



B.S. Abdur Rahman®
Crescent
Institute of Science & Technology
Deemed to be University u/s 3 of the UGC Act, 1956

*Regulations 2025
Curriculum and Syllabi
(As approved by the 24th Academic Council
- August 2025)*

**B.Tech.
(Civil Engineering)**



REGULATIONS 2025

**CURRICULUM AND SYLLABI (I & II semesters)
(as approved by the 24th Academic Council - August 2025)**

B.TECH. CIVIL ENGINEERING

VISION AND MISSION OF THE INSTITUTION

VISION

B.S. Abdur Rahman Crescent Institute of Science and Technology aspires to be a leader in Education, Training and Research in multidisciplinary areas of importance and to play a vital role in the Socio- Economic progress of the Country in a sustainable manner.

MISSION

- To blossom into an internationally renowned Institute.
- To empower the youth through quality and value-based education.
- To promote professional leadership and entrepreneurship.
- To achieve excellence in all its endeavors to face global challenges.
- To provide excellent teaching and research ambience.
- To network with global Institutions of Excellence, Business, Industry and Research Organizations.
- To contribute to the knowledge base through Scientific enquiry, Applied Research and Innovation.

DEPARTMENT OF CIVIL ENGINEERING**SCHOOL OF INFRASTRUCTURE****VISION AND MISSION****VISION**

To be a leading Department for Education, Training and Research in Civil Engineering for a better future of society and overall socio-economic progress of the country in a sustainable manner.

MISSION

- To offer world class undergraduate, postgraduate and research programs of industrial and societal relevance in civil engineering.
- To nurture ethically strong civil engineers to address global challenges through quality education and application-oriented research with emphasis on sustainability.
- To educate students on design, construction, and maintenance of infrastructure projects, and advancements in civil engineering for providing solutions to the advancement of society.
- To prepare competitive and responsible future citizens with good communication, leadership and managerial skills.
- To advance the best practices in various areas of civil & allied engineering through collaborations with Institutions of Excellence, Industries and Research Organizations.
- To provide a conducive environment for teaching, research, consultancy and extension activities.

PROGRAMME EDUCATIONAL OBJECTIVES AND OUTCOMES B.TECH. CIVIL ENGINEERING

Programme Educational Objectives

- ✓ **Technical Expertise:** Apply fundamental knowledge in mathematics, science, and engineering to analyze, design, and implement sustainable and safe civil engineering systems with care for society.
- ✓ **Professional elevation:** Pursue careers in civil engineering and related fields or higher education, with the ability to adapt to future technologies and practices.
- ✓ **Ethical Values and Social Responsibility:** Practice the civil engineering profession with ethics, considering social awareness, environment and society.
- ✓ **Communication and Leadership skills:** Demonstrate strong communication, teamwork, and leadership skills in multidisciplinary and multicultural environments.
- ✓ **Lifelong Learning:** Engage in lifelong learning through professional development, certifications, higher studies, or research to face global challenges

Programme outcomes

- ✓ 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 Problems: 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)

Knowledge and Attitude Profile (WK)

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.

Programme Specific Outcomes

- ✓ PSO1: Demonstrate proficiency in any of the following specialized areas of Civil Engineering: (i) Structural Engineering, (ii) Construction Engineering, Technology & Management, (iii) Geotechnical Engineering & Transportation Engineering, (iv) Environmental & Water Resources Engineering, and (v) Surveying and Architecture
- ✓ PSO2: Utilize modern engineering tools, software, and techniques to solve real-world civil engineering problems with accuracy and efficiency, while ensuring safety and quality standards.

REGULATIONS – 2025
B.TECH. DEGREE PROGRAMMES
(Under Choice Based Credit System)

1.0 PRELIMINARY DEFINITIONS & NOMENCLATURE

In these Regulations, unless the context otherwise requires:

- i) **"Programme"** means B.Tech. Degree Programme.
- ii) **"Branch"** means specialization or discipline of B.Tech. Degree Programme like Civil Engineering, Mechanical Engineering, etc.,
- iii) **"Course"** means theory / practical / laboratory integrated theory / seminar / internship / project and any other subject that is normally studied in a semester like English, Mathematics, Environmental Science, Engineering Graphics, Electronic Devices etc.,
- iv) **"Institution"** means B.S. Abdur Rahman Crescent Institute of Science and Technology.
- v) **"Academic Council"** means the Academic Council, which is the apex body on all academic matters of this Institute.
- vi) **"Dean (Academic Affairs)"** means the Dean (Academic Affairs) of the Institution who is responsible for the implementation of relevant rules and regulations for all the academic activities.
- vii) **"Dean (Student Affairs)"** means the Dean (Students Affairs) of the Institution who is responsible for activities related to student welfare, conduct of co-curricular, extra-curricular events and discipline in the campus.
- viii) **"Controller of Examinations"** means the Controller of Examinations of the Institution who is responsible for the conduct of examinations and declaration of results.
- ix) **"Dean of the School"** means the Dean of the School of the department concerned.
- x) **"Head of the Department"** means the Head of the Department concerned.

2.0 ADMISSION

2.1a) Candidates for admission to the first semester of the eight semester B. Tech. degree programme shall be required to have passed the Higher Secondary Examination of the 10+2 curriculum (Academic stream) prescribed by the appropriate authority or any other examination of any University or authority accepted by the Institution as equivalent thereto. Grade 12 or equivalent stage of education (Level 4) as per NEP 2020.

2.1b) The student shall have studied at least any three of the following courses: Physics, Mathematics, Chemistry, Computer Science, Electronics, Information Technology, Biology, Informatics Practices, Biotechnology, Technical Vocational Subjects, Agriculture, Engineering Graphics, Business Studies, Entrepreneurship at 10+2 level. In case if the student has not studied any or all the courses viz., mathematics, physics and chemistry, he / she shall undergo bridge course(s) in the concerned course(s) at 10+2 level knowledge (Level 4 of NEP 2020).

2.2 Notwithstanding the qualifying examination, the candidate might have passed at 10+2, the candidate shall also write an entrance examination prescribed by the Institution for admission to certain programmes. The entrance examination shall test the proficiency of the candidate in the courses considered eligible for admission on the standards prescribed for 10+2 academic stream.

2.3 Candidates for admission to the third semester of the eight semester B.Tech. programme under lateral entry category shall be required to have passed minimum Three years / Two years (Lateral Entry) Diploma examination in any branch of Engineering / Technology or passed B.Sc. Degree from a recognized University as defined by UGC and passed 10+2 examination with Mathematics as a subject or Passed three year Diploma of Vocation Stream (D.Voc) in the same or allied sector or any other examination of any other authority

accepted by the Institution as equivalent thereto.

- 2.4** The Institution shall offer suitable bridge courses in Mathematics, Physics, Engineering drawing, etc., for the students of diverse backgrounds.
- 2.5** The eligibility criteria such as marks, number of attempts and physical fitness shall be as prescribed by the Institution in adherence to the guidelines of regulatory authorities from time to time.
- 2.6** The eligibility and admission criteria prescribed by the respective programme regulating bodies shall be strictly followed for the selection and admission of candidates to the specific programmes.

3.0 BRANCHES OF STUDY

3.1 Regulations are applicable to the following B.Tech. Degree programmes in various branches of Engineering and Technology, each distributed over eight semesters, with two semesters per academic year.

1. Aeronautical Engineering
2. Artificial Intelligence and Data Science
3. Automobile Engineering
4. Biotechnology
5. Civil Engineering
6. Computer Science and Engineering
7. Computer Science and Engineering (Cyber Security)
8. Computer Science and Engineering (Internet of Things)
9. Computer Science and Engineering (Artificial Intelligence and Machine Learning)
10. Electrical and Electronics Engineering
11. Electronics and Communication Engineering
12. Electronics and Computer Engineering
13. Electronics and Instrumentation Engineering
14. Information Technology

15. Mechanical Engineering

16. Polymer Engineering

4.0 STRUCTURE OF THE PROGRAMME

4.1 Every programme has a curriculum with syllabi consisting of theory and practical courses as per AICTE such as,

- i) Basic Science Courses - BSC
- ii) Humanities and Social Sciences including Management Courses - HSC
- iii) Engineering Science Courses - ESC
- iv) Professional Core Courses - PCC
- v) Professional Elective Courses - PEC
- vi) Open Elective Courses - OEC
- vii) Laboratory Courses – LC
- viii) Laboratory Integrated Theory Courses – LITC
- ix) Mandatory Non Credit Courses- MNC
- x) Project - PROJ (Project work, seminar and internship in industry or at appropriate workplace)

4.1.1 Mandatory Induction Programme for First Year Students

The first year students upon admission shall undergo a mandatory three-week Induction programme consisting of physical activity, creative arts, universal human values, literary, proficiency modules, lectures by eminent people, visits to local areas, familiarization with departments / schools and centres, etc.,

4.1.2 Personality and Character Development

All students shall enroll, on admission, in any of the following personality and character development programmes or in departmental societies:

- National Cadet Corps (NCC)
- National Service Scheme (NSS)
- National Sports Organization (NSO)
- Youth Red Cross (YRC)

- Rotaract
- Crescent Indian Society Training Development (ISTD – C)
- Crescent Creative Strokes
- Crescent Technocrats club

The training activities / events / camp shall normally be organized during the weekends / vacation period.

4.1.3 Online Courses for Credit Transfer

Students are permitted to undergo department approved online courses under SWAYAM up to 40% of credits of courses in a semester excluding project semester with the recommendation of the Head of the Department / Dean of School and with the prior approval of Dean (Academic Affairs) during his / her period of study. The credits earned through online courses ratified by the respective Board of Studies shall be transferred following the due approval procedures. The online courses can be considered in lieu of core courses and elective courses.

4.1.4 Value Added Courses

The students are permitted to pursue department approved online courses (excluding courses registered for credit transfer) or courses offered / approved by the department as value added courses.

The details of the value added course viz., syllabus, schedule of classes and the course faculty shall be sent to the Dean (Academic Affairs) for approval. The students may also undergo the value added courses offered by other departments with the consent of the Head of the Department offering the course.

These value added courses shall be specified in the consolidated mark sheet as additional courses pursued by the student over and above the curriculum during the period of study.

4.1.5 Industry Internship

The students shall undergo training for a period as specified in the curriculum during the summer vacation in any industry relevant to the field of study.

The students are also permitted to undergo internship at research organizations / eminent academic institutions for the period prescribed in the curriculum during the summer vacation, in lieu of Industrial training.

In any case, the student shall obtain necessary approval from the Head of the Department / Dean of School and the training has to be taken up at a stretch.

4.1.6 Industrial Visit

The student shall undergo at least one industrial visit every year from the second year of the programme. The Heads of Departments / Deans of Schools shall ensure the same.

4.2 Each course is normally assigned certain number of credits:

- one credit per lecture period per week
- one credit per tutorial period per week
- one credit for two to three periods and two credits for four periods of laboratory or practical sessions per week
- one credit for two periods of seminar / project work per week
- one credit for two weeks of industrial training or 80 hours per semester.

4.3 Each semester curriculum shall normally have a blend of lecture courses, laboratory courses, laboratory integrated theory courses, etc.

4.4 The medium of instruction, examinations and project report shall be in English, except for courses in languages other than English.

5.0 DURATION OF THE PROGRAMME

5.1 A student is expected to complete the B.Tech. programme in eight semesters (six semesters in the case of lateral entry scheme), but in any case not more than 14 continuous semesters reckoned from the date of first admission (12 semesters in the case of lateral entry students).

5.2 Each semester shall consist of a minimum of 90 working days including the days of examinations.

5.3 The maximum duration for completion of the programme as mentioned in clause 5.1 shall also include period of break of study vide clause 7.1 so that the student may be eligible for the award of the degree.

6.0 REGISTRATION AND ENROLLMENT

6.1 The students of first semester shall register and enroll for courses at the time of admission by paying the prescribed fees. For the subsequent semesters registration for the courses shall be done by the student one week before the last working day of the previous semester.

6.2 Change of an Elective Course

A student can change an enrolled elective course within 10 working days from the commencement of the course, with the approval of the Dean (Academic Affairs), on the recommendation of the Head of the Department of the student.

6.3 Withdrawal from a Course

A student can withdraw from an enrolled course at any time before the first continuous assessment test for genuine reasons, with the approval of the Dean (Academic Affairs), on the recommendation of the Head of the Department of the student.

7.0 BREAK OF STUDY FROM PROGRAMME

7.1 A student may be allowed / enforced to take a break of study for two semesters from the programme with the approval of Dean (Academic Affairs) for the following reasons:

7.1.1 Medical or other valid grounds

7.1.2 Award of 'I' grade in all the courses in a semester due to lack of attendance

7.1.3 Debarred due to any act of indiscipline

- 7.2** The total duration for completion of the programme shall not exceed the prescribed maximum number of semesters (vide clause 5.1).
- 7.3** A student who has availed a break of study in the current semester (odd/even) can rejoin only in the subsequent corresponding (odd/even) semester in the next academic year on approval from the Dean (Academic affairs).
- 7.4** During the break of study, the student shall not be allowed to attend any regular classes or participate in any activities of the Institution. However, he / she shall be permitted to enroll for the 'I' grade courses and appear for the arrear examinations.

8.0 CLASS ADVISOR AND FACULTY ADVISOR

8.1 Class Advisor

A faculty member shall be nominated by the Head of the Department as class advisor for the class throughout the period of study except first year.

The class advisor shall be responsible for maintaining the academic, curricular and co-curricular records of students of the class throughout their period of study.

However, for the first and second semester, the class advisors (first year class advisors) are nominated by the first year coordinator.

8.2 Faculty Advisor

To help the students in planning their courses of study and for general counseling, the Head of the Department of the students shall attach a maximum of 20 students to a faculty member of the department who shall function as faculty advisor for the students throughout their period of study. Such faculty advisor shall guide the students in taking up the elective courses for registration and enrolment in every semester and also offer advice to the students on academic and related personal matters.

9.0 COURSE COMMITTEE

9.1 Each common theory course offered to more than one group of students shall have a “Course Committee” comprising all the course faculty teaching the common course with one of them nominated as a course coordinator. The nomination of the course coordinator shall be made by the Head of the Department / Dean (Academic Affairs) depending on whether all the course faculty teaching the common course belong to a single department or from several departments. The course committee shall ensure preparation of a common question paper and scheme of evaluation for the tests and semester end examination.

10.0 CLASS COMMITTEE

A class committee is constituted branch wise and semester wise by the Head of the Department / Dean of the School shall normally comprise of faculty members handling the courses, student representatives and a senior faculty member not handling any courses for that class as chairman.

10.1 The composition of class committees for first and second semester is as follows:

- i) The first year coordinator shall be the chairman of the class committee
- ii) Faculty members of all individual courses of first / second semester
- iii) Six student representatives (male and female) of each class nominated by the first year coordinator
- iv) The class advisor and faculty advisors of the class

10.2 The composition of the class committee for each branch from 3rd to 8th semester is as follows:

- i) One senior faculty member preferably not handling courses for the concerned semester appointed as chairman by the Head of the Department
- ii) All the faculty members handling courses of the semester

- iii) Six student representatives (male and female) of each class nominated by the Head of the Department in consultation with the relevant faculty advisors
- iv) All faculty advisors and the class advisors
- v) Head of the Department

10.3 The class committee shall meet at least three times during the semester. The first meeting shall be held within two weeks from the date of commencement of classes, in which the components of continuous assessment for various courses and the weightages for each component of assessment shall be decided for the first and second assessment. The second meeting shall be held within a week after the date of first assessment report, to review the students' performance and for follow up action.

10.4 During these two meetings, the student members shall meaningfully interact and express opinions and suggestions to improve the effectiveness of the teaching-learning process, curriculum and syllabi, etc.

10.5 The third meeting of the class committee, excluding the student members, shall meet after the semester end examinations to analyse the performance of the students in all the components of assessments and decide their grades in each course. The grades for a common course shall be decided by the concerned course committee and shall be presented to the class committee(s) by the course faculty concerned.

11.0 CREDIT LIMIT FOR ENROLLMENT & MOVEMENT TO HIGHER SEMESTER

11.1 A student can enroll for a maximum of 36 credits during a semester including Redo / Predo courses.

11.2 The minimum credits earned by the student to move to 7th semester shall not be less than 60 credits (40 credits for lateral entry

students).

12.0 ASSESSMENT PROCEDURE AND PERCENTAGE WEIGHTAGE OF MARKS

12.1 Every theory course shall have a total of three assessments during a semester as given below:

Assessments	Course Coverage in Weeks	Duration	Weightage of Marks
Assessment 1	1 to 6	1.5 hours	25%
Assessment 2	7 to 12	1.5 hours	25%
Semester End Examination	Full course	3 hours	50%

12.2 Theory Course

Appearing for semester end theory examination for each course is mandatory and a student shall secure a minimum of 40% marks in each course in semester end examination for the successful completion of the course.

12.3 Laboratory Course

Every practical course shall have 60% weightage for continuous assessments and 40% for semester end examination. However, a student shall have secured a minimum of 50% marks in the semester end practical examination for the award of pass grade.

12.4 Laboratory Integrated Theory (LIT) Courses

For laboratory integrated theory courses, the theory and practical components shall be assessed separately for 100 marks each and consolidated by assigning a weightage of 75% for theory component and 25% for practical component (for a 4 credit LIT course). Grading shall be done for this consolidated mark. Assessment of theory components shall have a total of three assessments with two continuous assessments carrying 25% weightage each and semester end examination carrying 50% weightage. The student shall secure a separate minimum of 40% in

the semester end theory examination. The evaluation of practical components shall be through continuous assessment.

Component	Maximum Marks	Weightage for Final Grade	Mode of Assessment
Theory Component	100	75%	CAT1 (25%) + CAT2 (25%) + SEE (50%)
Practical Component	100	25%	Continuous assessment only
Final Grade Basis	Consolidated	100%	75% Theory + 25% Practical
Pass Requirement	-	-	Minimum 40% in Semester-End Theory Exam (SEE)

Note:

1. Proportionate weightage shall be assigned to LIT courses based on their credit value, whether 2 or 3 credits.
2. In Lab-Integrated Professional Elective courses, the laboratory component shall be assessed by the course faculty.

12.5 The components of continuous assessment for theory / practical / laboratory integrated theory courses shall be finalized in the first class committee meeting.

12.6 Industry Internship

In the case of industry internship, the student shall submit a report, which shall be evaluated along with an oral examination by a committee of faculty members constituted by the Head of the Department. The student shall also submit an internship completion certificate issued by the industry / research / academic organisation. The weightage of marks for industry internship report and viva voce examination shall be 60% and 40% respectively.

12.7 Project Work (Mini and Capstone Project)

Mini project work, shall be carried out individually or as a group

activity involving a maximum of four students.

Each group shall identify a suitable topic within their domain, either disciplinary or interdisciplinary, based on the students' abilities and in consultation with the faculty mentor. The topic must lead to the development of a small-scale system or application.

The progress of the mini project shall be evaluated through three periodic reviews: two interim reviews and one final review. A project report shall be submitted by the end of the semester. The reviews shall be conducted by a committee of faculty members constituted by the Head of the Department / Dean of the School.

An oral examination (viva voce) shall be conducted as the semester-end examination by an internal examiner approved by the Controller of Examinations, based on the project report.

The weightage for assessment shall be as follows:

- Periodic Reviews: 50%
 - 25% by the Project Guide
 - 25% by the Review Committee
- Project Report: 20%
- Viva Voce Examination: 30%

In the case of capstone project work, the project shall be carried out individually or as a group activity, involving a maximum of three or four students.

A committee of faculty members, constituted by the Head of the Department / Dean of the School, shall conduct three periodic reviews during the semester to monitor and assess the progress of the project.

At the end of the semester, students shall submit a project report, based on which a semester-end oral examination (viva voce) shall be conducted by an external examiner approved by the Controller of Examinations.

The assessment weightage shall be as follows:

- Periodic Reviews – 50%

- 25% by the Project Guide
- 25% by the Review Committee
- Project Report – 20%
- Viva Voce Examination – 30%.

12.8 Assessment of seminars and comprehension shall be carried out by a committee of faculty members constituted by the Head of the Department.

12.9 For the first attempt of the arrear theory examination, the internal assessment marks scored for a course during first appearance shall be used for grading along with the marks scored in the arrear examination. From the subsequent appearance onwards, full weightage shall be assigned to the marks scored in the semester end examination and the internal assessment marks secured during the course of study shall become invalid.

In case of laboratory integrated theory courses, after one regular and one arrear appearance, the internal mark of theory component is invalid and full weightage shall be assigned to the marks scored in the semester end examination for theory component. **There shall be no arrear or improvement examination for lab components.**

13.0 SUBSTITUTE EXAMINATIONS

13.1 A student who is absent, for genuine reasons, may be permitted to write a substitute examination for any one of the two continuous assessment tests of a course by paying the prescribed substitute examination fee. However, permission to take up a substitute examination will be given under exceptional circumstances, such as accidents, admission to a hospital due to illness, etc. by a committee constituted by the Head of the Department / Dean of the School for that purpose. There is no substitute examination for semester end examinations.

13.2 A student shall apply for a substitute exam in the prescribed form to the Head of the Department / Dean of the School within a week

from the date of assessment test. However, the substitute examination will be conducted only after the last instructional day of the semester.

14.0 ATTENDANCE REQUIREMENT AND SEMESTER / COURSE REPETITION

14.1 A student shall earn 100% attendance in the scheduled contact hours (such as lectures, tutorials, labs, etc.) for that course. However, a **relaxation** of up to 25% in attendance may be granted to account for valid reasons such as medical emergencies, participation in co-curricular or extracurricular activities with prior approval, or other genuine circumstances.

If a student's attendance falls below 75% in a particular course, even after considering the permissible relaxation, they will not be allowed to appear for the semester-end examination in that course. Instead, the student will be awarded an "I" grade (Incomplete) for the course.

14.2 The faculty member of each course shall cumulate the attendance details for the semester and furnish the names of the students who have not earned the required attendance in the concerned course to the class advisor. The class advisor shall consolidate and furnish the list of students who have earned less than 75% attendance, in various courses, to the Dean (Academic Affairs) through the Head of the Department / Dean of the School. Thereupon, the Dean (Academic Affairs) shall officially notify the names of such students prevented from writing the semester end examination in each course.

14.3 If a student's attendance in any course falls between 65% and 75% due to medical reasons (e.g., hospitalization, illness) or participation in institution-approved events, they may be granted exemption from the minimum attendance requirement and allowed to appear for the semester-end exam. The student must submit valid documents to the

class advisor upon rejoining, with approval from the HoD/Dean. Final approval for **condonation** will be granted by the Vice Chancellor based on the Dean (Academic Affairs)'s recommendation.

- 14.4** A student who has obtained an “I” grade in all the courses in a semester is not permitted to move to the next higher semester. Such students shall **repeat** all the courses of the semester in the subsequent academic year.
- 14.5** The student awarded “I” grade, shall enroll and repeat the course when it is offered next. In case of “I” grade in an elective course either the same elective course may be repeated or a new elective course may be taken with the approval of the Head of the Department / Dean of the School.
- 14.6** A student who is awarded “U” grade in a course shall have the option to either write the semester end arrear examination at the end of the subsequent semesters, or to **redo** the course when the course is offered by the department. Marks scored in the continuous assessment in the redo course shall be considered for grading along with the marks scored in the semester end (redo) examination. If any student obtains “U” grade in the redo course, the marks scored in the continuous assessment test (redo) for that course shall be considered as internal mark for further appearance of arrear examination.
- 14.7** If a student with “U” grade, who **prefers to redo** any particular course, fails to earn the minimum 75% attendance while doing that course, then he / she is not permitted to write the semester end examination and his / her earlier “U” grade and continuous assessment marks shall continue.

15.0 REDO / PRE-DO COURSES

- 15.1** A student can register for a maximum of three redo courses per semester without affecting the regular semester classes, whenever such courses are offered by the concerned department, based on

the availability of faculty members and subject to a specified minimum number of students registering for each of such courses.

15.2 The number of contact hours and the assessment procedure for any redo course shall be the same as regular courses, except there is **no provision for any substitute examination and withdrawal from a redo course.**

15.3 A student shall be permitted to pre-do a course offered by the concerned department, provided it does not affect the regular semester class schedule. Such permission shall be granted based on the availability of faculty members, the maximum permissible credit limit of the semester, and the student's fulfillment of the necessary prerequisites for the course. The proposal shall be recommended by the Dean of the School and the Head of the Department, and shall require final approval from the Dean (Academic Affairs).

16.0 PASSING AND DECLARATION OF RESULTS AND GRADE SHEET

16.1 All assessments of a course shall be made on absolute marks basis.

The class committee without the student members shall meet to analyse the performance of students in all assessments of a course and award letter grades following the relative grading system. The letter grades and the corresponding grade points are as follows:

Letter Grade	Grade Points
S	10
A	9
B	8
C	7
D	6
E	5
U	0
W	-
I	-

PA	-
FA	-

- "W"- denotes withdrawal from the course
- "I" - denotes "Incomplete" ie. inadequate attendance in the course and prevention from appearance of semester end examination
- "U" - denotes unsuccessful performance in the course.
- "PA" - denotes the 'Pass' of the zero credit courses.
- "FA" - denotes the 'Fail' of the zero credit courses.

16.2 A student who earns a minimum of five grade points ('E' grade) in a course is declared to have successfully completed the course. Such a course cannot be **repeated by the student for improvement of grade.**

16.3 Upon awarding grades, the results shall be endorsed by the chairman of the class committee and Head of the Department / Dean of the School. The Controller of Examinations shall further approve and declare the results.

16.4 Within one week from the date of declaration of result, a student can apply for revaluation of his / her semester end theory examination answer scripts of one or more courses, on payment of prescribed fee, through proper application to the Controller of Examinations. Subsequently, the Head of the Department / Dean of the School offered the course shall constitute a revaluation committee consisting of chairman of the class committee as convener, the faculty member of the course and a senior faculty member having expertise in that course as members. The committee shall meet within a week to revalue the answer scripts and submit its report to the Controller of Examinations for consideration and decision.

16.5 After results are declared, grade sheets shall be issued to each student, which contains the following details: a) list of courses

enrolled during the semester including redo courses / arrear courses, if any; b) grades scored; c) Grade Point Average (GPA) for the semester and d) Cumulative Grade Point Average (CGPA) of all courses enrolled from the first semester onwards.

GPA is the ratio of the sum of the products of the number of credits of courses registered and the grade points corresponding to the grades scored in those courses, taken for all the courses, to the sum of the number of credits of all the courses in the semester.

If C_i is the number of credits assigned for the i^{th} course and GP_i is

$$GPA = \frac{\sum_{i=1}^n (C_i)(GP_i)}{\sum_{i=1}^n C_i}$$

the Grade Point in the i^{th} course,

Where n = number of courses

The Cumulative Grade Point Average (CGPA) is calculated in a similar manner, considering all the courses enrolled from first semester.

“I”, “W”, “PA” and “FA” grades are excluded for calculating GPA.

“U”, “I”, “W”, “PA” and “FA” grades are excluded for calculating CGPA.

The formula for the conversion of CGPA to equivalent percentage of marks shall be as follows:

Percentage equivalent of marks = CGPA X 10

16.6 After successful completion of the programme, the degree shall be awarded to the students with the following classifications based on CGPA.

Classification	CGPA
First Class with Distinction	8.50 and above and passing all the courses in first appearance and completing the programme within the prescribed period of 8 semesters for all students (except lateral entry students) and 6 semesters for lateral

	entry students
First Class	6.50 and above and completing the programme within a maximum of 10 semesters for all students (except lateral entry students) and 8 semesters for lateral entry students
Second Class	Others

16.6.1 Eligibility for First Class with Distinction

- A student should not have obtained 'U' or 'I' grade in any course during his/her study
- A student should have completed the UG programme within the minimum prescribed period of study (except clause 7.1.1)

16.6.2 Eligibility for First Class

- A student should have passed the examination in all the courses not more than two semesters beyond the minimum prescribed period of study (except clause 7.1.1)

16.6.3 The students who do not satisfy clause 16.6.1 and clause 16.6.2 shall be classified as second class.

16.6.4 The CGPA shall be rounded to two decimal places for the purpose of classification. The CGPA shall be considered up to three decimal places for the purpose of comparison of performance of students and ranking.

17.0 SUPPLEMENTARY EXAMINATION

Final year students and passed out students can apply for supplementary examination for a maximum of **three** courses thus providing an opportunity to complete their degree programme. Likewise, students with less credits in VI semester can also apply for supplementary examination for a maximum of **three** courses to enable them to earn minimum credits to move to higher semester. The students can apply for supplementary examination within three

weeks of the declaration of results in the **even semester**.

18.0 DISCIPLINE

18.1 Every student is expected to observe discipline and decorum both inside and outside the campus and not to indulge in any activity which tends to affect the reputation of the Institution.

18.2 Any act of indiscipline of a student, reported to the Dean (Student Affairs), through the Head of the Department / Dean of the School concerned shall be referred to a Discipline and Welfare Committee constituted by the Registrar for taking appropriate action.

19.0 MULTI ENTRY AND MULTI EXIT (MEME) FRAMEWORK

In accordance with the provisions of the National Education Policy (NEP) 2020, the programme shall support a Multi Entry – Multi Exit (ME-ME) framework to provide flexibility in the academic pathway of students.

19.1 Exit Option:

19.1.1 Credit Requirement for Award of B.Tech. Degree

To qualify for the award of a B.Tech. degree from the Institute, a student must successfully complete the total credit requirements as prescribed in the approved curriculum of the respective programme. The specific credit requirements are determined by the programme curriculum.

19.1.2 Provision for Multiple Exit

In alignment with NEP 2020 guidelines, the Institute provides students enrolled in undergraduate programmes with the option of multiple exits, subject to the following conditions:

a. Exit at the End of First or Second Year

Students may choose to exit the programme at the end of either the first year or the second year, provided they have fulfilled the prescribed academic requirements.

b. Application for Exit

A student intending to exit must submit a formal written application in the prescribed format at least **eight weeks prior to the scheduled end of the academic year.**

c. Departmental Recommendation

1. Upon receipt of the application, the concerned Department shall evaluate the academic record of the student and recommend the award of a **Certificate or Diploma** as applicable, based on the credits earned.
2. In the case of arrear courses, the Certificate/Diploma will be conferred only after successful clearance of all pending arrears.

d. Notification of Completion

Once a student has fulfilled the requirements for the award of Certificate/Diploma, the Department shall notify the same to Controller of Examinations for further processing and issuance.

19.1.3 Award of Qualifications under Multiple Exit Scheme

1. **Certificate:** Awarded after successful completion of the first year, subject to earning the minimum prescribed first-year credits as per respective curriculum along with a **3-credit Skill Based Course.**
2. **Diploma:** Awarded after successful completion of the second year, subject to earning the minimum prescribed cumulative credits as per the respective curriculum (e.g., 44 credits from the first year + 42 credits from the second year) along with **6 credits of Skill Based Courses.**

19.1.4 Conditions Governing Exit

1. The multiple exit facility is intended strictly for **genuine and exceptional circumstances**, such as prolonged illness, or

securing an employment opportunity necessitating a temporary withdrawal from the programme.

2. Students opting for a temporary exit after the first or second year must obtain **prior approval from the Registrar through the Dean (Academics)**, based on the recommendation of the respective Head of the Department.

19.1.5 Expectation of Programme Continuity

While the option for multiple exits exists, it is generally expected that students admitted to a B.Tech. programme shall pursue their studies continuously until completion of the final degree requirements.

19.2. Entry Option:

Students seeking re-entry into the programme (multi-entry) must submit an application through the proper channel at the beginning of the odd semester. Admission shall be subject to fulfilment of institutional guidelines, credit mapping, and availability of seats.

19.3. Credits Requirement for the Certifications:

Name of the Certificate Programme	Required
Certificate (Level 4.5 as per NEP 2020)	40* - 45
Diploma (Level 5 as per NEP 2020)	80* - 87

* The minimum number of credits that a student must earn (as per the respective curriculum) in order to get the above certification program.

20 ELIGIBILITY FOR THE AWARD OF DEGREE

20.1 A student shall be declared to be eligible for the award of B.Tech. degree provided the student has:

20.1.1 Successfully earned the required number of total credits as specified in the curriculum of the programme of study within a maximum period of 14 semesters (12 semesters for lateral entry)

from the date of admission, **including break of study**.

20.1.2 Successfully completed the requirements of the enrolled professional development activity through various institute level clubs or department level membership in societies.

20.1.3 No dues to the Institution, Library, Hostel, etc.

20.1.4 No disciplinary action pending against him/her.

20.2 The award of the degree must have been approved by the Institution.

21 MINOR DEGREE PROGRAMMES OFFERED FOR STUDENTS

21.1 The students admitted in the following B.Tech. programmes can graduate with a minor degree, which is optional, along with a major degree.

21.2 The eligibility for choosing the minor degree is given as below:

Sl. No.	Minor Degree	Eligible Major Degree Programmes (from other Departments)	Offering Dept.
1.	Artificial Intelligence and Machine Learning	Mechanical Engineering Aeronautical Engineering Polymer Engineering Automobile Engineering	CSE
2.	Block Chain	Civil Engineering	CSE
3.	Cyber Security	Biotechnology	IT
4.	Data Science	Electrical and Electronics Engg.	CSE
5.	Internet of Things (IoT)	Electronics and Instrumentation Engg.	ECE

Sl. No.	Minor Degree	Eligible Major Degree Programmes (from other Departments)	Offering Dept.
6.	Virtual & Augmented Reality	Mechanical Engineering Aeronautical Engineering Polymer Engineering Automobile Engineering Civil Engineering Biotechnology Electrical and Electronics Engg. Electronics and Instrumentation Engg. Electronics and Communication Engg.	CSE
7.	Sensor Technology	Mechanical Engineering Aeronautical Engineering Polymer Engineering Automobile Engineering Civil Engineering Biotechnology Electrical and Electronics Engg.	IT
8.	Robotics	Artificial Intelligence and Data Science Computer Science and Engg. (AIML) Computer Science and Engg.(CS) Computer Science and Engg.(IoT) Computer Science and Engineering Information Technology Civil Engineering Biotechnology Electrical and Electronics Engg. Electronics and Instrumentation Engg.	Mech.

Sl. No.	Minor Degree	Eligible Major Degree Programmes (from other Departments)	Offering Dept.
9.	3D Printing	Artificial Intelligence and Data Science Computer Science and Engineering Computer Science and Engg. (AIML) Computer Science and Engg. (CS) Computer Science and Engg. (IoT) Information Technology Biotechnology Electrical and Electronics Engg. Electronics and Instrumentation Engg. Electronics and Communication Engg.	Mech.
10.	Electric Vehicles	Artificial Intelligence and Data Science Computer Science and Engineering Computer Science and Engg.(AIML) Computer Science and Engg.(CS) Computer Science and Engg. (IoT) Information Technology Civil Engineering Biotechnology Electronics and Communication Engg.	EEE
11.	Industrial Automation	Artificial Intelligence and Data Science Computer Science and Engineering Computer Science and Engg. (AIML) Computer Science and Engg. (CS) Computer Science and Engg. (IoT) Computer Science and Engineering Information Technology Mechanical Engineering Aeronautical Engineering Polymer Engineering	EIE

Sl. No.	Minor Degree	Eligible Major Degree Programmes (from other Departments)	Offering Dept.
		Automobile Engineering Civil Engineering Biotechnology Electronics and Communication Engg.	
12.	GIS and Remote Sensing	Artificial Intelligence and Data Science Computer Science and Engg. (AIML) Computer Science and Engg. (CS) Computer Science and Engg. (IoT) Computer Science and Engineering Information Technology Mechanical Engineering Aeronautical Engineering Polymer Engineering Automobile Engineering Biotechnology Electrical and Electronics Engg. Electronics and Instrumentation Engg. Electronics and Communication Engg.	Civil
13.	Computational Biology	Artificial Intelligence and Data Science Computer Science and Engineering Computer Science and Engg. (AIML) Computer Science and Engg. (CS) Computer Science and Engg. (IoT) Information Technology Mechanical Engineering Aeronautical Engineering Polymer Engineering Automobile Engineering Civil Engineering Electrical and Electronics Engg.	Life Sciences

Sl. No.	Minor Degree	Eligible Major Degree Programmes (from other Departments)	Offering Dept.
		Electronics and Instrumentation Engg. Electronics and Communication Engg.	

21.3 A student shall earn an additional 18 to 20 credits for the award of a minor degree.

21.4 A student shall be awarded a minor degree only when he / she completes the requirements for the award of major degree stipulated in the respective programme.

22 POWER TO MODIFY

Notwithstanding all that has been stated above, the Academic Council has the right to modify the above regulations from time to time.

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**B.S. ABDUR RAHMAN CRESCENT INSTITUTE OF SCIENCE AND
TECHNOLOGY**

**B.TECH. CIVIL ENGINEERING
CURRICULUM & SYLLABI, REGULATIONS 2025**

(Choice Based Credit System)

I – SEMESTER

S. No	Course Category	Course Code	Course Title	L	T	P	C
1.	HSC	ENE 1181	English for Engineers	3	0	0	3
2.	BSC	MAE 1181	Matrices and Differential Calculus	3	1	0	4
3.	BSC	CHE 1181	Chemistry for Engineering Applications	3	0	2	4
4.	ESC	GEE 1101	Engineering Graphics	2	0	2	3
5.	ESC	GEE 1102	Design thinking	3	0	0	3
6.	ESC	GEE 1103	Digital Manufacturing and Fabrication Laboratory	0	0	2	1
7.	ESC	GEE 1104	Programming for problem solving	2	0	2	3
8.	MNC	GEE 1105	Environmental Sciences (MNC – I)	2	0	0	0
Credits							21

II – SEMESTER

S. No	Course Category	Course Code	Course Title	L	T	P	C
1.	HSC	MAE 1282	Transforms and its Applications	3	1	0	4
2.	BSC	CEE 1201	Solid Mechanics	3	0	2	4
3.	ESC	GEE 1201	Basic Mechanical and Electrical Engineering	2	0	2	3
4.	ESC	MEE 1201	Engineering Mechanics	2	1	2	4
5.	PCC	CEE 1202	Construction Materials and Practices	3	0	2	4
6.	HSC	GEE 1205	Universal Human Values (Humanities -I)	2	0	0	2
Credits							21

III - SEMESTER

S. No	Course Category	Course code	Course Title	L	T	P	C
1.	BSC		Mathematics-III	3	1	0	4
2.	HSC		Humanities Elective - II	3	0	0	3
3.	PCC	CEE 2101	Basics of Building Planning and Design	3	0	0	3
4.	PCC	CEE 2102	Mechanics of Structures	3	0	0	3
5.	PCC	CEE 2103	Surveying and Levelling	3	0	2	4
6.	PCC	CEE 2104	Concrete Technology	3	0	0	3
7.	PCC	CEE 2105	Computer Aided Building Drawing	0	0	2	1
8.	HSC	GEE 2101	Soft Skills – I	0	0	2	1
9.	MNC	GEE 2102	Indian Constitution (MNC-II)	2	0	0	0
10.	PCC		Skill Development Courses*	3	0	0	3*
Credits							22

IV – SEMESTER

S. No	Course Category	Course Code	Course Title	L	T	P	C
1.	PCC	CEE 2201	Structural Analysis I	3	0	0	3
2.	PCC	CEE 2202	Soil Mechanics	3	0	2	4
3.	PCC	CEE 2203	Fluid Mechanics	3	0	0	3
4.	PCC	CEE 2204	Transportation Engineering	3	0	0	3
5.	PCC	CEE 2205	Concrete and Highway Engineering Laboratory	0	0	2	1
6.	PEC		Programme Elective - I	3	0	0	3
7.	OEC		Open Elective – I	3	0	0	3
8.	PROJ	CEE 2206	Mini Project I (Survey and Soil Investigation Camp)	0	0	4	2
9.	HSC	GEE 2201	Soft Skills - II	0	0	2	1
10.	MNC	GEE 2202	IKS Course (MNC -III)	2	0	0	0
11.	PCC		Skill Development Courses *				3*
Credits							23

* (Applicable only for Exit category)

V – SEMESTER

S. No	Course Category	Course Code	Course Title	L	T	P	C
1.	PCC	CEE 3101	Structural Analysis II	3	0	0	3
2.	PCC	CEE 3102	Design of RC Structures	3	0	0	3
3.	PCC	CEE 3103	Foundation Engineering	3	0	0	3
4.	PCC	CEE 3104	Water and Wastewater Engineering	3	0	0	3
5.	PEC		Program Elective – II	3	0	0	3
6.	PEC		Program Elective - III	3	0	0	3
7.	PCC	CEE 3105	Environmental Engineering Laboratory	0	0	2	1
8.	HSC	GEE 3101	Soft Skills – III	0	0	2	1
9.	INT	CEE 3106	Internship - I ^{\$}	0	0	0	1
Credits							21

VI – SEMESTER

S. No	Course Category	Course code	Course Title	L	T	P	C
1.	HSC	MSE 3181	Fundamentals of Entrepreneurship	2	0	2	3
2.	PCC	CEE 3201	Design of Steel Structures	3	1	0	4
3.	PCC	CEE 3202	Estimation and Costing	3	0	2	4
4.	PCC	CEE 3203	Construction Management	3	0	0	3
5.	PCC	CEE 3204	Structural Design Laboratory	0	0	2	1
6.	PEC		Program Elective - IV	3	0	0	3
7.	OEC		Open Elective II	3	0	0	3
8.	HSC	GEE 3201	Soft Skills – IV	0	0	2	1
Credits							22

VII – SEMESTER

S. No	Course Category	Course Code	Course Title	L	T	P	C
1.	PCC	CEE 4101	Hydraulic and Hydraulic Machinery	3	0	2	4
2.	PCC	CEE 4102	Building Information Modelling Studio	0	0	4	2
3.	PEC		Program Elective - V	3	0	0	3
4.	PEC		Program Elective - VI	3	0	0	3
5.	PEC		Program Elective - VII	3	0	0	3
6.	OEC		Open Elective III	3	0	0	3
7.	PROJ	CEE 4103	Mini Project - II (Estimation/Design/Software Based)	0	0	6	3
8.	INT	CEE 4104	Internship – II \$	0	0	0	1
Credits							22

VIII – SEMESTER

S. No	Course Category	Course Code	Course Title	L	T	P	C
1.	PROJ	CEE 4201	Capstone Project	0	0	18	9
Credits							9

Total Credits - 161

\$ 15 days of Industrial training during the summer vacation of second year and third year. The credit will be awarded in the 5th and 7th semester.

Programme Electives: Structural Engineering

S. No	Course Category	Course code	Course Title	L	T	P	C
1.	PE	CEEX 01	Advanced Structural Analysis	3	0	0	3
2.	PE	CEEX 02	Advanced Design of RC Structures	3	0	0	3
3.	PE	CEEX 03	Prestressed Concrete Structures	3	0	0	3
4.	PE	CEEX 04	Design of Precast Concrete Buildings	3	0	0	3
5.	PE	CEEX 05	Seismic Resistant Design of Structures	3	0	0	3
6.	PE	CEEX 06	Bridge Engineering	3	0	0	3
7.	PE	CEEX 07	Advanced Design of Steel Structures	3	0	0	3
8.	PE	CEEX 08	Applications of AI in Structural Engineering	3	0	0	3

Programme Electives: Construction Engineering, Technology and Management

S. No	Course Category	Course code	Course Title	L	T	P	C
1.	PE	CEEX 11	Repair and Rehabilitation of Constructed Facilities	3	0	0	3
2.	PE	CEEX 12	Waterproofing of RC Buildings	3	0	0	3
3.	PE	CEEX 13	Corrosion Protection of RC Structures	2	0	2	3
4.	PE	CEEX 14	Lean Construction	3	0	0	3
5.	PE	CEEX 15	Automation in Construction	3	0	0	3
6.	PE	CEEX 16	Real Estate Management	3	0	0	3
7.	PE	CEEX 17	MEP Facilities Management	3	0	0	3
8.	PE	CEEX 18	Sustainable Materials and Green Buildings	3	0	0	3

Programme Electives: Geotechnical Engineering and Transportation Engineering

S. No	Course Category	Course Code	Course Title	L	T	P	C
1.	PE	CEEX 21	Engineering Geology	3	0	0	3
2.	PE	CEEX 22	Ground Improvement Techniques	3	0	0	3
3.	PE	CEEX 23	Pavement Engineering	3	0	0	3
4.	PE	CEEX 24	Geo-Environmental Engineering	3	0	0	3
5.	PE	CEEX 25	Urban Planning and Design	3	0	0	3
6.	PE	CEEX 26	Smart Cities	3	0	0	3
7.	PE	CEEX 27	Intelligent Transportation Systems	3	0	0	3
8.	PE	CEEX 28	Airport, Railway and Harbour Engineering	3	0	0	3

Programme Electives: Water Resources and Environmental Engineering

S. No	Course Category	Course code	Course Title	L	T	P	C
1.	PE	CEEX 31	Water Resources Engineering *	3	0	0	3*
2.	PE	CEEX 32	Hydrology	3	0	0	3
3.	PE	CEEX 33	Stormwater and Flood Management	3	0	0	3
4.	PE	CEEX 34	Design of Hydraulic Structures	2	0	2	3
5.	PE	CEEX 35	Air and Noise Pollution Control	3	0	0	3
6.	PE	CEEX 36	Solid Waste and Hazardous Waste Management	3	0	0	3
7.	PE	CEEX 37	Environmental Impact and Risk Assessment	3	0	0	3
8.	PE	CEEX 38	Industrial Waste Water Treatment	3	0	0	3
9.	PE	CEEX 39	Industrial Health Safety	3	0	0	3

Programme Electives: Architecture and Advanced Surveying

S. No	Course Category	Course code	Course Title	L	T	P	C
1.	PE	CEEX 41	Principles of Architecture	3	0	0	3
2.	PE	CEEX 42	Islamic Architecture	3	0	0	3
3.	PE	CEEX 43	Sustainable Habitat	3	0	0	3
4.	PE	CEEX 44	Applications of AI in Built Environment	3	0	0	3
5.	PE	CEEX 45	Remote Sensing Techniques and Applications	3	0	0	3
6.	PE	CEEX 46	GIS and its Applications	2	0	2	3
7.	PE	CEEX 47	GPS and Drone Surveying	3	0	0	3
8.	PE	CEEX 48	Spatial Data Modeling and Analysis	3	0	0	3

SEMESTER I

ENE 1181	ENGLISH FOR ENGINEERS	L	T	P	C
SDG: 4		3	0	0	3

COURSE OBJECTIVES:

- COB1:** To develop students' listening skills through exposure to diverse media and enhance comprehension and contextual understanding.
- COB2:** To enable students to speak effectively in a range of informal and formal contexts.
- COB3:** To make them analyze academic and technical texts using structured reading techniques.
- COB4:** To enable them to produce organized, purposeful writing for academic and technical use.
- COB5:** To equip students with appropriate use of grammar, and technical and academic vocabulary.

MODULE I**L: 10**

L: Listening to short audio-formal & informal conversations - Select episodes from *Learn English Podcasts*, British Council

S: Self Introduction - Present, Past, and Future framework (suggested by Harvard Business Review)

R: Process of reading: Skimming & Scanning, SQ3R

W: Technical Writing- Developing hints, Paragraph Writing (technical)

Grammar & Vocabulary: Prefixes & Suffixes, Articles, Present tense, Prepositions, Subject – Verb Agreement

MODULE II**L: 10**

L: Listening to podcasts - 1. "The impact of online abuse" from *Tech Life*, BBC sounds, 2. How can AI support designers? from *Technology Podcast*.

S: Telephonic conversations (Enquiring & Complaining)

R: Reading long technical texts - Comprehension passages - Select articles from *IEEE Spectrum*, *Techcrunch.com*

W: Jumbled sentences, Process description– Interpretation of Flow chart, Bar chart, Dialogue writing

Grammar & Vocabulary: Transition words, Past tense, Conjunctions, Wh /Yes or No questions, Modal verbs

MODULE III**L: 9**

L: Listening to TED / INK Talks - 1. "The next computer? Your glasses" - Shahramlzadi (TED Talk) 2. "The Society is our Lab" - Sanjay Podder (INK Talk)

S: Extempore-One minute presentation

R: Reading biography (Extracts from 'Profiles', The Hindu, Sunday Edition) / Autobiography / Fiction & Note- making

W: Letter seeking permission for Industrial Visit / symposium, Letter of invitation

Grammar & Vocabulary: Homonyms, Degrees of comparison, Future tense

L: 8**MODULE IV**

L: Listening to debates & discussions - 1. "Hydrogen vs Battery: The Future of Our Transport", "2. "Saudi Arabia's Economic Shift to Green Energy" from *The Gen-Z Debate* Podcast.

S: Group presentation on general topics

R: Reading magazines and articles (extracts from 'Sci-Tech', The Hindu, Sunday Edition)

W: Report writing (Industrial visit report), Argumentative writing

Grammar & Vocabulary: Active, Passive & Impersonal passive voice, Phrasal verbs

L: 8**MODULE V**

L: Listening to famous speeches - 1. "Commencement Address at Stanford University" by Steve Jobs 2. "The Voice of Women" by Tejaswini Manogna

S: Debates on Contemporary issues (Agreeing & Disagreeing)

R: Blogs - Articles on Technology, Workforce and Industries from *Deloitte Insights*

W: Book Reviews, Product reviews: Select reviews from "theverge.com"

Grammar & Vocabulary: If clauses, Idioms & Phrases

L: 45 ; Total Hours: 45**TEXT BOOKS:**

1. Course material by the Department of English

REFERENCES:**Books:**

- 1) Bailey, Stephen. *Academic Writing: A Practical Guide for Students*. New York: Routledge, 2011.
- 2) Dutt, P. Kiranmai & Rajeevan, Geeta. *Basic Communication Skills*. Foundation Books, 2013
- 3) Firth, Matt, Sowton, Chris, et al. *Academic English: An Integrated Skills Course for EAP*. Cambridge University Press, Cambridge, 2012.
- 4) Perry, Carol Rosenblum. *The Fine Art of Technical Writing*. Create Space Independent Publishing Platform, New Delhi, 2011.
- 5) Raman, Meenakshi & Sharma, Sangeeta. *Professional English*. Oxford University Press, First Edition, 2018.
- 6) *Using English: A Coursebook for Undergraduate Engineers and Technologists*. Orient Black Swan Limited, Hyderabad, 2015.

Podcasts:

- 1) BBC Sounds - Tech Life - available episodes. (n.d.).
BBC <https://www.bbc.co.uk/sounds/brand/p01plr2p>
- 2) Podcasts | LearnEnglish. (n.d.).
LearnEnglish. <https://learnenglish.britishcouncil.org/general-english/audio-series/podcasts>
- 3) Podcasts from The Verge | The Verge. <https://www.theverge.com/podcasts>
- 4) *Saudi Arabia's economic shift to green energy*. (2022, July 29). Spotify.
<https://open.spotify.com/episode/2vjpyVMPjxEswgPxiSoG25>
- 5) Technology Podcast. (n.d.). Thoughtworks. <https://www.thoughtworks.com/en-in/insights/podcasts/technology-podcasts>
- 6) *The Gen-Z debate*. (n.d.). Spotify.
<https://open.spotify.com/show/0ngu1lheqit2yGWI7c575T>

Reviews:

- 1) Reviews. (2001, May 24). The Verge. <https://www.theverge.com/reviews>

Famous Speeches:

- 1) Stanford. (2008, March 8). *Steve Jobs' 2005 Stanford Commencement Address* [Video]. YouTube. <https://www.youtube.com/watch?v=UF8uR6Z6KLc>
- 2) *Tejaswini Manogna: The Voice of Women*. (2025, May 25). Spotify.
<https://open.spotify.com/episode/3s4v8SzuDQgKpf0tCEuZQP>

Ted / Ink Talks:

- 1) Izadi, S. (n.d.). *The next computer? Your glasses* [Video]. TED Talks. https://www.ted.com/talks/shahram_izadi_the_next_computer_your_glasses
- 2) *The society is our lab - INK Talks*. (2021, December 20). INK Talks. <https://inktalks.com/talks/the-society-is-our-lab/>

Others (Websites & Articles for Reading Skills)

- 1) Business insights, analysis & perspectives | Deloitte Insights. (n.d.). Deloitte Insights. <https://www2.deloitte.com/us/en/insights.html>
- 2) Datta, S. (n.d.). Latest The Hindu Profiles News, Photos, Latest News Headlines about The Hindu Profiles-The Hindu. The Hindu. <https://www.thehindu.com/topic/the-hindu-profiles/>
- 3) IEEE Spectrum. <https://spectrum.ieee.org/>
- 4) Mukunth, V. (n.d.). Sci-Tech News | latest technological developments. The Hindu. <https://www.thehindu.com/sci-tech/>
- 5) TechCrunch. | Startup and technology news. <https://techcrunch.com/>
- 6) Wojnicki, A. (2022, August 2). *A simple way to introduce yourself*. Harvard Business Review. <https://hbr.org/2022/08/a-simple-way-to-introduce-yourself>

COURSE OUTCOMES:

On completion of the course, students will be able to

- CO1:** Comprehend and interpret a variety of English audio sources.
- CO2:** Perform effectively in self-introductions, discussions, debates, and collaborative speaking activities.
- CO3:** Extract relevant information and evaluate content from technical and academic texts using reading strategies.
- CO4:** Construct academic and technical documents with clarity and coherence.
- CO5:** Use appropriate vocabulary and grammar in oral and written tasks.

Board of Studies (BoS):

18th BoS of the Department of English
held on 04.06.2025

Academic Council:

24th AC held on 26.08.2025.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1														
CO2														
CO3														
CO4														
CO5														

Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation

SDG 4: Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.

Statement:

The course equips the students with relevant academic and technical communication skills to gain quality employment and entrepreneurial opportunities.

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – Solution of standard types of first order partial differential equations – Lagrange's linear equation – Linear partial differential equations of second and higher order with constant coefficients.

L – 45; T – 15; TOTAL HOURS – 60

TEXT BOOKS:

1. Ramana B.V, "Higher Engineering Mathematics" Tata McGraw Hill Publishing Co. New Delhi, 2017.
2. B. S. Grewal, "Higher Engineering Mathematics", 45th Edition, Khanna Publishers, New Delhi, 2024.
3. Erwin Kreyszig, "Advanced Engineering Mathematics", 10th Edition, John Wiley and Sons (Asia) Pvt Ltd., 2011 (reprint 2024).

REFERENCES:

1. T. Veerarajan, "Engineering Mathematics", 6th Edition, Tata McGraw Hill Publishing Co., New Delhi, 2018.
2. Jain R. K & Iyengar S. R. K, "Advanced Engineering Mathematics", 5th Edition, Narosa Publishers, 2016.
3. Peter V. O'Neil, "Advanced Engineering Mathematics", 7th Edition, Cengage Learning, 2011.
4. Dennis G. Zill and Warren S. Wright, "Advanced Engineering Mathematics", 7th Edition, Jones & Bartlett (IWAA), Sudbury, 2012.
5. Venkataraman M. K., "Engineering Mathematics", Volume I, 2nd Edition, National Publishing Co., Chennai, 2003.

COURSE OUTCOMES: At the end of the course students will be able to

CO1: use the matrix techniques to compute eigenvalues and eigenvectors of a given matrix.

CO2: apply differential calculus in engineering problems.

CO3: differentiate the functions with more than one variable and their applications.

CO4: solve the differential equations with constant and variable coefficients.

CO5: form and solve the partial differential equations.

Board of Studies (BOS):

17th BOS of Department of Mathematics
and Actuarial Science held on 23.06.2025

Academic Council:

24th AC held on 26.08.2025.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO 1	2	1													
CO 2	3	1													
CO 3	3	1													
CO 4	3	2													
CO 5	3	2													

Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation

SDG 4 – Quality Education: Ensure inclusive and equitable quality education and promote lifelong opportunities for all.

Learning various mathematical tools will lead to knowledge of applications in Engineering problems.

CHE1181	CHEMISTRY FOR ENGINEERING APPLICATIONS	L	T	P	C
SDG: 6, 9		3	0	2	4

COURSE OBJECTIVES: To make the students conversant with

- COB1:** the basic water quality parameters and the current scenario in terms of TDS, TSS, DO, hardness, alkalinity and their treatment.
- COB2:** Preparation, properties and applications of various polymers and composites
- COB3:** Types of corrosion, corrosion rate and control methods
- COB4:** Metals, nonmetals, alloys and their property and applications
- COB5:** Different types of sensors, working principle and applications.

MODULE I	WATER TECHNOLOGY	L:	T:	P:
		9	0	0

Sources of water - Types of impurities in water: Physical, chemical and biological impurities - Specifications of water for domestic use (recommended by BIS and WHO) - Water Quality Parameters: Physical Characteristics - Colour, Turbidity (Turbidimetry and nephelometry), Taste and Odour (dissolved gases), Total Dissolved Solids (TDS), Total Suspended Solids (TSS) and Chemical Characteristics: Hardness - types and estimation (EDTA method), boiler problems, Acidity and Alkalinity (types) and pH correction, DO, BOD, COD - Water softening: Internal Conditioning (Carbonate, Phosphate, Calgon and colloidal conditioning) and External Conditioning (Ion-exchange process) - Desalination: Reverse Osmosis - Purification using nano and biomaterials - Domestic water treatment (Physical Processes: Screening, Aeration, Coagulation, Sedimentation, Filtration, Disinfection (UV treatment, bleaching powder and breakpoint chlorination)) - Heavy metals in water: Arsenic, Lead, Fluoride, Mercury in water, effects and removal.

MODULE II	POLYMERS FOR ENGINEERING APPLICATIONS	L:	T:	P:
		9	0	0

Classification based on source, structure and intermolecular forces (elastomers, fibers, resins, plastics (thermoplastics and thermosetting plastics)) - Society of the Plastics Industry (SPI) Codes - Glass Transition Temperature and its significance - Preparation, properties and applications of: Commodity Polymers: Polyethene (LDPE,

HDPE), PVC and PMMA - Engineering Polymers: polycarbonate, Teflon, bakelite, ABS Co-polymer (Terpolymer) - Conducting polymers (Polyaniline) – Light emitting polymers (Polypyrrole (PPy)) - Biopolymers (PLA) - Dielectric polymers (Polyimide) - Foams (polyurethane) - Polymer blends and alloys (Definition and example) - Compounding and moulding techniques: Types (Injection Moulding and blow Moulding) - Polymers in sensors, self-cleaning and healing polymers (windows).

MODULE III CORROSION AND ITS PREVENTION

L: T: P:
9 0 0

Types of corrosion - dry and wet corrosion - Electrochemical corrosion: galvanic corrosion, differential aeration corrosion and types - Rate of corrosion (weight loss method) - Factors affecting corrosion and determination - Prevention of corrosion: choice of materials and design - Corrosion inhibitors - anodic, cathodic, vapour phase and nano inhibitors - Sacrificial anodic protection and Impressed Current Cathodic Protection - Electroplating and electroless plating of PCB.

MODULE IV METALS, ALLOYS, METAL OXIDES AND COMPOSITES

L: T: P:
9 0 0

Metals: copper, iron, aluminium - electrical conductivity and thermal conductivity, electrical wiring, components - phase changing materials heat sink - Alloys: steel (carbon alloy), brass and bronze (copper alloys), titanium alloys, solder (Pb and Sn) and lead-free solder - strength, hardness, and corrosion resistance - Metal oxides and mixed metal oxides: semiconductor, hardness and strength, catalysts, ceramics, clay based insulating materials - Composites: metal matrix composites, metal ceramics composites, metal fiber composites - strength and weight reduction, Fibre reinforced plastics (FRP).

MODULE V SENSORS

L: T: P:
9 0 0

Sensors: Introduction and types - Principle, working and applications of Electrochemical sensors: MEMS and NEMS – Biosensors: construction, working and classification, Advantages - Biochips and genomics - Touch sensor (oximeter and glucometer) - Toxic gas sensor (H₂S and CO (septic tank)) - Smoke sensor - humidity sensor - temperature sensor - alcohol sensor (breathalyser).

PRACTICALS

1. Estimation of hardness in water sample.

2. Estimation of the alkalinity of water sample.
3. Estimation of dissolved oxygen in water sample.
4. Removal of hardness from the water sample by carbonate and phosphate conditioning.
5. Determination of total suspended solids by evaporation method
6. Preparation of polymers - polylactic acid, epoxy resin, PMMA
7. Moulding - Demo
8. Corrosion (acid, base and salt) and control (anodic and cathodic inhibitors)
9. Rate of corrosion (weight loss method)
10. Electroplating of copper on iron nail and determination of plating rate
11. Estimation of metals in alloys (precipitation method)
12. Synthesis of mixed metal oxides/ceramics/FRP
13. Glucose detection and alcohol sensing

L - 45; T - 0; P - 30; Total Hours: 75

TEXT BOOKS:

1. P.C. Jain and Monica Jain, Engineering Chemistry, 17th Edition, Dhanpat Rai Publishing Company Pvt. Ltd., Delhi, 2025 (ISBN: 978-93-5216-213-0).
2. A. Ravikrishnan, Engineering Chemistry, Sri Krishna Hitech Publishing Company, 2018.
3. K. Sessa Maheswaramma, Engineering Chemistry, Pearson India, 2015 (ISBN: 9789332541573).
4. Rajender Singh, Introduction to Basic Manufacturing Process and Workshop Technology, New Age International Pvt. Ltd., 2006 (ISBN:9788122418460, 8122418465).
5. John Vetelino and Aravind Reghu, Introduction to Sensors, CRC Press, 2011 (ISBN: 9781439808528).

REFERENCES:

1. Clair N Sawyer, Perry L McCarty and Gene F Parkin, Chemistry for Environmental engineering and science, McGraw-Hill, Year: 2003 (ISBN: 9780072480665).
2. Mackenzie L. Davis, Michigan State University and David A. Cornwell, Introduction to Environmental Engineering, V Edition, McGraw-Hill, 2013 (ISBN 9780073401140).
3. Fred W. Billmeyer, Textbook of polymer science, John Wiley & Sons, Year: 1984 (ISBN: 9780471031963).
4. Vasant R. Gowariker, N.V. Viswanathan and Jayadev Sreedhar, Polymer Science, V Edition, New Age International Publishers, 2024 (ISBN: 9789389802580)
5. Mars Fontana, Corrosion Engineering, III Edition, McGraw-Hill India, 1986 (ISBN: 9780070607446)
6. David F. Tver and Roger W. Bolz, Encyclopedic Dictionary of Industrial Technology:

- Materials, Processes and Equipment, Springer US, Year: 1984 (ISBN: 978146159676)
7. John Martin, Materials for engineering, CRC Press, 2006 (ISBN: 9780849387807).
 8. Ali A. Ensafi, Electrochemical Biosensors, Elsevier, 2019 (ISBN: 9780128164914).
 9. Brian R. Eggins, Chemical Sensors and Biosensors, John Wiley & Sons, Ltd., 2002.

COURSE OUTCOMES: The students will be able to

- CO1:** Determine hardness, alkalinity, dissolved oxygen, TSS associated with any water and suggest the treatment processes as per water quality.
- CO2:** Choose the polymers based on properties and application and the method of preparation.
- CO3:** Identify the type of corrosion and suggest the methods to control it.
- CO4:** Choose the materials from metals, meta oxides, alloys and composites based on their property and application.
- CO5:** categorize the sensors based on its applications to real time situation.

Board of Studies (BoS):

14th BoS of Chemistry held on
17.07.2025

Academic Council:

24th AC held on 26.08.2025

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	1	1	2	2		2	1	1	1		
CO2	1	1		1		2		1	1		
CO3	1	1	2	2		2		1	1		
CO4	1	1		1		2		1	1		
CO5	1	1		1		2		1	1		

Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation

SDG 6: Clean Water and Sanitation Ensure availability and sustainable management of water and sanitation for all

SDG 9: Industry, Innovation & Infrastructure Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation

Statement:

Water quality parameters and its treatment methods ensures the availability of clean drinking water, Polymeric and composite materials, metals and alloys as well as sensor systems for sustainable design and industrialization

GEE 1101	ENGINEERING GRAPHICS	L	T	P	C
SDG: 9		2	0	2	3

COURSE OBJECTIVES:

- COB1:** To develop basic skills in engineering drawing and orthographic projection using BIS standards, covering projections of points, lines, and planes in different quadrants.
- COB2:** To visualize and construct orthographic projections of regular solids.
- COB3:** To impart the ability to generate sectional views and determine the true shape of sections, by enhancing interpretation of internal features.
- COB4:** To introduce isometric projections by creating isometric views of regular solids and frustums using isometric axes and scale.
- COB5:** To familiarize with the basics of Computer-Aided Drafting and Design (CADD), and to draw orthographic projection views of simple machine parts.

MODULE I INTRODUCTION TO ENGINEERING DRAWING AND ORTHOGRAPHIC PROJECTION OF POINTS, STRAIGHT LINE AND PLANES L: 08 T: 0 P: 10

Drawing instruments, dimensioning, BIS conventions, types of lines, simple geometric constructions -Scale - Orthographic projection – first angle, second angle, third angle and fourth angle projections - Orthographic projection of points in all quadrants - Projection of straight lines inclined to both reference planes in first quadrant - Projection of plane lamina inclined to both reference planes in first quadrant.

MODULE II ORTHOGRAPHIC PROJECTION OF REGULAR SOLIDS L: 06 T: 0 P: 06

Orthographic projections of solids in first quadrant: Axis inclined to one reference plane -prism, pyramid, cone, and cylinder only– change of position method.

MODULE III SECTIONAL VIEWS OF RIGHT REGULAR SOLIDS L: 05 T: 0 P: 04

Section of solids: prism, pyramid, cone and cylinder– sectional view – true shape of section- cutting simple position solids – section plane inclined to one reference plane only.

MODULE IV ISOMETRIC PROJECTIONS**L: T: P:
05 0 04**

Principle of isometric projection: isometric scale – isometric axes- isometric projection and view of prism, pyramid, cylinder, cone, frustums and combination of simple solids.

MODULE V OVERVIEW OF COMPUTER GRAPHICS AND CADD**L: T: P:
06 0 06**

Listing the computer technologies that impact on graphical communication, demonstrating knowledge of the theory of CAD software such as: The menu system, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), drawing area, dialog boxes and windows, shortcut menus, command line, status bar, zoom as used in CAD, select and erase objects. - Sketching orthographic views of simple solids and machine parts as per first angle projection

L – 30; T – 0; P – 30; Total Hours: 60**TEXT BOOKS:**

1. N.D. Bhatt, "Engineering Drawing", Charotar Publishing house, 54th Edition, 2023.
2. Venugopal. K, and V. Prabhu Raja, "Engineering Graphics", New Age International (P) Ltd., Publication, Chennai, Edition 15th, 2018.

REFERENCES:

1. K.V. Natarajan, "A text book of Engineering Graphics", Dhanalakshmi publishers, Chennai, 31st Edition, 2018.
2. Agrawal B. & Agrawal C. M., "Engineering Graphics", TMH Publication, 2017.
3. Jeyapoovan, T., "Engineering Graphics using AutoCAD", Vikas Publishing House Pvt. Ltd., New Delhi, 7th Edition 2014.
4. AutoCAD Software Theory and User Manuals
5. Engineering graphics You tube Lecture videos link: <https://www.youtube.com/user/BSAUNIV/videos>
6. Alternative NPTEL / SWAYAM course: (1.) Prof. Nihar Ranjan Patra of IIT Kanpur on Engineering Graphics and (2.) Prof. Rajaram Lakkaraju of IIT KGP on Engineering Drawing and Computer Graphics

COURSE OUTCOMES: After completion of the course, the students should be able to

CO1: Apply BIS standards and conventions to create basic engineering drawings, including projections of points, lines, and planes in various quadrants.

CO2: Construct orthographic projections of regular solids with axes inclined

to one reference plane using appropriate methods.

- CO3:** Interpret and draw sectional views of solids and determine the true shape of sections for given cutting plane conditions.
- CO4:** Create isometric projections and views of regular solids and frustums using isometric principles and scale.
- CO5:** Use CAD software tools to generate accurate orthographic views of simple machine parts following first-angle projection standards.

Board of Studies (BoS):

25th BoS of Mechanical held on
09.07.2025.

Academic Council:

24th AC held on 26.08.2025

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	1	1						1			1	
CO2	2	1	1						1			1	
CO3	2	1	1						1			1	
CO4	2	1	1						1			1	
CO5	2	1	1		2				1			1	

Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation

SDG 9: Build resilient Infrastructure, promote inclusive and sustainable industrialization and foster innovation.

Understanding various industrial standards for technical drawing and applying orthographic projections to represent simple solids support the development of innovative designs, contributing to sustainable industrialization.

GEE 1102	DESIGN THINKING	L	T	P	C
SDG: 9		3	0	0	3

COURSE OBJECTIVES:

- COB1:** To impart the basics of design thinking and train the students in identifying the opportunity to develop innovative solutions for problem faced by the society
- COB2:** To introduce the tools of empathy and inculcate the problem definition phase of design thinking
- COB3:** To acquaint the idea generation methods used for solving engineering problems
- COB4:** To develop the culture of making prototype from design concepts
- COB5:** To familiarize the role of innovation and patents in engineering

MODULE I	INTRODUCTION TO DESIGN THINKING	L:	T:	P:
		09	0	0

Importance of design in engineering – Evolution of products – Difference between product, process, system and software – Origin and relevance of design thinking – Stages of design thinking - Customer centric design - Development of user persona – Opportunity and problem identification.

MODULE II	PROBLEM DEFINITION	L:	T:	P:
		10	0	0

Empathy: Tools and methods, empathy map, customer journey mapping – Define: Tools used in define phase, 5-WHY method, fish bone diagram, importance of problem framing, Point Of View (POV) statement. Case studies for empathy and problem definition.

MODULE III	IDEATION	L:	T:	P:
		09	0	0

Idea generation: Tools and methods – Bench marking, Brainstorming, idea affinity maps, 6-3-5 method, Mind mapping, SCAMPER, Co-design - Case studies on ideation.

MODULE IV	PROTOTYPING AND TESTING	L:	T:	P:
		09	0	0

Types of prototypes: Prototype fidelity, Evolutionary vs Throwaway prototypes,

Minimum Viable Prototype, Sketch models, Story boards, Digital prototypes, working prototypes, 3D printed prototypes – User testing with prototypes – Test the design feasibility, capability and usability - Value proposition canvas.

MODULE V INNOVATION

L: T: P:
08 0 0

Creativity and innovation – Role of innovation in Engineering – incremental innovation – Break through innovation - scientific approach to driving innovation – Intellectual property rights – Startups - case studies on innovative products and startups.

L – 45; T – 0; P – 0; Total Hours: 45

TEXT BOOKS:

1. Tim Brown, “Change by Design”, HarperCollins, 2019.
2. Nigel Cross, “Design Thinking”, Berg Publishers, 2011.

REFERENCES:

1. Tom Kelley, “The Art of Innovation”, Profile Books Ltd, London, 2016
2. E. Balagurusamy, “Design Thinking”, McGraw Hill, First Edition, 2024
3. Clive L. Dym, Patrick Little, and Elizabeth J. Orwin, “Engineering Design: A Project Based Introduction”, 4th Edition, Wiley, 2014.
4. Cliff Matthews, “Case Studies in Engineering Design”, John Wiley & Sons Pvt. Ltd, New York, 1998.
5. Eppinger, S. and Ulrich, K., “Product design and development”. McGraw-Hill, 7th Edition 2020.

COURSE OUTCOMES: On completion of the course, students should be able to

- COB1:** Explain the basic concepts of design thinking and identify the opportunity for developing innovative solutions for the problem faced by the society
- COB2:** Empathize to collect customer needs and write problem statement based on design thinking principles
- COB3:** Generate innovative ideas for solving engineering problems using the tools and methods of design thinking
- COB4:** Develop and test simple prototypes to verify design viability
- COB5:** Apply innovative approaches to engineering problems and provide design solutions

Board of Studies (BoS):

25th BoS of Mechanical held on
09.07.2025.

Academic Council:

24th AC held on 26.08.2025

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1			3								1	3	
CO2		1	3	1	3				3			3	
CO3			3		3				3			3	
CO4			3		3				3			3	
CO5			3									3	

Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation

SDG 9: Industry, Innovation & Infrastructure.

The holistic understanding of Engineering design, Design thinking, Prototypes and Creativity and innovation.

Our industries and infrastructure must be upgraded to meet future challenges. In order to achieve this, we must promote innovative, sustainable technologies while also ensuring equal and universal access to information and financial markets.

GEE 1103	DIGITAL MANUFACTURING AND	L	T	P	C
SDG: 8, 9	FABRICATION LABORATORY	0	0	2	1

COURSE OBJECTIVES:

- COB1:** To familiarize with the plumbing and sanitary fixtures in a building.
- COB2:** To understand the materials used in construction, its functions and the structural elements in buildings.
- COB3:** To provide hands-on experience in fundamental manufacturing processes, including various welding techniques and traditional foundry operations, enabling students to understand material joining and shaping.
- COB4:** To introduce modern manufacturing technologies like additive manufacturing (3D printing) fostering diverse fabrication methods.
- COB5:** To provide hands-on experience on basic electrical wiring systems and to ensure safe and effective electrical installations.
- COB6:** To introduce the active and passive electronic components, wire up simple electronic circuits and test them.

LIST OF EXPERIMENTS:**CIVIL ENGINEERING PRACTICE:**

1. Plumbing: Components and tools used in residential plumbing work – Plumbing layout of a typical building – Types of pipes and connection details – plumbing arrangement for washroom and kitchen.
2. Masonry and Concrete: Materials for cement mortar and concrete – Types of wall materials and their arrangement.
3. Steel rebar for construction – Types and properties.
4. Building Frame: Elements of building frame – Typical Load transfer arrangement – Model Making: Foundation, beam and Column.

MECHANICAL ENGINEERING PRACTICE:

1. Introduction to various weld joints. Fabrication of a simple structures using Lap / Fillet Joints using Arc Welding – Gas cutting (Demo)
2. Foundry operations such as sand mold preparation for simple Engineering components.

3. Group exercises in 3D Printers.
4. Joints using Drilling – Study exercise.

ELECTRICAL ENGINEERING PRACTICE:

1. Domestic Wiring
2. Staircase Wiring
3. Measurement of Earth Resistance

ELECTRONICS ENGINEERING PRACTICE:

1. Identifications and symbolic representation of active and passive electronic components
2. Soldering and tracing of electronic circuits and checking its continuity
3. Design and testing of electronic circuits using active and passive electronic components.

L – 0; T – 0; P – 30; Total Hours:30

TEXT BOOKS

1. S.Gowri and T.Jeyapoovan, “Engineering Practices Lab Manual – Civil, Mechanical, Electrical, Electronics included”, Vikas Publishing, 5th Edition, 2019.

REFERENCES:

1. SubhransuSekhar Dash &K.Vijayakumar, “Electrical Engineering Practice Lab Manual”, Vijay Nicole Imprints Private Ltd., First Edition, 2013.
2. Raghbir Singh Khandpur, “Printed Circuit Boards: Design, Fabrication, and Assembly”, Tata McGraw-Hill Education, 2005.

COURSE OUTCOMES: After completion of the course, students should be able to

- CO1:** To recognize the materials used in construction, its functions, and load transfer arrangement of structural elements in a residential building.
- CO2:** To identify the plumbing and sanitary fixtures, and its arrangement in a residential building.
- CO3:** Identify and differentiate various weld joint types and demonstrate

proficiency in fabricating simple structures using arc welding for lap and fillet joints.

CO4: Demonstrate an understanding of additive manufacturing principles and applications.

CO5: Identify active and passive electronic components and Wire up simple electronic circuits, solder the components and test.

CO6: Apply electrical wiring diagrams to construct domestic and staircase wiring systems

Board of Studies (BoS):

25th BoS of Mechanical held on 09.07.2025.

Academic Council:

24th AC held on 26.08.2025

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3				3				2				
CO2	3				3				2				
CO3	3				3				2				
CO4	3				3				2				
CO5	3				3				2				
CO6	3				3				2				

Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation

SDG 8: Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all.

SDG 9: Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation.

Equips individuals with practical skills like welding, basic wiring, and electronic circuit for a stable and sustainable livelihood.

Develops essential infrastructure maintenance skills such as plumbing, and masonry, for resilient and functional buildings and sanitation systems.

GEE 1104	PROGRAMMING FOR PROBLEM SOLVING	L	T	P	C
SDG: 4		2	0	2	3

COURSE OBJECTIVES:

- COB1:** To introduce the basic concepts of computing systems, software, hardware, and programming language evolution.
- COB2:** To equip students with problem-solving skills using algorithms, flowcharts, and design strategies.
- COB3:** To enable students to write structured C programs using variables, operators, control structures, and modular programming with functions.
- COB4:** To gain skills to work with arrays, strings, structures, and unions for solving data manipulation problems.
- COB5:** To provide an understanding of pointers, memory access, file operations, and advanced C programming constructs.

MODULE I	COMPUTATIONAL THINKING AND PROBLEM SOLVING	7
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Fundamental of Computing System-History of computing – Hardware – Software – Languages – Machine - Assembly - High-level - Language Translators – Compiler – Interpreter - Linker - Loader – Program Execution – Design - Flowchart – Algorithm – Design techniques - Divide and conquer- Brute Force – Greedy algorithms - Dynamic Programming.

MODULE II	FUNDAMENTALS OF PROGRAMMING USING C	8
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Introduction to C Programming-Structure of C Program- Applications of C language- Data Types - Variables - Constants - Keywords - Operators: Precedence and Associativity – Expressions - Input and Output operations – Decision making – Branching – Looping statements.

MODULE III	ARRAYS AND FUNCTIONS	8
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Arrays – One dimensional array - Two and multidimensional array – Strings - String operations – Functions - Category of Functions – Call by value – Call by reference – Recursion - Structures - Unions.

MODULE IV POINTERS AND FILE MANAGEMENT**7**

Pointers - Pointer Arithmetic - Pointers and Arrays - Pointers and Strings - Pointers and Functions - File Handling – File Operations - Command Line Arguments - Preprocessor Directives - Enumerated Data Types and Typedef.

PRACTICALS**15**

1. I/O statements and operators
2. Decision Making statements
3. Looping statements
4. Single and Two dimensional Arrays
5. String Operations
6. Functions: call, return, passing parameters by (value, reference), passing arrays to function
7. Recursion
8. Structures and Unions
9. Pointers
10. File operations in C using standard I/O functions

L – 30; P- 15; Total Hours – 45**TEXT BOOKS:**

1. E. Balagurusamy, *Programming in ANSI C*, 9th edition. New Delhi, India: McGraw-Hill Education India, ISBN-13: 978-9355326720, 2024.
2. Y. Kanetkar, “Let Us C: Authentic guide to C Programming Language”, 20th edition. New Delhi, India: BPB Publications, ISBN-13 978-9355515513, 2024.
3. Thomas H. Cormen, Charles E. Leiserson , Ronald L. Rivest, Clifford Stein, “Introduction to Algorithms”, 4th edition, ISBN-13: 9780262046305, 2022.
4. Nell Dale and John Lewis, “Computer Science Illuminated”, 7th edition, Jones and Bartlett Learning , ISBN-13:9781284155617, 2020.

REFERENCES:

1. Kernighan, B.W and Ritchie,D.M, “The C Programming language”, 2nd Edition, Pearson Education, ISBN-13:9789332549449, 2015.
2. Ashok. N. kamthane, “Computer Programming”, 1st Edition, Pearson Education, ISBN-13: 9788131704486, 2007.

COURSE OUTCOMES: The students who complete this course will be able to

- CO1:** Describe the fundamental components of a computing system, evolution of programming languages, and program execution process..
- CO2:** Develop algorithms and flowcharts using standard problem-solving strategies such as divide and conquer, greedy, brute force, and dynamic programming.
- CO3:** Write programs in C using basic syntax, data types, operators, control structures, and functions including recursion.
- CO4:** Implement arrays, strings, structures, and unions to solve real-world programming problems.
- CO5:** Apply the concepts of pointers, file handling, command-line arguments, and preprocessor directives for efficient C programming.

Board of Studies (BoS) :

25th BoS of CSE held on 07.07.2025

Academic Council:

24th AC held on 26.08.2025

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2
CO1	3	2	1	1	1	-	-	-	3	-	2	3	1	1
CO2	3	3	2	2	1	-	-	-	3	-	2	3	2	3
CO3	3	3	3	2	2	-	-	-	3	2	2	2	3	3
CO4	3	3	3	2	2	3	-	-	3	2	2	2	3	3
CO5	3	3	3	2	3	-	-	-	3	2	2	1	3	3

Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation

SDG 4: Quality Education focuses on ensuring inclusive and equitable quality education and promoting lifelong learning opportunities.

Statement: Equipping students with essential programming skills in C programming fosters computational thinking, problem-solving abilities, and software development proficiency that are foundational for lifelong learning and future-ready employment in the digital economy.

GEE 1105	ENVIRONMENTAL SCIENCES	L	T	P	C
SDG: 3, 6, 13, 14, 15		2	0	0	0

COURSE OBJECTIVES: To make the student conversant with the

- COB1:** various natural resources, availability, utilisation and its current scenario.
- COB2:** diverse ecosystems and its function, importance of biodiversity, its values, threats and conservation.
- COB3:** types of pollutants and its impacts on the environment and the effects of natural disasters.
- COB4:** impacts of human population, human health, diseases and immunisation for a sustainable lifestyle.

MODULE I Natural Resources L: 8 T: 0 P: 0

Introduction to Environmental Science - Lithosphere, hydrosphere and atmosphere – Biosphere - Natural Resources: Renewable and non-renewable resources - Natural resources and associated problems: (a) Land resources: soil erosion and desertification (b) Forest resources: deforestation (c) Water resources: conflicts over water, dams: benefits and problems, effects on forest and tribal people, rain water harvesting (d) Mineral resources: environmental effects of extracting and using mineral resources and mining (e) Food resources: changes caused by agriculture and overgrazing, effects of modern agriculture (f) Energy resources: Growing energy needs, renewable and nonrenewable energy sources, use of alternate energy sources.

Case Studies: Case studies in the current scenario in TN/India/across the world

MODULE II Ecosystems and Biodiversity L: 7 T: 0 P: 0

Ecosystems - Concept of an ecosystem and types: Terrestrial Ecosystems: Forest ecosystem, Grassland ecosystem, Desert ecosystem; Aquatic fresh water ecosystems: Ponds and lakes, rivers and streams; Aquatic salt water ecosystems: oceans and estuaries - Food chains, food webs - Energy flow in the ecosystem - Ecological pyramids - Ecological succession - Biodiversity and its conservation: Types: genetic, species and ecosystem diversity - Values of biodiversity - Invasive, endangered, endemic and extinct species - Hot spots of biodiversity and Red Data

book - Threats to biodiversity - Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

Case Studies: Case studies in the current scenario in TN/India/across the world

MODULE III Environmental Pollution and Disaster L: 8 T: 0 P: 0 Management

Carbon foot prints - greenhouse effect, global warming and ozone layer depletion - Sources, cause, effects and control measures of (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Nuclear Hazards (g) ill-effects of fireworks and upkeep of clean environment - Types of fire and fire extinguishers - Solid waste Management: types, collection, processing and disposal of urban waste, industrial waste, e-waste and biomedical wastes - Disaster management: flood, drought, cyclone, landslide, avalanche, volcanic eruptions, earthquake and tsunami.

Case Studies: Case studies in the current scenario in TN/India/across the world

MODULE IV Human Population, Health and Social Issues L: 7 T: 0 P: 0

Human Population, Population growth and population explosion - Population pyramid among nations - Human Rights and NHRC - Value Education - Environment and human health: air-borne, water borne, infectious diseases, contagious diseases and immunisation (all types of vaccines), covid-19 and bioweapons - Risks due to chemicals in food and water, endocrine disrupting chemicals, cancer and environment - Sustainable development and SDG - Resettlement and rehabilitation of people - Programme for Family, Women and Child welfare.

Case Studies: Case studies in the current scenario in TN/India/across the world

L – 30; T – 0; P – 0; Total Hours: 30

TEXT BOOKS:

1. Erach Bharucha, Textbook for Environmental Studies for Undergraduate Courses of all Branches of Higher Education for University Grants Commission, Orient Blackswan Pvt. Ltd., Hyderabad, India, 2013.
2. Benny Joseph, Environmental Studies, Tata McGraw-Hill Education, India, 2009.
3. Ravikrishnan A, Environmental Science and Engineering, Sri Krishna Publications, Tamil Nadu, India, 2018.

4. Raman Sivakumar, Introduction to Environmental Science and Engineering, McGraw Hill Education, India, 2009.
5. Venugopala Rao P, Principles of Environmental Science and Engineering, Prentice Hall India Learning Private Limited; India, 2006.
6. Anubha Kaushik and Kaushik C.P., Environmental Science and Engineering, New Age International Pvt. Ltd., New Delhi, India, 2009.

REFERENCES:

1. Masters G.M., Introduction to Environmental Engineering and Science, Prentice Hall, New Delhi, 1997.
2. Henry J.G. and Heike G.W., Environmental Science and Engineering, Prentice Hall International Inc., New Jersey, 1996.
3. Miller T.G. Jr., Environmental Science, Wadsworth Publishing Co. Boston, USA, 2016.
4. Waste to Resources: A Waste Management Handbook, The Energy and Resources Institute, 2014.
5. <https://www.teriin.org/article/e-waste-management-india-challenges-and-opportunities>.
6. <https://green.harvard.edu/tools-resources/how/6-ways-minimize-your-e-waste>.
7. <https://www.aiims.edu/en/departments-and-centers/central-facilities/265-biomedical/7346-bio-medical-waste-management.html>.
8. <https://tspcb.cg.gov.in/Shared%20Documents/Guidelines%20for%20Management%20of%20Healthcare%20Waste%20Waste%20Management%20Rules,%202016%20by%20Health%20Care%20Facilities.pdf>.

COURSE OUTCOMES: The student will be able to

- CO1:** analyse the current scenario of various natural resources and their depletion and suggest remedies to curb the exploitation.
- CO2:** identify food chains and web and its function in the environment, assess the impacts on the biodiversity and propose solutions to conserve it.
- CO3:** analyse the types and impacts of pollutants in the environment and propose suitable methods to alleviate the pollutants and the natural disasters.
- CO4:** assess on the impact of human population and the health related issues and immunisation practices and sustainable developments for

a healthy life.

Board of Studies (BoS):

14th BoS of Chemistry held on
17.07.2025

Academic Council:

24th AC held on 26.08.2025

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	1		2			3					
CO2	1		2			3					
CO3	1		2			3	1				
CO4	1		2			3	1				

Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation

SDG 3: Good Health and Well-Being	Ensure healthy lives and promote well-being for all at all ages
SDG 6: Clean Water and Sanitation	Ensure availability and sustainable management of water and sanitation for all
SDG 13: Climate Action	Take urgent action to combat climate change and its impacts
SDG 14: Life Below Water	Conserve and sustainably use the oceans, seas and marine resources for sustainable development
SDG 15: Life on Land	Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss

Statement:

Natural resources, land and water ecosystems, biodiversity and its degradation, pollution and its management to have a sustainable environment.

SEMESTER II

MAE 1282	TRANSFORMS AND ITS APPLICATIONS	L	T	P	C
SDG: 4		3	1	0	4

COURSE OBJECTIVES:

COB1: To develop the knowledge of expressing the function as a series and applications of Fourier series.

COB2: To acquire the knowledge of boundary value problems.

COB3: To introduce techniques and engineering applications of Laplace Transforms.

COB4: To know the Fourier transform techniques.

COB5: To acquaint with Z -Transform techniques for discrete time systems.

MODULE I **FOURIER SERIES** **9+3**

Introduction to Fourier Series – Dirichlet's conditions – General Fourier series – Half range Fourier series – Root mean square value – Parseval's identity – Harmonic analysis.

MODULE II **BOUNDARY VALUE PROBLEMS** **9+3**

Classification of second order linear partial differential equations – Solutions of one dimensional wave and heat equations – Steady state solution of twodimensional heat equation – Fourier series solutions in Cartesian coordinates.

MODULE III **LAPLACE TRANSFORM** **9+3**

Introduction to Laplace transform – Existence of Laplace transform – Properties of Laplace transforms – Initial & Final value theorems – Laplace transform of periodic functions – Inverse Laplace transform – Convolution theorem – Solution of ordinary differential equations – Applications.

MODULE IV **FOURIER TRANSFORM** **9+3**

Fourier integral theorem (without proof) – Fourier transform pair – Fourier sine and cosine transform – Fourier inverse transform – Properties – Convolution theorem – Parseval's identity.

MODULE V Z – TRANSFORM**9+3**

Introduction to Z-transform – Properties of Z-transform – Inverse Z-transform – Convolution theorem – Formation of difference equations – Solving difference equations using Z-transform.

L –45; T–15; TOTAL HOURS – 60**TEXT BOOKS:**

1. Ramana B.V, “Higher Engineering Mathematics” Tata McGraw Hill Publishing Co. New Delhi, 2017.
2. B. S. Grewal, “Higher Engineering Mathematics”, 45th Edition, Khanna Publishers, New Delhi, 2024.
3. Erwin Kreyszig, “Advanced Engineering Mathematics”, 10th Edition, John Wiley and Sons (Asia) Pvt Ltd., 2011 (reprint 2024).

REFERENCES:

1. T. Veerarajan, “Engineering Mathematics (for Semester III)”, 3rd Edition, Tata McGraw Hill Publishing Co. New Delhi, 2012.
2. R. K. Jain and S. R. K. Iyengar, “Advanced Engineering Mathematics”, 5th Edition, Narosa Publishers, 2016.
3. Peter V. O’Neil, “Advanced Engineering Mathematics”, 7th Edition, Cengage Learning, 2011.
4. Dennis G. Zill and Warren S. Wright, “Advanced Engineering Mathematics”, 7th Edition, Jones & Bartlett (IWAA), Sudbury, 2012.
5. Alan Jeffrey, “Advanced Engineering Mathematics”, 3rd Edition, Academic Press, USA, 2001(2002).

COURSE OUTCOMES: At the end of the course students will be able to

CO1: derive a Fourier series of a given periodic function by evaluating Fourier coefficients.

CO2: solve boundary value problems.

CO3: use Laplace transforms techniques to solve ordinary differential equations.

CO4: apply Fourier transform to evaluate the integrals.

CO5: solve difference equations using Z-transform.

Board of Studies (BOS):

17th BOS of Department of Mathematics
and Actuarial Science held on
23.06.2025

Academic Council:

24th AC held on 26.08.2025

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1													
CO2	3	2													
CO3	3	2													
CO4	2	1													
CO5	2	1													

Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation

SDG 4 – Quality Education: Ensure inclusive and equitable quality education and promote lifelong opportunities for all.

Learning various mathematical tools will lead to knowledge of applications in engineering problems.

CEE 1201
SDG: 4

SOLID MECHANICS

L T P C
3 0 2 4

COURSE OBJECTIVES:

The objectives of the course are to impart knowledge on

COB1: the basic concepts of stresses, strains, and deformation due to internal forces.

COB2: the principal stresses, strains, and theories of failure.

COB3: theory of torsion, stresses, and deformation in circular and hollow shafts.

COB4: concept of stresses and strains in thin-walled cylinders and spheres with their application.

COB5: concept of stresses and strains in thick-walled cylinders and spheres with their application.

MODULE I PROPERTIES OF MATERIALS 9

Stress - Types of stress – Strain – Types of strains – Poisson’s ratio – Hooke’s Law – Elastic constants and their relationship – Volumetric Strain – Plastic deformation of metals. Tensile test on metals – Standards for different materials (brittle, quasi-brittle, elastic, and ductile) – True stress – strain interpretation of tensile test, and hardness of materials.

MODULE II SIMPLE & COMPOUND STRESSES AND STRAINS 9

Deformation of simple and compound bars – Bar with uniform and varying section – Thermal Stresses – Principal stresses, strain and maximum shear stresses – Mohr’s Circle for Plane stress – Principal theories of failure for a member subjected to biaxial stress.

MODULE III TORSION IN SHAFTS AND SPRINGS 1

Elastic Theory of Torsion – Torsion of Circular and Hollow Shafts - Shaft in series and parallel – Stresses and Deflection in Circular Solid and Hollow Shafts – Combined bending moment and torsion of shafts – Strain energy due to torsion – Power transmitted to shaft.

Types of springs – Open and closed – Carriage or leaf springs – Springs in series

and parallel – Deflection of springs.

MODULE IV THIN-WALLED CYLINDERS AND SPHERES 8

Thin-walled cylindrical shells and spheres – longitudinal and circumferential stresses – hoop, longitudinal, and volumetric strains.

MODULE V THICK-WALLED CYLINDERS AND SPHERES 8

Thick-walled cylindrical shells and spheres – Types - Lamé's theory - hoop and radial stresses – longitudinal, and volumetric strains - compound cylinders.

PRACTICALS:

1. Verification of Hooke's Law for materials – Deflection Test on Members
2. Hardness of metal - Rockwell and Brinell hardness tests.
3. Impact strength of metal - Izod and Charpy methods.
4. Tension test on steel rebars
5. Torsion test on Metals
6. Compression Test on Helical springs.

L – 45; P – 30; Total Hours – 75

TEXT BOOKS:

1. Popov, E.P. and Balan, T.A., "Engineering Mechanics of Solids", Pearson India Education Services, 2nd Edition, India, 2018.
2. Stephen Timoshenko, "Strength of Materials: Elementary Theory and Problems", CBS Publishers & Distributors, 3rd Edition, New Delhi, 2004.

REFERENCES:

1. Jindal, U.C., "Strength of Materials", Pearson Education, India, 2012
2. Ramamrutham, S, and Narayan, S., "Strength of Materials", Dhanpat Rai Publishing Company Pvt. Ltd., New Delhi, 2008.
3. Bedi, D.S., "Strength of Materials", Khanna Publishing House, New Delhi, 2013.
4. Srivastava, A.K and Gope P.C., "Strength of Materials", PHI Learning Pvt. Ltd., New Delhi, 2013.
5. Gambhir, M.L., "Fundamentals of Structural Mechanics and Analysis", PHI Learning Pvt. Ltd., New Delhi, 2011.

COURSE OUTCOMES:

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

CO1: describe stresses, strains, elastic constants of materials, and their relationship.

CO2: determine the principal stresses and strains in materials.

CO3: solve problems based on torsion.

CO4: determine the stresses and strains in thin-walled cylinders and spheres.

CO5: determine the stresses and strains in thick-walled cylinders and spheres.

Board of Studies (BoS):

20th BoS of Department of Civil Engineering
held on 08.07.2025

Academic Council:

24th AC held on 26.08.2025

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	-	2	2	-	-	-	-	-	-	3	-	-
CO2	3	2	-	2	2	-	-	-	-	-	-	3	-	-
CO3	3	2	-	2	3	-	-	-	-	-	-	3	-	-
CO4	3	2	-	2	2	-	-	-	-	-	-	3	-	-
CO5	3	2	-	2	2	-	-	-	-	-	-	3	-	-

Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation

SDG 4: Ensuring inclusive and equitable quality education for all persons and promote lifelong learning opportunities.

Statement: Pursuing the course promotes lifelong learning opportunities for students.

GEE 1201	BASIC ELECTRICAL & MECHANICAL	L	T	P	C
SDG: 8,9	ENGINEERING	2	0	2	3

COURSE OBJECTIVES:

- COB1:** To make the students understand the basic calculations and measurements in DC circuits.
- COB2:** To get overview of basic electrical installations and calculations for energy consumption and single phase transformer and three phase induction motor.
- COB3:** To learn the fundamentals of Internal combustion engines, power plants, turbines and pumps.
- COB4:** To gain knowledge about shafts, keys and couplings and the basics of vibration.

MODULE I DC and AC Circuits L: 8

Voltage, Current, Power, Energy –Circuit Components: Resistor, Inductor, Capacitor – Ohm's Law-Kirchhoff's Laws–Series and parallel circuits-Voltage Division and current Division- Source transformation - Simple problems.

Generation of sinusoidal voltage-RMS and average value, Form factor, Peak factor-Voltage and current relationship with phasor diagrams in R, L, and C circuits-RL, RC and RLC circuits-Real power, Reactive power and Complex power-Single and three phase circuit- Star and Delta connection-Simple problems.

MODULE II AC MACHINES AND SAFETY INSTALLATION L:7

Construction, Principle of operation of single phase transformer and three phase induction motor-applications.

Electrical Installations: Components of LT Switchgear: Switch Fuse Unit (SFU), Miniature Circuit Breaker (MCB), Earth Leakage Circuit Breaker (ELCB), and Residual Current Circuit Breaker (RCCB)-Types of Wires and Cables-Electrical Lighting calculation simple problems-Earthing and its types- Measurement of earthing- I.E. rules relevant to earthing.

MODULE III INTERNAL COMBUSTION ENGINES AND POWER PLANTS L: 7

Internal combustion engines – Types – Working principle of Petrol and Diesel Engines – Four stroke and two stroke cycles – Comparison of four stroke and two stroke engines – Classification of Power Plants - Working principle of steam, Gas, Diesel, Hydro - electric and Nuclear Power plants – working principle of Boilers, Turbines, Reciprocating and Centrifugal Pumps.

MODULE IV MACHINE DESIGN & VIBRATION ANALYSIS

L: 8

Keys, Nuts, Bolts, Screws and Fasteners – Transmission Systems: Chains, Pulleys, and Belts – Couplings and Shafts – Vibration in shaft : Transverse and Longitudinal - Vibrations –Undamped free vibrations –Natural frequency of single degree of freedom system - Transverse vibration with point load and UDL-Dunkerley's method - Critical speed of the shaft - Damping factor and Logarithmic Decrement in free vibration - Forced vibrations - Steady state amplitude - Vibration isolation and transmissibility ratio –Problems.

PRACTICALS:

List of Experiments:

1. Verification of Ohm's law and Kirchhoff's law.
2. Measurement of voltage, current, power in AC/DC circuits.
3. Load test on single phase transformer.
4. Load test on three phase induction motor.
5. Familiarization with protective devices.
6. Valve Timing diagram for four stroke engine
7. Performance test on four stroke Diesel engine
8. Vibrating spring mass system -Determination of damping co-efficient of single degree of freedom system.
9. Transverse vibration – Determination of natural frequency of undamped and damped vibration of beam.

L – 30; P – 30; Total Hours:60

TEXT BOOKS:

1. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw-Hill Education, 1st Edition, 2019.
2. Edward Hughes, "Electrical and Electronics Technology", Pearson India, 12th Edition, 2016.

3. Mehta, V. K., Mehta, Rohit "Principles of power system" S. Chand & company LTD., 4th edition, 2005.
4. R.K Rajput, Thermal Engineering, Laxmi Publications, 2020
5. R.K. Bansal, Fluid Mechanics and Hydraulic Machines, Laxmi Publications, 2019
6. R.S. Khurmi & J.K. Gupta "Theory of Machines", S. Chand Publications, 14th edition, 2020.

REFERENCES:

1. D P Kothari and I J Nagrath, "Basic Electrical Engineering", McGraw Hill Education, 1st Edition, 2017
2. Cotton H, "Electrical Technology", CBS Publishers, 7th Edition, 2007.
3. Del Toro, "Electrical Engineering Fundamentals", Pearson Education, 2nd Edition, New Delhi, 2015.

COURSE OUTCOMES: The students will be able to:

- CO1:** Perform the basic calculations in DC and AC circuits and measure the various quantities associated with DC and AC circuits.
- CO2:** Understand the constructions of single phase transformer and three phase induction motor, wiring methods, electricity billing, and working principles of circuit protective devices and personal safety measures.
- CO3:** Explain the working of Internal combustion engines, power plants, turbines and pumps
- CO4:** Understand the basics of mechanical elements and able to solve vibration problems in shafts.

Board of Studies (BoS):

21st BoS of EEE held on 23.06.2025.

Academic Council:

24th AC held on 26.08.2025

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	1	1	2	2	-	-	-	-	-	-	2	1	3
CO2	2	3	2	1	-	-	-	-	-	-	3	3	3
CO3	3	2											
CO4	3	2											

Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation

SDG 8: Decent work and economic growth.

Statement: The learners of this course can get decent work and earn financial benefits and they can work in interdisciplinary areas

SDG 9: Build resilient Infrastructure, to support economic development and human well-being with a focus on affordable and equitable access for all.

Statement : The complete understanding of electron devices and components lead to sustainable industrialization and promote economic development.

MEE 1201	ENGINEERING MECHANICS	L	T	P	C
SDG: 9		2	1	2	4

COURSE OBJECTIVES:

- COB1:** To introduce the basic laws of mechanics, resolution of forces, equilibrium of particles in 2D and 3D force systems.
- COB2:** To enhance knowledge about moments, supports reactions and equilibrium of rigid bodies
- COB3:** To educate surface properties such as centroid and moment of inertia
- COB4:** To impart knowledge on friction and its applications
- COB5:** To develop knowledge on the laws of motion, work energy principles and impact of bodies

MODULE I	FORCE VECTOR AND EQUILIBRIUM OF	L:	T:	P:
	PARTICLE	06	03	06

Introduction - Vectorial representation of forces and moments - Laws of Mechanics - Forces in plane and space - - Resolution and Composition of forces- Lamé's theorem - Equilibrium of a particle in 2D plane - Equilibrium of a particle in 3D.

Practical Experiments:

1. Verification of Triangle Law of Forces
2. Verification of Polygon Law of Forces

MODULE II	MOMENT AND EQUILIBRIUM OF RIGID	L:	T:	P:
	BODY	06	03	06

Moments and Couples – Moment of a force about a point and about an axis – Equilibrium of Rigid bodies in two dimensions –Examples- Varignon's theorem- Free body diagram – Types of supports and their reactions – requirements of stable equilibrium.

Practical Experiments:

1. Finding the Moment using BCL
2. Determining the Support Reactions in SS Beams

MODULE III PROPERTIES OF SECTIONS**L: T: P:****06 03 06**

First moment of area and the Centroid of sections – T section, I section, Angle section, Hollow section using standard formula – Second moments of plane area – Physical relevance - Standard sections: Rectangle, triangle, circle-composite sections, Hollow section using standard formula –Parallel axis theorem.

Practical Experiments:

1. Centre of Gravity of Plane Lamina
2. Moment of Inertia of I Section (MAT LAB)

MODULE IV FRICTION**L: T: P:****06 03 06**

Introduction to friction- types of friction- Laws of Coulomb friction- Frictional force – simple contact friction –Block friction– ladder friction and rolling resistance.

Practical Experiments:

1. Find the Coefficient of Friction between two surfaces
2. Determination of angle of repose.

MODULE V FORCES IN MOTION**L: T: P:****06 03 06**

Laws of motion – D'Alembert's principle and its applications in plane motion- Work Energy Equation of particles– Impact of elastic bodies.

Practical Experiments:

1. Work Energy Principle. (MAT LAB)
2. Coefficient of Restitution. (MAT LAB)

L – 30; T – 15; P – 30; Total Hours – 75**TEXT BOOKS:**

1. Beer, F.P and Johnston Jr. E.R, —Vector Mechanics for EngineersII, McGraw Hill Education, 12th Edition, 2017.
2. R.K. Bansal., —A Text Book of Engineering MechanicsII, Laxmi Publications, 6th Edition, 2015.

REFERENCES:

1. Russell C Hibbeler, —Engineering Mechanics: Statics & Dynamics, 14th Edition, Pearson, 2015.
2. Irving H. Shames, —Engineering Mechanics – Statics and Dynamics, 4th Edition, Pearson Education India, 2005.
3. R.S. Khurmi., —A Text Book of Engineering Mechanics, S. Chand Publishing, 22nd Edition, 2019.

COURSE OUTCOMES: After completion of the course, the students should be able to

- CO1:** Resolve forces, apply the concept of equilibrium to particles, and solve problems.
- CO2:** Apply the concept of equilibrium to rigid bodies and solve problems.
- CO3:** Determine the centroid and moment of inertia of the bodies.
- CO4:** Analyse and evaluate the frictional forces between the bodies.
- CO5:** Apply the laws of motion in solving dynamics problems

Board of Studies (BoS):

25th BoS of Mechanical held on
09.07.2025.

Academic Council:

24th AC held on 26.08.2025

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	PSO1	PSO2
CO1	3							3	3			3	
CO2	3							3	3			3	
CO3	3				2			3	3			3	
CO4	3							3	3			3	
CO5	3				2			3	3			3	

Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation

SDG 9: Build resilient Infrastructure, promote inclusive and sustainable industrialization and foster innovation.

Acquiring problem solving ability and analysing skills on the various topics of engineering mechanics such as equilibrium, centroid, moment of inertia, friction and dynamics will support the development of innovative designs, contributing to sustainable industrialization.

CEE 1202	CONSTRUCTION MATERIALS AND	L	T	P	C
SDG: 9	PRACTICES	3	0	2	4

COURSE OBJECTIVES:

The objectives of the course are to

- COB1:** Provide knowledge on physical and mechanical properties of basic construction materials.
- COB2:** Introduce allied construction materials and their applications in modern engineering practices.
- COB3:** Familiarize students with different building components and structural systems.
- COB4:** Develop an understanding of conventional and advanced construction practices.
- COB5:** Equip students with practical knowledge of construction equipment and field applications.

MODULE I BASIC CONSTRUCTION MATERIALS & PROPERTIES **L:9**

Physical and mechanical properties of construction materials – Bricks – Types, Stones, coarse aggregate, fine aggregate cement and steel alloys: Manufacturing process and testing methods as per Indian standards.

MODULE II ALLIED CONSTRUCTION MATERIALS **L: 9**

Tiles, refractory lining materials, Bitumen and asphaltic materials, Timber, Glass and Plastics, Geopolymer, Metals for cladding, Paints and varnishes, Acoustic material, geo-textiles, rubber and asbestos, laminates and adhesives, Graphene, Fibre reinforced plastics, carbon composites and other engineering materials: Salient properties and application areas.

MODULE III BUILDING COMPONENTS AND STRUCTURAL SYSTEMS **L: 9**

Overview of building process - elements of a building - basic requirements of a building. Types of structures: Load Bearing, framed, steel and composite structures. Foundation – Types , Functions and requirements of good foundation. Walls: Types of walls - load bearing, partition walls and cavity walls. Doors, Windows and Ventilators - Materials and types. Floors: Category, types of flooring materials and

application. Roof: Types, materials and application areas. Lintels and arches, Staircase - types.

MODULE IV BASIC CONSTRUCTION PRACTICES

L: 9

Masonry - Definition and terms used in masonry - Mortar – Ingredients – Mixing – Grades. Brick masonry - characteristics and requirements of good brick masonry - Types of Bonds in brick work - Stone masonry - Joints in masonry. Plastering and Pointing - purpose, materials and methods of plastering and pointing - defects in plastering. Painting – Purpose, surface preparation, application areas and defects. Form work and Scaffolding – 3d printing technology.

MODULE V CONSTRUCTION EQUIPMENT

L: 9

Excavator – concrete mixers – hoists and lifts – concrete pumping equipment – cranes – types and applications.

PRACTICALS

P: 30

List of Experiments:

1. Tests on cement: Fineness test, initial and final setting time, standard consistency, specific gravity.
2. Tests on fine aggregate: Particle size distribution using sieves, Specific gravity, bulking and water absorption of Fine aggregate.
3. Tests on coarse aggregate: Particle size distribution using sieves, Specific gravity, water absorption of coarse aggregate.
4. Test on Tiles
5. Test on Bricks – Water absorption, Efflorescence, Compressive Strength
6. Bonds used in brick Masonry - Demonstration
7. Plastering Process – Demo – Site Visit
8. Making model for Building Components
9. Painting – Exercise - Demo – Site Visit

L – 45; T – 0; P – 30; Total Hours: 75

TEXT BOOKS:

- [1] S. K. Duggal, *Building Materials*, New Delhi, India: New Age International Publishers, 2021.
- [2] M. S. Shetty, *Concrete Technology*, New Delhi, India: S. Chand & Company

Ltd., 2020.

- [3] B. C. Punmia, A. K. Jain, and A. K. Jain, *Building Construction*, New Delhi, India: Laxmi Publications, 2022.
- [4] P. C. Varghese, *Building Materials*, New Delhi, India: PHI Learning Pvt. Ltd., 2016.
- [5] P. K. Mehta and P. J. M. Monteiro, *Concrete: Microstructure, Properties, and Materials*, 4th ed., New York, USA: McGraw Hill Education, 2014.

REFERENCES:

- [1] S. C. Rangwala, *Engineering Materials*, Anand, India: Charotar Publishing House, 2021.
- [2] Bureau of Indian Standards, *IS 456: 2000 – Plain and Reinforced Concrete – Code of Practice*, New Delhi, India: BIS, 2000.
- [3] Bureau of Indian Standards, *IS 383: 2016 – Specification for Coarse and Fine Aggregates for Concrete*, New Delhi, India: BIS, 2016.
- [4] A. M. Neville, *Properties of Concrete*, 5th ed., Harlow, UK: Pearson Education, 2012.
- [5] R. K. Rajput, *Engineering Materials*, New Delhi, India: S. Chand Publishing, 2019.

COURSE OUTCOMES:

By the end of this course, students will be able to:

- CO1:** Explain the properties, manufacturing processes, and testing methods of basic construction materials.
- CO2:** Describe the properties and applications of allied and advanced construction materials.
- CO3:** Explain the building components, structural systems, and their functional requirements.
- CO4:** Apply knowledge of masonry, plastering, painting, formwork, and scaffolding techniques in practice.
- CO5:** Select appropriate construction equipment and technologies for efficient site execution.

Board of Studies (BoS):

20th BoS of Department of Civil Engineering
held on 08.07.2025

Academic Council:

24th AC held on 26.08.2025

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	-	-	-	2	-	-	-	-	2	3	3
CO2	3	3	2	-	2	2	-	-	-	-	2	3	3
CO3	3	3	3	2	-	2	-	-	-	-	2	3	3
CO4	2	2	3	2	2	1	-	2	2	-	2	3	3
CO5	3	3	3	3	3	3	-	2	2	2	3	3	3

Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation

SDG 9: Build resilient Infrastructure, promote inclusive and sustainable industrialization and foster innovation.

Statement:

This course empowers students to contribute toward SDG 9 by fostering innovation in construction materials, promoting sustainable practices, and developing resilient infrastructure through modern technologies.

GEE 1205	UNIVERSAL HUMAN VALUES	L	T	P	C
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SDG: 4, 8, 10, 16 and 17

COURSE OBJECTIVES:

The objectives of the course are to

- COB1:** To enable students to grasp the fundamental concepts and significance of value education, fostering positive behavioral changes that enhance their personal growth and professional conduct.
- COB2:** To examine core human values, the relationship between the self and the body, and how these values can guide ethical behavior in both personal and professional contexts.
- COB3:** To promote understanding of the principles of harmony within oneself, relationships, families, and society, and how these contribute to a sustainable and balanced life.
- COB4:** To provide knowledge and insights into the ethical responsibilities of engineers, the significance of engineering ethics, and the importance of leadership and ethical decision-making in the field.

MODULE I INTRODUCTION TO VALUE EDUCATION L: 8

Value Education - Concept, Importance and Need - components of Value Education, Human Rights and Value Education - Self-exploration as the Process for Value Education - Continuous Happiness and Prosperity - The Basic Human Aspirations, Method to Fulfil the Basic Human Aspirations - Strategies for Transition towards Value - based Life and Profession

MODULE II HARMONY IN THE HUMAN BEING L: 7

Meaning and Relevance of Harmony in Human Beings - Core Human Values - Application of Universal Human Values - Understanding The Human Being as Co-Existence of Self ('I') And Body - The Needs of Body vs. Self - Fulfilling the Needs of the Self and Body - Understanding the Relationship between Body and Self - the Activities of the Self and the Body - The Mind as a Key Factor in Fostering Harmony in Human Beings - The Influence of Scriptures on the Formation of Human Values.

MODULE III HARMONY IN THE FAMILY, SOCIETY AND NATURE L: 7

Components of Harmony in the Human Beings – Harmony in The Family: Understanding Values in Human Relationships - Vision for The Universal Human Order – Harmony in Nature: The Four Orders in Nature - Understanding Harmony in The Society.

MODULE IV THE BASICS FOR ETHICAL CONDUCT OF ENGINEERS L: 8

Why Engineers Should Learn About Ethics - Significance of Engineering Ethics - Senses of Engineering Ethics - Engineering Code of Ethics - Commitment: The Foundation of Professional Success in Engineering - Leadership in Engineering and Industry - The Ethical Implications of Technology.

L – 30; Total Hours: 30

TEXT BOOKS

1. Anand, R. (2025). Foundation course in universal human values and professional ethics (1st ed.). CBS Publishers & Distributors. ISBN 978-8197982231
2. Maio, G. R. (2016). The psychology of human values. Routledge.
3. Narayan, S. (2015). *Value Education: A Source Book for Teachers and Educators*. Pearson Education India.
4. Kumar, K. (2016). *Human Rights and Value Education*. National Book Trust.
5. Rao, K. S. (2013). *Ethics in Engineering Education: Value-Based Approach*. I.K. International Publishing House.
6. Bhattacharyya, S. (2014). *Education and Value Systems: A Conceptual Approach*. Academic Publishers.
7. Laszlo, E., & Wilbur, J. B. (Eds.). (1971). Human values and the mind of man: Proceedings. Gordon & Breach.

REFERENCE BOOKS

1. Giri, A. K. (Ed.). (2022). *Mahatma Gandhi and Sri Aurobindo*. Routledge India.
2. Vasudevan, S. (2018). *Universal Human Values: A Guide for Educators and Students*. Chintan Publications.
3. Schwartz, M. S. (2017). *Ethical Decision Making in Engineering*. Wiley-IEEE Press.
4. Sreenivasan, G. (2012). *Engineering Ethics: Concepts and Cases*. Wadsworth Publishing.
5. Chakrabarty, B. (2019). *Harmony in the Human Being: A Philosophical and Practical Approach*. Orient Black Swan.
6. Slote, M. A. (2013). Education and human values: Reconciling talent with an ethics of care. Routledge. <https://doi.org/10.4324/9780203116555>

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		3	3		3	3	3		3		3	3
CO2			3			3	3		3		3	3
CO3	2	2	3			3	3		3		3	3
CO4			3			3	3	3	3		3	3

Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation

SDG 4: Quality Education focuses on value education, which is essential for promoting inclusive and equitable quality education. It emphasizes the development of critical thinking, ethical conduct, and personal growth, all of which are key components of quality education.

SDG 8: Decent Work and Economic Growth highlights the ethical implications of technology that is essential for fostering responsible and ethical behavior in future engineers, and which contributes to decent work and economic growth.

SDG 10: Reduced Inequalities aligns with efforts to reduce inequalities by encouraging ethical behavior, respect for others, and harmonious relationships, which are essential in building inclusive societies.

SDG 16: Peace, Justice, and Strong Institutions promotes peaceful and inclusive societies, access to justice for all, and accountable, effective institutions. It aligns deeply with the principles of value education by emphasizing harmony, ethical conduct, human rights, and social justice.

SDG 17: Partnerships for the Goals integrating ethics into professional education, especially for engineers, students are encouraged to contribute positively to collaborative global efforts in solving complex challenges.

The course syllabus aligns with **SDGs 4, 8, 10, 16 and 17** by focusing on value education, ethics, human rights, harmony, and responsible engineering practices. It contributes to peaceful, just, and inclusive societies through self-awareness, interpersonal harmony, and responsible citizenship aligned with universal human values. These themes are essential for promoting sustainable development, equality, and ethical conduct, which are core elements of the SDGs.