for excavation, formwork, scaffolding, and working at height. Use of personal protective equipment (PPE), safety signage, and emergency preparedness at construction sites. Safety management practices, accident prevention, and role of safety officers in construction projects.		
Learning Resources		
Text Books:		
<ol style="list-style-type: none"> 1. Building Construction by B.C. Punmia, Laxmi Publications. 2. Building Materials by S.V.Deodhar, Khanna Publication. 3. Building Construction by Bindra and Arora, Dhanpat Rai Publications. 		
Reference Books:		
<ol style="list-style-type: none"> 1. Building Materials by S. K. Duggal, New Age International Publishers. 2. Building Construction by S.C. Rangwala, Charotdar Publications. 3. National Building Code of India 2005. 4. Modern Construction Techniques, Oxford University Press, Sushant Abhishek. 5. Construction Safety, Health and Environment, K.K. Chitkara Tata McGraw-Hill Education 		
E-resources:		
<ol style="list-style-type: none"> 1. https://nptel.ac.in/courses/105/106/105106160/ 2. https://civilengineeronline.com/building-construction-basics/ 3. https://www.open.edu/openlearn/ocw/mod/oucontent/view.php?id=86471 4. https://www.educatedworld.net/concrete-flooring-installation/ 5. https://nptel.ac.in/courses/105/106/105106143 6. https://labour.gov.in/act/boiler-factory-child-labour 7. https://nptel.ac.in/courses/105/106/105106153/ 		



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Class: Second Year Engineering (2025 Pattern)	Sem: III
Course Code: PCC-238-CVL	Name of Course: Construction Materials and Technology Lab

Teaching Scheme (Hrs/Week):			Credits:		
Lecture	Practical	Tutorial	Theory	Practical	Tutorial
-	2	-	-	1	-

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

Prerequisite:
1. Elements of Civil Engineering

Course Objective: The objectives of this Course aims to

- To develop the ability to prepare and interpret construction drawings, sketches, and reports related to building components, foundations, masonry bonds, staircases, doors, windows, and finishing works.
- To familiarize students with practical aspects of construction materials, site practices, and safety management through comparative studies and on-site hazard identification and reporting.

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

PCC-238-CVL.01	Prepare and interpret drawings and sketches of building components, foundations, masonry bonds, staircases, doors, and windows with functional and dimensional details.
PCC-238-CVL.02	Analyze and compare construction materials and finishing works such as flooring, plastering, and surface treatments based on suitability, advantages, and applications.
PCC-208-CVL.03	Identify construction site hazards and evaluate safety measures, PPE usage, and emergency preparedness through site visits and safety audit reports.

List of Laboratory Assignments

- Prepare a report showing basic building components (substructure and superstructure) with sketches and functional requirements.
- Prepare sketches showing suitability of foundations for different soil conditions.
- Draw neat sketches of common brick bonds such as English, Flemish, Header, and Stretcher bonds.
- Prepare drawings showing staircase terminology, types, and basic dimensional calculations for rise, tread, and number of flights.
- Prepare a comparative chart showing suitability, advantages, and applications of various flooring materials, plaster types, and finishing work.
- Prepare drawings showing components of doors and windows.
- Any on-going Construction Site (visit report should contain: Identify hazards, safety measures, PPE usage, and emergency preparedness).



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Department of Civil Engineering



Class: Second Year Engineering (2025 Pattern) **Sem: III**

Course Code: MDM-239-CVL **Name of Course: Engineering Geology (Hybrid Mode)**

Teaching Scheme (Hrs/Week):			Credits:		
Lecture	Practical	Tutorial	Theory	Practical	Tutorial
MOOC	2	-	2	1	-

Examination Scheme :

FA	SA	PR	OR	TW
-	-	50	-	50

Prerequisite:
Fundamentals of Physics, Mathematics, Engineering Mechanics

Course Objective:
The objectives of this Course aims

1. To get the knowledge of the physical properties of mineral and rocks types, their characteristics with Civil Engineering applications.
2. To learn geomorphic features formed by fluvial, marine processes and their role, Indian stratigraphy and historical geology in civil engineering.
3. To learn the role of Geological Studies & effect of Geological hazards.
4. To learn Structural geology applied to civil engineering projects and to get ideas about plate tectonics.
5. To identify favorable & unfavorable conditions for the proposed construction of dams, reservoirs and tunnels. Precautions and treatments required to improve the site conditions of dams, reservoirs and tunnels.

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

MDM-239-CVL.1	Explain about the basic concepts of engineering geology, various rocks, and minerals in laboratory and on fields and their inherent characteristics and their uses in civil engineering
MDM-239-CVL.2	Exploring the importance of various tectonic processes & its effect on design of civil engineering projects and on environment and sustainability.
MDM-239-CVL.3	Explain various methods of survey, to evaluate and interpret geological nature of the rocks, effect of geological hazards.
MDM-239-CVL.4	Recognize the effect of plate tectonics, structural geology and their significance and utility in civil engineering activities.
MDM-239-CVL.5	Assess the Importance of geological nature of the site, precautions and treatments to improve the site conditions for dams, reservoirs, and tunnels..

Following experiments are to be compulsorily performed. Term work shall consist of journals giving details of the experiments performed.

1. Megascopic identification of following mineral specimens (around 50).
2. Megascopic identification of following different rock specimens. (Around 50).

3. Interpretation and construction of geological sections from contoured geological maps (A. G. Series-IV: Any 5 maps)

4. Logging of drill core and interpretation of drilling data with graphical representation of core log.

5. Site visit desirable to study various geological features.

Learning Resources

Text Books:

1. Principles of Engineering Geology by D. Venkat Reddy. 2010, Vikas Publishers.
2. Engineering Geology by N. Chenna Kesavulu. 2010, McMillan India Ltd.
3. Engineering Geology by R.B. Gupte , 2001, P.V.G. Publications, Pune.

Reference Books:

1. Principals of Engineering Geology, S.K. Garg, Vikas Publisher
2. Geology and Engineering, K. V. G. K. Gokhale, D. M. Rao, Tata McGraw Hill.
3. Structural Geology, M. P. Billings, Pearson India Pvt. Ltd.

E-resources:

1. https://onlinecourses.swayam2.ac.in/ini25_ce01/preview
2. <https://testbook.com/civil-engineering/engineering-geology-notes>
3. https://onlinecourses.nptel.ac.in/noc25_ce129/preview

Engineering Geology - Video course

Introduction (1 lecture)

Origin and development

Geologic Mapping and Remote Sensing

Topographic maps, geologic maps, preparation of geologic sections, aerial photographs, LIDAR, SAR, GIS (3 lectures + 1 laboratory)

Mineralogy (3 lectures)

Chemical analysis of rocks and minerals, rock and soil minerals, physical properties of minerals, susceptibility of minerals to alteration, basics of optical mineralogy, SEM, XRD

Classification of Soil and Rock (2 lectures + 1 laboratory)

Types of rock and origin: Igneous (extrusive and intrusive), sedimentary and metamorphic, ternary diagrams, definitions (structure, texture)

Igneous Rock (1 lecture)

Agents, structure, texture, IUGG classification of intrusive and extrusive rocks

Metamorphic Rock (1 lecture)

Causes of metamorphism (stress, temperature, tectonism, pore fluid), recrystallization, phase change, structure and texture

Sedimentary Rock (1 lecture)

Sedimentation environments, structure, textural classification of siliclastic and carbonate rock

Soil Formation (2 lectures)

Weathering processes, transportation and sedimentation processes, structure, texture and classification, surficial deposits and landforms

Subsurface exploration (3 lectures)

Intrusive and non intrusive sub-surface investigation, drilling and sampling, geophysical methods, geologic investigations for site selection of dams, reservoirs, tunnels, bridges and highways

Engineering Properties of Soil and Rock (2 lectures + 1 laboratory)

Engineering properties (density, unit weight, porosity), strength, index measurements for soil and rock (SPT blow count, RQD, RMR, Point Load Index), relationships of index measurements with strength of soil and rock.

Strength Behavior of Soil and Rock (5 lectures)

Stress and strain in rock, Mohr's Circle, concept of effective stress, failure of soil and rock, fracturing of rock, folds, faults and joints in rock, shear failure of soil and rock, consequences of failure (landslides, earthquakes, subsidence)

Subsurface water (5 lectures)

Sources, aquifer, aquiclude, water table, Artesian groundwater in soil and rock, springs, hydraulic conductivity and its measurement, Darcy's law, well hydraulics, well yield, water capacity of rock, lowering of water table and subsidence, salt water intrusion in coastal areas

Geologic and seismotectonic setting of India (3 lectures)

Geologic provinces of India and their surficial and subsurface geology, seismotectonics of the Indian plate, seismic zones of India

Geological Hazards (5 lectures)

Major geological hazards Geological considerations in design of constructed facilities and infrastructure, causes and classification of landslides, stability assessment for soil and rock slopes, mitigation of landslide hazard, effect of earthquakes on constructed facilities and infrastructure, geotechnical and structural considerations in mitigation of earthquake hazard



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Civil
Engineering

Coordinators:

Dr. Debasis Roy

Department of Civil
Engineering IIT Kharagpur



ENGINEERING GEOLOGY

PROF. R. K. DUBEY

Department of Applied Geology
IIT(ISM) Dhanbad

PRE-REQUISITES : Students should have a sound understanding of mechanical attributes of rock strata and soil layers

INTENDED AUDIENCE : Graduate, Post-graduate and Ph.D. students of Geology/Earth sciences and Civil Engineering, Mining Engineering, Petroleum Engineering, Geophysics, Environmental Science and Engineering and professional working on problems related to geology/earth sciences, geophysics, civil engineering, mining engineering, petroleum engineering and environmental science and engineering, and working in the field of energy sector, environment issue, mineral, natural disasters, hydropower, road and bridge construction, railways, construction industries.

INDUSTRY SUPPORT : All the hydropower industries, geothermal energy sectors, road bridge and constructions, energy sector, and organizations dealing with mitigation aspect of natural hazards.

COURSE OUTLINE :

Engineering Geology is fundamental course in translating different information related to geo-ground for sound, safe, stable, naturally compact, environmentally sustainable and economic development of various facilities for safe, and environmentally sustainable progress of civilization and existing ecosystem. This course is comprehensively designed to cover most of aspects related to involvements of engineering geology, thus this course will helps students and professional concern to earth sciences and geotechnology for understanding and solving various kinds of technical problems arises during development of various facilities for human safety and welfare. This course is also relevant to consultants and engineers working with geoground.

ABOUT INSTRUCTOR :

Prof. R. K. Dubey is a faculty member of Department of Applied Geology, Indian Institute of Technology (Indian School of Mines), Dhanbad, India. His research thrust areas are related to geotechnical characterization of ground with inclusion of rock mechanics, soil mechanics, and hydrology in providing pertinent solution of problems concern to various kinds of surface and subsurface engineering construction and development for proper, stable and safe settlement in domain of natural and anthropogenic environments.

Prof. R. K. Dubey teaches courses of geotechnical engineering, engineering geology, geotechniques of dams, tunnels and underground spaces for geoscientists and engineers.

Prof. R. K. Dubey has 20 years of teaching and 22 years research experiences in working on various kinds of problems related to, engineering geology, geotechnical engineering, geomechanics, and hydrological aspects, he has experience in taking various kinds of consultancies and research projects related to engineering geology, geotechnical engineering, rock engineering, and hydrological aspects.

COURSE PLAN :

Week 1: Advances in engineering geology, significance and kinds of geo-ground, geomorphology of river valley and mountainous regions and landforms.

Week 2: Rock-water interaction, weathering, weathering indices, erosion, and deposition.

Week 3: Engineering geological properties of rocks, concept of geological strata and geomechanical classification of rock strata.

Week 4: Geological construction materials, deleterious rocks, and cement-aggregates reactions.

Week 5: Engineering Geology of dams and forces acting on dams

Week 6: Tunnels and methods of tunneling, treatment and anchoring of geological strata.

Week 7: Effect of geological structures such as folds, faults, beddings, foliations and lineations on stability of dams foundation and tunnels



Week 8: Rock-load/ground pressure, factors affecting ground pressure, method for determination of ground pressure, and support system.

Week 9: Engineering geological investigations for roads and highways, bridges and buildings foundations

Week 10: Engineering Geological Natural hazards and mitigations: landslide, earthquakes and induced seismicity

Week 11: Geomorphology of sea and sea shore, shoreline engineering geology, hazards and mitigation

Week 12: Engineering geological aspects of geothermal energy, Coal bed methane (CBM), Gas hydrate, shale gas, Carbon Capture, Usage and Storage (CCUS).

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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



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Class: Second Year Engineering (2025 Pattern) **Sem: III**

Course Code: VEC-231-CVL **Name of Course: Professional Ethics & Human Values**

Teaching Scheme (Hrs/week):			Credits:		
Lecture	Practical	Tutorial	Theory	Practical	Tutorial
2	-	-	2	-	-

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

Pre-requisites:
None.

- Course Objective:**
- To help the students develop a holistic, humane world-vision, and appreciate the essential complementarity between values and skills to ensure mutual happiness and prosperity
 - To elaborate on 'Self-exploration' as the process for Value Education
 - To facilitate the understanding of harmony at various levels starting from self and going towards family and society.
 - To Identify the core values that shape the ethical behavior of an engineer and create an awareness on professional ethics and Human Values

Course Outcomes:
On completion of this Course, the Learners will be able to;

VEC-231-CVL.1	Recognize the concept of self-exploration as the process of value education and see they have the potential to explore on their own right.
VEC-231-CVL.2	Explore the human being as the coexistence of self and body to see their real needs / basic aspirations clearly.
VEC-231-CVL.3	Explain the relationship between one self and the other self as the essential part of relationship and harmony in the family
VEC-231-CVL.4	Understood the core values that shape the ethical behavior of an engineer Exposed awareness on professional ethics and human values.

Course Content

Unit I	Introduction to Value Education	(07Hours)
Understanding Value Education Self-exploration as the Process for Value Education, Continuous Happiness and Prosperity - the Basic Human Aspirations and their Fulfilment, Right Understanding, Relationship and Physical Facility, Happiness and Prosperity - Current Scenario 29, Method to Fulfil the Basic Human Aspirations		

Unit II	Harmony in the Human Being	(07Hours)
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	(07 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	Professional Ethics	(07Hours)
Value-based Life and Profession Identify the core values that shape the ethical behavior of an engineer to create an awareness on professional ethics and Human Values To appreciate the rights of others Professional Ethics in the light of Right Understanding Strategies for Transition towards		
Learning Resources		
Text Books:		
<ol style="list-style-type: none"> 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:		
<ol style="list-style-type: none"> 1. Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw Hill, New York (2005). 2. Charles E Harris, Michael S Pritchard and Michael J Rabins, "Engineering Ethics – Concepts and Cases", Thompson Learning, (2000). 3. Charles D Fleddermann, "<i>Engineering Ethics</i>", Prentice Hall, New Mexico, (1999). 4. John R Boatright, "<i>Ethics and the Conduct of Business</i>", Pearson Education, (2003). 5. Edmund G Seebauer and Robert L Barry, "<i>Fundamentals of Ethics for Scientists and Engineers</i>", Oxford University Press, (2001). 		
e-resources:		
<ol style="list-style-type: none"> 1. https://fdp-si.aicte-india.org/download.php#1/ 2. https://www.youtube.com/channel/UCQxWr5QB_eZUnwxSwxXEkQw 		



Class: Second Year Engineering (2025 Pattern)				Sem: III		
Course Code: EEM-232-CVL			Name of Course: Engineering Economics			
Teaching Scheme (Hrs/Week):				Credits:		
Lecture	Practical	Tutorial	Theory	Practical	Tutorial	
2	-	-	2	-	-	
Examination Scheme :						
FA	SA	OR	PR	TW		
-	-	-	-	25		
Prerequisite: Physics, Mathematics						
Course Objective: The objectives of this Course aims to						
<ol style="list-style-type: none"> 1. To enable students to understand the economics principles applicable to engineering. 2. To learn the techniques of economic decision making. 3. To familiarize the students with basic fundamentals of Indian financial economy. 						
Course Outcome: On completion of course, Learner will be able to						
EEM-232-CVL.1	Understand the basic principles of economics and analyze market mechanisms including demand, supply, elasticity, consumer equilibrium, and price determination.					
EEM-232-CVL.2	Identify and classify sources of project finance and capital structures and evaluate the role of FDI in infrastructure development.					
EEM-232-CVL.3	Analyze and evaluate projects using different appraisal techniques.					
EEM-232-CVL.4	Learn the implications of monetary and fiscal policies in Indian economy.					
Course Content						
Unit I	Introduction and Demand Analysis				(07 Hours)	
Principles of economics, how markets work: market forces of supply and demand, Demand, Demand Schedule, Law of Demand, Supply Schedule, Supply Curve, Demand Curve, Elasticity of Demand, Supply, Elasticity and its application, Consumer equilibrium, Elasticity of Supply Equilibrium, Equilibrium Price, Equilibrium Amount, Factors affecting Price Determination, Law of Diminishing Marginal Utility, Law of Substitution.						
Unit II	Project Economics				(07 Hours)	
Introduction to Project Economics - Definition, Importance in Construction Industry, Difference between Cost, Value, Price, Rent, Simple and Compound Interest, Profit, Annuities, Concept of Cost of Capital, Time Value of Money, Sources of Project Finances –Concepts of Debt Capital and Equity Capital. Types of Capital – Fixed and Working, Equity Shares and Debenture Capital, FDI in Infrastructure.						
Unit III	Project appraisal				(07 Hours)	
Types of Appraisals such as Political, Social, Environmental, Techno-Legal, Financial and Economical, Criteria for Project Selection - Benefit - Cost Analysis, NPV, IRR, Pay-Back Period, Break Even Analysis [Fundamental and Application Component], Study of Project Feasibility report and Detailed Project Report (DPR).						

Unit IV	Indian Economy	(07 Hours)
Nature and size of Indian Economy, Problems- Poverty, Unemployment, Inflation, measures for controlling these problems, Monetary policy- meaning, objectives, tools, fiscal policy-meaning, objectives, tools.		
One assignment shall be given for each unit, comprising five questions		
Learning Resources		
Text Books: <ol style="list-style-type: none"> 1. N. Gregory Mankiw, Principles of Microeconomics. 2. G. S. Thuesen & W. J. Fabrycky, Engineering Economics, Prentice-Hall of India Pvt Ltd, New Delhi 		
Reference Books:		
<ol style="list-style-type: none"> 1. Ruder Dutt and Sundaram, Indian Economy, S. Chand 2. Chan S Park, Fundamentals of Engineering Economics, Always Learning 		
E-resources:		
https://onlinecourses.nptel.ac.in/noc25_ec15/preview https://design.cbe.cornell.edu/index.php?title=Engineering_economic_analysis https://ndl.ethernet.edu.et/bitstream/123456789/44454/1/43.pdf https://mpbou.edu.in/uploads/files/INDIAN_ECONOMY.pdf https://sleepyclasses.com/indian-economy-basics-upsc		



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Class: Second Year Engineering (2025 Pattern) **Sem: III**

Course Code: AEC-233-CVL **Name of Course: Modern Indian Language**
आधुनिक भारतीय भाषा (मराठी)

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

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

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-233-CVL.1	मराठी भाषेचा इतिहास आणि जडणघडण कळेल.
AEC-233-CVL.2	आधुनिक मराठीचे सौंदर्य आणि क्षमता कळेल तसेच मराठी साहित्यास भरीव योगदान देणारे लेखक, कवी यांचा आणि त्यांच्या साहित्याचा परिचय होईल.
AEC-233-CVL.3	समाज माध्यमे वापरताना योग्य ती दक्षता घेता येईल व मराठी भाषेतून व्यक्त होता येईल.
AEC-233-CVL.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)
<ul style="list-style-type: none"> वाराखडी, 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)
<ul style="list-style-type: none"> 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)
<ul style="list-style-type: none"> 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)
<ul style="list-style-type: none"> 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:		
<ul style="list-style-type: none"> 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:		
<ul style="list-style-type: none"> “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:		
<p>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.</p>		

Semester IV



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Class: Second Year Engineering (2025 Pattern)					Sem: IV	
Course Code: PCC-241-CVL			Name of Course: Mechanics of Structures			
Teaching Scheme (Hrs/week):				Credits:		
Lecture	Practical	Tutorial		Theory	Practical	Tutorial
3	-	1		2	-	1
Examination Scheme:						
FA	SA	PR	OR	TW		
50	50	-	-	-		
Pre-requisites:						
Engineering Mechanics, Mechanics of Materials, Linear Algebra, Differential and Integral Calculus						
Course Objectives:						
By the end of the course, students should be able to;						
<ul style="list-style-type: none"> • Understand the basic types of structural arrangements, static and kinematic indeterminacies. • Understand basic and elegant methods of slope deflection analysis of determinate structures. • Understand exact and approximate methods of slope deflection analysis of indeterminate structures. 						
Course Outcomes:						
On completion of this Course, the Learners will be able to;						
PCC-241-CVL.1	Determine slope and deflection at nodal points in the determinate beams and frames.					
PCC-241-CVL.2	Determine slope and deflection at nodal points in the indeterminate beams and frames.					
PCC-241-CVL.3	Analyze a truss for redundant forces and a portal frame for SF and BM.					
PCC-241-CVL.4	Analyze a continuous beam and frame and develop BMD using Slope-deflection method.					
PCC-241-CVL.5	Analyze a continuous beam and frame and develop BMD using Moment distribution method.					
Course Content						
Unit I	Slope & Deflection in Determinate Beams & Frames					(08 Hours)
Double Integration Method, MaCaulay's Technique, Concept of strain energy, Castigliano's Theorem, Unit Load Method for determinate beams and frames.						
Unit II	Slope & Deflection in Indeterminate Beams & Frames					(08 Hours)
Static and kinematic indeterminacy, Method of Least Work, Propped cantilever, fixed beam and continuous beam analysis, Analysis of portal frame with indeterminacy up to 2.						
Unit III	Analysis of Trusses and Multi-bay, Multi-floor Portal Frames					(08 Hours)

Deflection at a point in truss by method of least work, Analysis of redundant truss with degree of indeterminacy up to 2. Approximate analysis of 2-bay, 2-floor frames by Portal method and Cantilever method, Drawing BMD for a portal frame.		
Unit IV	Slope Deflection Method	(08 Hours)
Establishing Slope-deflection equations, analysis of beams with and without sinking of support, Analysis of non-sway frames only with indeterminacy up to 3.		
Unit V	Moment Distribution Method	(08 Hours)
Stiffness factor, carry-over moment, carry-over factor, distribution factor, Iterative technique of Hardy-Cross method, analysis of indeterminate beams with and without sinking of support, Analysis of non-sway frames with indeterminacy up to 3.		
Self Learning Exercise		
Research on the history of structural analysis in <i>Bharatiya</i> context and the latest advancements in the field of structural analysis is to be done by students and to be submitted as Assignment for Term-work.		
Learning Resources		
Text Books		
<ol style="list-style-type: none"> 1. Structural Analysis: A matrix approach by G.S. Pandit and S. P. Gupta, Tata Mc Graw Hill. 2. Analysis Structures: Strength and behavior by T. S. Thandavamoorthy, Oxford University Press. 3. Mechanics of solids and Structures Volume I by R. Vaidynathan, P. Perumal and S Lingedwari, Scitech Publication (India) Pvt Ltd. 4. Structural Analysis Vol-1, third edition, By S S Bhavikatti, Vikas publishing House, Pvt Ltd. 		
Reference Books:		
<ol style="list-style-type: none"> 1. Mechanics of Structures Vol. II by S B Junnarkar and Dr. H J Shah, Twenty second edition, Charotar Publishing House Pvt. Ltd. 2. Basic Structural Analysis by C. S. Reddy, Second Edition, Tata Mc Graw Hill. 3. Structural Analysis by R. C. Hibbler, sixth edition, Pearson Education. 4. Plastic Methods of Structural Analysis by B. G. Neal, Champman and Hall. 5. Elementary Structural Analysis by Senol Utku, Charles Head Norris, John Benson Wilbur, TMH. 6. Intermediate Structural Analysis by C K Wang, Tata McGraw Hill. 		
e-resources:		
<ol style="list-style-type: none"> 1. https://www.youtube.com/@dr.sameersawarkar3878/videos 2. https://nptel.ac.in/courses/105101085 3. https://nptel.ac.in/courses/105101086 		
One Assignment on each Unit comprising of 5 Numerical Examples each has to be submitted by students.		



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Class: Second Year Engineering (2025 Pattern)				Sem: IV		
Course Code:PCC-242-CVL		Name of Course: Architectural Design & Drawing				
Teaching Scheme (Hrs/Week):				Credits:		
Lecture	Practical	Tutorial		Theory	Practical	Tutorial
3	-	-		2	-	-
Examination Scheme :						
FA	SA	PR		OR		TW
50	50	-		-		-
Prerequisite: Fundamentals of Engineering Graphics, Construction Materials & Technology						
Course Objective: The objectives of this Course aim to						
<ol style="list-style-type: none"> To study building byelaws and architectural aspects, regulations and drawing norms, standards with respect to UDCPR, Maharashtra State. To plan different building units, Town planning parameters, and safety of buildings. 						
Course Outcome: On completion of course, Learner will be able to						
PCC-242-CVL.01	Prepare basic architectural drawings using planning principles and standard conventions.					
PCC-242-CVL.02	Make use of Building byelaws for building construction.					
PCC-242-CVL.03	Plan effectively various types of Residential Building forms according to their utility, functions with reference to National Building Code.					
PCC-242-CVL.04	Plan effectively various types of Public Buildings according to their utility functions with reference to National Building Code.					
PCC-242-CVL.05	Understand town planning laws, different services and safety aspects					
Course Content (TH)						
Unit I	Introduction to Architectural drawing					(08 Hours)
Principles of Building Planning and Principles of Architectural design relation between form and function, utility, aesthetics, Concept of Line plan, Developed Plan, Elevation, Section, Selection of scales for various drawings, dimensioning, abbreviations and symbols as per IS 962, Elements of perspective drawings, parallel and angular perspective of small building elements.						
Unit II	Building bye laws					(08 Hours)
Building Byelaws: Necessity of bye-laws, UDCPR (Unified Development Control and Promotion Regulations for Maharashtra State)-Plot Sizes, Road Width, Open Spaces, Marginal Distances, Building Line, Control Line, Room Sizes, Area Calculations-Built-up Area, Carpet Area, Floor Space Index (F.S.I.), Transfer Development Rights (TDR), Norms for Ventilation, Lighting, Vertical Circulation, Sanitation, Parking Spaces of Vehicles, Land Use Planning (Utilization of Space, Zoning).						
Unit III	Residential Buildings and green buildings					(08 Hours)
a) Residential Buildings- Functional requirements and dimensions of Residential Buildings like Bungalows, Twin bungalows, Row houses, Apartment. Prepare Developed Plan, Elevation and Sectional Elevation of above-mentioned categories. Design of staircase: Dog legged /Quarter turn						

b) Green Building-Salient features, benefits, planning concepts of Green Building (site selection, orientation, sun path and wind diagram etc.), introduction to Leadership in Energy and Environmental Design (LEED)

Unit IV

Planning of Public Buildings

(08 Hours)

Functional requirements and dimensions and planning of Public Buildings like industrial buildings, commercial buildings, School, Colleges, Hostel, Auditorium, Restaurant/ Hotel building, Primary Health Center/ Hospital, Shopping complex, Sports complex, Vegetable market, Post office, and Bank buildings.

Unit V

Town Planning and Legal Aspects

(08 Hours)

a) Town Planning and legal aspects: Necessity of town planning. Development plan and its importance, Land use zoning, N.A. Sanction procedure, Introduction to different zones of land in town planning, Aspects of zoning. meaning of different terms of 7/12 abstract, Form 6 and its types, Concept of TDR, List of documents to be submitted to local authority., Introduction to RERA act. Introduction to Maharashtra Regional and Town Planning (MRTP) Act.

b) Safety aspects and services – Fire load, grading of occupancies by fire loads, Evacuation Time, fire escape elements, Need for earthquake resistant structures. Noise and Acoustics – Sound insulation, Acoustical defects, Reverberation time, Sabine’s formula, sound absorbents, planning for good acoustics. Ventilation – Necessity and types of Ventilation, Lighting -Principles of day lighting, solar energy systems for lighting (BIPV), Plumbing –Types of plumbing system.

Learning Resources

Text Books:

1. Building Construction by B.C. Punmia, Laxmi Publications.
2. Building Materials by S.V. Deodhar, Khanna Publication.
3. Building Construction by Bindra and Arora, Dhanpat Rai Publications.

Reference Books:

1. Building Materials by S. K. Duggal, New Age International Publishers.
2. Building Construction by S.C. Rangwala, Charotdar Publications.
3. The construction of buildings; seventh edition, Vol.1 & Vol.2 by R. Barry, Oxford: Blackwell
4. Science.
5. Building Materials Technology by Ruth T. Brantley & L. Reed Brantley, Tata McGraw Hill.
6. National Building Code (latest).
7. Building Design and construction by Frederick Merrit, Tata McGraw Hill.
8. I.S. 962 – 1989 Code for Practice for Architectural and Building Drawings.
9. UDCPR Updated To 30.1.2024.
10. Model Building Bye-Laws 2016.

E-resources:

1. UDCPR: <https://share.google/tcRbIRWrLbc3vB4EL>
2. Structure, Form, and Architecture -<https://youtu.be/3xoVwCUkGs0>



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Class: Second Year Engineering (2025 Pattern)					Sem: IV	
Course Code:PCC-243-CVL			Name of Course: Architectural Design & DrawingLab			
Teaching Scheme (Hrs/Week):			Credits:			
Lecture	Practical	Tutorial	Theory	Practical	Tutorial	
-	2	-	-	1	-	
Examination Scheme :						
FA	SA	PR	OR	TW		
-	-	25	-	-		
Prerequisite:						
Fundamentals of Engineering Graphics.						
Course Objective: The objectives of this Course aims to						
<ol style="list-style-type: none"> To study building bye-laws, architectural regulations, and drawing standards as per UDCPR, Maharashtra State. To understand the planning of residential and public building units. 						
Course Outcome: On completion of course, Learner will be able to						
PCC-243-CVL.01	Prepare and interpret building drawings of basic components and complete building layouts including plan, elevation, and section using conventional drafting methods.					
PCC-243-CVL.02	Develop professional-quality architectural drawings and typical floor plans using computer-aided drafting software, following standard drawing conventions and documentation practices.					
PCC-243-CVL.03	Analyze real-world construction practices through site visit.					
List of Laboratory Assignments						
<ol style="list-style-type: none"> Students shall prepare abbreviations and drawings symbols as per IS 962. Students shall prepare Perspective drawing of a small building element Floor Plan/ Typical floor plan with construction notes, schedule of openings, of residential type of building, (Plan, Elevation and Section) (Full Imperial sheet) Floor Plan/ Typical floor plan with construction notes, schedule of openings, of any one type of public building, (Plan, Elevation and Section) (Full Imperial sheet) Develop typical floor plan drawing exercise as completed in assignment number 3 using computer Layout/ Site plan indicating water supply and drainage line (with area statement, make max. four students in one group). Site Visit: Any on-going Construction Site (visit report should contain: details of the project, stage of construction, sketches of components with cross section & dimensions, materials used and site plan OR Site Visit: Green Building, Salient features like materials used/technology etc, benefits, planning concepts of Green Building (site selection, orientation, sun path and wind diagram etc.) 						



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

Course Code: PCC-244-CVL **Name of Course: Concrete Technology**

Teaching Scheme (Hrs/Week):			Credits:		
Lecture	Practical	Tutorial	Theory	Practical	Tutorial
3	-	-	2	-	-

Examination Scheme :

FA	SA	PR	OR	TW
50	50	-	-	-

Prerequisite:
 Physics, Chemistry and Building Materials.

Course Objective: The objectives of this Course aims to

1. To develop fundamental understanding of the properties and behavior of concrete ingredients such as cement, aggregates, water, and admixtures.
2. To introduce the principles governing fresh concrete properties, workability, and the role of mix proportions and admixtures.
3. To provide knowledge of hardened concrete behavior including strength, durability, and testing methods.
4. To train students in concrete mix design procedures and quality control practices as per relevant IS codes.
5. To familiarize students with modern concreting techniques, special concretes, repair methods, and sustainable construction practices.

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

PCC-244-CVL.1	Explain the characteristics and testing procedures of cement, aggregates, water, and admixtures, and their effects on concrete quality.
PCC-244-CVL.2	Analyze workability and fresh concrete properties, including the influence of admixtures and mix proportion variations.
PCC-244-CVL.3	Evaluate the mechanical strength, durability, and performance of hardened concrete using destructive and non-destructive testing methods.
PCC-244-CVL.4	Design concrete mixes for specified grades and applications by applying IS 456 and DOE methods with quality control measures.
PCC-244-CVL.5	Assess concreting techniques, special concretes, repair methods, and modern innovations to ensure durability and sustainability in concrete construction.

Course Content (TH)

Unit I	Cement, Aggregates, Water and Admixtures	(08 Hours)
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Historical development of cement, types, hydration, and basic properties. Standard tests such as fineness, consistency, setting time, soundness, and compressive strength. Fine and coarse aggregates with properties, grading, specific gravity, water absorption, impact, crushing, and abrasion tests. Quality requirements of water for concrete with permissible limits. Admixtures, both chemical and mineral, with types and functions including workability modification, setting control, and durability enhancement.

Unit II	Test on Fresh Concrete	(08 Hours)
<p>Workability, consistency, cohesiveness, and mobility of concrete. Practical tests such as slump cone, compacting factor, Vee-Bee consistometer, and flow table. Effects of admixtures on workability. Factors affecting workability and compressive strength, including water-cement ratio, aggregate characteristics, cement content, temperature, and admixture use. Optimization of fresh concrete properties for practical applications.</p>		
Unit III	Properties and Testing of Hardened Concrete	(08 Hours)
<p>Mechanical properties including compressive, tensile, and flexural strength, stress–strain behavior, micro-cracking, creep, shrinkage, impact strength, and abrasion resistance. Destructive tests: compression, flexural, split tensile, and core tests. Non-destructive tests: rebound hammer, ultrasonic pulse velocity, pull-out, and impact echo tests. Relationship between tensile and compressive strength.</p>		
Unit IV	Concrete Mix Design	(08 Hours)
<p>Principles and objectives of concrete mix design. Factors influencing mix design such as workability, strength, durability, and economy. variability of laboratory test results, and acceptance criteria as per IS 456. Grade designation, exposure conditions, minimum and maximum cement content, and permissible water-cement ratio. Methods of mix design: IS Code method and DOE method for developing concrete mixes meeting practical and regulatory requirements.</p>		
Unit V	Concreting Equipment, Special Concretes, Durability, Repairs and Modern Trends	(08 Hours)
<p>Batching, mixing, transporting, placing, and compacting concrete using mixers, pumps, vibrators, and compaction devices. Special concreting techniques such as ready-mix, underwater, roller-compacted, and cold and hot weather concreting. Basic special concretes including lightweight, foam, no-fines, self-compacting, high-density, fiber-reinforced, and ferrocement. Durability issues: permeability, sulphate, acid, and chloride attack, carbonation, and reinforcement corrosion. Repair techniques: patching, grouting, shotcrete, and retrofitting using fiber-reinforced polymers and polymer-modified concrete. Modern trends: geo-polymer concrete, high-performance concrete, advanced non-destructive monitoring.</p>		
Learning Resources		
<p>Text Books:</p> <ol style="list-style-type: none"> 1. Shetty, M.S., <i>Concrete Technology: Theory and Practice</i>, S. Chand & Company, New Delhi. 2. Gambhir, M.L., <i>Concrete Technology</i>, McGraw Hill Education. 3. Neville, A.M., <i>Properties of Concrete</i>, Pearson Education. 		
<p>Reference Book:</p> <ol style="list-style-type: none"> 1. Properties of concrete by A. M. Neville, Longman Publishers. 2. Concrete Technology by R.S. Varshney, Oxford and IBH. 3. Ferrocement Construction Manual by Dr. D. B. Divekar-1030, Shivaji Nagar, Model Colony, Pune. 4. Concrete Mix Design by A. P. Remideos, Himalaya Publishing House. 		
<p>E-resources:</p> <ul style="list-style-type: none"> • NPTEL Course on Concrete Technology – https://nptel.ac.in • American Concrete Institute (ACI) – https://www.concrete.org 		



Pimpri Chinchwad Education Trust's
Pimpri Chinchwad College of Engineering and Research, Ravet, Pune
Department of Civil Engineering



Class: Second Year Engineering (2025 Pattern)				Sem: IV		
Course Code: PCC-245-CVL				Name of Course: Concrete Technology Lab		
Teaching Scheme (Hrs/Week):				Credits:		
Lecture	Practical	Tutorial		Theory	Practical	Tutorial
-	2	-		-	1	-
Examination Scheme :						
FA	SA	PR		OR	TW	
-	-	-		25	-	
Prerequisite: Physics, Chemistry and Building Materials						
Course Objective: The objectives of this Course aims to						
<ol style="list-style-type: none"> 1. To develop practical understanding of testing procedures for cement and aggregates used in concrete construction. 2. To introduce the principles of fresh concrete behavior and workability through laboratory experiments. 3. To provide knowledge of strength evaluation and performance testing of hardened concrete. 						
Course Outcome: On completion of course, Learner will be able to						
PCC-245-CVL.1	Apply laboratory test procedures to determine properties of cement and aggregates and interpret the results.					
PCC-245-CVL.2	Analyze workability and fresh concrete characteristics using standard experimental methods.					
PCC-245-CVL.3	Evaluate and compare strength properties of hardened concrete using destructive and non-destructive tests.					
Course Content (PR)						
List of Practical Experiments						
<ol style="list-style-type: none"> 1. Fineness Test of Cement 2. Standard Consistency Test 3. Initial and Final Setting Time Tests 4. Compressive Strength Test of Cement Mortar Cubes 5. Le Chatelier soundness Test 6. Fineness Modulus Test of Aggregates 7. Silt Content Test of Fine Aggregate (Sand) 8. Slump Cone Test 9. Compaction Factor Test 10. Vee-Bee Consistometer Test 11. Compressive Strength Test on Concrete Cubes/Cylinders 12. Split Tensile Strength Test on Concrete Cylinders 13. Flexural Strength Test on Concrete Beams 14. Rebound Hammer Test. 						



Pimpri Chinchwad Education Trust's
Pimpri Chinchwad College of Engineering and Research, Ravet, Pune
Department of Civil Engineering



Class: Second Year Engineering (2025 Pattern)	Sem: IV
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Course Code: PCC-246-CVL	Name of Course: Hydrology and Water Resource Engineering
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Teaching Scheme (Hrs/Week):			Credits:		
Lecture	Practical	Tutorial	Theory	Practical	Tutorial
3	-	-	2	-	-

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

Prerequisite:
 Fluid Mechanics, Basics of Civil Engineering

- Course Objective: The objectives of this Course aims**
1. To develop a fundamental understanding of the hydrological cycle, precipitation processes, abstractions, and their role in water resources management.
 2. To study and analyze runoff processes, hydrograph development, stream flow measurement techniques, and modern sensor-based monitoring systems.
 3. To introduce methods for flood estimation, flood routing, and watershed modeling using GIS and remote sensing tools for effective planning and decision-making.
 4. To provide knowledge of reservoir planning, capacity estimation, sedimentation control, and cost apportionment methods with an emphasis on sustainable operation.
 5. To explore groundwater hydrology, well hydraulics, irrigation water management practices, and the integration of smart irrigation and climate-resilient water management techniques.

Course Outcome: On completion of course, Learner will be able to	
PCC-246 CVL.1	Explain the hydrological cycle, precipitation processes, and methods of measurement.
PCC-246-CVL.2	Analyze runoff, develop hydrographs, and estimate streamflow using conventional and modern methods.
PCC-246-CVL.3	Apply statistical and GIS-based approaches for flood estimation and watershed analysis.
PCC-246-CVL.4	Design reservoir storage capacity, evaluate sedimentation, and discuss cost apportionment methods.
PCC-246-CVL.5	Assess groundwater occurrence, hydraulics of wells, irrigation practices, and modern water management systems.

Course Content (TH)		
Unit I	Hydrological Cycle and Precipitation Analysis	(08 Hours)
Introduction to the hydrological cycle and applications of hydrology; types and forms of precipitation; methods of measurement and rain gauge network design; consistency test and analysis of rainfall data; mass rainfall curves, hyetographs, point rainfall, and mean precipitation using arithmetic mean, Thiessen polygon, and isohyetal method; depth–area–duration and intensity–duration–frequency relationships; abstractions of precipitation including evaporation, transpiration, and evapotranspiration (Modified Penman method); infiltration concepts, infiltration capacity and measurement, Horton’s equation and infiltration indices. Introduction to real-time weather stations, satellite-based rainfall estimation, and the role of climate change in precipitation variability.		

Unit II	Runoff and Hydrograph Analysis	(08 Hours)
Introduction, Factors affecting runoff and empirical rainfall–runoff relationships; runoff hydrograph and its components; base flow separation and effective rainfall determination; unit hydrograph theory, S-curve hydrograph, and limitations; introduction to synthetic hydrograph. Stream gauging: site selection and discharge measurement by velocity–area method. Advanced methods for discharge measurement including radar-based systems, current meters, and Acoustic Doppler Current Profiler (ADCP). Application of IoT and sensor-based streamflow monitoring for real-time hydrological data collection.		
Unit III	Flood Hydrology and Watershed Modeling	(08 Hours)
Estimation of peak flood discharge using rational and empirical methods; flood frequency analysis and design floods; introduction to hydrologic design of culverts and bridges. Principles of flood routing with emphasis on the Muskingum method. Introduction to watershed modeling and hydrologic simulation using GIS-based tools such as QGIS, HEC-HMS, and SWAT. Application of remote sensing and GIS in flood forecasting, early warning systems, and watershed management.		
Unit IV	Reservoir Planning and Sedimentation Management	(08 Hours)
Fundamentals of reservoir planning and terminology related to yield, storage, and operation; methods of fixation of reservoir capacity using mass curve, demand curve, and elevation-capacity relationships; dependable yield analysis; reservoir losses due to evaporation and seepage. Reservoir sedimentation: phenomenon, causes, effects, and sediment control measures; density currents and trap efficiency; useful life of reservoirs. Introduction to cost apportionment methods including use of facilities, equal apportionment, and alternative justifiable expenditure approaches. Modern practices in reservoir operation including decision-support systems, climate resilience strategies, and sediment monitoring using remote sensing techniques.		
Unit V	Groundwater Hydrology and Water Management	(08 Hours)
Occurrence and distribution of groundwater; specific yield of aquifers and movement of groundwater; Darcy’s law, permeability, and safe yield of a basin. Hydraulics of wells under confined and unconfined conditions; specific capacity of wells; types of wells including tube wells and open wells, their design and construction. Water logging and drainage: causes, impacts, preventive and curative measures; reclamation of waterlogged and saline lands. Irrigation water management systems including Warabandi, rotational supply, participatory irrigation management (PIM), and cooperative water distribution. Integration of smart irrigation systems using IoT-based soil moisture sensors, automated drip irrigation, and groundwater monitoring using satellite-based datasets (GRACE and GRACE-FO).		
Learning Resources		
Text Books:		
<ol style="list-style-type: none"> 1. Engineering Hydrology, K. Subramanyam, McGraw- Hill Publication, 4th Edition-2017 2. Hydrology and Water Resources Engineering, S. K. Garg, Khanna Publishers, 2015 		
Reference Books:		
<ol style="list-style-type: none"> 1. Irrigation, Water Resources and Water Power Engineering, P. N. Modi, Standard Book House, 11th Edition-2020 2. Irrigation and Water power Engineering, Dr. Punmia and Dr. Pande, Standard Publisher, 17th Edition-2021 		
e-resources:		
<ol style="list-style-type: none"> 1. https://nptel.ac.in/courses/105103213 2. https://nptel.ac.in/courses/105105214 3. https://nptel.ac.in/courses/105103026 		



Pimpri Chinchwad Education Trust's
Pimpri Chinchwad College of Engineering and Research, Ravet, Pune
Department of Civil Engineering



Class: Second Year Engineering (2025 Pattern)				Sem: IV		
Course Code:PCC-247-CVL		Name of Course: Hydrology and Water Resource Engineering Lab				
Teaching Scheme (Hrs/Week):				Credits:		
Lecture	Practical	Tutorial		Theory	Practical	Tutorial
-	2	-		-	1	-
Examination Scheme :						
FA	SA	OR		PR		TW
-	-	-		-		25
Prerequisite:						
Fluid Mechanics, Basics of Civil Engineering						
Course Objective: The objectives of this Course aims to						
<ol style="list-style-type: none"> Develop practical competence in analysis of hydrological data related to rainfall, runoff, floods, evaporation, and infiltration using standard methods and field instruments. Provide hands-on exposure to watershed and reservoir analysis, including catchment delineation, runoff estimation, flood discharge computation, and storage capacity assessment. Introduce modern tools and practices in hydrology through the application of GIS-based software and exposure to contemporary hydrological monitoring systems. 						
Course Outcome: On completion of course, Learner will be able to						
PCC-247 CVL.1	Analyze hydrological data to estimate rainfall consistency, runoff characteristics, flood frequency, and return periods for water resources applications.					
PCC-247 CVL.2	Apply watershed, unit hydrograph, and reservoir mass curve techniques to estimate peak discharge, runoff, and storage capacity.					
PCC-247 CVL.3	Use GIS tools and field instruments to delineate watersheds, estimate runoff, and interpret hydrological measurements obtained from laboratory and field studies.					
Course Content (PR)						
1. Analysis of rainfall data using double mass curve and estimation of missing rainfall data.						
2. Catchment area delineation on toposheet and computation of average annual precipitation and yield.						
3. Demonstration of software tools HEC-HMS used in water resources applications.						
4. Frequency analysis of hydrologic events and determination of return period.						
5. Determination of peak flood discharge using unit hydrograph technique.						
6. Estimation of reservoir storage capacity using inflow–outflow mass curve.						
7. Demonstration/measurement of evaporation using pan evaporimeter.						
8. Demonstration/measurement of infiltration using infiltrometer.						
9. Demonstration of software tool - MODFLOW used in water resources applications.						
10. Site visit to meteorological or water resources department for exposure to modern hydrological equipment.						



Pimpri Chinchwad Education Trust's
Pimpri Chinchwad College of Engineering and Research, Ravet, Pune
Department of Civil Engineering



Department: Second Year Engineering (2025 Pattern)				Sem: IV		
Course Code: FP-248-CVL			Name of Course: Structural Audit & Non-Destructive Testing (NDT)			
Teaching Scheme (Hrs/week):			Credits:			
Lecture	Practical	Tutorial		Theory	Practical	Tutorial
-	4	-		-	2	-
Examination Scheme:						
FA	SA	PR	OR	TW		
-	-	-	25	25		
STRUCTURAL AUDIT & NON-DESTRUCTIVE TESTING (NDT)						
Prerequisite:						
Construction Materials, Concrete Technology						
Course Objectives:						
<ol style="list-style-type: none"> 1. To introduce students to the principles and need of structural auditing in reinforced concrete structures. 2. To develop practical skills in conducting non-destructive tests for assessing structural condition. 3. To train students in interpretation of NDT results for evaluating safety and serviceability. 4. To enable preparation of professional structural audit reports with repair recommendations. 						
Course Outcomes:						
<ol style="list-style-type: none"> 1. Perform visual inspection and identify common structural distress in RCC structures. 2. Conduct standard NDT tests such as rebound hammer, UPV, and corrosion assessment. 3. Analyze and correlate NDT data to evaluate structural health. 4. Prepare a structured audit report with technical findings and repair suggestions. 						
List of Projects:						
Sr. No.	Content					
01	Visual Inspection and Distress Mapping of RCC Structures (Identification of cracks, spalling, corrosion signs, leakage, and preparation of distress map)					
02	Rebound Hammer Test on Concrete Elements (Assessment of surface hardness and estimation of compressive strength as per IS 13311-2)					
03	Ultrasonic Pulse Velocity (UPV) Test on Concrete (Evaluation of concrete quality, uniformity, and detection of internal flaws as per IS 13311-1)					
04	Half-Cell Potential Test for Corrosion Assessment (Measurement of corrosion probability in reinforced concrete structures)					
05	Correlation and Interpretation of NDT Results (Comparison of visual inspection, rebound hammer, UPV, and corrosion data for structural condition assessment)					
06	Structural Audit Report Preparation and Case Study Evaluation (Preparation of a complete structural audit report including observations, test results, interpretation, repair recommendations, and ethical considerations)					

Learning Resources

Text Books:

1. Practical Non-Destructive Testing by Baldev Raj, M. Thavasimuthu, and T. Jayakumar
2. Non-Destructive Test and Evaluation of Materials by Dr. M Adithan and others

Reference Books:

1. Halmshaw, Non-Destructive Testing
2. Jean-Paul Balayssac & Vincent Garnier, Non-Destructive Testing and Evaluation of Civil Engineering Structures (Elsevier)
3. Prasad & Nair, Non-Destructive Test and Evaluation of Materials

e-resources:

1. Review article (Concrete NDT methods, published Jan 2025) – Non-Destructive Testing Techniques for Condition Assessment of Concrete Structures (American Journal of Civil Engineering)
<https://doi.org/10.11648/j.ajce.20251301.12> [Science Publishing Group](#)
2. Nondestructive Testing of Materials and Structures (Springer / RILEM)
<https://link.springer.com/book/10.1007/978-94-007-0723-8> Springer
4. Bureau of Indian Standards — BIS official standards repository (can search NDT codes like IS 13311)
https://www.bis.gov.in/wp-content/uploads/2025/04/Group_1_02042025.pdf Bureau of Indian Standards
5. NDT Book (Indian Railways example, usable for concrete NDT overview)
https://iricen.gov.in/iricen/books_jquery/ndt_book_for_printing17022015.pdf iricen.gov.in
6. ScienceDirect review — NDE of construction materials & structures (2023)
<https://www.sciencedirect.com/science/article/pii/S0950061823021761> ScienceDirect



Pimpri Chinchwad Education Trust's
Pimpri Chinchwad College of Engineering and Research, Ravet, Pune
Department of Civil Engineering



Class: Second Year Engineering (2025 Pattern)				Sem: IV		
Course Code: MDM-249-CVL		Name of Course: Applied Numerical Methods in Engineering (MOOC)				
Teaching Scheme (Hrs/Week):				Credits:		
Lecture	Practical	Tutorial		Theory	Practical	Tutorial
MOOC	-	-		2	-	-
Examination Scheme :						
FA	SA	PR	OR	TW		
-	-	25	-	50		
Prerequisite: Engineering Mathematics I & II.						
Course Objective: The objectives of this Course aims						
<ol style="list-style-type: none"> 1. To introduce fundamental numerical methods for solving linear, nonlinear, differential, and integral equations arising in engineering problems. 2. To develop the ability to analyze accuracy, stability and convergence of numerical algorithms. 3. To provide foundational knowledge of finite difference and finite element methods for solving partial differential equations relevant to civil engineering applications. 						
Course Outcome: On completion of course, Learner will be able to						
MDM-249-CVL.1	Identify sources of numerical errors and evaluate the accuracy and stability of numerical solutions using Taylor series and error analysis.					
MDM-249-CVL.2	Solve systems of linear equations using direct and iterative numerical techniques, and assess matrix properties such as conditioning, singularity, and dominance.					
MDM-249-CVL.3	Apply numerical methods for solving nonlinear algebraic equations and analyze convergence behavior of iterative schemes.					
MDM-249-CVL.4	Formulate and solve ordinary and partial differential equations using numerical differentiation, finite difference, and finite element methods.					
MDM-249-CVL.5	Implement numerical techniques for time-dependent problems and integral equations, and interpret results for engineering applications.					
Learning Resources						
Text Books:						
<ol style="list-style-type: none"> 1. Numerical Methods for Engineers, <i>McGraw-Hill Education</i> by Chapra, S. C. and Canale, R. P.. (Covers errors, linear & nonlinear systems, numerical differentiation, integration, and PDEs) 2. Applied Numerical Analysis, <i>Pearson Education</i> by Gerald, C. F. and Wheatley, P. O. (Useful for iterative methods, stability, and accuracy concepts) 3. Applied Numerical Analysis by Gerald, C. F. and Wheatley, P. O; <i>Pearson Education</i>. 						
Reference Books:						
<ol style="list-style-type: none"> 1. "Numerical Methods" by D. Dahlquist, and A. Bork, Dan Prentice-Hall, Englewood Cliffs, NJ., 1974. 2. The Finite Element Method by Prentice Hall, 1987. 3. Numerical Solution of Partial Differential Equations: Finite Difference Methods by Smith, G. D, Oxford University Press. 						

E-resources:

1. <https://nptel.ac.in/courses/105105041>
2. <https://nptel.ac.in/courses/105105043>
3. <https://nptel.ac.in/courses/111106101>
4. <https://nptel.ac.in/courses/111101038>

Numerical Methods in Civil Engineering - Video course

COURSE OUTLINE

This course attempts to give a broad background to numerical methods common to various branches of civil engineering.

It starts with core concepts of error estimate and accuracy of numerical solutions.

It then introduces the student to methods of solution of linear and non-linear equations.

Both direct and iterative solution methods are discussed.

Next we introduce the numerical solution of partial differential equations, after a brief review of canonical partial differential equations and well known analytical techniques for their solution, stressing when and why numerical solutions are necessary.

Finite difference operators are introduced and used to solve typical initial and boundary value problems.

Following this we introduce the finite element method as a generic method for the numerical solution of partial differential equations.

The concepts of weak form, finite element discretization, polynomial interpolation using Lagrange polynomials and numerical quadrature are introduced.

Numerical integration in the time domain is discussed, emphasizing the key requirements of stability and accuracy of time integration algorithms.

Finally we discuss integral equations and introduce numerical techniques for their solution.

COURSE DETAIL

Sl. No	Topic	No. of Hours
1	Introduction to Numerical Methods: <ul style="list-style-type: none"> Why study numerical methods. Sources of error in numerical solutions: truncation error, round off error. Order of accuracy - Taylor series expansion. 	2
2	Direct Solution of Linear systems: <ul style="list-style-type: none"> Gauss elimination, Gauss Jordan elimination. Pivoting, inaccuracies due to pivoting. Factorization, Cholesky decomposition. 	4



NP-TEL

NPTEL

<http://nptel.iitm.ac.in>

Civil Engineering

Additional Reading:

- "The Finite Element Method", by T. J. R. Hughes, Prentice Hall, Englewood Cliffs, NJ, 1987.
- "Green's functions and Boundary Value Problems" by I. Stakgold, Wiley, 1998.

Coordinators:

Dr. A. Deb



Department of Civil Engineering IIT
Kharagpur

	<ul style="list-style-type: none"> • Diagonal dominance, condition number, ill conditioned matrices, singularity and singular value decomposition. • Banded matrices, storage schemes for banded matrices, skyline solver. 	
3	Iterative solution of Linear systems: <ul style="list-style-type: none"> • Jacobi iteration. • Gauss Seidel iteration. • Convergence criteria. 	3
4	Direct Solution of Non Linear systems: <ul style="list-style-type: none"> • Newton Raphson iterations to find roots of a 1D nonlinear equation. • Generalization to multiple dimensions. • Newton Iterations, Quasi Newton iterations. • Local and global minimum, rates of convergence, convergence criteria. 	4
5	Iterative Solution of Non Linear systems: <ul style="list-style-type: none"> • Conjugate gradient. • Preconditioning. 	3
6	Partial Differential Equations: <ul style="list-style-type: none"> • Introduction to partial differential equations. • Definitions & classifications of first and second order equations. • Examples of analytical solutions. • Method of characteristics. 	4
7	Numerical Differentiation: <ul style="list-style-type: none"> • Difference operators (forward, backward and central difference). • Stability and accuracy of solutions. • Application of finite difference operators to solve initial and boundary value problems. 	4
8	Introduction to the Finite Element Method as a method to solve partial differential equations: <ul style="list-style-type: none"> • Strong form of the differential equation. • Weak form. • Galerkin method: the finite element approximation. • Interpolation functions: smoothness, continuity, 	6

	<p>completeness, Lagrange polynomials.</p> <ul style="list-style-type: none"> Numerical quadrature: Trapezoidal rule, simpsons rule, Gauss quadrature. 	
9	<p>Numerical integration of time dependent partial differential equations:</p> <ul style="list-style-type: none"> Parabolic equations: algorithms - stability, consistency and convergence, Lax equivalence theorem. Hyperbolic equations: algorithms - Newmark's method, stability and accuracy, convergence, multi-step methods. 	4
10	<p>Numerical solutions of integral equations:</p> <ul style="list-style-type: none"> Types of integral equations. Fredholm integral equations of the first and second kind. Fredholm's Alternative theorem. Collocation and Galerkin methods for solving integral equations. 	6

References:

- "Numerical Methods" by D. Dahlquist, and A. Bork, Dan Prentice-Hall, Englewood Cliffs, NJ, 1974.

	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: 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-COMP	Critical Thinking and Problem Solving	OEC
OEC-272-ETC	Financial management	OEC
OEC-273-ITT	Media, Society, and Digital Culture	OEC



Pimpri Chinchwad Education Trust's
Pimpri Chinchwad College of Engineering and Research, Ravet, Pune
Department of Civil Engineering



Class: Second Year Engineering (2025 Pattern)	Sem: IV
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Course Code: VSE-241-CVL	Name of Course: GIS & Remote Sensing
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Teaching Scheme (Hrs/week):			Credits:		
Lecture	Practical	Tutorial	Theory	Practical	Tutorial
-	4	-	-	2	-

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

Pre-requisites:
Surveying, Mathematics, Geology, Environment, Statistics, Hydrology.

Course Objective:

1. Introduce fundamentals of GIS and Remote Sensing for spatial data acquisition and analysis.
2. Develop skills in processing and interpreting satellite imagery and geospatial datasets.
3. Apply GIS–RS techniques to civil engineering problems such as hydrology, urban planning, and transportation.
4. Integrate multi-source spatial data for effective modeling, visualization, and decision-making.
5. Encourage research, innovation, and use of modern geospatial tools for sustainable development.

Course Outcomes:
On completion of this Course, the Learners will be able to;

VSE-241-CVL.1	Apply principles of GIS and Remote Sensing to acquire, manage, and analyze spatial data.
VSE-241-CVL.2	Interpret satellite imagery and aerial photographs for civil engineering applications.
VSE-241-CVL.3	Perform spatial analysis and modeling using GIS tools for infrastructure and environmental planning.
VSE-241-CVL.4	Integrate multi-source geospatial data to support decision-making in civil engineering projects.
VSE-241-CVL.5	Demonstrate proficiency in modern GIS/RS software for problem-solving and research innovation.

GIS & Remote Sensing- Practical

List of Practicals:	
Pr No.	Content
01	Introduction to GIS Software- Install and explore QGIS/ArcGIS interface, Load vector and raster datasets, Perform basic map navigation, zoom, pan, and layer management.
02	Coordinate Systems & Map Projections- Import shapefiles with different coordinate systems, reproject data into UTM/WGS84, Compare distortions in area, distance, and shape

03	Spatial Data Creation & Editing- Digitize features (roads, rivers, buildings) from satellite imagery, Attribute table editing and linking non-spatial data, Create thematic maps (e.g., land use map of campus area)
04	Remote Sensing Data Acquisition- Download satellite imagery (Sentinel-2, Landsat 8) from open sources, Explore metadata: spatial resolution, spectral bands, acquisition date, Compare multispectral vs panchromatic imagery
05	Image Preprocessing- Perform radiometric and geometric corrections, Apply atmospheric correction using QGIS/ERDAS tools, Generate false color composites (FCC)
06	Image Classification- Conduct supervised classification (Maximum Likelihood), Conduct unsupervised classification (K-means/ISODATA), Accuracy assessment using confusion matrix
07	Terrain Analysis- Generate Digital Elevation Model (DEM) from satellite data, Derive slope, aspect, and hillshade maps, Perform watershed delineation and drainage network extraction
08	Spatial Analysis in Civil Engineering, Buffering and overlay analysis for highway alignment, Site suitability analysis for dam/reservoir construction, Network analysis for shortest path in road networks
09	Advanced Techniques- UAV/drone data processing for high-resolution mapping, LiDAR point cloud visualization and DEM generation, Introduction to Google Earth Engine for cloud-based analysis
10	Civil Engineering Applications Project- Choose one application (urban planning, flood risk mapping, landslide susceptibility, groundwater potential, etc.)

Learning Resources

Text Books:

1. Remote Sensing and GIS – Basudeb Bhatta
2. Remote Sensing and Image Interpretation – Thomas M. Lillesand, Ralph W. Kiefer, Jonathan Chipman
3. Introduction to Geographic Information Systems – Kang-Tsung Chang
4. Fundamentals of Remote Sensing – George Joseph
5. Concepts and Techniques of Geographic Information Systems – C.P. Lo and Albert K.W. Yeung

Reference Books:

1. Principles of Geographical Information Systems – P.A. Burrough and R.A. McDonnell
2. Geographic Information Systems and Science – Paul A. Longley, Michael F. Goodchild, David J. Maguire, David W. Rhind
3. Remote Sensing: Models and Methods for Image Processing – Robert A. Schowengerdt
4. Geoinformation: Remote Sensing, Photogrammetry and Geographic Information Systems – Gottfried Konecny
5. Applied Remote Sensing in Urban Planning – Xiaojun Yang

e-resources:

1. NASA Earthdata Portal – <https://earthdata.nasa.gov>
2. USGS Earth Explorer – <https://earthexplorer.usgs.gov>
3. ISRO Bhuvan Portal – <https://bhuvan.nrsc.gov.in>
4. QGIS Official Documentation – <https://qgis.org>
5. Esri GIS Learning Resources – <https://www.esri.com/training>



Pimpri Chinchwad Education Trust's
Pimpri Chinchwad College of Engineering and Research, Ravet, Pune.
Department of Civil Engineering



Class: Second Year Engineering (2025 Pattern)					Sem: IV	
Course Code: VEC-242-CVL			Name of Course: Emotional Intelligence & Human Relations			
Teaching Scheme (Hrs/week):				Credits:		
Lecture	Practical	Tutorial		Theory	Practical	Tutorial
2	-	-		2	-	-
Examination Scheme:						
FA	SA	PR	OR	TW		
25	25	-	-	-		
Pre-requisites:						
Professional Ethics & Human Values						
Course Objective:						
<ol style="list-style-type: none"> 1. To introduce the fundamental concepts of emotions, emotional intelligence, and human relations relevant to engineering professionals 2. To develop self-awareness, emotional regulation, motivation, and interpersonal sensitivity among students. 3. To enhance interpersonal communication, conversational intelligence, and relationship-management skills. 4. To enable students to apply emotional intelligence and human relations concepts in personal, academic, and professional engineering environments. 						
Course Outcomes:						
On completion of this Course, the Learners will be able to;						
VEC-242-CVL.1	Explain the concepts, components, models, and measurement techniques of emotional intelligence and emotions.					
VEC-242-CVL.2	Demonstrate self-awareness, emotional control, motivation, empathy, and social skills in real-life situations.					
VEC-242-CVL.3	Apply effective interpersonal communication and conversational intelligence in academic and workplace contexts.					
VEC-242-CVL.4	Analyze human relations issues in organizations and society using emotional intelligence principles for improved decision-making and teamwork.					
Course Content						
Unit I	Fundamentals of Emotional Intelligence					(06 Hours)
Emotion- Meaning, characteristics of emotion, components of emotion-cognitive component, physiological component, Behavioral component, Types of emotions, exposing the myths about emotion, physiological or bodily changes accompanying emotions, How emotions affect our thinking and actions, Development of emotions and emotional maturity, Emotional Intelligence – concept, history, measurement of EI - Bar-On Emotional Quotient Inventory, emotional competency inventory, Emotional and social competency inventory, Mayer-Salovey-Caruso Emotional Intelligence Test, self-rated emotional intelligence scale						

Unit II	Aspects & Impact of Emotional Intelligence	(06 Hours)
Seven Elements defined in Behavioral terms, Self Awareness, Emotional Resilience, Motivation, Interpersonal Sensitivity, Influence, Intuitiveness, Conscientiousness, Five Elements defined in Competence terms, Self Awareness, Self Management, Self Motivation, Empathy, Social Skills, Application of Impact of fundamental elements of EI in our daily life, Everyday Behaviour, Education, Workplace, Case Study Discussion with Role Plays		
Unit III	Interpersonal Communication & Conversational Intelligence	(06 Hours)
Defining Interpersonal Communication, What is Conversational Intelligence, A Communication Continuum, Communication in Everyday Life, Workplace: Diagnosis: Cultural Miscommunication, Communication in Everyday Life—Insight: Poor Interpersonal Communication as the Number One Cause of Divorce, Features of Interpersonal Communication, Models of Interpersonal Communication, Linear Models, Interactive Models, Transactional Models, The Interpersonal Imperative, Physical Needs, Safety Needs, Belonging Needs, Communication in Everyday Life: Social Media: Networking on the Job, Self-Esteem Needs, Communication in Everyday Life—Diversity: Missing Socialization, Self-Actualization Needs, Participating Effectively in a Diverse Society, Communication in Everyday Life—Diversity: Communicating in a Multicultural World, Case Study Discussions, Role Plays & Analysis of Videos as a Group Work, especially focusing on Emotional Intelligence & Behavioural Intelligence application.		
Unit IV	Fundamentals of Human Relations	(06 Hours)
What is Human Relations, Human Relations Timeline / Brief History of Human Relations, The Early Years & Industrial Revolution - Early to Mid 1800s, Bureaucracy, Scientific Management & World War I - Early 1900s, Labor Unions Gaining Power & end of World War II - Before Mid 1900s (Birth of Human Relations), Human Relations Philosophy, Theories & Management - After Mid 1900s (Maslow, Theory X & Y, TQM), Group Dynamics - Early 2000s, Emotional Intelligence, Social Media - Current 1.3: The Importance of Human Relations Skills, Human Fundamental Rights, Emphasis on People as Human Resources, Renewed Emphasis on Working in Groups, Increasing Diversity at Work Place, The Global Marketplace, Case Study Discussion on Human Relations Skills Topics, Human Relations & You, Employee, Manager / Leader, Entrepreneur, Family Person and Global Citizen		
Learning Resources		
Text Books:		
<ol style="list-style-type: none"> 1. Emotional Intelligence by Stephen Tower- Kindle Edition 2. Emotional Intelligence by Daniel Goleman publication Bloomsbury India 		
Reference Books:		
<ol style="list-style-type: none"> 1. Working with Emotional Intelligence: Bloomsbury Publication, Daniel Goleman (1998) 2. Interpersonal Communication: The Whole Story: McGraw-Hill - Kory Floyd (2009) 3. The Brain and Emotional Intelligence: New Insights: Daniel Goleman HBR's 10 Must Reads on Emotional Intelligence (2015) 4. The Five Dysfunctions of a Team: Jossey Bass / Wiley - Patrick Lencioni (2002) 		
e-resources:		
https://nptel.ac.in/courses/109105116 https://donainfo.wordpress.com/wp-content/uploads/2017/09/emotional-intelligence-daniel-goleman.pdf https://nacin.gov.in/Documents/e-Books/Vadodara/Emotional%20Intelligence%20Book.pdf		

Assignments on Emotional Intelligence & Human Relations

1. Assignment on identifying and analyzing emotions in academic and real-life situations with reference to components of emotion and their impact on thinking and behavior.
2. Assignment on self-assessment of emotional intelligence using a self-rated EI scale and preparation of a reflective report highlighting strengths, limitations, and improvement strategies.
3. Case study on the application of emotional intelligence at a civil engineering workplace, such as construction sites, project teams, or academic group projects.
4. Case study on motivation, emotional resilience, and conscientiousness in managing academic stress, project deadlines, or failure situations.
5. Case study on interpersonal communication breakdown and conflict at workplace or academic environment with EI-based solutions.
6. Presentation on cultural diversity, empathy, and conversational intelligence in professional communication with reference to engineering workplaces.
7. Case study on human relations theories (Maslow, Theory X, and Theory Y) and their relevance to leadership, teamwork, and group dynamics.
8. Role play on human relations and emotional intelligence scenarios, such as manager–employee interaction, team conflict resolution, client communication, or leadership situations, followed by individual reflection